

The Effect of Being an Only Child on Adolescent Mental Health

--- Evidence from the Chinese Family Panel Studies

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Abstract:

This study was undertaken to determine whether or not the negative relationship between being an only child and adolescent mental health that has been found in previous studies holds true in the Chinese context, using an instrumental variable technique to identify causality. I examined a total of 3,262 adolescents between the ages of 12 and 17 from 25 provinces in China using the China Family Panel Studies (CFPS). Mental health status was measured using the Center for Epidemiologic Studies Depression (CES-D) score and its four components: the somatic symptoms score, the depressed affect score, the positive affect score, and the interpersonal problems score. Contrary to most of the previous studies, I find no significant difference between adolescents who are only children and adolescents who have siblings for three of the measures of mental health (somatic symptoms, depressed affect, and interpersonal problems) considered. Furthermore, where differences are found (overall CES-D and positive affect), I find that adolescents who are only children possess *better* mental health. Urban children show significantly better mental health than rural children. Children who are 14 years of age appear to be those with relatively worse reported mental health, an effect which is more significant among girls.

Keywords: One Child Policy, Only Child, Mental Health

I. Introduction

Adolescence is a time of psychosocial and biological transition, as well as a time when symptoms of many mental disorders first emerge. More than half of substance and drug abuse problems begin by the age of 14 and three-quarters begin by the age of 24 (Kessler et al., 2005). Along with these issues come negative emotional and behavioral patterns including decreased academic performance, an increased risk of unprotected sex, and increased incidences of teen pregnancy and impaired relationships (Murphey et al., 2013). According to the World Health Organization (WHO) (2014), 1.3 million adolescents died worldwide in 2012. Most of these deaths were preventable or were the result of treatable conditions. Depression was the leading cause of disability among adolescents and suicide was the third leading cause of death (WHO, 2014).¹ The proportion of mid-adolescents who experience feelings of depression and uncertainty is striking. Flemming et al. (1989) finds that 1.8 percent of children between the ages of 12 and 16 in Ontario, Canada have severe depressive syndrome, of which 1.8 percent and 7.8 percent have moderate and severe depression. Liu et al., (1999) conducted

¹ The first was road injuries and the second was HIV (WHO 2014).

a survey of 2,462 students measuring a SDS (Self-Rating Depression Scale) in the Shandong Province of China. The study shows that 16.9 percent of adolescents exhibited signs of depression. Thus, the mental health of adolescents is a concern in both developed and developing countries.

In developed countries, some empirical studies have sought to examine the correlation between sibling size and the mental health of adolescents. These studies compare adolescents between those who do not have siblings (only children) and those who do. Adolescents who are only children demonstrate better mental health than those with siblings in Britain and Denmark (Lawson et al., 2010; Pedersen et al., 2004).

Smaller families are encouraged in many developing countries for health, economic development and quality of living standard. For example, reductions in family size should improve children's health by increasing parental investment on every child (Angrist et al., 2010). Numerous studies using Chinese data have found that adolescents from only-child families are more likely to suffer from depression and anxiety and are more prone to frustration when compared to adolescents who have siblings (Jiao et al., 1985; Fan et al., 1984; Munakata et al., 2005). However, Yang et al. (1995), Hesketh et al. (2003), and Falbo et al. (1990) find that adolescents from only-child families have better mental health in that they are found to be less likely to have anxiety, less likely to report high levels of fear and depression.²

Unlike the studies described above, many studies treat sibling size as endogenous. Specifically, the authors of these studies worry that unobserved characteristics of parents simultaneously determine the number of children they will have, and the kind of time and money investments they will make in their children. Thus the number of siblings present in a family and the outcomes of those siblings (health or educational outcomes for example) are endogenous - and OLS regressions cannot establish any causality. To address the endogeneity of sibling size, researchers have used natural occurrences of twins and gender composition as instruments since parents of same-gender siblings are more likely to have an additional child (Angrist et al., 1998).

² There are some studies that show that gender and location of residence play an important role in mental health status. Girls and adolescents living in urban areas receive higher ratings in regards to depression and moodiness factors (better mental health) than boys and adolescents living in rural areas (Tseng et al., 1990; Munakata et al., 2005).

Being an only child is not always associated with worse outcomes. A related literature looks at the relationship between sibling size and adolescents' school attainment. Using similar instruments as those discussed above, adolescents who are only children are found to have higher educational attainment in Norway and Israel (Black et al., 2005; Angrist et al., 2010) while no such correlation is found in China and India (Rosenzweig et al., 1980b; Li et al., 2008).

Using a sample of adolescents born just before and just after the introduction of China's One Child Policy (OCP), Cameron et al. (2013) use the OCP as an instrument for having an only child. They find that adolescents who are from only-child families are less willing to share, less trusting, more willing to compete and take fewer risks. Similarly, Qian (2010) use a sample of first-born adolescents who were born between the years 1972 to 1982 (born before and born after the OCP) to study the effect of family size on adolescents' educational attainment. They use the relaxations of the OCP as an instrumental variable for family size and find a positive correlation between family size and adolescents' educational attainment.³

China's OCP was implemented in the late 1970s in response to concern regarding the social and economic consequences of rapid population growth. The government promoted this policy by offering a financial subsidy and providing preferential access to schools and health care to families that have only one child (Hesketh et al., 1997). The policy was strictly applied to the people of *Han* ethnicity, people who work for the government, and people living in urban areas (Hesketh et al., 2005).⁴ The targeted families who chose to have more than one child were forced to forgo jobs, birth certificates for the second child, benefits for their children, and were forced to pay fines (Settles et al., 2002). As Figure 1 shows, the policy effectively controlled the natural population growth rate by dropping the rate from 12 permille to 4.92 permille between the years 1978 and 2013 (National Bureau of Statistics of China, 2014). More details on One Child Policy are provided in section 2.

³ Relaxation in the One Child Policy (1-son-2-child policy): government allows rural couples to have a second child if the first child was a girl.

⁴ The *Han* ethnicity was the only ethnicity that was targeted by the policy at beginning. However, as many minority groups grew, the government also applied the policy to those minorities with a population of over 10 million. Thus, minorities of the *Zhuang and Man* ethnicities were also restricted by the policy in 1980s. However, the restriction varied from province to province.

In this paper, I will identify the effect of being an only child on the mental health of adolescents, specifically. I use the sample of 12-17 year olds from the 2012 China Family Panel Studies (CFPS) which covers 25 provinces. Mental health is measured using the Center for Epidemiologic Studies Depression (CES-D) Scale and its four components: somatic symptoms, depressed affect, positive affect, and interpersonal problems. I also take advantage of China's OCP to address the endogeneity of having an only child, similar to Cameron et al. (2013) and Qian et al. (2010). Three instrumental variables are included: having a parent who works for the government, having a parent with an education level higher than college, and having a parent who belongs to the *Han, Zhuang, or Man* ethnicities. These are targeted groups in the OCP, as mentioned above, which should directly impact the number of children in a family. For example, the policy is strictly enforced upon residents of the *Han, Zhuang, and Man* ethnicities and government employees. Therefore, parents falling into these categories should be more likely to have only one child.

This work builds on the existing literature done in the Chinese context examining the effect of being an only child on mental health in three ways. First, the existing papers do not use validated measures of mental health but rely instead on teachers' or parents' and schools' evaluations or the adolescent's performance in games.⁵ Second, these papers focus on one province or just a few provinces, thus limiting the representativeness of their findings. Third, these studies rely on relatively old data (the 1980s through the 1990s) which may not be representative of China's current situation. This is especially true since rapid economic development has occurred in the past twenty years and this may have remedied the limitations to the access of health care and resources.

