Fertility Restrictions and Life Cycle Outcomes: Evidence from the One Child Policy in China

Wei Huang*

Please click here for the most recent version.

Abstract

I use the experience of China's One Child Policy to examine how fertility restrictions affect economic and social outcomes over the lifetime. The One Child Policy imposed a birth quota and heavy penalties for "out-of-plan" births. Using variation in the fertility penalties across provinces over time, I examine how fertility restrictions imposed early in the lives of individuals affected their educational attainment, marriage and fertility decisions, and later life economic outcomes. Exposure to stricter fertility restrictions when young leads to higher education, more white-collar jobs, delayed marriage, and lower fertility. Further consequences include lower rates of residing with the elderly, higher household income, consumption, and saving. Finally, exposure to stricter fertility restrictions in early life increases later life female empowerment as measured by an increase in the fraction of households headed by women, female-oriented consumption, and gender-equal opinions. Overall, fertility restrictions imposed when people are young have powerful effects throughout the life cycle. (*JEL* classification: H70, I20, J00, O12)

Keywords: One Child Policy, Long-term effects, Life-cycle outcomes

*Harvard University and NBER, 1050 Massachusetts Avenue, Cambridge MA 02138 (e-mail: huangw@nber.org).
I thank David Cutler, Richard Freeman, Edward Glaeser, Claudia Goldin, Lawrence Katz, Adriana Lleras-Muney, and Stefanie Stantcheva for their constructive suggestions. I also thank the participants at numerous seminars for their helpful comments. All errors are my own.

1 Introduction

Economists have long been interested in the relationship between fertility and economic outcomes, particularly among women (Becker and Lewis, 1973; Rosenzweig and Wolpin, 1980a,b; Barro and Becker, 1989). But studying the consequences of fertility on lifetime outcomes is difficult because fertility choices are determined by social and economic circumstances.

This study uses China's One Child Policy (OCP) as an exogenous shock to fertility and fertility expectations and investigates the impact of exposure to fertility restrictions in early life on individual lifecycle outcomes. Individuals growing up under the OCP expected to have fewer children and therefore formulated different plans for their lives and faced different incentives for human capital investment than did previous cohorts.[1] I consider how the OCP affected three sets of lifetime outcomes: 1) demographic transitions, including the age at first marriage and fertility; 2) socioeconomic outcomes, including education, income, consumption, and saving; and 3) female empowerment, including household head being a woman, female-oriented consumption, and opinions about the role of women.

The OCP, which was formally started in late 1979, is the most radical fertility policy affecting the largest population in world history. Compared with birth control policies such as the "pill" or abortion regulations,[2] China's OCP is unique in imposing a mandated birth quota and heavy penalties for "out-of-plan" births (Schultz, 2007). I exploit geographic variation in the government-imposed financial penalties for an unauthorized birth to examine the effects of exposure to fertility restrictions in early life.

Using a nationally representative sample of more than 10 million observations from Chinese

[1]The expected lower fertility may change education, labor supply, and saving behavior. For example, people may delay their marriage and childbearing because of fewer expected children, which thus lowers the costs of education (Field and Ambrus, 2008). In addition, fewer expected children may lead to potential more time in labor market because of fewer family restrictions, and thus expected return of education may increase and incentive of human capital investment may be also changed (Jensen, 2010). Finally, being supported by fewer children during old age also induces a higher incentive to work during the prime ages to save for retirement (Schultz, 2007). The ideology is similar to the literature on the impact of expectations on current behaviors (e.g., Manski, 2004; Jayachandran and Lleras-Muney, 2009; Oster et al., 2013).

[2]Starting with Goldin and Katz (2002) and continuing with Bailey (2006, 2010), Hock (2008), Miller (2010), and Ananat and Hungerman (2012), researchers have found that increased access to the pill by young unmarried women in the 1960s and 1970s affected marital, educational, labor market and child outcomes.

censuses covering people born between 1940 and 1980, I relate demographic and economic outcomes to fertility penalties in place in early life at ages 6 to 20 years. Controlling for fixed effects for survey year, year of birth, and province, as well as provincial-specific linear trends in year of birth, I find large effects of fertility penalties on the outcomes mentioned above. The results are robust to adding additional covariates, including number of siblings, local sex ratio at birth, economic conditions, education resources, and compulsory schooling laws. In addition, the effects only exist for the Han people, and there are no significant effects of the OCP among the minorities, who were not constrained by the OCP.

Exposure to the fertility restrictions imposed by the OCP leads to a 4.5 percentage points higher (35 percent of the mean) senior high school completion rate for women, and a 3.1 percentage points (13 percent) higher completion rate for men.[3] It also leads to a significantly higher likelihood of delaying marriage until after age 25 and to increased white-collar employment. Further consequences include a significant reduction in number of births (12 percent) and improved quality, as measured by mortality and education, of the children of the women who grew up under the OCP.

To examine household economic outcomes, I use a sample from China's Urban Household Survey (UHS), of about 200,000 households. The data show that exposure to the OCP in early life leads to an increase in household income, consumption, saving, as well as an increase in the proportion of households headed by women and increased female-oriented consumption. Finally, data from the China Family Panel Studies (CFPS) show that women who experienced fertility restrictions when they were young are happier, more satisfied with their marriage, more satisfied with spousal housework duties, and less in agreement with the notion that marriage and children are extremely important to women's lives.

Overall, the findings suggest that expected fertility plays an important role in human capital accumulation, economic development, and female empowerment. First, most of existing studies on the OCP usually treat the household conditions such as education attainment of couples and age at marriage as exogenous, and investigate how introduction or strictness of the OCP impacts the

[3]For college completion, the corresponding numbers are 1.7 percentage points (34 percent) for women, and 1.8 percentage points (26 percent) for men.

household decisions such as fertility and children's education investment in the following calendar years.[4] However, by allowing people exposed to the OCP when young to alter their pre-fertility behaviors, I extend this research by looking at how the OCP plays out over the lifecycle of affected individuals. Different from the findings in existing studies, this study finds significantly larger effects on fertility reduction and human capital accumulation.

Furthermore, this study sheds some light on the relationship of fertility with human capital and economic development (Barro and Becker, 1989; Galor and Weil, 1996; Schultz, 2007). Traditionally, the classical child quantity-quality trade-off is used to explain the negative correlation between fertility and economic development. Actually, empirical studies found mixed evidence on the effects of fertility on children's quality (Angrist et al., 2010). Instead of considering fertility as a coordinated behavior within a given household, I consider fertility under the context of lifecycle and find that expected lower fertility remarkably increases education attainment of people themselves.

Finally, consistent with the existing literature on other birth control policies (Goldin and Katz, 2002; Bailey, 2006, 2010; Ananat and Hungerman, 2012), this study provides new evidence on why fertility control is an important factor in human capital accumulation, economic development, and female empowerment. However, the effects of the mandatory quantity-control policy are much larger than those of voluntary ones. For example, the availability of the pill increased college attainment by 0.5 percentage point (2 to 3 percent) among young women in the United States (Ananat and Hungerman, 2012). By contrast, my estimates suggest that China's OCP increased the female competition rate of college by 1.7 percentage points (34 percent). The differential magnitudes reflect fundamental differences between the OCP and other birth control policies.

The paper is structured as follows. The next section provides background on China's One

[4]For example, Ebenstein (2010); Li et al. (2011) found that the OCP led to an abnormally high male-to-female sex ratio at birth among the post-1980 birth cohorts; Edlund et al. (2013) and Wei and Zhang (2011) found that the high sex ratio led to higher crime rate and higher saving rates, respectively. Fertility consequences are mixed: Schultz and Zeng (1995) found a small role of the OCP in fertility reduction while Yang et al. (2000) found a significant fertility reduction among the rural households. Li and Zhang (2007) used the province panel and found that the fertility decline led to higher GDP per capita; Rosenzweig and Zhang (2009) used twin births under the OCP as an exogenous shock in fertility and found some evidence for the child quantity-quality trade-off.

Child Policy, and describes how the fertility penalties changed over time. Section 3 introduces a theoretical framework and corresponding empirically testable implications. Section 4 introduces the data used in this study and how to measure fertility restrictions in early life. Section 5 presents descriptive evidence by graphically showing the effects of experiencing the OCP in early life. Section 6 provides regression analysis on the impact of the OCP on life-cycle outcomes, and Section 7 discusses the results in the context of the existing literature. Section 8 concludes.

2 China's One Child Policy

In the 1970s, after two decades of explicit encouragement of population growth, policy-makers in China enacted a series of measures to curb population growth. The OCP was formally conceived in 1979 (Banister, 1991). This was the first time that family planning policy formally became one article in the laws of China.

2.1 Different Implementation by Ethnicity and Type of *hukou*

The OCP in principle restricted a couple to having only one birth. However, the de facto regulations varied among different ethnicities and types of *hukou* (urban/rural). First, implementation of the OCP differed for Han and for minorities. It is mainly focused on the Han ethnicity, which is the largest ethnic group in China and makes up 92 percent of the population. In all provinces, most minorities are allowed to have a second birth or face no restrictions. Second, the regulations of the OCP also differ by urban and rural *hukou*. The policy is strictly enforced in urban areas but less so in rural areas. Couples with rural *hukou* are mostly allowed to have a second child if the first is a girl, which is also named the "One-and-Half Children Policy." In this study, I use the different implementation by ethnicity and type of *hukou* to verify to the robustness of the results.

2.2 Different Implementation across Region over Time

In recognition of diversity of demographic and socioeconomic conditions across China, the central government issued "Document 11" in February 1982 to allow the provincial governments to issue specific and locally adjusted regulations. Two years later, the central government issued "Document 7", which further stipulated that regulations regarding birth control were to be made in accordance with local conditions and to be approved by the provincial Standing Committee of the People's Congress and provincial-level governments. This document devolved responsibility from the central government to the local and provincial governments (Baochang et al., 2007).

At the very beginning of the OCP, vice premier *Muhua Chen* proposed that it would be necessary to pass new legislation imposing penalties on unauthorized births. Subnational leaders would face practical difficulties in collecting penalties and pressure from resistance and complaints. For example, Guangdong province received more than 5,000 letters complaining about the implement of One Child Policy in 1984. Therefore, the central government fully authorized the provincial governments to determine their "tax rates" for excessive births after "Document 7" in 1984. Because the local governments were concerned more about social stability than the central government, they had little incentive to design a high penalty rate. Consistent with Figure 1, some of the local government even lowered the penalty rates after the 1984, and the period before 1989 witnessed few changes in the fertility penalties.

A major change in fine rate happened at the end of the 1980s, when the central government linked the success of fertility control to OCP promotions of local officials. As Greenhalgh and Winckler (2005) wrote in the book *Governing China's Population*:

> *"Addressing governors in spring 1989 Li Peng (current premier) said that population remained in a race with grain, the outcome of which would affect the survival of the Chinese race. To achieve subnational compliance, policy must be supplemented with more detailed management by objectives (ME 890406). At a meeting on birth policy in the premier's office, Li Peng explained that such targets should be 'evaluative'."*

In March 1991, to show resoluteness, the central government listed family planning among the three basic state policies in *Eighth Five-Year Plan* passed by National People's Council. The *Eighth Five-Year Plan* explicitly set an objective that the natural growth rate of population should be reduced to less than 1.25 percent on average during the following decade. To achieve such a challenging objective, the national leaders employed a management-objective "responsibility system" to induce subnational or provincial officials to set high fine rates.

Following the previous studies (Ebenstein, 2010; Wei and Zhang, 2011), I use the average monetary penalties for an unauthorized birth in the province-year panel from 1979 to 2000. It is also called the "social child-raising fee" in China, and this paper uses "policy fine" or "fertility fine" for the sake of brevity. The penalties are formulated in multiples of local household annual income. Figure 1 shows the pattern of policy fines from 1979 to 2000 in each province.[5]

According to Figure 1, during the short period between 1989 and 1992, over half of the provinces (16 out of 30) saw a significant increase in the fine rate and the average increased from 0.8 to 3.0 yearly household incomes. Indeed, 16 out of all the 21 significant increases in the history occurred in this period.[6] Scrutinizing the official documents in more details, I find strong correlation between the increases in fine rate and the incidence of government successions. Among the 16 significant increases, 12 happened during the first two years of new provincial governors' tenures.[7] In addition, the provincial governors who increased the fertility fines tend to be younger. The average age of these 16 provincial governors was 56 years old, which was significantly lower than the average age of other provincial governors, i.e., 59 years old (p-value = 0.02). These numbers suggest that the promotion incentive of provincial governors could be a major force driving the changes. It is consistent with the premise that the incentive to raise the fine rate depends on the

[5]The amount of the policy fine collected was not made public until recent years: the total was about 20 billion RMB yuan (3.3 billion US$) among 24 provinces that reported in 2012. For example, Guangdong, one of the richest provinces in China, collected 1.5 billion. In comparison, the total local government expenditure on compulsory schooling was 10.5 billion.

[6]"Significant increase" refers to an increase higher than one-year household incomes.

[7]The average tenure of these 16 provincial governors was about 6 years. And they on average had higher chance of being promoted than their peers. For example, two of them became the standing members of the Political Bureau of Central Committee of the Communist Party (CCCP): one was promoted as executive vice premier and the other was promoted as the chairman of Chinese People's Political Consultative Conference (CPCCC).

governor's personal characteristics, such as inauguration time and age.

One potential concern about the exogeneity of the fine rates is the possibility that the predecessors of these governors were replaced due to poor performance in OCP implementation (e.g., higher fertility rates). Therefore I also investigate the placements of former governors whose successors raised fine rate by more than one-year household incomes. These former governors were at least as successful as their peers in political career.[8]

2.3 Statistical Tests for the OCP Penalties

It is possible that changes in the fine rate are related to other policies or previous economic conditions in the local region. For example, the ambitious officials who raised the fines may also be aggressive in implementation of other policies, such as compulsory schooling laws (CSLs), pension programs, and so forth. As emphasized by the "Eighth Five-Year Plan," economic growth and poverty reduction are also factors to be evaluated. If these policies are correlated with the fine rates, the estimates in this study may suffer omitted variables bias.

To examine this, I use 28 province-year level macroeconomic indices from four large categories to examine their correlation with the OCP fines. The four sets of factors are: 1) demographic variables including population size, and birth and death rates; 2) basic economic conditions, such as employment, wages, GDP, and unemployment rate; 3) government programs and expenditure, including numbers of pension program participants and health insurance participants, as well as government expenditures; and 4) sanitary conditions, such as the number of hospitals and education resources measured by the number of teachers.[9]

For each macroeconomic index, I examine whether its average levels in the previous one, two, and three years are correlated with fertility fines, respectively. And I also test whether the changes

[8]Several of them, such as Rongji Zhu, Changcun Li and Guanzheng Wu, even became political leaders of the central government. There is no evidence that any provincial governors were displaced due to poor performance in the OCP implementation.

[9]Previous literature has found that these factors may influence economic outcomes: the demographic variables (Galor and Weil, 1996; Soares, 2005; Ashraf et al., 2013); economic conditions (Sullivan and Von Wachter, 2009; Oreopoulos et al., 2012; Cutler et al., 2016); and government programs and local conditions (Aizer et al., 2016; Hoynes et al., 2016; Chetty et al., 2016; Jackson et al., 2016).

in fines are correlated with the changes in these indices. Specifically, I regress the indice on fine rates with controls such as the fixed effects for year and province, and provincial-specific time linear trends. The first three columns in Appendix Table B.1 report the p-values for the coefficients on the fine rate. In addition, I also classify them into different subgroups, put them together in the regressions with the same controls, and test the joint significance in column 4. Figure B.2 plots the distribution of the p-values. As the figure shows, none of the macro indicators is significantly correlated with the fertility penalty levels or changes.

2.4 High Public Awareness

According to the central government, local governments must explicitly regulate the penalty level and make it be publicly known. Since the performance of the OCP directly affected the potential promotion of local governors, they had a strong incentive to raise the penalty levels and publicize the stricter regulations of the OCP to ensure that people would be aware of them. For example, local media, such as newspapers and television stations, repeatedly announced the detailed regulations and punishment for violations, such as the levels of the penalties. In addition, local governments distributed leaflets to residents to ensure that people would know about the regulations of the OCP. Based on data from the 2001 National Family Planning/Reproductive Health Survey, more than 98 percent of the people knew about the OCP, over 84 percent of people had received any information about the OCP regulations in any form, and 45 percent received paper leaflets on the details of the policy.

In addition, the effective publicity and strong enforcement of the OCP enabled expectations to form. Population and Family Planning Commissions (PFPCs) were set up at every level of government to raise awareness and carry out registration and inspection. A large-scale public campaign about the law was launched during the 1980s. Meanwhile, curbing population growth became the highest priority for local officials, and enforcement was strengthened dramatically. Those who had an unauthorized birth but did not pay the fine could be sued by the local PFPC and the penalties would be collected compulsorily. In addition, if the fertility fine was not paid, the

couple's social insurance would be withheld; property could be confiscated; and the unauthorized-born child could not be registered to the hukou system, a requirement for school entrance. In an extreme case in Shaoyang City, Hunan Province, the "illegally" born children themselves were confiscated and settled in the social welfare institution if the policy fine was not paid.[10]

3 Model and Implications

This section examines the role that fertility restrictions such as the OCP might play on socioeconomic outcomes over the life cycle in a theoretical framework. Suppose there are two periods for the representative individual. In the first period, people accumulate human capital, work, give birth to children and save money; in the second period, people enjoy the saving from the first period and transfers from children. For each period i ($i = 1$ or 2), the utility gained from goods consumption is $u(c_i)$, with $u' > 0, u'' < 0$. The lifetime utility gained from number of births, N, is $v(N)$, with $v' > 0, v'' < 0$. I also assume the utility function is separable. Thus, the problem the individuals face is

$$\max_{c_1,c_2,N} u(c_1) + u(c_2) + v(N)$$

In the first period, individuals choose three variables to maximize total utility: years of education of themselves, h; savings s; and number of children, N. Different from the usual household setting, individual education, h, is endogenously determined here. The cost of education is $C(h)$ with $C'(h) > 0$ and $C''(h) > 0$.[11] For each birth, the fixed financial cost is f and the time cost is τ. The total time on children and work is T. The wage rate, $w = \alpha h$ with $\alpha > 0$. In the second period, each child transfers b to parents, and the total consumption in period 2 is composed of only transfers from children and savings from the first period. Suppose that the OCP leads to a much higher financial cost of fertility. Based on these settings, appendix A derives the following testable implications.

[10] Source in Chinese: http://baike.baidu.com/subview/5708887/5757115.htm

[11] The cost of human capital include both financial and time cost. If we separate the cost into financial part $C_f(h)$ and the time part $C_t(h)$. The opportunity (monetary) cost of human capital would be $C_t(h)\alpha h + C_t(h)$.

Implication 1. Exposure to stricter fertility restrictions in early life leads to lower fertility, higher education, and more savings.

The expectation of having fewer children implies that individuals growing up under the OCP may have formulated different plans for their lives. They faced different incentives for human capital investment than did previous cohorts. Because of the exogenous increase in the financial cost of fertility, expected fertility would drop mechanically. Lower expected fertility leads to potentially more time involved in the labor market, and thus the marginal return to human capital investment increases. Therefore, if faced with stricter fertility restrictions in early life, young people will re-maximize their utility by increasing their investment in education. Because individuals would receive fewer transfers in the second period, people would need more savings in first period to smooth consumption.

Because women give birth and spend more time on child bearing than men do, the model also implies that exposure to fertility restrictions caused by the OCP would bring stronger incentives for women to enhance their education level than that for men. Therefore, similar to other birth control policies, which mainly provide more freedom to women, the sex-neutral fertility control policy could also lead to female empowerment.

Implication 2. Fertility responses to the restrictions will be greater among young people than those among who have already finished their education.

The behavioral responses to stricter fertility restrictions are different between married couples and younger people. Under stricter fertility restrictions, the married couples can only adjust household choices such as savings and fertility, but they cannot change their own education and age at marriage as these have been determined. By contrast, the younger people would re-optimize their lifetime utility by obtaining more education and delaying marriage. That is, the unmarried young people actually have more flexible choices than those married couples. When these young people get married, they can have lower fertility without more utility loss. Therefore, the differential effects among the married couples and younger people reflect the difference between contemporary effects and lagged effects of the OCP on fertility outcomes.

4 Data and Summary Statistics

4.1 Census Data

The main data used in this study are taken from the 1990 and 2000 Population Censuses, and the 2005 One-Percent Population Survey (censuses 1990, 2000 and 2005, hereafter). All the datasets contain gender, education level, year and month of birth, type of *hukou* (urban/rural), *hukou* province, ethnicity (Han/minorities), marital status, number of siblings, and relation to the head of household.[12]

For married respondents, the data also provide the year and month of first marriage. For respondents older than age 16 years, the data also provide information about labor market participation, including working status and occupation in the past week. For women over age 16, the census data provide the numbers of male births, female births, and gender-specific live births at the survey. The census data divide education into six levels: illiterate, primary school, junior middle school, senior middle school, college, and graduate or above.

To analyze the impact of fertility restrictions in early life, I keep the birth cohorts born between 1940 and 1980 in the census data and further restrict to those aged over 25 ensure that most individuals in the sample have finished their education. By doing so, all the cohorts in this study were born before the OCP formally started.[13] Panel A of Table 1 shows the summary statistics for education, marriage, and labor market outcomes, by gender. Women have a significantly lower level of education attainment, with 16 percent completing senior high school and 4.6 percent finishing college. The completion rates of senior high school and college for men are 17 and 7 percent, respectively. In addion, women married earlier than men. Over 98 percent of women were ever married and 92 percent of those aged 26–30 are married. However, about 92 percent of men were

[12]The number of siblings is provided for respondents younger than age 30 years in 2005, i.e., those born later than 1975 in the 2005 data.

[13]The late 1970s birth cohorts may be also affected by the OCP because their potential siblings may be born after the OCP. That is, they may have fewer younger brothers and sisters than their parents had imagined, To mitigate this, I have estimated models using the sample composed of those born earlier than 1975, whose sibling number should not be affected by the OCP. The results are consistent. In addition, I do not find any material changes when we control for the number of siblings in analysis below.

ever married and only 78 percent of those aged 26–30 are married. Finally, men are more likely to work (i.e., 91 percent for men and 76 percent for women), and have a higher chance of occupying a white-collar job (i.e., 13 percent for men and only 8 percent for women). The respondents in the sample are age 39 years on average, among men and women.

[Table 1 about here]

Panels B and C present the summary statistics for fertility and children outcomes. On average, each woman gave 2.0 births.[14] Among those who ever gave birth (97 percent of original sample), each woman give 2.1 births, out of which 1.1 births are male, implying a higher proportion of boys than girls. Among the births born to the women, about 3.0 percent died by the survey. And in a more restricted sample of children with ages at years 6 to 15 and detailed information on education, about 71 percent receive normal education.[15]

Panel a in Figure 2 shows how education attainment changes over birth cohorts, by gender. The figure shows a remarkable increase in education attainment among between the 1940s and 1980s birth cohorts, especially for women. For the 1940s birth cohort, the rates of senior high school completion are 14 and 7.2 percent for men and women, respectively. Among the 1970s birth cohorts, who were exactly the cohort growing up under the OCP, the corresponding rates doubled for men and more than tripled for women. Therefore, the gender gap in education narrowed significantly. The gender difference in senior high school completion is 7 percent among those born in the 1940s, while the gap narrowed by half to 3.5 percent for the 1970s birth cohorts. For college attainment, the figure shows a similar pattern.

[Figure 2 about here]

[14] There are two reasons why the number of births is much larger than one. First, many of the women were not subject to the OCP as the sample is composed by those born between 1940 and 1980. Women of earlier birth cohorts would almost finished fertility in lifetime then. Second, in most rural regions, women could give birth to two births if the first is a girl.

[15] Details about the children sample for education are in Appendix C. Normal education is defined based on the eligible age for primary school, middle high and senior high school in China. Specifically, children with ages 6-12 should be in primary school or institution of higher level; children with ages 13-15 should be in junior middle high school or institution of higher level.

Because the OCP mainly restricted fertility of Han people, minorities naturally compose a comparison group (Li and Zhang, 2007; Li et al., 2011). Panel b in Figure 2 plots female education attainment over the birth cohorts, by Han and minorities. The education attainment gap between Han and minorities grew over time. Specifically, for minorities, the completion rates of senior high school and college increased by 10.6 and 4.7 percentage points, respectively. In contrast, the comparable statistics for Han women are 16.0 and 6.5 percentage points. The gap between Han and minorities started to widen in the 1960s birth cohorts, whose members experienced the OCP during their teenage years. This comparison thus provides additional evidence on the role of the OCP in the increase in education attainment among the Han people.

However, minorities may not be a perfect control group. For example, because Han-minority couples were allowed to have more children, Han people had a higher incentive to marry with the minorities (Huang and Zhou, 2015). Han-minority marriages capture less than 2 percent among the Han people, but over 18 percent of minorities. Therefore, the results for minorities may be affected by inter-ethnicity marriages. In addition, the OCP also restricted certain groups of minorities, although the regulations are not as strict as those for Han people. Finally, minorities account for only 8 percent of the population, and the percentage is even smaller in urban regions. The estimates based on data from smaller surveys other than censuses could be very inaccurate. With these concerns, this study uses the Han people for the main analysis, but the appendix provides the results for minorities from the census data.

4.2 Other Data

The census data provide information on demographics and some socioeconomic measures, such as education. To study household structure, income, and expenditure, as well as individual subjective opinions, I also use the following two data sets.