I find that there is no significant difference between adolescents who are only children and those who have siblings in regards to somatic symptoms, interpersonal problems, and depressed affect. However, the difference is significant when mental health is measured in the full sample using CES-D scores and positive affect. In the male subsample, adolescents who are male only children have a lower score (*better* mental status) than boys with siblings in depressed affect at a 1 percent significance level. In

⁵ Cameron et al. (2013) use adolescents' performance in games as the benchmark for mental health. Jiao et al. (1985), Falbo et al. (1990), Fan et al. (1984) and Hesketh et al. (2003) use evaluations from teachers or parents and school performance as the indicators for mental health.

addition, adolescents who are female only children also show a *better* mental status than females with siblings in measuring the female subsample of positive affect, somatic symptoms, and CES-D.

In Section 2, I will summarize China's Cultural Revolution and One Child Policy in detail. In Section 3 I will discuss the empirical model and then introduce the relevant econometric approach. In Section 4, I summarize the data. In Section 5, I present the results of the regression analysis. In Section 6 I discuss the results of the analysis, limitations and directions for future work.

II. Big context in China ---- beginning in the 1960s

i. The Cultural Revolution

Similar to other larger nations, China has experienced a long, drastic, and tortuous path towards development. The leader of the Communist Party, and also the chairman of China at that time, Mao Zedong, started the Cultural Revolution (CR) in May of 1966. Most intelligentsia and people in the upper class were targeted as a group that “might become a ‘privileged stratum’ and take the capitalist road” (Deng et al. 1997, page 399; Bernstein 1977, page 19). Thus “intelligentsia origins were often treated as tantamount to ‘bad’ class backgrounds” (Bernstein 1977, page 18).

Right after the CR began, secondary schools and universities were gradually closed, causing a massive disruption of education in China. The government sent students to factories and to the countryside to perform manual labor instead of providing these students with further schooling. Universities were then reopened in 1972. The only eligible applicants were workers including peasants and soldiers. In 1977, universities reestablished entrance exams and recruited qualified teachers. During the first few years after the entrance exams resumed, many people were still afraid of becoming involved in political issues by going back to school. As a result, people worked in the countryside and factories for years rather than attending university. These people preferred to stay in their positions rather than receive an improved education. At this time, the government promised to assign government jobs to encourage people to take the entrance exams necessary for university admission. Therefore, all of the candidates, including new secondary school graduates and people who had qualified for testing during the past ten years, were competing for a limited number of positions in the government-run organizations. (Deng

et al., 1997; Xiao, 2011).

The CR was a disaster for China in many ways including economic, educational, and human capital. The CR shortened the education system from 12 years to 9 years for primary and secondary schools, which decreased the potential human capital stock by at least 14.3 percent. Undergraduate and graduate educations ceased for almost ten and twelve years, respectively. Moreover, fourteen million people were sent to the countryside and to factories without secondary school graduation certificates (Cai et al., 2003). Using a one percent sample from the 1982 census of China, Deng (1997) showed that educational attainment in China was much weaker than other countries during the CR. Additionally, the impact of the CR was more severe on intelligentsia than it was on peasants and cadres.⁶ Dong (1999) estimated that the yearly investment efficiency index during the years of 1966 through 1970 (during the CR) was 74.8 percent, which is 3 percent lower than the years following the CR and five years prior to the CR. CR is one of the most crucial factors led to most of parents in my sample have lower schooling.

Undoubtedly, the CR resulted in a significant turning point in China. It changed the educational system, the direction of economic development, and the political structure of the nation. Since the economy and Chinese residents are now liberated from the CR, the government is determined to seek opportunities to develop economic and human capital, and eliminate any barriers.

ii. The One Child Policy

China's government recognized the potential threat and the social and economic consequences of the rapid population growth occurring since the 1950s (Kane et al., 1999). In 1970, the population growth rate in China was at 2.74 percent, as compared to India, the United States and Vietnam with population growth rates were at 2.25 percent, 0.92 percent and 2.6 percent respectively (United Nations, 2014). The government estimated that the population would climb to 1.3 billion by the year 2000, or even rise to 2.1 billion by the year 2080, if something was not done to decrease the population growth rate.

⁶ Cadres: people who work for the government.

The goal of the Chinese government was to control the population growth to a rate of one percent in 1980, reaching a growth rate of zero by the year 2000 (Ching, 1982; Kane et al., 1999). In 1979, China implemented the OCP as an official policy to control the growth of the population. This policy was made compulsory in 1980. Within just thirty years, the population growth rate dropped from 1.3 percent in 1979 to 0.5 percent in 2012. In addition, the fertility rate decreased from 18.25 percent in 1978 to 12.08 percent in 2013 (National Bureau of Statistics of China, 2014). The policy significantly decreased the number of children who were born in China by approximately 400 million from 1978 to 2013 (Feng et al., 2013).

The government encouraged citizens to have one child by giving families who complied a financial subsidy and providing them with preferential access to housing, schools, and health services (Kane et al., 1999; Hesketh et al., 2003). Urban families received an additional 5 percent of the average capital income. Rural families were paid much more than 5 percent. This subsidy was effective until their children reached 14 years of age (Hesketh et al., 1997).

In urban areas, the government was forced to rely on fines to control the nation's birth rates and enforce the policy. The amount of these fines, however, varied from one province to another (Hesketh et al., 1997). The penalty was proportionate to monthly salaries, sometimes as high as 70 percent (Li et al., 2008). In families with more than one child, the second child did not have the right to *hukou* or an approval for a certificate of birth approval (White, 2006).⁷ People who worked in government-run organizations usually experienced social pressures, job loss, elimination of benefits for their children, steep fines, and seizure of possessions as permanent punishments for violating the policy (Settles et al., 2002).

The policies worked very well in large cities. It was difficult, however, to convince rural residents to follow the policy's guidelines. Rural residents, such as peasants, have multi-generation families for not

⁷ *Hukou*: a system of household registration by law in China. A household registration officially identifies a person as a resident of an area that including identifying information such as name, birth place (rural or urban), parents, spouse, date of birth, job title.

only traditional reasons, but also because more children in a family equates to more means of support in old age. While local authorities did spread and promote the benefit of having only one child, these same authorities also allowed a family to have more than one child if the first child born was a girl. This was due to the fact that boys are traditionally more beneficial to a family's economic welfare (Hesketh et al., 2005).

It is important not to underestimate the success of the OCP over the past three decades. The policy did manage to impede the population growth rate in China. As Figure 2 shows, the average number of children per woman decreased from an estimated 2.8 children between the years 1975 and 1980 to approximately 1.7 children between the years 2010 and 2015. As can be seen, the negative effect on fertility may have been caused by the OCP. As such, a reduction in infant mortality and fertility is one of the outcomes that can be reached by proper family planning programs in developing countries.⁸

III. Empirical Method

I begin by presenting the Ordinary Least Square (OLS) method regressions to examine the effects of being an only child on the mental health of adolescents.

$$MH_i = \alpha + \beta Only_Child_i + \gamma Male_i + \delta Urban_i + \theta MS_i + \rho Fincome_i + \mu Age13_i + \eta Age14_i + \omega Age15_i + \nu Age16_i + \tau Age17_i + \varphi Missingincome_i + \varepsilon_i \quad (1)$$

where MH_i represents five measures of mental health. $Only_Child_i$ is 1 if the individual is an only child, and 0 for non-only child. $Urban_i$ is a dummy variable to indicate whether or not the individual lives in an urban or rural area, with 1 being assigned for urban residents and 0 being assigned for rural residents. MS_i takes the value 1 for married or common law parents, zero otherwise. $Fincome_i$ is a

⁸ The regulation of the policy is flexible when the first child has a non-hereditary disability, allowing the family to have a second child. To mitigate aging problem (China's population aged 60 years and over increased at the fastest rate in the world from 12.4 percent in 2010 to 28.1 percent in 2014. Moreover, in 2050, China will be the country has largest population of aged 80 years or over at 90 million (United Nations, 2013).)and low fertility rates, the government gradually eased the policy's enforcement by allowing a family to have more than one child if both parents were only children in 1984 (Greenlaugh, 1986).

continuous variable that indicates the annual family income. This is measured in 10 thousands CNY.⁹ $Age13_i$ is a dummy variable that is used to indicate the age of the adolescents. It equals to 1 if the adolescent is 13 years old and 0 for other ages. By this analogy, it is the same for the other age dummy variables. $Missingincome_i$ is a dummy variable that is used to indicate the individuals that have missing values for family income. Finally, ε_i is the error term.