Urban Household Survey (UHS) The Chinese UHS 2002–2009 data cover 170 cities all over China. It is the largest data set for the household balance sheets in China. The households are

required to make records of their cash flows every day, and the yearly data include detailed information on income, expenditure, and consumption and their minor categories.

China Family Panel Studies (CFPS) The CFPS is a biennial survey and is designed to be complementary to the Panel Study of Income Dynamics in the United States. The first national wave was conducted in 2010. This study uses the CFPS data collected in 2010, 2012, and 2014. The five main parts of the questionnaire include data collection on communities, households, household members, adults, and children. I use CFPS data because the data collect information on individual subjective welfare and general opinions on the importance of marriage and children for women.

To make the analysis consistent with that for the census data, for the above two data sets, I also keep respondents born between 1940 and 1980, and further restrict the analysis to those ages over 25 years. However, considering that household heads could retire at age 60, I further restrict the UHS sample to those ages below 60, although this does not affect the results materially. After this restriction, the UHS sample has more than 200,000 households; and the CFPS sample has about 60,000 individuals in total.

Because the UHS and the CFPS were collected later than the census data, the respondents are older. In the census sample, the ages of respondents range between 25 and 65 years, with a mean of 39 years. For the UHS 2002–2009 sample, the respondents were born between 1943 and 1980, and their ages are between 25 and 60 years, with a mean of 43 years. For the CFPS sample, the respondents were born between 1940 and 1980, and their ages range from 30 to 74 years, with a mean of 50 years.

In the UHS sample, less than 2 percent of the households are minorities. There are only 4,000 minority households in the sample. In the CFPS data, the number of minorities is ever smaller (i.e., about 3,000). The small sample size for minorities makes the estimates rather inaccurate, and thus I do not use the minorities in these survey data for this study.

4.3 Measure of Fertility Restrictions in Early Life

I use the mean value of fertility penalties for respondents between ages 6 and 20 years in local provinces to measure individual exposure to the fertility restrictions in early life. The age range 6-20 is the period when children receive education, and previous literature suggests this period is crucial for lifetime outcomes (Heckman, 2000; Chetty et al., 2011; Oreopoulos et al., 2012; Cutler et al., 2016; Chetty et al., 2016). The youngest age starts at 6 years, because of the following facts. First, because there were few changes in penalties before 1985, there is very little variation in the fertility penalties before age 6 for all the birth cohorts in the sample (1940–1979). Second, I do so to alleviate the potential quantity-quality trade-off effects. Since the average gap between births is two years and the mean number of births is 2.0, most mothers have completed fertility when the first child reaches age 6 years.

I use age 20 years as the maximum age, because most the women (over 90 percent) have not started fertility at age 20 and it is the minimum age required for marriage for Chinese women in the latest marriage laws. Thus, the results could be interpreted as the effects of exposure to fertility restrictions in early life before the age of fertility. It is noteworthy that the results are consistent if different starting and ending ages are used, as shown in Appendix Table C.1.

Researchers are also interested in the effects of the shocks at different ages (e.g., Chetty et al., 2016; Cutler et al., 2016). The analyses in the next section investigate the effects of the penalties at different ages, and extend to age 25 years. In general, I find consistent results by doing so. Because there are not many changes across provinces over time, the study faces a trade-off between obtaining heterogeneous effects at different ages and the accuracy of the estimates. Therefore, my main estimates are based on a single variable, the mean value of the penalty level at ages 6 to 20 years.

5 Descriptive Evidence for the Effects of the One Child Policy

I present descriptive graphical and formal econometric evidence to examine the notion that exposure to fertility restrictions in early life had profound social and economic consequences. This section provides the descriptive analysis. Section 6 provides the formal econometric analysis.

5.1 Education, Marital Status, and Labor Market Outcomes

Since 16 provinces increased the fertility penalties during 1989–1995, I divide the provinces into two groups, and use the 16 provinces as the treated group and the others as the control. For each group, I plot the means of the outcome variable against birth cohort. For simplicity, I only keep women of Han ethnicity in the latest wave (i.e., only census 2005 for the outcomes in the census data) for this analysis. But the results are consistent if the analysis also includes men or data from earlier waves.

Figure 3 shows the results for education attainment (panels a and b), marital status (panel c), and white-collar job occupation (panel d). The diamond line represents the birth year trend for the treated group, and the point line for the control group. The dashed line plots the differences between the two (i.e., treated – control). The two vertical dashed lines denote the 1959 and 1969 birth cohorts, because these two birth cohorts are age 20 in 1979 (i.e., the starting year of the OCP) and 1989 (i.e., the year the government started to consider performance in the OCP as a factor in the promotion of local officials), respectively. The two lines divide all the birth cohorts into three parts: 1) the 1940-1958 birth cohorts, who experienced no fertility restrictions by age 20 in both groups; 2) the 1959-1968 birth cohorts, who experienced similar fertility restrictions in both groups; and 3) the 1969+ birth cohorts, who experienced differential fertility restrictions in early life in treated and control groups. Note that the 1969 birth cohort is aged 20 in 1989, when the fertility fines started to increase in the treated group.

[Figure 3 about here]

Panel a in Figure 3 shows the pattern for senior high school completion. There is a good deal

of movement in both the treated and control groups: For the pre-1951 birth cohorts, the rates are consistent and stable over time; for the cohorts born between 1951 and 1968, there is a hump caused by the great Cultural Revolution; and the completion rates go up again for the post-1968 birth cohorts. There is consistently no significant difference between the two for the birth cohorts prior to 1969. However, the difference started to grow significantly in the late-1960s birth cohorts.

Panel b shows the pattern for college completion. Different from panel a, the trends in college completion rates do not present any hump.[16] But, similar to panel a, the difference between the control and treated groups is consistently zero for the 1940-1968 birth cohorts, and the difference started to grow among the late-1960s birth cohorts.[17] Panels c and d present the results for marital status and white-collar employment. The dashed lines in both panels show a stable difference between the treated and control groups among the cohorts born prior to the 1969, and the difference gradually grows for the cohorts born later. Overall, Figure 3 consistently suggests that exposure to stricter fertility restrictions is associated with higher education, later marriage, and white-collar job occupation.

5.2 Fertility and Children Outcomes

I further investigate the impact of exposure to fertility restrictions in early life on fertility and outcomes of the subsequent generation by following the same methodology. Figure 4 presents the descriptive evidence for the effects of the OCP on fertility and children outcomes.

Panel a presents the results for fertility measured by the number of children ever born. Fertility consistently declines over birth cohorts, for both treated group and control group.[18] The difference

[16] Most of the middle high schools and colleges were closed during the Great Culture Revolution starting from 1967. However, in July 1968, Chairman Mao Zengdong instructed: "We still need universities and colleges." Therefore, during the turbulent times, the universities were still open, and the students were chosen from young workers in different disciplines.

[17] Because the normal age for senior high school ranges from age 15 to 18 years and that for college from age 19 to 22 years, the turning point for college is earlier than that for senior high school.

[18] Fertility goes down for two reasons. First, the later birth cohorts were younger in the 2005 census, and thus they may not have completed their fertility; second, fertility goes down because of the fertility restrictions and economic growth in China. I cannot control for the age effects here because age is perfectly co-linear with birth year. In regression analysis, I control for the age fixed effects and the results are consistent.

between treated and control group is of main interest. Among the pre-1960 birth cohorts, fertility dropped faster in control group. Among the 1960-1969 birth cohorts, fertility declined at similar pace in the both two groups. However, among the post-1969 birth cohorts, fertility in the treated group declined faster. It means that the stricter OCP in early life is associated with fewer children to have.

[Figure 4 about here]

Panels b and c consistently show that the children have higher quality measured by mortality and education, if their mothers were exposed to stricter fertility restrictions in early life. For both panels, child quality in treated group relatively declined among the prior 1969 birth cohorts. However, among the post-1969 birth cohorts, the trend reversed, which indicates that the quality of children improved in treated group among the post-1969 birth cohorts.

5.3 Other Outcomes in the UHS and the CFPS

Similarly, Appendix Figure C.1 examines the main household outcomes such as household income, expenditure, consumption, and saving rate, in the UHS. Following the same methodology above, I separately plot the mean values of the outcomes for the treated and control groups in the same figure. Because of the smaller sample size in these survey data, I pool the data from all the waves.

The shapes of the solid lines for the treated and control groups reflect the life-cycle pattern for income, expenditure, consumption, and saving. But the difference between the treated and control groups is interesting in this study. For all four panels, the differences become larger for the cohorts born later than 1969. The consistent patterns suggest that people who experienced stricter fertility restrictions in early life would have higher income, spend more, consume more, and save more.

Appendix Figure C.2 shows the descriptive evidence for the subjective welfare and opinions affected by exposure to fertility restrictions in early life. In general, among the pre-1969 birth cohorts, the differences between treated and control group were stable and consistent. However, for those born after 1969, the treated group presents greater satisfaction in marriage and less agreement with the statement "marriage/child is important for women."

6 Regression Analysis

6.1 Econometric Model

To obtain more precise estimates, I estimate the following regression:

$$Y_{ijbt} = \beta_0 + \beta fine_{jb}^{6-20} + \delta_{bt} + \delta_j + T_j + \varepsilon_i \quad (1)$$

In the equation, subscript i denotes individuals, j *hukou* provinces, b the year of birth, and t the year of the survey. The dependent variable Y_{ijbt} is the outcome of individual i born in year b in j *hukou* province in survey year t. It can be senior high school completion, married ever, or the number of births (of women). The key variable, $fine_{jb}^{6-20}$, denotes the mean value of the fine rate in *hukou* province j in the years in which birth cohort b was between 6 and 20 years of age. The coefficient, β, is of our main interest because it presents the impacts of the fertility restrictions when agents were young on the outcomes.

δ_{bt} denotes the indicators for birth cohorts, calendar years, and interactions between the two. We control for the interactions to avoid any systematic sampling difference in a specific birth cohort between surveys in different years. δ_j denotes the dummies for *hukou* province that capture time-invariant heterogeneity across provinces. T_j denotes province-specific birth linear time trends to control for any potential province-specific trends such as feminist views or attitudes toward women's education and careers. Since the variation in fine rates used in equation (1) is at province-year of birth (YoB) level, we report the standard errors clustered at province level for all the regression results.

I use the fertility penalties in the registered residency (*hukou*) province, with the consideration that the respondents were likely to grow up in their *hukou* province. However, the UHS data only provide information for the province of current residence. There is a potential issue because the level of penalties in early life potentially affected individual migration behaviors, and thus the province of current residence is endogenously determined. However, the census 2005 data show that over 95 percent of individuals live in the same province as their *hukou* province, suggesting

that migration should not be a serious issue here. In addition, the results are consistent when using different provinces for the data with the available information on *hukou* province and province of current residence.

Considering the different patterns for men and women, I divide the sample by gender and conduct the regressions separately. Because only Han people are subject to the OCP, I report the results for Han ethnicity in the main text and the results for minorities in the Appendix.

6.2 Evidence from Census Data

6.2.1 Education, Marital Status and Labor Market Outcomes

Table 2 shows the OLS estimation results for the equation (A.1). The first two columns present the estimates for the effects of exposure to the fertility restrictions in early life on education attainment. The results show that being exposed to the higher fertility penalties at ages 6 to 20 years leads to significantly higher rates of completion of senior high school and college, for men and women. Specifically, a one-unit increase in the fertility fine rate in early life leads to a 4.5 percentage points higher (28 percent of the mean) senior high school completion rate for women, and 3.1 percentage points (13 percent) higher completion rate for men. The gender difference is statistically significant (p-value < 0.05). For college completion, the corresponding numbers are 1.7 percentage points (34 percent) for women, and 1.8 percentage points (26 percent) for men.

[Table 2 about here]

For the 1965–1980 birth cohorts in the census sample, the mean value of fertility fine rate experienced at ages 6-20 years is one, with the units being yearly household income. From the 1940s birth cohorts (i.e., no exposure to the OCP in early life) to the 1965–1980 birth cohorts, the senior high school completion rates increase by 15 and 13 percentage points, for women and men, respectively. Therefore, exposure to fertility restrictions caused by the OCP explains 32 and 24 percent of the increases for women and men, respectively. Consequently, exposure to the OCP explains 70 percent of the gender gap compression among the birth cohorts. I will further compare

the estimates to those in the literature in the Section 7.

Columns 3 in Table 2 presents the effects of exposure to fertility restrictions in early life on the age at first marriage. The estimates suggest that a one-unit increase in fertility fines at ages 6-20 years leads to significant 2.9 and 3.1 percentage points lower likelihood of being married before age 25, for women and men, respectively. Further analysis suggests this finding is caused by individuals delaying marriage rather than remaining single. Appendix Table C.2 divides the whole sample by individuals older and younger than age 30, and shows that the effects on marital status are only present for those ages 26 to 30.