As Table 1 shows, the total CES-D score, based on the work of Radloff (1977), has twenty questions in total, which are based on four parts including somatic symptoms, depressed affect, positive affect, and interpersonal problems.¹⁰ In this paper, the dependent variables are CES-D, somatic symptoms, depressed affect, positive affect, and interpersonal problems. The somatic symptoms variable measures routine activities with seven questions. These questions pertain to being bothered, the child's appetite, effort, sleep, motivation, focus, and communication. A high score in somatic symptoms would suggest that the individual is frequently disturbed by negative emotions in daily life. The depressed affect scale shows the extent of depression with the corresponding seven questions, which include feeling depressed, feeling sad, a feeling of failure, being fearful, lonely, crying, and a sense of having the "blues". The positive affect uses four questions to estimate the degree of the respondent's optimism. The questions include inquiries pertaining to feeling good, hopeful, happy, and a subject's level of enjoyment. Interpersonal problems features two questions pertaining to how the subject feels about how other people treat them, such as being unfriendly and disliking them (Radloff, 1977). Every question is scored from 0 to 3, with 0 representing rarely or never, and 3 representing most of the time, except positive affect. To unify all measurements following the rule of a higher score means an increased tendency to develop mental problems, the score scales for positive affect are reversed.¹¹ Thus, the total CES-D score can take on values from 0 to 60, with 0 to 21 for somatic symptoms and a depressed affect, 0 to 12 for positive affect, and 0 to 6 for interpersonal problems.

⁹ 10 thousands CNY = 1852 CAD

¹⁰ The only difference between the CES-D of Radloff and the one used in this study is the frequency of measurement. This study measures these questions by the frequency in a week instead of measuring the frequency in a month, as Radloff did.

¹¹ The Cronbach α of CES-D questionnaires in adult part is 0.8486 and 0.8092 in children part respectively (CFPS, 2012). This high correlation means the measures of mental health have high validity and reliability.

The variable *Only Child* may be endogenous in the specification described above. Specifically, there may be unobserved characteristics of parents that simultaneously determine the number of children they will have, and the kind of investments they will make in their children might affect their children's mental health. To address this problem, I use dichotomous indicators for those who have a parent working for the government, those who have a parent with an education level higher than that of college, and those who have a parent belonging to the *Han, Zhuang, and Man* ethnicities as instrumental variables.¹² As mentioned above, those from the *Han, Zhuang, and Man* ethnicities and those who work in the government are strictly governed by the OCP. Parents who correspond to the selected children in my data sample are those who were among the first to take the university entrance exam after the CR. The government promoted the university entrance exam by promising to assign a job in government to those who successfully graduated from university. Thus, parents with an education level of higher than college are more likely to work in a state-run organization. In addition, educated parents are more likely to support the OCP than uneducated parents are (Nie et al., 2005).

The Instrumental Variable strategy is as follows:

First Stage:

$$Only_Child_i = \alpha + \beta * Instruments_i + \gamma X_i + \omega_i \quad (2)$$

Where the X matrix includes all the exogenous variables from equation (1).

Second Stage:

$$MH_i = \alpha_2 + \beta_1 * X_i + \gamma_i * \widehat{Only_Child}_i + \mu_i \quad (3)$$

The estimation technique outlined above should mitigate an endogeneity bias. It is designed to give results that accurately represent the causal effect of being an only child on an adolescents' mental

¹² When referring to parents who have an educational level of higher than college, this means parents who have a degree certificate higher than that of college. For example, an undergraduate, master, or PhD degree. In China, colleges have a more technology-based curriculum, whereas universities offer a curriculum that is more knowledge based. As such, a certificate from a university has more credibility and is more valuable than a college certificate.

health and associated problems.

IV. Data

The data used in this study come from the China Family Panel Studies (CFPS). The CFPS is conducted by the Institutes of Social Science Survey (ISSS) of Peking University. This study is a nationally representative, annual longitudinal survey of Chinese communities, families, and individuals through the years 2008 to 2012. The survey is conducted in three stages including county, village, and household. The survey consists of three parts including family, parents, and adults, which focus on economic factors, non-economic factors, and the well-being of Chinese children and adults. The interviews were conducted in 25 of provinces in China and covered 15,000 families and more than 40,000 individuals within these families.¹³ The family meets the requirements of being included in the survey if the family is located in a traditional residential community and at least one of the family members is a Chinese citizen.¹⁴ The individuals within the family are included in the sample if: a) they are directly related to family, such as having blood-relations b) are not directly related to family, but have blood-relations based on marriage or adoption and have lived in the same family for more than 3 months, or c) do not have any blood-relations, marriage relations, or adoption relations, but have lived in the same family for more than 6 months. The original data includes five large provinces and twenty small cities. There were 1,600 households that were randomly selected in each large province. Additionally, 8,000 households were selected in each of the small cities, for a total of 16,000 households. Representative estimates for all of China can be inferred using the survey weights provided.

For my analyses I restrict the data to information from the year 2012 and include information from the children's, adults' and families' surveys. Age 15 is the cut-off point for CFPS to separate individuals into children and adults. Originally there were 35,720 individuals in the 2012 adult data. For my

¹³ In 2007, a chosen family was eligible for the survey if at least one of the family members reside in the chosen community for over 6 months. However, this requirement was removed for subsequent surveys.

¹⁴ The traditional residential community means: apartment, condo, or old community. People living in a house or villa are excluded since they cannot represent normal residents in China. People living in a house or villa have a much higher income and a higher living standard than traditional residents. Moreover, most of these individuals are self-employed so have a higher possibility of refusing to answer questions.

purposes, I kept only the 1,112 individuals who ranged in age from 16 to 17 years from the adult survey. In the children's data of 2012, there were 8,624 observations in the beginning. I dropped individuals who were under 12 years of age, which resulted in 2,695 observations. In addition, I excluded observations for which the mental health outcomes (the dependent variable for my analyses) were missing or otherwise unavailable. This eliminated a total of 425 observations from the adolescents' data above. My adolescents sample includes 3,382 individuals. The dependent variables, age, sex, and urban information are all from the adult and children datasets.

Family income is obtained from the family file of 2012. I merged the family data with the adolescents' data using the family's ID. Since every individual has a corresponding unique family ID, the number of data samples left should be the same as the adolescents' data sample, which is 3,382. Unfortunately 108 observations were not matched and thus I had no information on income for these adolescents. Some economists impute mean values for missing observations, but doing so weakens covariance and correlation estimates in the data and also reduces variability and contaminates the regression results (Osborne et al., 2012; Allison, 2000). Further, Wang et al., (2005) conclude that the errors will be amplified if mean values are imputed. To maintain sample size, I generated a new dummy variable, "omitted family income", to retain these 108 observations with missing family income.

The number of children in the family, parents' marital status, parents' employers, parents' level of education, and parents' ethnicity are also retrieved from the adult file for 2012. I matched these with my adolescents' data by family ID, which left only 3,262 observations. The difference between this number and the 3,382 individuals in the adolescents' sample is due to missing information for both parents. The reason behind the missing information for both parents is due to the fact that the parents do not meet the survey requirements, are not available for contact, or refuse to answer the questions.

Table 2 presents the sample description. My sample includes 933 only children and 2,239 children with siblings. Cameron et al., (2013), Munakata et al., (2005), Jiao et al., (1985), and Fan et al., (1984) reported 86.4 percent, 68 percent, 41.9 percent, and 52 percent of only children in their samples, respectively. Compared to their estimates for the proportion of only children, my sample with only 29%

only children is, perhaps, surprising. This may be due to the implementation of the OCP not being comprehensive enough in rural areas. From 1984 onwards, approximately 70 percent of families in rural areas were allowed to have a second child after five years if the first child was a girl (Hesketh, 2005; Greenlaugh, 1986). “As the National Population and Family Planning Commission says ‘... now, only child only applied to 35.9 percent of the mainland’s population. 52.9 percent of the population was allowed to give birth to a second child if their first was a girl, and another 9.6 percent were poor farmers who were permitted to have two children. Also, the number of individuals from rural areas is much larger than that of urban areas...’” (AsianNewsit, 2007).¹⁵ Recall my sample consisting of adolescents 12-17 years old in 2012 who were born between 1995 and 2000.

The proportion of girls and boys are almost equally distributed, with 49.99 percent being girls in the national representative sample. Urban families are more likely to have an only child. We see that 61.46 percent of urban families have only one child, which is almost double that of the rural area. Families with only one child have a higher annual family income as compared to families with siblings.

The average CES-D score is approximately 14 in the group of adolescents who are only children and 15 for adolescents with siblings, which is close to the cutoff point in Radloff’s study (CESD = 16) for indicating severe depression. Note however that the cutoff point in Radloff’s study was based on American data in the 1970s and the cutoff point might be different in China due to different social backgrounds and eras. In other studies the cutoff score of 16 is considered too low in the Chinese context (Zhang et al., 2010; Chen et al., 2009). If it is not the case, more than half of the adolescents have severe depression in the data. Adolescents who are only children report lower average scores (better mental health) as compared to adolescents with siblings in all measurements other than somatic symptoms.

Table 2 also presents descriptive statistics for the instrumental variables. Twenty-three percent of parents who have only children work for the government, which is a much higher percentage than

¹⁵ Retrieved from <http://www.asianews.it/news-en/China%E2%80%99s-one-child-policy-won%E2%80%99t-change-despite-causing-skewed-male/female-ratio-8315.html>, accessed December 15, 2014.

parents with more than one child. Parents of only children are slightly more likely to have a higher degree (an education beyond a college certificate), even though the portion of those having an education beyond a college certificate is small overall. It is surprising to find that parents' ethnicity is so closely connected to the possibility of having an only child. All of the families with multiple children are minorities that are not affected by the OCP. Of the families who have only one child, 93.51 percent belong to the ethnicities that are affected by the policy. Due to a lack of variation in the sibling children group, I will not use ethnicity as one of my instruments.¹⁶

V. Result

First I will discuss the OLS estimates for all five mental health outcomes and then turn to the IV results. Regression results for CES-D, somatic symptoms, depressed affect, positive affect, and interpersonal problems are presented in Tables 3 to 7, respectively.

The OLS estimates from Table 3 show that there is a significant difference between adolescents who are only children and those who have siblings. Being an only child has an advantageous effect on the CES-D score, lowering it by 0.697. The difference is larger for boys, which is lower by 1.507 at a 1 percent significance level. In addition, urban adolescents' CESD scores are lower by 1.181 at the 1 percent significance level, which is not substantially different since the score range is 0 to 60. Family income is found to have a protective effect on mental health at a 1 percent significance level. A 10 thousand Yuan increase in family income decreases CES-D scores by 0.128, 0.118, and 0.140 in the full sample, male subsample, and female subsample, respectively. Ages 14 and 17 are associated with a higher CES-D score relative to age 12, which illustrates that adolescents who are in the age 14 and age 17 groups have a higher probability of having mental problems. This could be driven by the fact girls are more sensitive to stressful life events than boys during the post-pubertal years (Petersen et al., 1991; Ge et al., 1994). The age 14 and 17 effects are more severe among girls, increasing the score by 2.609 and 1.935 at a 1 percent and 5 percent significance level, respectively.

¹⁶ When I include ethnicity as an instrument in my regression, the F-statistics for the joint significance of the instruments in the first stage regression is higher than 10,000 due to the extremely high predictive power (and low variation) of the ethnicity variable.

Somewhat different results are found for somatic symptoms. Being an only child and family income are not found to be associated with somatic symptoms, whereas the advantage of urban adolescents is still robust in somatic symptoms. Urban boys are particularly more apparent than rural boys by having a 0.538 lower score at a 1 percent significance level. Adolescents ages 14, 15, and 17 show higher scores in somatic symptoms as compared to those who are 12 years old, especially among girls. As the adolescents grow older, the scores become even higher (become worse in somatic symptoms).

In Table 5, the results in a depressed affect is similar to those somatic symptoms to a certain extent. Although the difference of being an only child and a non-only child is not significant in the full sample, only boys are found to have a lower score in the depression scale than non-only boys when measuring the male subsample. In addition, boys tend to score 0.346 lower than girls in depressed affect as well. Urban residency does matter in regards to adolescents feeling symptoms of depression, in that urban adolescents feel fewer depressive emotions than rural adolescents.

In Table 6, positive affect has the similar results to CES-D. Adolescents who are only children score better on the positive affect scale, which measures optimism by 0.592. The effect is stronger among girls, with a 0.654 reduction in score at a 1 percent significance level. Additionally, urban adolescents receive a 0.34 lower score than rural adolescents. Adolescents who are 14 years old are still the distinct group, showing less positive emotion since all the coefficients are positive. On the other hand, family income has a positive impact on feeling positive, but the extent is much less than that in the CES-D.

There is no evidence of a difference in interpersonal problems between adolescents who are only children and adolescents with siblings. Furthermore, adolescents' residency does not correlate with interpersonal problems. However, adolescents from higher income families score lower on the interpersonal interaction scale. Once again, adolescents between the ages of 14 and 17 have significantly more severe interpersonal problems. In particular, the degree among girls who are 14 and 17 years of age is more serious than others at a 1 percent significance level by bringing up scores by 0.322 and 0.185, respectively.

Since being an only child may be endogenous, I attempt to address this issue by using an instrumental variable approach. The IV coefficient for the effect of being an only child on the CES-D scores reveals that OLS estimates may have been understated. Instrumented coefficients suggest that being an only child causes a 4.428 reduction in the CES-D score, which is much greater than the 0.697 estimated previously. The Durbin-Wu-Hausman test shows that being only child is in fact endogenous (the P-value is 0.04), and do the IV estimate is preferred to the OLS. That IV is larger is somewhat surprising. IV estimates provide the causal effect of being an only child on CES-D for those children for which instrument is binding as opposed to OLS which provides an average effect for the sample.. Parents who work for the government, the more effective instrument in this analysis, are more educated. These types of parents who comply with the OCP respond by providing different parenting styles (more open-minded and authoritative), their children have better mental health as I find in my result.¹⁷ However, the difference among only boys becomes insignificant. Only girls show a better mental status than non-only girls by 5.256 at a 1 percent significance level with the IV approach. The significance levels of urban residency are reduced in the IV approach in all cases, but urban boys still score 1.394 lower than rural boys at a 1 significance level. The effect of family income is still robust after controlling endogeneity, and similar results as the OLS are found for the age dummies.