The final two columns in Table 2 show the results for labor market outcomes. There is no significant evidence showing that exposure to the fertility restrictions leads to alteration in the labor supply in general. However, it leads to a significantly higher likelihood of being employed in a white-collar job occupation.

6.2.2 Fertility and Outcomes of the Subsequent Generation

Following the same methodology, I estimate equation (1) for fertility outcomes and report the results in Table 3. Consistent with the implications of the model, the estimates in the first column show that exposure to stricter fertility restrictions leads to significantly fewer births. Specifically, a one-unit increase in fertility fines at ages 6–20 years leads to 0.2 (10 percent) fewer births per woman. Among the 1965–1985 birth cohorts, there was a total of 210 million women in 2010 (based on the 2010 census aggregate data). My estimate suggests that there would have been more than 40 million children born by these women if there had been no OCP.

[Table 3 about here]

The next three columns in Table 3 show the results for the outcomes for the subsequent generation. Based on the fertility history reported by the women, I transfer the data from the mother level to the child level. Now each observation in columns 2 to 4 stands for one birth. To estimate the impact of mother's exposure to the fertility restrictions in early life, I also estimate equation (1).[19]

[19]Note that the covariates in the regressions are at the mother level, and include dummies for year, mother's year of

The results imply higher quality, measured by mortality and education, in children born to women who experienced stricter fertility restrictions in early life. The estimates in column 2 show that a one-unit increase in the fertility fine rate (i.e., the mean value of fines at ages 6–20 for birth cohorts 1965–1980) leads to a significant 0.65 percentage point (25 percent) lower mortality among the subsequent generation. The last two columns in the table show the impact of mothers experiencing fertility restrictions in early life on children's education outcomes. To do so, I use a more restricted sample of children, and further control with dummies for the age and gender of the children in the household.[20] The results show that mother experiencing the OCP in early life leads to children being more likely to receive normal education. Therefore, based on the estimates in columns 2 to 4, the results show that the OCP has lasting effects on the outcomes of the next generation, which is consistent with the findings in Ananat and Hungerman (2012).

I also estimate the impact of exposure to fertility restrictions in early life on the sex composition of the children. However, the results are not robust to different model specifications, and thus I do not have solid evidence on this.

6.2.3 Effects of Fertility Restrictions at Different Ages

In this section, I divide the fines at ages 6-20 into fines at ages 6-15 (i.e., the ages for primary and junior high school), and fines at ages 16-20 (i.e., the ages for senior high and early college). I do not divide the ages into smaller subgroups, because the smaller the age groups are, the smaller is the variation in the fines, and thus the results are more inaccurate. This is especially true for the fines at ages 6-15. Because the substantial changes in fines started in the late 1980s, there was little variation in the fines before age 10 for all the birth cohorts in the sample I use.

I also extend the maximum age to 25 by further adding fines at ages 21-25 (i.e., the ages for college or above). Since the normal age for senior high school ranges from 15 to 18, and that for college ranges from 19 to 22, it is expected that the fertility penalties at ages 21-25 would not

birth, and province, as well as province-specific linear trends in mother's birth year.

[20]The details of the sample restriction are in Appendix C. The results are consistent if I do not control for the age and gender of the children. The results are available upon request.

matter for senior high school completion. Doing this exercise helps to figure out what ages matter for education attainment of different levels, and provides additional evidence for the exogeneity of the fertility penalties. The first two columns in Appendix Table C.3 show the results. Consistent with expectation, for fertility penalties at ages 21-25, there is no significant effect on senior high school completion, but a positive and significant effect on college attainment.

Although most women in the sample got married and gave birth during ages 21-25 (as shown in Appendix Figure C.3), results in Appendix Table C.2 show that exposure to fertility restrictions before age 20 actually matters more for the age at marriage. For example, a one-unit increase in the fertility penalty level at ages 16-20 leads to a significant estimate of 0.072 fewer births, while the effect of fertility penalties at ages 21-25 is a scale smaller and statistically insignificant. Overall, for later life outcomes such as marriage, fertility, and investment in children, the fertility penalties in earlier life (i.e., younger than age 20) matter more than those at later ages (i.e., older than age 20).

It is noteworthy that adding the fines at ages 21-25 does not affect the estimates for all the estimates in Table 2 and Table 3, even for college attainment and white-collar job occupation. The results are available upon request.

The insignificant effects of the OCP restrictions at ages 21-25 on fertility outcomes also motivate to investigate the *contemporary* effects of the OCP on the fertility and children outcomes, which are usually investigated in the literature (e.g., Schultz and Zeng 1995; Yang et al. 2000). The *contemporary* effects here are defined as the effects of an increase in the fertility fines increase on fertility and children outcomes in the following few years among the households. Appendix Table C.8 uses the children sample in column 3 of Table 3, and investigates whether the fertility fines in the birth year of the first child affect the household size and the education level of the children. Consistently, I do not find any significant effects on the fertility and the quality of the children measured by education attainment. Comparison of these *contemporary* effects and the effects investigated in Table 3 makes the story consistent with the model predictions. The findings also suggests that earlier exposure to the fertility restrictions allows people to adjust their behaviors

over the life cycle, such as human capital investment and age at marriage, so as to get used to the policy change.

6.2.4 Results of Minorities and Different Types of *Hukou*

The results discussed so far have been based on people of Han ethnicity. Minorities could be a comparison group. Therefore, I show the results in Appendix Tables C.5 and C.6. In contrast to the significant effects for the Han people, I do not find any significant effects for minorities. These placebo results provide further suggestive evidence of the effects identified among the Han people.

Appendix Table C.7 shows the *hukou*-specific results. Overall, for education and white-collar job, the estimates for urban people have larger magnitude at the absolute scale, but smaller at the relative scale. For example, a one-unit increase in fines at ages 6-20 leads to a 5.9 percentage points (or 12 percent) increase in senior high school completion rate for urban people, but a 2.0 percentage points (or 28 percent) increase for rural people. For the fertility outcomes, the estimates for rural people have larger magnitude at the absolute scale, and the same or larger at the relative scale. Specifically, a one-unit increase in fines at ages 6-20 leads to 0.16 percentage point (or 11 percent) fewer births for urban women, but -0.2 percentage point (or 9 percent fewer) births for rural women. In addition, the same amount of increase in fines at ages 6-20 leads to a 0.15 percentage point (or 13 percent) lower child mortality rate for the urban sample, but -0.79 percentage point or (27 percent lower) child mortality rate for the rural sample.

The differential effects for urban and rural *hukou* may reflect different aspects between urban and rural regions: on the one hand, policy regulations varied dramatically by type of *hukou*. The OCP regulations are much stricter in urban regions, as all urban couples were allowed only one birth, while those in most rural regions were conditionally allowed two births. It is thus reasonable that the effects of the OCP in urban regions should be larger. On the other hand, however, the socioeconomic status of rural people is significantly lower. For example, about 20 percent of urban people complete college, while the comparable number for rural people is only 0.3 percent. The differential effects by urban/rural *hukou* could thus simply reflect the impacts among people

at different socioeconomic status levels. Therefore, it is possible that the coefficients for the urban sample are larger or smaller than those for the rural sample.

6.2.5 Robustness Checks

To test the robustness of the results, I further consider the following potential concerns.

Contemporary conditions. The first concern is that the fertility restrictions may be correlated with different contemporary conditions across the provinces such as feminist opinions and social norms. These contemporary effects could be potential confounding factors that drive the results.

Number of siblings. Another concern is that the fertility penalties in early life could be directly correlated with the number of siblings. The potential effects may lead to differential human capital investment, because of the traditional quantity-quality trade-off, and then affect the life-cycle outcomes.

Sex ratio at birth. Previous literature suggest that the sex ratio at birth may be an important factor that drives the premarital investment such as education and marriage outcomes (Angrist, 2002; Lafortune, 2013). Although the birth cohorts studied here were born before the OCP started, the local sex ratio at birth may be another potential confounding factor that is correlated with the OCP penalties and lifetime outcomes.

Economic development. China experienced rapid economic development in the past few decades. If the fines were correlated with economic development (although the previous results suggest no significant evidence of this), the effects of the penalties may reflect the effects of rapid economic development.

Education resources. The central government devoted a lot of resources to education in the past few decades. If the fines are correlated with education resources, such as the number of teachers hired in a local province, then the effects identified above may be biased.

Compulsory Schooling Laws (CSLs). The CSLs in China were approved by the central government in 1986, and the local provinces began enforcing them in the following years. If the fines were correlated with the policy implementation, then the effects above may be driven by the CSLs,

and cannot be interpreted as the effects of fertility restriction.

To test the robustness of the results, I additionally control for the above potential confounding factors by including province-year fixed effects (contemporary conditions), number of siblings, sex ratio at birth in the local province, logarithm of GDP per capita of the local province at age 15 (economic development), logarithm of the number of teachers in primary school and secondary school (education resources), and the CSL eligibility in the local province, respectively. Then, for each dependent variable, I plot the point estimate of the effects of the fertility penalty level and corresponding 90 percent confidence intervals in Appendix Figure C.4 for each additional set of covariates. As the figures show, there is no material change in the main coefficients of interest, indicating the results are fairly robust to controlling for these potential confounding factors. I do not control for these variables in my main estimation, because most of them are endogenous or may lead to bad-control issues. (Angrist and Pischke, 2008).

6.3 Evidence from the UHS: Household Outcomes

This section investigates the effects on household outcomes in the UHS. Because most of the outcomes are at the household level (except for marital status) and the proportion of minorities is very low (2 percent in the sample), I only use the data on the women in the Han sample for this analysis.

6.3.1 Household Structure

To start, Table 4 shows the impacts on household composition, which includes marital status (married or not), household size, cohabiting with the elderly (i.e., those over age 60 years), cohabiting with children aged 0-16, and female proportion in the household. I follow the same identification as shown in equation (1) and report the results in Table 4. Consistent with the findings for the census data, the stricter fertility restrictions in early life leads to a higher rate of unmarried women

in the UHS.[21]

[Table 4 about here]

In addition, exposure to fertility restrictions leads to a significantly lower proportion residing with the elderly, which is consistent with Miller (2010). One possible explanation is that the people growing up under the OCP have higher socioeconomic status and thus are more likely to purchase privacy by living independently.[22] Overall, the results in Table 4 show that exposure to fertility restrictions affects the household structure and living arrangement. Because the household structure may also influence income, consumption, and saving (Strauss et al., 1995; Rosenzweig and Zhang, 2014), I will check whether the effects of fertility restrictions are mainly driven by changed household structure.

6.3.2 Household Income, Expenditure, and Saving

Table 5 shows how exposure to the fertility restrictions influences household income, expenditures, and saving. For each outcome, I conduct two regressions: the first is without any additional controls other than those in equation (1), and the second one further adds the household composition such as marital status, household size, co-residence conditions, as well as female proportion. Since household structure could directly influence the household balance sheet, it is meaningful to check whether it is the household structure that matters for the effects of fertility restrictions in early life.

The estimates in Table 5 suggest that a one unit increase in the fertility fines at ages 6-20 leads to 8.8, 13.6, 7.0, and 6.6 percent higher household income, earnings, expenditure, and consumption per capita, respectively. In addition, controlling for household structure does not lead to material change. This suggests that household composition is not the major pathway from the fertility restrictions in early life to higher household income and expenditure.

[Table 5 about here]

[21] The scale is consistent with that of the effects estimated in the census data. Consistent with the results in Appendix Table C.2, I only find significant effects among those aged 30 or below.

[22] Consistent with this, I also find that exposure to the OCP while growing up also leads to a higher proportion of housing ownership. The results are available upon request.

Furthermore, the estimates suggest that fertility restrictions lead to a larger increase in income than that in consumption. The last two columns in Table 5 examine the effects on saving rate. Consistently, exposure to fertility restrictions in early life leads to a significantly higher saving rate, which is also consistent with the model prediction. Therefore, given the various discussions of China's high and increasing saving rate (Banerjee et al., 2010; Chamon and Prasad, 2010; Wei and Zhang, 2011; Banerjee et al., 2014; Choukhmane et al., 2016), the results suggest that the OCP contributes to an explanation of the increasing saving rate in recent China.

Appendix Figure C.5 shows the shares of income sources and expenditure categories. It shows that 80 percent of the household income comes from labor earnings, and that consumption attributes 79 percent of total expenditure of the households. Appendix Table C.9 shows how exposure to the OCP in early life affects these. I do not find any significant change in income resources or expenditure categories caused by exposure to the OCP in early life.

6.3.3 Household Head and Female-oriented Consumption

Table 6 shows how the fertility restrictions affect women's empowerment by looking into whether the fertility fines at ages 6-20 led to more households headed by women, and whether they led to more female-oriented consumption. Since the household head is defined as the person who has the major role in financial decisions and household issues, it indicates that the household head may have greater power within the household. In addition, the share of consumption is usually treated as an indicator of bargaining power within the household in the literature (Browning et al., 1994; Lise and Seitz, 2011; Browning et al., 2013). Therefore, more households headed by women or a larger proportion of female-oriented consumption suggests female empowerment in the UHS data.