From the estimation of Table 4, adolescents who are only children do not show any advantage in somatic symptoms. In addition, the significance of urban residency is reduced. Urban boys, however, still show a lower degree of somatic symptoms than rural boys by having a 0.5 lower score. Moreover, previous estimates from the OLS may have overstated the effect of children ages 14, 15, and 17. However, the extent among girls is much more severe by having 0.588, 0.824, and 0.833 higher scores than boys at a 1 percent significance level.

From the IV estimated coefficients of Table 5, the difference between adolescents who are only children and non-only children is statistically weak. However, OLS estimation actually underestimated the positive effect of being an only child on depressed affect. The effect of family income is reduced to 0.033 when compared to the result from the OLS, which is 0.0375 in the full sample. Boys still score

¹⁷ Larger IV estimates can also be explained if the measurement error in CES-D is random (Lleras-Muney, 2005).

lower (better) by 0.298 points, a result that is significant at a 5 percent significance level, although the significant level is a bit weaker than what is found in the OLS results.

In Table 6, the IV estimations are not found to be significant predictors for urban children. All of the significance levels are also reduced, but still show the positive effect of being an only child in the full sample. The positive impact of family income on positive affect is the same as in the OLS estimates. The coefficient for age 14 children is much lower than in the OLS estimates, which is 0.636 with a 10 percent significance level.

The IV estimation from Table 7 is almost the same as the results from the OLS estimation. The effect of being an only child is not significant on interpersonal problems. Family income still shows a robust positive effect on interpersonal skills. The age 14 group also appears to have the most significant interpersonal problems among all age dummies, and girls are the most prominent.

Altogether significant differences are found between adolescents who are only children and non-only children for only two of the five measures considered, which include the CES-D scores and positive affect scores. There into, only boys have lower scores than non-only boys in all mental health measurements in the OLS approach. Urban residency has a positive impact on all measurements except interpersonal problems. After controlling for endogeneity, no significant differences are found between urban adolescents and rural adolescents. Only boys still show better mental outcomes in depressed affect than non-only boys. Results show the peak age of having mental problems to be 14, and girls have a more severe outcome than boys. Moreover, family income is found to be protective of mental health for three of the measures considered including interpersonal problems, depressive affect, and CES-D.

Table 8 shows the results of first-stage regressions for the full sample, the male subsample and the female subsample. The variable for having a parent working for the government is found to be a strong predictor for having an only child with a statistical significance at the 1 percent level for the full sample and each sex subsample. However, the parents' educational level does not show a statistically

significant relationship in regards to having an only child, but the coefficients have the right signs – more highly educated parents are less likely to have an only child. As discussed above, parents who have higher education level are more likely to work in a government-run organization which is more strict affected by the OCP.

While the first stage F statistics (Table 8) were very promising, the endogeneity and over-identification tests shed some doubt as to the validity of the IV results as compared to the OLS.¹⁸ The p values for these tests are provided below each regression in Tables 3 to 7. Over-identification tests for the full sample and male subsample of CES-D, somatic symptoms, and depressed affect generate p-values smaller than 0.05 suggesting that the instruments are invalid.¹⁹ The same conclusion is also applied in measuring the full sample of interpersonal problems. It could be that the instrument of “having a parent with an education level higher than college” is not a good indicator since it does not show any statistically significant correlation with having an only child in the first stage. In addition, parents’ educational levels may be correlated with unobserved factors that would affect adolescents’ mental health directly, such as parental behavior and inappropriate parenting methods.

The Durbin-Wu-Hausman test is presented in the last row of each table. In many specifications I find that IV is preferred to OLS in measuring full sample and female subsample of CES-D and female subsample of somatic symptoms. However in other specifications I find OLS is the preferred specification.²⁰

VI. Discussion

As was found by Yang et al. (1995) and Hesketh et al. (2003), my results suggest that adolescents who are only children have better mental health than adolescents who have siblings. There are several possible explanations for the finding that adolescents who are only children score lower (better) than

¹⁸ The F-statistics for the all sample is 22.47, 9.29 for the male sample, and 13.24 for the female sample.

¹⁹ The p-values of over-identification tests in measuring the full sample and the male subsample of CES-D, somatic symptoms, and depressive affect are 0.01, 0.03, and 0.02, 0.04, and 0.01, 0.04 respectively. The p-value in the full sample of interpersonal problem is 0.02.

²⁰ The p-values of endogeneity tests in measuring the full sample and the female subsample of CES-D are 0.04 and 0.02. The p-value in measuring the female subsample of somatic symptoms is 0.02.

non-only children in CES-D and positive affect scores. Bian (1987) indicates that parents with only children report devoting more time to their children and taking a more didactic approach when communicating with their children. Also, the parental behavior of parents with only children is found to be more consistent across time compared to parents with multiple children (Newman et al., 2000). This may have a positive effect on mental health and may nurture a child's self-confidence and happiness.

On the other hand, there is no significant difference between adolescents who are only children and non-only children in somatic symptoms, depressive affect, and interpersonal problems. It could be that friends from school or the surrounding neighborhood step into the role of sisters and brothers for the adolescents who are only children (Nie et al., 2005). This reduces the interpersonal gap between adolescents who are only children and non-only children. In addition, every adolescent has been told since they were born that they were to obtain a university degree or even higher education, and that this is the only way for them to obtain a good job. Therefore, adolescents bear the burden of these expectations and demands and sacrifice to study diligently. Accordingly, every parent emphasizes fostering their children to be the most outstanding individual in a crowd. Parents are more severe in punishing, and are overly-interfering. A negative effect of inappropriate parental behavior, such as being overly protective, practicing harsh punishment, over-emphasizing the importance of meeting performance standards, and over interference, have an impact on a child's implicit self-esteem and self-confidence to a certain extent (Yang et al., 2008; Newman et al., 2000). Therefore, it may be that the social and family pressures in regards to schooling competition have the same negative impact on every adolescent, regardless of how big the sibling group is.

The low agricultural growth and significant income differences between urban and rural areas were the largest incentives for rural residents to seek opportunities in cities in the early 1980s. The “*hukou*” restriction policy prevented rural parents from bringing their children to urban areas for schooling since they have to pay higher tuition fees.²¹ Hu et al., (2009) find that left-over children from rural

²¹ The “*hukou*” restriction policy means rural residents are not allowed to migrate to urban areas, otherwise they do not have local access to health care, jobs, and education during the years between 1958 and 1978. The migration policy was implemented in the early 1980s. To prevent a strong impact on the urban job market and the limited resources to

migration families experience lower school achievement and increased neurotic depression based on migrant workers in five large cities in China. The more distant a family is, the higher the possibility is for children to experience depressive disorders (Fang et al., 2004). In addition, rural families have fewer resources with which to support their children (Brown et al., 2002). Based on my findings, family income has a protective effect on having mental problems. As a result, it is not hard to understand why rural adolescents show a lower mental status than urban adolescents.

As my results show, girls experience a more significant depressed affect and positive affect than boys. This result is also found by Tseng et al., (1988) who stated that only girls proved to be more aggressive and moody than sibling girls. The situation is more salient in rural areas where families are more likely to have more than one child. In rural migration families, the more children left in the hometown, the more significant the negative effect on the school achievements of girls. However, the difference in school achievements is not statistically significant in regards to boys (Hu et al., 2009). This is probably attributable to gender-specific socialization. Compared to boys, girls are more vulnerable to neglect in the family since boys are acknowledged to be the traditional preference (Hesketh et al., 1997). Adolescents subjected to a negligent parenting approach are more likely to succumb to depression. Parental neglect that leads to insecurity attachment can cause adolescent girls to feel increased depression after interpersonal stress (Cheng et al., 2005; Hankin, 2006).

Across all measures of mental health but depressive affect, we can see that age 14 is associated with significantly higher (worse) mental health scores relative to the other ages considered. The statistics show the difference is particularly significant in the girl group. These results are consistent with several (Hankin, 2004; Hankin, 1998; Ge et al., 1994) studies. These studies find that adolescents after 13 years of age experience uncontrollable increased negative life events. More girls become clinically stressed, face interpersonal obstacles, and show depression after age 13 than boys.

Even though in some measurements the family income does not show a statistically significant

schooling and health, the government set higher tuition fees and higher requirement for entering college for rural children (Chan, 1999). The situation has improved since 2003, with some provinces practicing unification of the urban and rural “*hukou*” (Wang, 2004).

association with mental problems, the coefficient signs are consistently negative. This suggests that family income has a protective effect on an adolescents' mental health.

This paper extends the current literature that is available in regards to being an only child on the mental health of adolescents. Previous literature has found that being an only child can have a negative effect on personality traits, school attainment, and mental problems. My contribution further improves our understanding by studying adolescents between the ages of 12 and 17 with 2012 CFPS data, which covers 25 provinces across China. The mental health measurements are based on the normative CES-D scales. In addition to using OLS estimations, I also use “parent working for the government” and “having a parent with an education level higher than college” as instruments to control for the potential endogeneity of being an only children. Comparing the results at both procedures, I find there is no significant difference in adolescents who are only children and non-only children in the full sample, but adolescents who are only children perform better than non-only children in CESD and positive affect. Urban adolescents usually have lower scores in all mental measurements, which results in a better mental status. In addition, boys perform better than girls. Girls at age 14, who present the worst mental problems when compared to other age groups.

Furthermore, a large proportion of my sample included parents who worked for non-government organizations, had lower educational levels, and lived in rural areas. But my results are weighted to provide nationally representative results. Most of under-educated and non-government working parents in my sample experienced the CR. As such, they received less schooling and a lower quality of schooling (Cai et al., 2003). Although my sample covers more provinces and considers a larger age group than most of the previous studies in China, the cross-sectional format was unable to explore the trend and continuity of mental disorders from adolescence into adult life. Further studies could address these limitations.

Table 1: CES-D Scale Questions

Somatic Symptoms

1. I was bothered by things that usually don't bother me
 2. I did not feel like eating; my appetite was poor
 3. I had trouble keeping my mind on what I was doing
 4. I felt that everything I did was an effort
 5. My sleep was restless
 6. I talked less than usual
 7. I could not get "going"
-

Depressed Affect

8. I felt that I could not shake off the blues even with help from my family or friends
 9. I felt depressed
 10. I thought my life had been a failure
 11. I felt fearful
 12. I felt lonely
 13. I had crying spells
 14. I felt sad
-

Positive Affect

15. I felt that I was just as good as other people
 16. I felt hopeful about the future
 17. I was happy
 18. I enjoyed life
-

Interpersonal Problems

19. I felt that people were unfriendly
 20. I felt that people dislike me
-

The questions are measured based on past month

Rarely or None of the time (less than 1 day)

Some or a Little of the time (1-2 days)

Occasionally or a Moderate Amount of Time (3-4 days)

Most or All of the Time (5-7 days)

Table 2: Sample Description (N=3262) (in %)

Variables	All (n=3,262)	Only Children (n=933)	Children with Siblings (n=2,329)
Demographic			
Male	50.33 (0.50)	57.15 (0.49)	47.13 (0.48)
Urban	45.69 (0.48)	61.46 (0.49)	38.28 (0.49)
Married/Common-in- Law Parents	91.61 (0.29)	88.78 (0.31)	92.94 (0.26)
Average Family Income (CNY in 10 thousands/year)	3.38 (3.70)	3.71 (3.46)	3.23 (3.80)
Average Age	14.58 (1.72)	14.64 (1.77)	14.54 (1.70)
Mental Health Status			
Average CES-D	14.57 (6.90)	13.88 (7.40)	14.90 (6.62)
Average Somatic Symptoms	3.34 (2.59)	3.34 (2.74)	3.34 (2.52)
Average Depressive Aff ect	2.88 (2.82)	2.72 (3.02)	2.95 (2.71)
Average Positive Affect	7.74 (3.54)	7.25 (3.86)	7.97 (3.36)
Average Interpersonal Problems	0.62 (0.95)	0.57 (0.95)	0.64 (0.94)
Instruments			
Ethnicity (<i>Han, Zhuang, Man</i>)	29.86 (0.46)	93.35 (0.25)	0 (0.00)
Parents work in the government	12.85 (0.33)	22.74 (0.42)	8.20 (0.27)
Parent with education level higher than college	4.97 (0.22)	6.16 (0.24)	4.41 (0.21)

Note:

- Standard deviations are presented in parentheses. All the percentage and mean values are weighted by survey weight.
- The Family income, age, CES-D, Somatic Symptoms, Depression Affect, Positive Affect, and Interpersonal problems are continuous variable. They are all measured at average values instead of percentage.
- The range of CES-D score is 0-48 (total score is 60). The range of Somatic Symptoms score is 0-18 (total score is 21). The range of Depression Affect is 0-18 (total score is 21). The range of Positive Affect score is 0-12 (total score is 12). The range of Interpersonal problems is 0-6 (total score is 6).

Table 3: Regression Results CES-D

	CES-D					
	All (n=3,262)		Male (n=1,652)		Female (n=1,610)	
	OLS	IV	OLS	IV	OLS	IV
Only Child	-0.697*	-4.428**	-1.507***	-3.700	0.258	-5.256**
	(0.381)	(1.987)	(0.460)	(3.234)	(0.615)	(2.475)
Male	-0.594*	-0.470				
	(0.315)	(0.337)				
Urban	-1.181***	-0.466	-1.701***	-1.394**	-0.796*	0.539
	(0.320)	(0.530)	(0.436)	(0.652)	(0.464)	(0.829)
Family Income (CNY in 10 thousands/year)	-0.128***	-0.104***	-0.118**	-0.111**	-0.140***	-0.0961*
	(0.0341)	(0.0362)	(0.0522)	(0.0544)	(0.0457)	(0.0496)
Age_13	0.372	0.317	0.116	-0.114	0.503	0.626
	(0.508)	(0.508)	(0.725)	(0.716)	(0.709)	(0.726)
Age_14	1.289***	1.198**	-0.0429	0.269	2.609***	2.018***
	(0.493)	(0.499)	(0.705)	(0.697)	(0.684)	(0.719)
Age_15	0.515	0.455	-0.315	-0.0718	1.325*	0.930
	(0.535)	(0.547)	(0.729)	(0.722)	(0.776)	(0.819)
Age_16	-0.301	-0.414	-1.167	-1.357*	0.531	0.474
	(0.547)	(0.573)	(0.722)	(0.742)	(0.795)	(0.880)
Age_17	0.909*	1.021*	-0.0948	0.407	1.935**	1.566*
	(0.550)	(0.574)	(0.790)	(0.824)	(0.768)	(0.807)
Omitted Family Income	-1.561*	-1.299	-1.968*	-1.804*	-1.445	-0.656
	(0.888)	(0.975)	(1.008)	(1.068)	(1.357)	(1.619)
Married/Common- in-Law Parents	-0.377	-0.969	-0.869	-1.469*	0.166	-0.290
	(0.568)	(0.621)	(0.730)	(0.812)	(0.887)	(0.996)
OLS F-stats	5.51		5.50		3.34	
1 st stage F-stats			22.47		9.29	
Over identification (p-value)			0.01		0.03	
Endogenous (p-value)			0.04		0.45	

Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 4: Regression Results of Somatic Symptoms