Table 6 presents the evidence that fertility restrictions lead to female empowerment. Column 1 shows that the fertility restrictions led to more female household heads. The magnitude is also sizable: a one-unit increase in the penalty level leads to a 6 percentage points (20 percent of the mean) higher proportion of female household heads. To rule out the effects from changed household composition, such as more women remaining single, column 2 further controls for household

structure variables, and finds little change in the coefficient. The results are also consistent if I only use the married sample or those over age 30.

[Table 6 about here]

Columns 3 to 8 show whether fertility restrictions changed the composition of consumption. The three categories examined include: 1) clothing, adornment, and beauty goods; 2) drinks, liquor, sugar, and restaurants; and 3) food consumption. The first category is considered female-oriented, the second male-orientated, and the last almost gender neutral.[23] The estimates in columns 3, 5, and 7 suggest that an increase in fertility fines at ages 6-20 increases the share in consumption of clothing and beauty goods, and decreases the share of drinks, sugar, restaurants, and food. However, because stricter fertility restrictions lead to higher household income and expenditure, the effects identified in columns 3, 5, and 7 could be driven by income effects. Therefore, I further control for the household structure and total expenditure in columns 4, 6, and 8. Then, a one-unit increase in fertility fines in early life leads to a 0.73 percentage point (5.6 percent) higher share of consuming clothing, adornments, and beauty goods, but a 0.61 percentage point (6.5 percent) lower consumption share of drinks, liquor, sugar, and restaurants. Compared with the estimates in columns 3 and 5, the coefficients have changed, but the changes are statistically insignificant. For reference, after controlling for household composition and expenditure, the effects on the share of food in consumption diminish, indicating that the estimate in column 7 is mainly driven by the changed household composition or income effect.

Appendix Table C.10 reports the results for all the different consumption categories. In addition, I also conduct the results for men, which are similar to those for female sample but the magnitudes are smaller. The results are available upon request.

[23] Based on the UHS sample, I conduct some regressions to examine the correlations of these consumption shares with the proportion of female members in the household. The estimates suggest that, if the household is composed of all female members, the share of clothing, adornments, and beauty goods consumption would increase by 11 percent; the share in the second category would drop by 8 percent; and that in the third category would drop by only 2 percent. The results for food consumption may be also influenced by the energy demand by men and women. Normally speaking, a male adult needs 2,500-3,000 cal per day but a female adult 2,000-2,300 cal per day.

6.4 Evidence from the CFPS: Subjective Welfare and Opinions

The CFPS questionnaire asked the respondents to score their happiness on a 1-10 scale, and I use the happiness score directly. For satisfaction with marriage and spousal housework duty, respondents were asked to provide an answer ranging from 1 ("very satisfied") to 5 ("not satisfied at all"). I create a dummy variable that equals one if the answer is "very satisfied" or "satisfied." For the question about opinions, the respondents were asked to provide an answer ranging from 1 ("strongly agree") to 5 ("strongly disagree"). Similarly, I create a dummy variable that equals one if the answer is "strongly agree" or "agree."

The first three columns in Table 7 show the results for happiness and satisfaction with marriage. Exposure to higher fertility penalties in early life significantly enhances happiness, satisfaction with marriage and spousal household duty, among women but not men. The next two columns report the results for opinions. People exposed to fertility restrictions in early life have a lower level of agreement with the statement that marriage or children are important to women, for men and women. The effects are larger and significant for women. Overall, the results with the CFPS data show that exposure to the fertility restrictions in early life leads to a significant improvement in women's subjective welfare and changes the social traditional norm about women's independence.

[Table 7 about here]

7 Discussion

Another question is how the results in previous section compare to other interventions that affects fertility and the findings in the existing literature. To understand this, I use the national mean value of the OCP fines in the 1980s, one year of household income, as the value of fertility fines at ages 6-20, to interpret the results and make the comparison.

7.1 Comparison with the Literature on Other Birth Control Policies

Starting with Goldin and Katz (2002) and continuing with Bailey (2006), Goldin (2006), Hock (2008), Miller (2010), and Ananat and Hungerman (2012), researchers have found that increased access to the pill by young unmarried women in the 1960s and 1970s affected marital, educational, labor market and children outcomes. The estimates in my study are in the same direction. However, a further comparison suggests much greater magnitudes than those in the prior literature.

Educational attainment. Both previous literature and this study find that birth control policies increased the education attainment of the women. The pill availability increased college attainment by 0.5 percentage points (2-3 percent) among young women in the U.S. (Ananat and Hungerman, 2012; Hock, 2008). Miller (2010) found that family planning policy in Columbia increased women's years of education by 0.1 (about 5 percent of mean). By contrast, among Han women in China, the OCP increased the senior high school completion rate by 4.5 percentage points (18 percent), and college by 1.7 percentage points (34 percent). The magnitudes of the effects of the OCP are larger in absolute and relative scale.

Age at marriage. Goldin and Katz (2002) found that availability of the pill to young women decreased the proportion of women marrying before age 23 by 2 percentage points (or 0.08 standard deviations) among college graduates (mean = 0.41). My estimates suggest that experiencing the OCP early in life leads to a 2.9 percentage points (or 0.3 standard deviations) lower likelihood of marriage before age 25 (mean = 0.89).

Fertility. Both Bailey (2006) and Ananat and Hungerman (2012) found that the availability of the pill to young women significantly reduced fertility in the short term. For example, Ananat and Hungerman (2012) found the short-term fertility dropped 3.3 percent on average. But the effects were mainly driven by the women aged between 14 and 20, whose birth rate dropped by 9 percent with no effects among those aged 21-25. However, effects on the lifetime fertility are mixed. Ananat and Hungerman (2012) found zero effects on the total fertility over the lifecycle in the U.S.; Bailey (2006) found small but insignificant effects on the number of children ever born (3 percent of the mean) in the US; and Miller (2010) found that the availability of contraception

pills led to 4 percent fewer births in Columbia. Therefore, the power of the pill, at least in the US, is mainly due to the delayed fertility rather than the total number of children in lifetime.

In contrast, according to the estimates in Table 3 in this study, experiencing the OCP in early life (i.e., a one-unit increase in fertility fines) significantly leads to 0.2 percentage point (or 10 percent) fewer births for each woman. During 2005-2015, there were 16 million new births per year in China. Since the women giving birth during this period all grew up under the OCP, the results of the study imply that there would have been at least 1.6 million more births per year during this period if there had been no OCP.

The differential estimates above reflect fundamental and profound differences between the OCP and other birth control policies. Above all, China's OCP is alone in adopting a mandatory birth quota and heavy penalties for an "out-of-plan" birth (Schultz, 2007; Miller and Babiarz, 2014), while the pill is an access to technology that breaks the constraints of unwanted births. In addition, the OCP is gender neutral and restricts the number of births directly; the availability of the pill offers women greater control over their fertility, and thus enhances their bargaining power (Pezzini, 2005; Chiappori and Oreffice, 2008). Finally, the effects of the availability of the pill or abortion originate from the policy "compliers"; the OCP is a policy of restricting fertility, and thus its effects could be interpreted as the average impact in the population.

7.2 Human Capital, Economic Development and Female Empowerment

Human capital. One classical relationship between fertility and human capital accumulation is the child quantity-quality trade-off (Becker, 1962; Becker and Lewis, 1973; Becker and Tomes, 1976). However, many empirical economists examined the relationship but found mixed evidence.

For example, Rosenzweig and Zhang (2009) used twin births under China's OCP as an exogenous shock to fertility to examine whether this affected children's education. The estimates suggest the elasticity between family size and children education ranges from -0.04 to -0.5. Based on this, Rosenzweig and Zhang (2009) estimated that the OCP at most increased middle high school attainment by 4 percent, and college attainment by 9 percent. In contrast, Angrist et al. (2010) reviewed

the evidence in previous literature and concluded no evidence for the child quantity-quality trade-off. In addition, this study does not find evidence for the traditional child quantity-quality evidence, either.

However, this paper establishes the association between fertility and human capital by considering fertility under the context of life cycle and examining how individuals to alter their own education investment if they expect fewer births to have in the future. The estimates show that one unit increase in fertility fines in early life lead to a 0.2 (10 percent) fewer births, a 0.45 percentage points (28 percent) higher senior high school completion rate, and a 0.17 percentage points (34 percent) higher college completion rate. Therefore, these results suggest the elasticity between human capital and fertility ranges from -2.8 to -3.4 under the life cycle context, which is almost ten times larger than that in Rosenzweig and Zhang (2009). The empirical results imply that the linkage between fertility expectation and self education is stronger than that between actual fertility and child education.

Economic development and saving. Previous literature has examined the effects of fertility on income. For example, Ashraf et al. (2013) used a macro simulation model and quantitatively estimated that 10 percent lower fertility rate would lead to a 6-15 percent higher GDP per capita. Similarly, Li and Zhang (2007) found that 10 percent lower fertility rate increased income per capita by 3-8 percent in a province-year panel data. Consistent with these, my estimates suggest that 10 percent lower fertility caused by the OCP is associated with a 6-10 percent higher income per capita.

In addition, the OCP also increased saving rate among the post-1960 birth cohorts. As shown in Panel A of Figure 5, among the 1975-1979 birth cohorts, the saving rate would be 2-4 percentage points lower if there had been no OCP. This also contributes an mechanism for the findings in Choukhmane et al. (2016).

[Figure 5 about here]

Female empowerment. Duflo (2012) documented the relationship between economic development and female empowerment. This study presents new evidence on the role of fertility. The

results show that the exposure to fertility restrictions in early life could be an important factor that contributes to a higher level of economic development and female empowerment.

Indeed, China is an outlier in female empowerment, given the country's GDP level. Panel b of Figure 5 shows this by plotting the relative education increase of women during 2003-2009 against the GDP per capita. Education is measured by the tertiary education enrollment rate. As the results imply, the OCP may be an important factor in explaining the increase in female education and empowerment in recent decades

Fertility Policy. The results suggest that the fertility reduction caused by the OCP could be show and lagged. Individuals need time to adjust behaviors such as education and age at marriage to cater to the fertility restrictions required by the policy. That is also consistent with what happened to China in recent years. The Chinese government started to loosen the OCP in 2010, but the fertility rate has been consistently low.[24] According to the findings in this study, people growing up under the strict OCP in the past few decades have formed the one-child expectation, and thus their behaviors along the lifecycle, such as education, age at marriage, labor supply, and so forth, are consistent with such an expectation. After the household formation of these cohorts, it may be that having two children is no longer the optimal choice.

8 Conclusion

Since the late-1970s, China's One Child Policy has restricted fertility of millions of couples in China for more than 30 years. This study uses China's OCP as an exogenous shock to fertility (and fertility expectations), to investigate the effects of exposure to fertility restrictions in early life on life-cycle outcomes, including demographic transition, socioeconomic status, and female empowerment.

[24]Since the 2010, the governments considered to loose the policy restrictions. In the late 2013, China government started the "Selective two-child policy". This policy allowed couples to have to have two children if one member of the couple has no siblings. In the November 2015, the government ended the OCP and started the "universal two-child policy". However, the total fertility rate in recent years seem not to respond to the loosen fertility restrictions. The census 2010 data show that the total fertility rate (TFR) is 1.18. However, the TFR is 1.047 in 2015, which is even lower, according to the China Statistic Yearbook 2016.

Fertility restrictions imposed when people are young have profound effects throughout the life cycle. restrictions when young leads to higher education, more white-collar jobs, delayed marriage, and lower fertility. Further consequences include lower rates of residing with the elderly, and higher household income, consumption, and saving. Finally, exposure to stricter fertility restrictions in early life increases female empowerment later in life, as measured by an increase in the fraction of households headed by women, female-oriented consumption, and gender-equal opinions.

These findings are consistent with the literature, and provide new evidence on why fertility control is an important factor in human capital accumulation, economic development, and female empowerment. In addition, compared with the literature on the short-term effects of the OCP, my estimates imply much larger effects if they are evaluated in the long run under the context of the life cycle. This study provides new insights into evaluation of the OCP, and partly explain some puzzling phenomena in current China, such as high saving rate and rapid economic growth.

Although the results suggest that the OCP has contributed to human capital accumulation and economic growth in recent China, they do not mean that the OCP is good in general. The negative sides of this mandatory birth control policy include but not limited to loss of children, loss of fertility freedom, high male-female sex ratio, and distortion of marriage market. Before coming to a conclusion on whether the OCP is good or bad, it is necessary to investigate and calculate how much benefit and loss the policy has brought. Studies in the future may shed some light on this.

References

Aizer, Anna, Shari Eli, Joseph Ferrie, and Adriana Lleras-Muney, "The Long-Run Impact of Cash Transfers to Poor Families," *American Economic Review*, April 2016, *106* (4), 935–71.