	Somatic Symptoms					
	All (n=3,262)		Male (n=1,652)		Female (n=1,610)	
	OLS	IV	OLS	IV	OLS	IV
Only Child	0.0492 (0.140)	-1.059 (0.734)	-0.300* (0.175)	-0.530 (1.041)	0.457** (0.218)	-1.507 (1.029)
Male	-0.0994 (0.118)	-0.0573 (0.133)				
Urban	-0.359*** (0.121)	-0.155 (0.188)	-0.538*** (0.165)	-0.500** (0.229)	-0.242 (0.175)	0.206 (0.303)
Family Income (CNY in 10 thousands/year)	-0.0167 (0.0138)	-0.0112 (0.0141)	-0.00561 (0.0210)	-0.00778 (0.0215)	-0.0265 (0.0178)	-0.0126 (0.0194)
Age_13	0.196 (0.193)	0.184 (0.194)	0.0556 (0.296)	0.0235 (0.289)	0.286 (0.245)	0.294 (0.259)
Age_14	0.413** (0.197)	0.350* (0.201)	0.00380 (0.290)	0.0696 (0.289)	0.832*** (0.269)	0.588** (0.281)
Age_15	0.562*** (0.200)	0.533*** (0.204)	0.164 (0.291)	0.220 (0.289)	0.951*** (0.272)	0.824*** (0.289)
Age_16	0.0950 (0.207)	0.0909 (0.215)	-0.360 (0.290)	-0.373 (0.291)	0.528* (0.281)	0.542* (0.315)
Age_17	0.606*** (0.218)	0.643*** (0.222)	0.159 (0.319)	0.416 (0.336)	1.062*** (0.297)	0.833*** (0.295)
Omitted Family Income	-0.375 (0.331)	-0.238 (0.349)	-0.607 (0.421)	-0.505 (0.437)	-0.301 (0.483)	0.0720 (0.557)
Married/Common- in-Law Parents	-0.197 (0.221)	-0.356 (0.238)	-0.265 (0.290)	-0.309 (0.310)	-0.118 (0.336)	-0.350 (0.378)
OLS F-stats	2.62		2.52		2.91	
1 st stage F-stats			22.47		9.29	
Over identification (p-value)			0.02		0.04	
Endogenous (p-value)			0.09		0.80	

Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 5: Regression Results of Depressed Affect

	Depressed Affect					
	All (n=3,262)		Male (n=1,652)		Female (n=1,610)	
	OLS	IV	OLS	IV	OLS	IV
Only Child	-0.0931 (0.160)	-1.372* (0.827)	-0.568*** (0.178)	-2.213* (1.162)	0.447* (0.268)	-0.781 (1.131)
Male	-0.346*** (0.133)	-0.298** (0.147)				
Urban	-0.443*** (0.131)	-0.211 (0.210)	-0.652*** (0.169)	-0.401 (0.245)	-0.297 (0.198)	-0.0369 (0.335)
Family Income (CNY in 10 thousands/year)	-0.0375*** (0.0130)	-0.0330** (0.0137)	-0.0406** (0.0192)	-0.0276 (0.0216)	-0.0379** (0.0178)	-0.0388** (0.0185)
Age_13	0.00176 (0.210)	0.0163 (0.207)	-0.0535 (0.295)	-0.0918 (0.299)	0.0222 (0.299)	0.0729 (0.294)
Age_14	0.0828 (0.205)	0.114 (0.209)	-0.331 (0.291)	-0.237 (0.302)	0.512* (0.287)	0.475 (0.296)
Age_15	-0.127 (0.222)	-0.0719 (0.226)	-0.456 (0.293)	-0.357 (0.305)	0.195 (0.330)	0.200 (0.332)
Age_16	-0.0889 (0.233)	-0.0257 (0.241)	-0.461 (0.288)	-0.548* (0.298)	0.265 (0.350)	0.450 (0.366)
Age_17	0.290 (0.227)	0.407* (0.232)	0.175 (0.330)	0.442 (0.353)	0.424 (0.319)	0.382 (0.315)
Omitted Family Income	-0.578* (0.325)	-0.404 (0.341)	-1.081*** (0.399)	-0.505 (0.437)	-0.348 (0.469)	-0.110 (0.504)
Married/Common- in-Law Parents	-0.0229 (0.226)	-0.155 (0.249)	-0.0472 (0.265)	-0.406 (0.296)	0.000851 (0.378)	0.117 (0.406)
OLS F-stats	3.84		5.09		1.55	
1 st stage F-stats			22.47		9.29	
Over identification (p-value)			0.01		0.04	
Endogenous (p-value)			0.09		0.10	

Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 6: Regression Results Positive Affect

	Positive Affect					
	All (n=3,262)		Male (n=1,652)		Female (n=1,610)	
	OLS	IV	OLS	IV	OLS	IV
Only Child	-0.592*** (0.192)	-2.046* (1.218)	-0.521** (0.250)	-1.078 (1.885)	-0.654** (0.299)	-2.931* (1.527)
Male	-0.0637 (0.158)	-0.0420 (0.186)				
Urban	-0.340** (0.165)	-0.0491 (0.292)	-0.375 (0.229)	-0.348 (0.373)	-0.312 (0.240)	0.311 (0.431)
Family Income (CNY in 10 thousands/year)	-0.0521** (0.0214)	-0.0372* (0.0218)	-0.0580* (0.0336)	-0.0593* (0.0334)	-0.0470* (0.0273)	-0.0177 (0.0286)
Age_13	0.100 (0.263)	0.0646 (0.263)	-0.00350 (0.354)	-0.0905 (0.348)	0.195 (0.393)	0.232 (0.404)
Age_14	0.637** (0.250)	0.577** (0.247)	0.310 (0.357)	0.461 (0.341)	0.943*** (0.352)	0.636* (0.368)
Age_15	0.0763 (0.267)	-0.0204 (0.268)	0.00435 (0.363)	0.0916 (0.357)	0.152 (0.392)	-0.140 (0.406)
Age_16	-0.261 (0.285)	-0.439 (0.296)	-0.221 (0.386)	-0.305 (0.393)	-0.283 (0.419)	-0.558 (0.444)
Age_17	-0.136 (0.279)	-0.160 (0.290)	-0.526 (0.386)	-0.512 (0.396)	0.254 (0.403)	0.165 (0.427)
Omitted Family Income	-0.346 (0.441)	-0.411 (0.492)	-0.0225 (0.615)	-0.247 (0.636)	-0.502 (0.646)	-0.303 (0.825)
Married/Common- in-Law Parents	-0.0629 (0.273)	-0.392 (0.315)	-0.417 (0.379)	-0.586 (0.436)	0.336 (0.391)	-0.106 (0.455)
OLS F-stats	3.53		1.88		2.56	
1 st stage F-stats			22.47		9.29	
Over identification (p-value)			0.56		0.34	
Endogenous (p-value)			0.23		0.76	

Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 7: Regression Results Interpersonal Problems