Ananat, Elizabeth Oltmans and Daniel M Hungerman, "The power of the pill for the next generation: Oral contraception's effects on fertility, abortion, and maternal and child characteristics," *Review of Economics and Statistics*, 2012, *94* (1), 37–51.

Angrist, Josh, "How do sex ratios affect marriage and labor markets? Evidence from America's second generation," *Quarterly Journal of Economics*, 2002, pp. 997–1038.

Angrist, Joshua D and Jörn-Steffen Pischke, *Mostly harmless econometrics: An empiricist's companion*, Princeton university press, 2008.

Angrist, Joshua, Victor Lavy, and Analia Schlosser, "Multiple experiments for the causal link between the quantity and quality of children," *Journal of Labor Economics*, 2010, *28* (4), 773–824.

Ashraf, Quamrul H, David N Weil, and Joshua Wilde, "The effect of fertility reduction on economic growth," *Population and development review*, 2013, *39* (1), 97–130.

Bailey, Martha J, "More power to the pill: the impact of contraceptive freedom on women's life cycle labor supply," *The Quarterly Journal of Economics*, 2006, pp. 289–320.

_ , "" Momma's Got the Pill": How Anthony Comstock and Griswold v. Connecticut Shaped US Childbearing," *American Economic Review*, 2010, *100* (1), 98–129.

Banerjee, Abhijit, Xin Meng, and Nancy Qian, "The life cycle model and household savings: Micro evidence from urban china," *National Bureau of Demographic Dividends Revisited*, 2010, *21*.

_ **,** _ **, Tommaso Porzio, and Nancy Qian**, "Aggregate Fertility and Household Savings: A General Equilibrium Analysis using Micro Data," Technical Report, National Bureau of Economic Research 2014.

Banister, Judith, *China's changing population*, Stanford University Press, 1991.

Baochang, Gu, Wang Feng, Guo Zhigang, and Zhang Erli, "China's local and national fertility policies at the end of the twentieth century," *Population and Development Review*, 2007, pp. 129–147.

Barro, Robert J and Gary S Becker, "Fertility choice in a model of economic growth," *Econometrica: journal of the Econometric Society*, 1989, pp. 481–501.

Becker, Gary S, "Investment in Human Capital: A Theoretical Analysis," *Journal of Political Economy*, 1962, *70.*

_ **and H Gregg Lewis**, "On the Interaction between the Quantity and Quality of Children," *Journal of Political Economy*, 1973, *81* (2), S279–S288.

_ **and Nigel Tomes**, "Child Endowments and the Quantity and Quality of Children," *Journal of Political Economy*, 1976, *84* (4, Part 2), S143–S162.

Browning, Martin, Frangois Bourguignon, Pierre-Andre Chiappori, and Valerie Lechene, "Income and Outcomes: A Structural Model of Intrahousehold Allocation," *Journal of Political Economy*, 1994, *102* (6).

_ **, Pierre-Andre Chiappori, and Arthur Lewbel**, "Estimating consumption economies of scale, adult equivalence scales, and household bargaining power," *The Review of Economic Studies*, 2013, p. rdt019.

Chamon, Marcos D and Eswar S Prasad, "Why are saving rates of urban households in China rising?," *American Economic Journal: Macroeconomics*, 2010, *2* (1), 93–130.

Chetty, Raj, John N Friedman, Nathaniel Hilger, Emmanuel Saez, Diane Whitmore Schanzenbach, and Danny Yagan, "How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project Star*.," *Quarterly Journal of Economics*, 2011, *126* (4).

_ **, Nathaniel Hendren, and Lawrence F. Katz**, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review*, April 2016, *106* (4), 855–902.

Chiappori, Pierre-André and Sonia Oreffice, "Birth control and female empowerment: An equilibrium analysis," *Journal of Political Economy*, 2008, *116* (1), 113–140.

Choukhmane, Taha, Nicholas Coeurdacier, and Keyu Jin, "The one-child policy and household savings," 2016.

Cutler, David M., Wei Huang, and Adriana Lleras-Muney, "Economic Conditions and Mortality: Evidence from 200 Years of Data," Working Paper 22690, National Bureau of Economic Research September 2016.

Duflo, Esther, "Women Empowerment and Economic Development," *Journal of Economic Literature*, 2012, *50* (4), 1051–79.

Ebenstein, Avraham, "The missing girls of China and the unintended consequences of the one child policy," *Journal of Human Resources*, 2010, *45* (1), 87–115.

Edlund, Lena, Hongbin Li, Junjian Yi, and Junsen Zhang, "Sex ratios and crime: Evidence from China," *Review of Economics and Statistics*, 2013, *95* (5), 1520–1534.

Field, Erica and Attila Ambrus, "Early marriage, age of menarche, and female schooling attainment in Bangladesh," *Journal of Political Economy*, 2008, *116* (5), 881–930.

Galor, Oded and David N Weil, "The Gender Gap, Fertility, and Growth," *American Economic Review*, 1996, pp. 374–387.

Goldin, Claudia, "The Quiet Revolution That Transformed Women's Employment, Education, and Family," *American Economic Review*, 2006, *96* (2), 1–21.

_ **and Lawrence F Katz**, "The Power of the Pill: Oral Contraceptives and Womenąŕs Career and Marriage Decisions," *Journal of Political Economy*, 2002, *110* (4), 730–770.

Greenhalgh, Susan and Edwin A Winckler, *Governing China's population: From Leninist to neoliberal biopolitics*, Stanford University Press, 2005.

Heckman, James J, "Policies to foster human capital," *Research in economics*, 2000, *54* (1), 3–56.

Hock, Heinrich, "The pill and the college attainment of American women and men," 2008.

Hoynes, Hilary, Diane Whitmore Schanzenbach, and Douglas Almond, "Long-Run Impacts of Childhood Access to the Safety Net," *American Economic Review*, April 2016, *106* (4), 903–34.

Huang, Wei and Yi Zhou, "One-Child Policy, Marriage Distortion, and Welfare Loss," 2015.

Jackson, C Kirabo, Rucker C Johnson, and Claudia Persico, "The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms," *The Quarterly Journal of Economics*, 2016, pp. 157–218.

Jayachandran, Seema and Adriana Lleras-Muney, "Life Expectancy and Human Capital Investments: Evidence from Maternal Mortality Declines," *The Quarterly Journal of Economics*, 2009, *124* (1), 349–397.

Jensen, Robert, "The (perceived) returns to education and the demand for schooling," *The Quarterly Journal of Economics*, 2010, *125* (2), 515–548.

Lafortune, Jeanne, "Making yourself attractive: Pre-marital investments and the returns to education in the marriage market," *American Economic Journal: Applied Economics*, 2013, *5* (2), 151–178.

Li, Hongbin and Junsen Zhang, "Do high birth rates hamper economic growth?," *The Review of Economics and Statistics*, 2007, *89* (1), 110–117.

_ **, Junjian Yi, and Junsen Zhang**, "Estimating the effect of the one-child policy on the sex ratio imbalance in China: identification based on the difference-in-differences," *Demography*, 2011, *48* (4), 1535–1557.

Lise, Jeremy and Shannon Seitz, "Consumption inequality and intra-household allocations," *The Review of Economic Studies*, 2011, *78* (1), 328–355.

Manski, Charles F, "Measuring expectations," *Econometrica*, 2004, pp. 1329–1376.

Miller, Grant, "Contraception as Development? New Evidence from Family Planning in Colombia," *The Economic Journal*, 2010, *120* (545), 709–736.

_ **and Kimberly Singer Babiarz**, "Family Planning: Program Effects," Technical Report, National Bureau of Economic Research 2014.

Oreopoulos, Philip, Till von Wachter, and Andrew Heisz, "The Short- and Long-Term Career Effects of Graduating in a Recession," *American Economic Journal: Applied Economics*, January 2012, *4* (1), 1–29.

Oster, Emily, Ira Shoulson, and E Dorsey, "Limited Life Expectancy, Human Capital and Health Investments," *American Economic Review*, 2013, *103* (5), 1977–2002.

Pezzini, Silvia, "The effect of women's rights on women's welfare: evidence from a natural experiment," *The Economic Journal*, 2005, *115* (502), C208–C227.

Rosenzweig, Mark and Junsen Zhang, "Co-residence, Life-Cycle Savings and Inter-generational Support in Urban China," Working Paper 20057, National Bureau of Economic Research April 2014.

Rosenzweig, Mark R and Junsen Zhang, "Do population control policies induce more human capital investment? Twins, birth weight and China's one-child policy," *The Review of Economic Studies*, 2009, *76* (3), 1149–1174.

_ **and Kenneth I Wolpin**, "Life-cycle labor supply and fertility: Causal inferences from household models," *The Journal of Political Economy*, 1980, pp. 328–348.

_ **and** _ , "Testing the quantity-quality fertility model: The use of twins as a natural experiment," *Econometrica: journal of the Econometric Society*, 1980, pp. 227–240.

Schultz, T Paul, "Population policies, fertility, women's human capital, and child quality," *Handbook of Development Economics*, 2007, *4*, 3249–3303.

_ **and Yi Zeng**, "Fertility of rural China. Effects of local family planning and health programs," *Journal of Population Economics*, 1995, *8* (4), 329–350.

Soares, Rodrigo R, "Mortality reductions, educational attainment, and fertility choice," *American Economic Review*, 2005, *95* (3), 580–601.

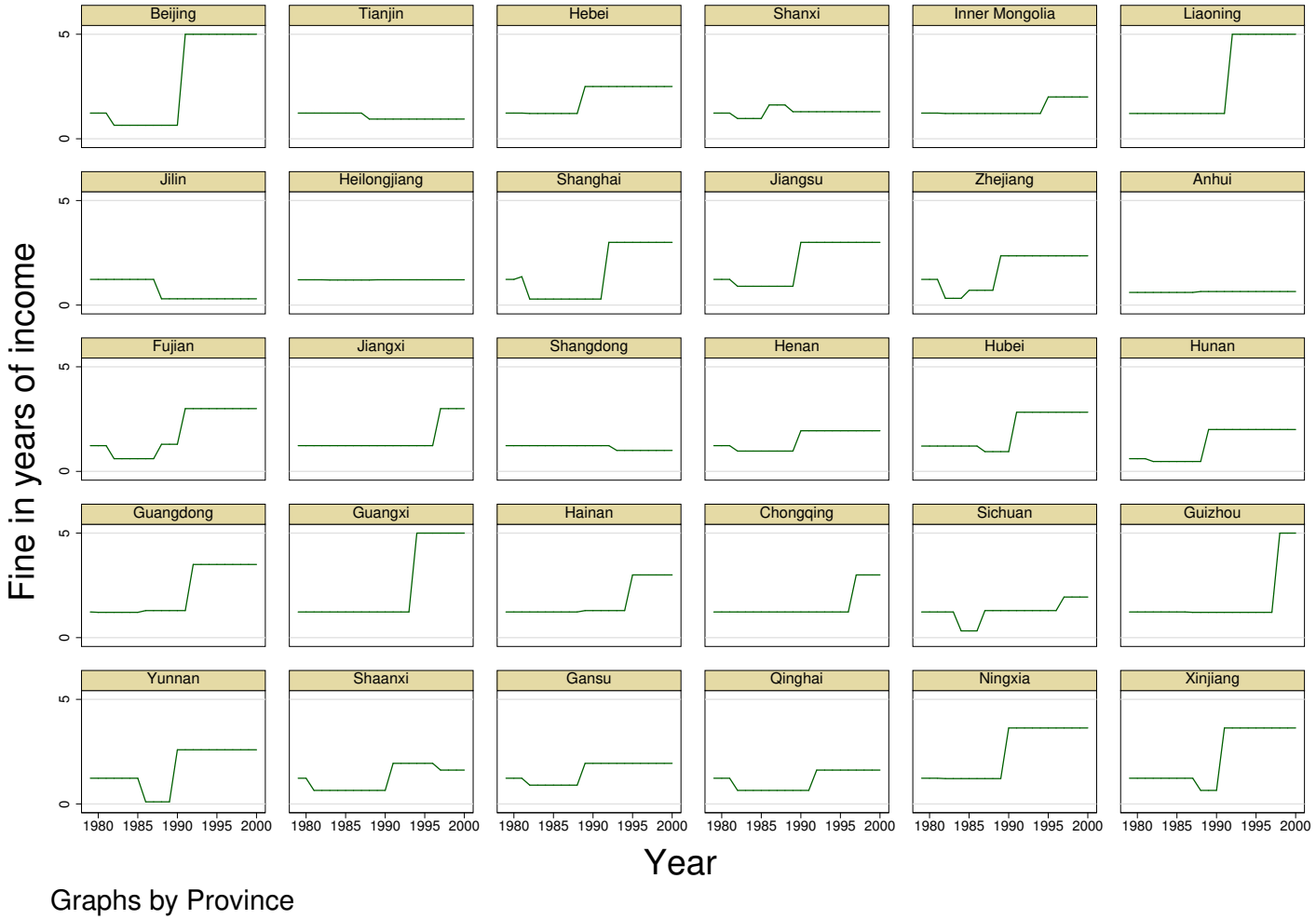
Strauss, John, Duncan Thomas et al., "Human resources: Empirical modeling of household and family decisions," *Handbook of Development Economics*, 1995, *3*, 1883–2023.

Sullivan, Daniel and Till Von Wachter, "Job displacement and mortality: An analysis using administrative data," *The Quarterly Journal of Economics*, 2009, pp. 1265–1306.

Wei, Shang-Jin and Xiaobo Zhang, "The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China," *Journal of Political Economy*, 2011, *119* (3), 511–564.

Yang, Dennis Tao, Marjorie McElroy et al., "Carrots and Sticks: Fertility Effects of China's Population Policies," *American Economic Review*, 2000, *90* (2), 389–392.

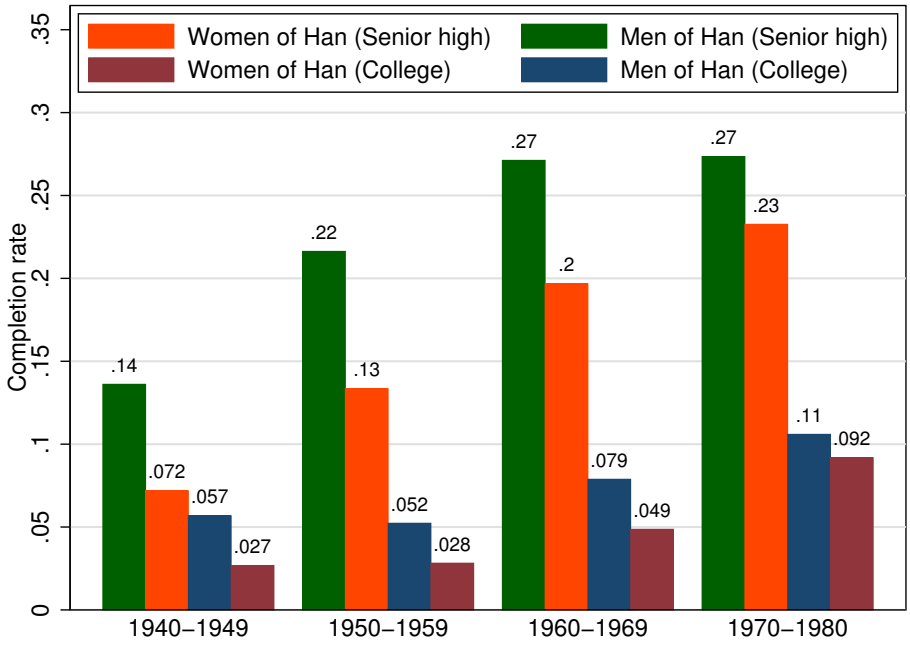
Figure 1: The OCP Fertility Fine Rates over Year, by Province



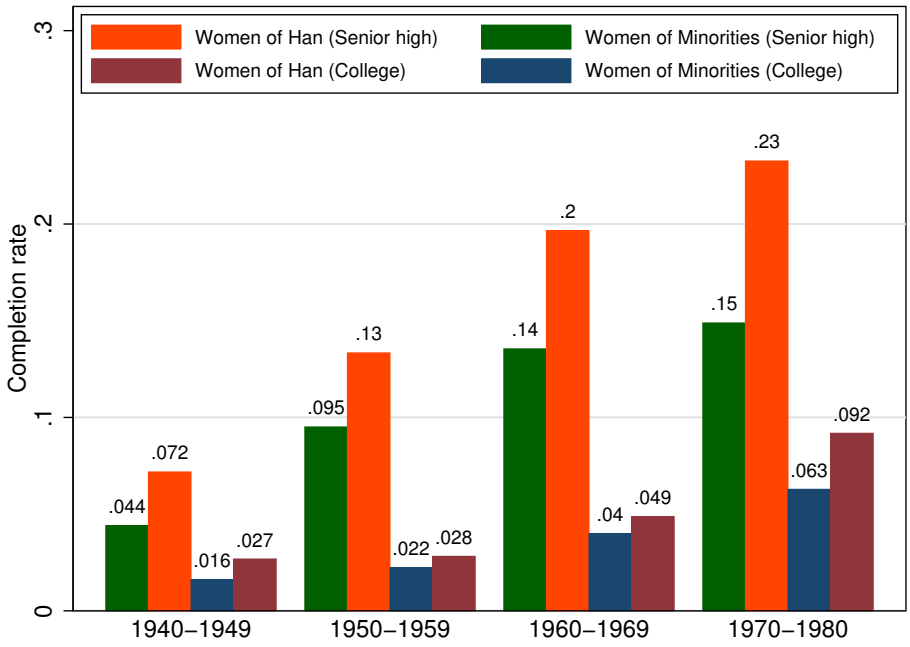
Note: Data are from Ebenstein (2010). The penalties are measured in multiples of local household annual income.

Figure 2: Education Attainment over Birth Cohort, by Gender and Ethnicity

(a) Education Attainment over Birth Cohort among Han People, by Gender



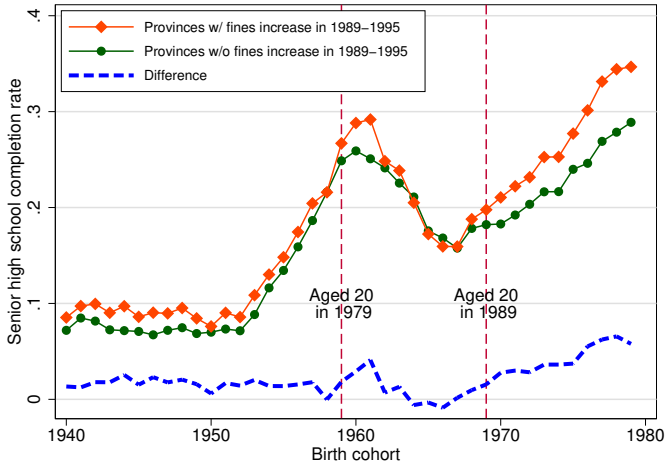
(b) Education Attainment over Birth Cohort among Women, by Ethnicity



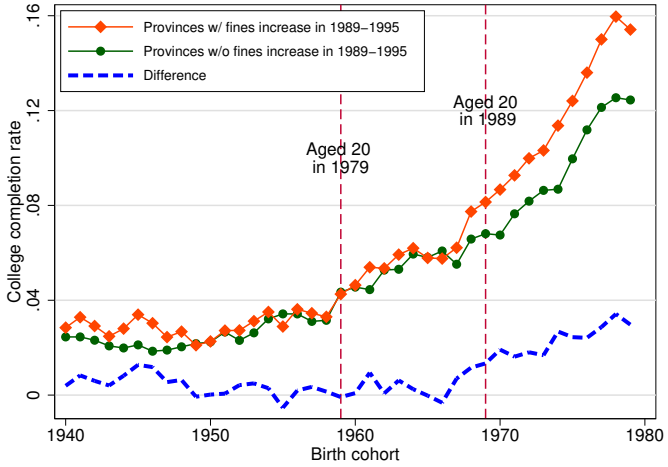
Note: Data are from the 1990, 2000, and 2005 censuses. Panel a is from the sample of only Han people, and panel b is from the sample of women.

Figure 3: Descriptive Evidence: Education, Marital Status, and Labor Market Outcomes

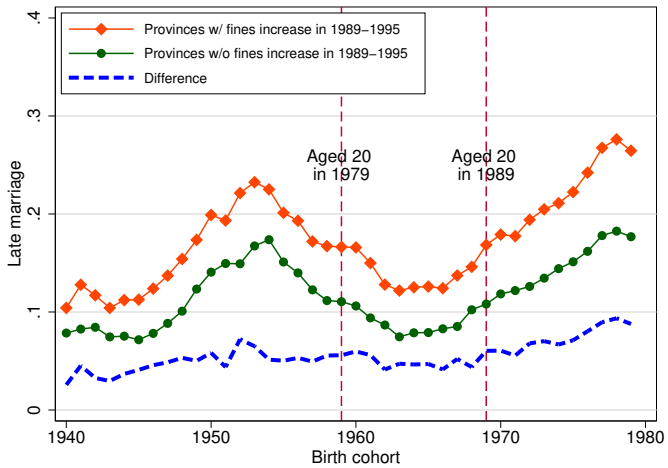
(a) Senior High School Completion



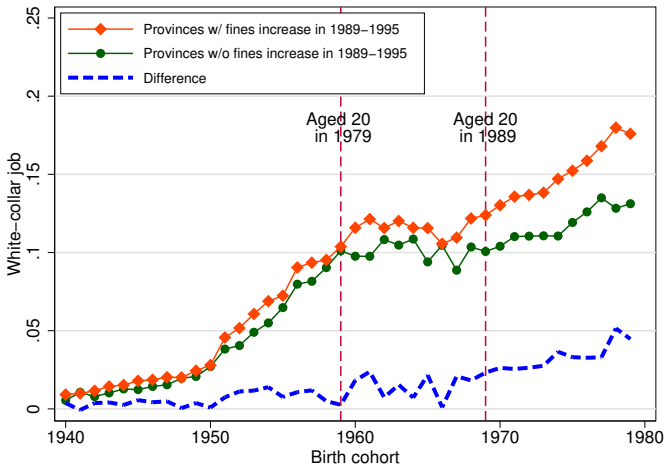
(b) College Completion



(c) Not Married or Married after Age 25



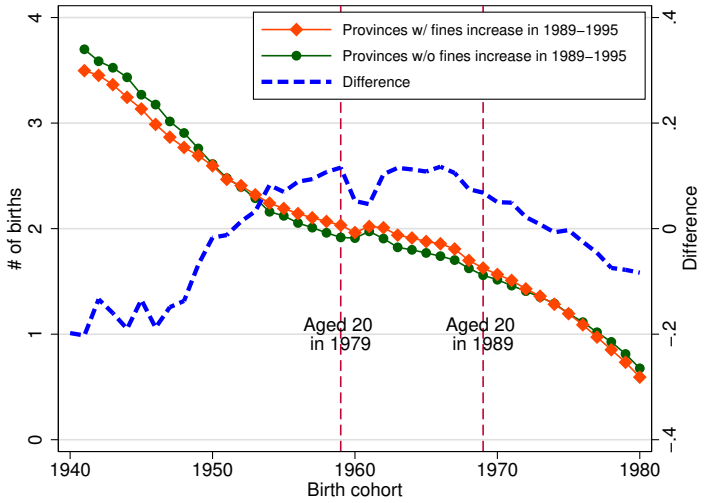
(d) White-collar Job



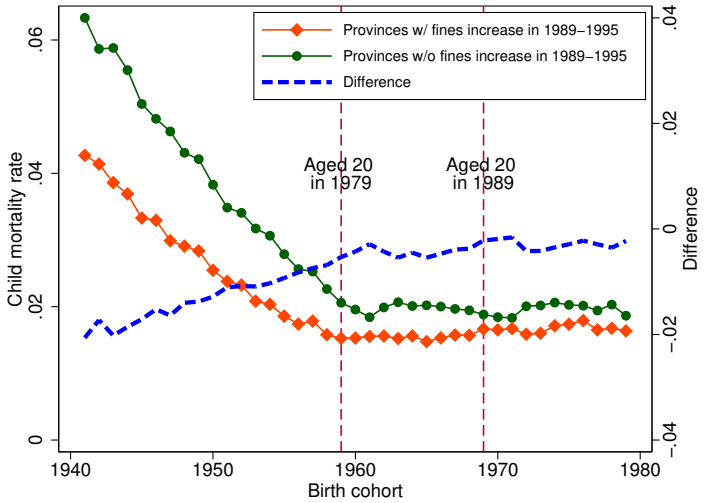
Note: Data are from the 2005 census. The sample is divided by whether the province significantly increased the fertility fines in 1989–1995. The treated group is composed of those provinces with significant increases during the period. The square lines and point lines plot the mean values for the treated group and the control group against year of birth, respectively. The two dashed vertical lines divide all the birth cohorts into three groups: 1) cohorts born before 1959, those receiving no fertility restrictions before age 20 for the treated or control group; 2) cohorts born between 1960 and 1969, those receiving similar fertility restrictions before age 20 for both groups; and 3) cohorts born after 1969, those in the treated group receiving stricter fertility restrictions than those in the control group. The dashed lines plot the difference between the treated and control groups over year of birth.