	Interpersonal Problems					
	All (n=3,262)		Male (n=1,652)		Female (n=1,610)	
	OLS	IV	OLS	IV	OLS	IV
Only Child	-0.0605 (0.0510)	0.0487 (0.317)	-0.119** (0.0602)	0.121 (0.476)	0.0360 (0.0847)	-0.0371 (0.423)
Male	-0.0847* (0.0444)	-0.0729 (0.0501)				
Urban	-0.0382 (0.0467)	-0.0510 (0.0692)	-0.137** (0.0591)	-0.146* (0.0800)	0.0410 (0.0732)	0.0581 (0.113)
Family Income (CNY in 10 thousands/year)	-0.0217*** (0.00435)	-0.0222*** (0.00469)	-0.0138** (0.00642)	-0.0162** (0.00682)	-0.0273*** (0.00604)	-0.0270*** (0.00649)
Age_13	0.0741 (0.0682)	0.0522 (0.0669)	0.117 (0.0994)	0.0450 (0.0984)	0.0282 (0.0904)	0.0282 (0.0900)
Age_14	0.156* (0.0823)	0.156* (0.0848)	-0.0252 (0.107)	-0.0245 (0.107)	0.322*** (0.122)	0.318** (0.128)
Age_15	0.00411 (0.0674)	0.0147 (0.0671)	-0.0276 (0.0939)	-0.0256 (0.0958)	0.0497 (0.0931)	0.0463 (0.0939)
Age_16	-0.0455 (0.0722)	-0.0406 (0.0724)	-0.124 (0.0985)	-0.132 (0.102)	0.0407 (0.104)	0.0387 (0.104)
Age_17	0.150** (0.0730)	0.130* (0.0744)	0.0976 (0.103)	0.0615 (0.106)	0.185* (0.105)	0.186* (0.105)
Omitted Family Income	-0.261*** (0.0966)	-0.246** (0.101)	-0.257** (0.128)	-0.138 (0.151)	-0.294** (0.148)	-0.316** (0.149)
Married/Common- in-Law Parents	-0.0942 (0.0766)	-0.0659 (0.0885)	-0.139 (0.0959)	-0.169 (0.120)	0.0566 (0.124)	0.0492 (0.133)
OLS F-stats	4.84		3.60		3.28	
1 st stage F-stats	22.47		9.29		13.24	
Over identification (p-value)	0.02		0.19		0.05	
Endogenous (p-value)	0.76		0.61		0.87	

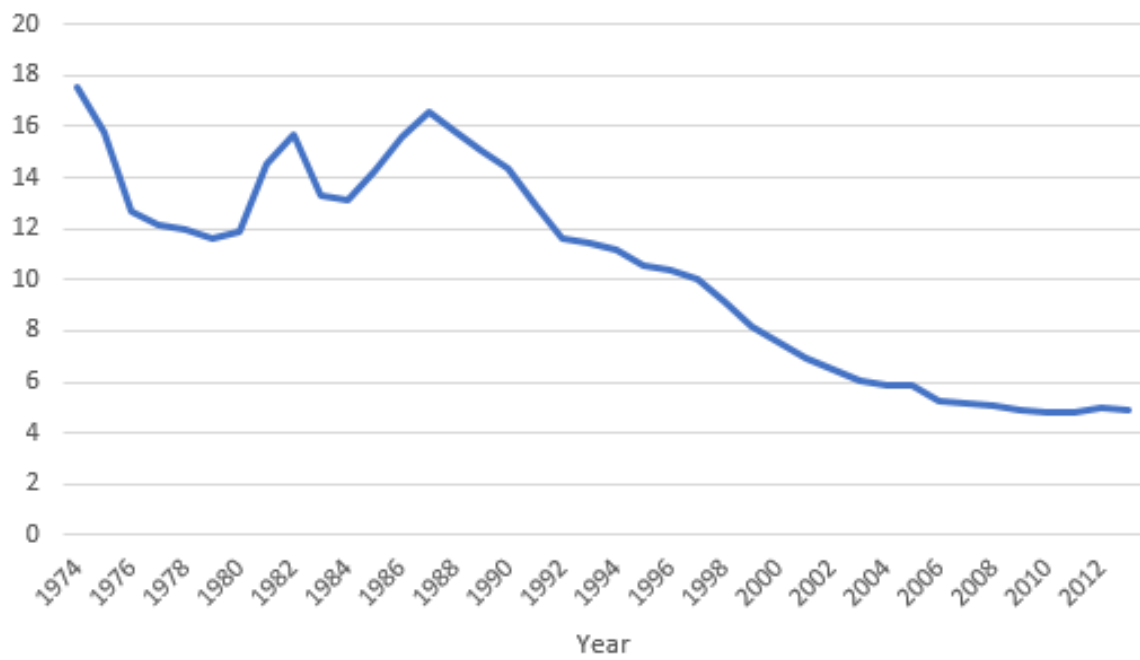
Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 8: First Stage Regression Results

	1st stage statistics		
	All (n=3,262)	Male (n=1,652)	Female (n=1,610)
Male	0.078* (0.02)		
Urban	0.162*** (0.022)	0.13*** (0.03)	0.20*** (0.03)
Family Income (CNY in 10 thousands/ year)	0.0020 (0.0028)	0.00034 (0.0043)	0.0032 (0.0037)
Age_13	0.0084 (0.033)	0.0046 (0.047)	0.014 (0.047)
Age_14	-0.023 (0.033)	0.0024 (0.050)	-0.046 (0.043)
Age_15	-0.027 (0.034)	-0.025 (0.053)	-0.027 (0.044)
Age_16	-0.030 (0.036)	-0.042 (0.053)	-0.020 (0.049)
Age_17	0.054 (0.036)	0.073 (0.056)	0.033 (0.049)
Omitted Family Income	0.055 (0.066)	-0.070 (0.089)	0.16* (0.089)
Married/Common- in-Law Parents	-0.15*** (0.04)	-0.142** (0.056)	-0.15*** (0.059)
Parents work in the government	0.25*** (0.038)	0.22*** (0.052)	0.28*** (0.055)
Parent with education level higher than college	-0.055 (0.05)	-0.019 (0.085)	-0.072 (0.062)
F-stat for joint significance of the instruments	22.47	9.29	13.24

Note: Robust standard errors are presented in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

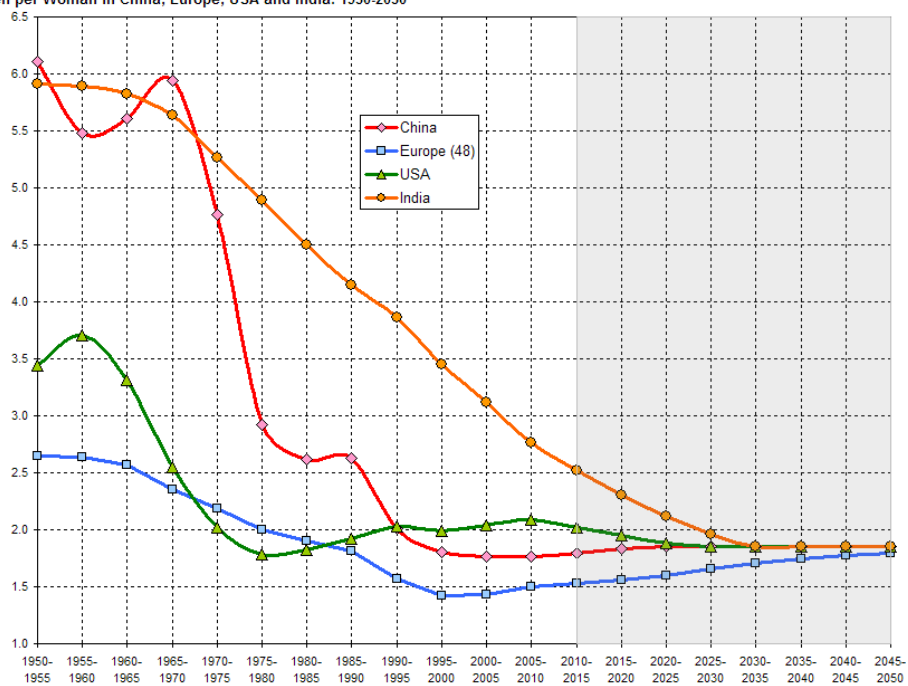
Figure 1. The natural population growth rate in China (%) (1974-2013)



Source: National Bureau of Statistics of China (2014). From: <http://data.stats.gov.cn/workspace/index?m=hgnd>

Figure2. The average number of children per woman (1950-2050)

Average Number of Children per Woman in China, Europe, USA and India: 1950-2050



Source: World Population Prospects, the 2008 Revision. United Nations, Department of Economic and Social Affairs (DESA), Population Division, New York. See: www.unpopulation.org
 Note: This chart displays average Total Fertility Rates by five-year intervals.

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