Figure 4: Descriptive evidence: Fertility outcomes

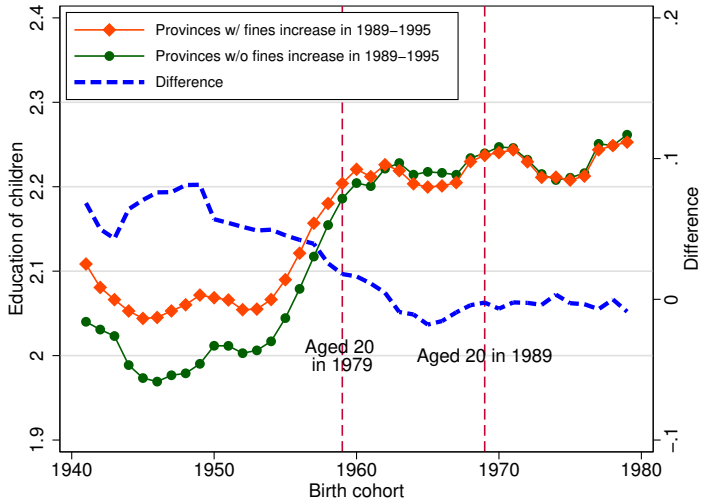
(a) Number of births



(b) Children mortality



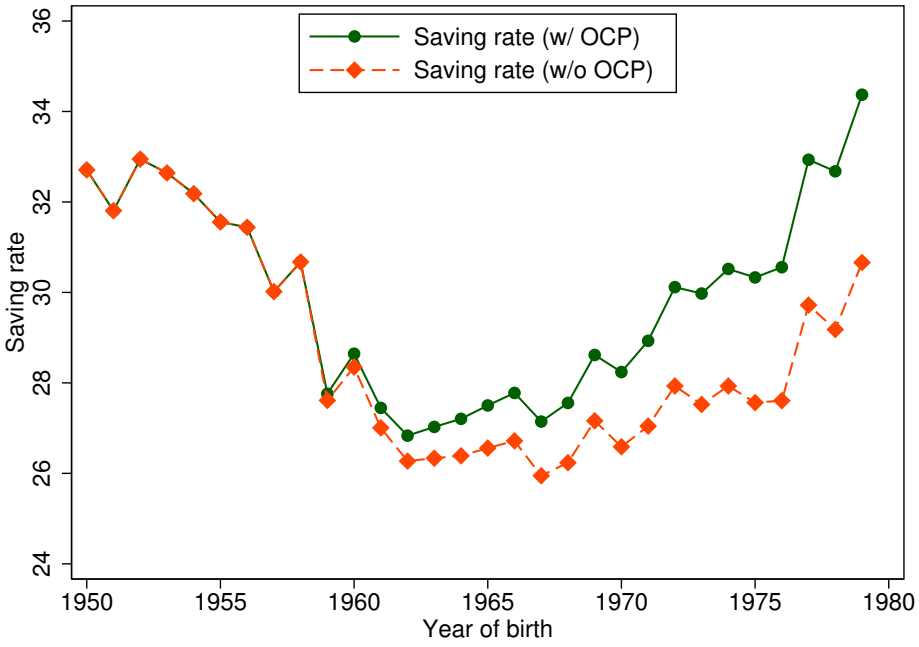
(c) Children Education



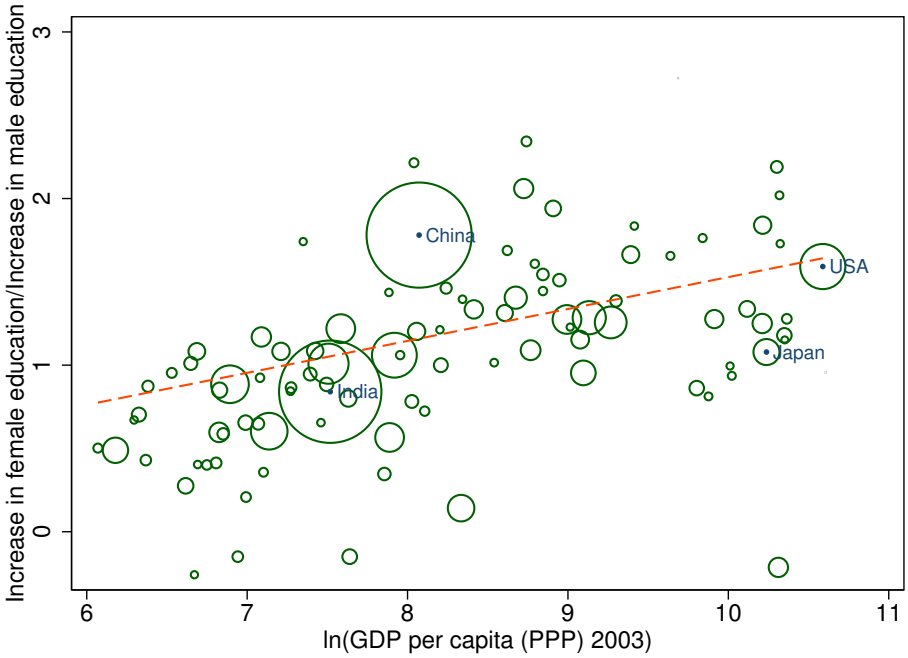
Note: Data source is census 2005. The descriptive evidence for fertility outcomes is presented. The settings are the same as those in Figure 3.

Figure 5: High Saving Rate and Female Empowerment in China

(a) China's One Child Policy and Higher Saving Rates in Post-1960 Birth Cohorts



(b) Relative Increase in Female Education over GDP across Countries



Note: In panel a, I first use the regression in column 10 of Table 5 and plot the predicted saving rate against birth cohorts; then I set the coefficient on the fertility fines to be zero, re-predict the saving rates, and plot them against birth cohorts. In panel b, the tertiary school enrollment rates are from the United Nations Organization for Education, Science and Culture, which covers the years between 1999 and 2012. Real GDP per capita in 2000 is from the Penn World Table and is the mean in purchasing power parity. The values on the Y-axis are estimated through country-specific regressions, indicating by how much the female tertiary enrollment rate will increase if there is a one-unit increase in that of men.

Table 1: Summary Statistics for Census Data

	(1)	(2)	(3)	(4)
Panel A: Education, marital status and labor market outcomes				
Sample	Female sample		Male sample	
Variables	*N*	*Mean (std)*	*N*	*Mean (std)*
Senior high school completion (Yes = 1)	5,668,820	0.16 (.36)	5,878,746	0.22 (0.42)
College completion (Yes = 1)	5,668,820	0.046 (0.21)	5,878,746	0.070 (0.25)
Married ever (Yes = 1)	5,668,820	0.98 (0.14)	5,878,746	0.92 (0.28)
Married ever among those with ages 26-30 (Yes = 1)	1,353,760	0.92 (0.27)	1,371,132	0.78 (0..41)
Married ever among those with ages 31+ (Yes = 1)	4,315,060	0.995 (0.07)	4,507,614	0.95 (0.21)
Married before age 25 (Yes = 1)	5,668,820	0.89 (0.30)	5,878,746	0.72 (0.45)
Working now	5,668,820	0.76 (0.42)	5,878,746	0.91 (0.29)
White collar job occupation	5,668,820	0.08 (0.28)	5,878,746	0.13 (0.33)
Age in years	5,668,820	38.9 (8.91)	5,878,746	38.8 (8.89)

Panel B: Fertility outcomes at mother level		
Variables	N	*Mean (std)*
Number of births	4,949,360	2.04 (1.25)
Number of births, among those who ever gave birth	4,770,117	2.11 (1.21)
Number of male births, among those who ever gave birth	4,770,117	1.12 (0.87)

Panel C: Subsequent Generation Outcomes		
Variables	N	Mean (std)
Mortality (%)	10,175,200	3.0 (17.0)
Receiving "normal" education (Yes = 1)	3,161,650	0.71 (0.45)
Education level (1-4)	3,161,650	2.2 (0.56)

Note: Data are from the 1990, 2000, and 2005 censuses. Han and non-Han people are included. Panel a reports the summary statistics for education, labor market, and marriage outcomes. Panel b reports the summary statistics for fertility outcomes at the level of the mothers, and Panel c for the measures for investment in children, measured by mortality rate and education. Standard deviations are in parentheses.

Table 2: Effects of Fertility Restrictions in Early Life on Education, Age at Marriage, and Labor Market Outcomes, among Han people

Variables	(1) Senior high school completion (Yes = 1)	(2) College completion (Yes = 1)	(3) Married before age 25 (Yes = 1)	(4) Working now (Yes = 1)	(5) White collar job occupation (Yes = 1)
Panel A: Women (N = 5,224,635)					
Sample mean	*0.16*	*0.05*	*0.89*	*0.76*	*0.08*
Fines at ages 6-20	0.045**	0.017*	-0.029*	-0.003	0.017*
	(0.019)	(0.009)	(0.016)	(0.012)	(0.009)
Panel B: Men (N = 5,420,588)					
Sample mean	*0.23*	*0.07*	*0.72*	*0.91*	*0.13*
Fines at ages 6-20	0.031**	0.018	-0.031*	-0.012	0.016***
	(0.014)	(0.011)	(0.017)	(0.009)	(0.006)

Note: Data are from the 1990, 2000, and 2005 censuses. The sample includes only Han people. The covariates in both panels include dummies for birth year, survey year, and interactions of the two, and province dummies, as well as the provincial-specific linear trends in birth cohort. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Effects of Fertility Restrictions in Early Life on Quantity and Quality of Children, among Han people

	(1)	(2)	(3)	(4)
Sample	All women	Children born to the women	Children with ages 7-16 in the households	
Variables	Number of births	Mortality (%)	Receiving "normal" education (Yes = 1)	Education level
Sample mean	*2.0*	*2.6*	*0.72*	*2.2*
Fines at ages 6-20	-0.202*	—	—	—
	(0.116)			
Fines when mothers were aged 6-20	—	-0.650**	0.076*	0.099*
		(0.260)	(0.038)	(0.052)
Observations	4,621,938	9,309,439	2,641,034	2,641,034
R-squared	0.418	0.022	0.521	0.574

Note: Data are from the 1990, 2000, and 2005 censuses. The sample includes only Han people. The first column uses the corresponding female sample, following the same setting as in Table 1. Column 2 transfers the data from the mother level to the birth level, and investigates the impact of mother's exposure to the fertility restrictions on child mortality. The covariates are the same as those in column 1. Columns 3 and 4 use a sample composed of children ages 7 to 15 years at the surveys, and investigate the impact of exposure to mother's fertility restrictions on children's education, with additional controls for the age and gender of the child. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Effects of Fertility Restrictions in Early Life on Household Structure, in the UHS sample

Variables	(1) Married (Yes =1)	(2) Household size	(3) Cohabiting with seniors aged 60+ (Yes = 1)	(4) Cohabiting with children aged 0-18 (Yes = 1)	(5) Female proportion in the household
Sample mean	*0.94*	*3.1*	*0.14*	*0.32*	*0.52*
Fines at ages 6-20	-0.052*	-0.048	-0.062***	-0.076	0.011
	(0.025)	(0.091)	(0.018)	(0.091)	(0.008)
N	208,254	208,254	208,254	208,254	208,254
R^2	0.193	0.071	0.053	0.366	0.030
Basic controls	Yes	Yes	Yes	Yes	Yes

Note: Data are from the UHS 2002-2009. The sample includes only women of Han ethnicity. The basic controls include dummies for birth year, survey year, and interactions of the two, and province dummies, as well as the provincial-specific linear trends in birth cohort. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Effects of Fertility Restrictions in Early Life on Household Balance Sheet, in the UHS sample

Variables	(1) Log(HH income per capita)	(2) Log(HH income per capita)	(3) Log(HH earnings per capita)	(4) Log(HH earnings per capita)	(5) Log(HH exp. per capita)	(6) Log(HH exp. per capita)	(7) Log(HH consump. per capita)	(8) Log(HH consump. per capita)	(9) Saving rate (%)	(10) Saving rate (%)
Sample mean	*9.2*		8.8		*9.0*		*8.8*		*29.7*	
Fines at ages 6-20	0.088***	0.091***	0.136***	0.104***	0.070***	0.071***	0.066***	0.064***	1.54*	1.86**
	(0.021)	(0.018)	(0.034)	(0.026)	(0.021)	(0.020)	(0.019)	(0.018)	(0.83)	(0.86)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.246	0.329	0.136	0.230	0.170	0.267	0.185	0.268	0.05	0.06
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household structure	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note: Data are from the UHS 2002-2009. The sample includes only women of Han ethnicity. The basic controls have the same definition as those in Table 4. Household structure includes marital status, household size, proportion of women, those over age 60, and those below age 18. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Effects of Fertility Restrictions in Early Life on Household Head and Consumption Shares, in the UHS sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Female household head		Shares of different consumption categories (%)					
			Clothing, adornments		Drinks, liquors,			
Variables	(Yes = 1)		& beauty goods		sugar & restaurant		Food	
Sample mean	*0.31*		12.8		*9.3*		32.3	
Fines at ages 6-20	0.06***	0.05*	1.06***	0.73*	-0.43*	-0.61***	-1.15***	0.01
	(0.02)	(0.03)	(0.34)	(0.35)	(0.25)	(0.20)	(0.25)	(0.30)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.05	0.08	0.12	0.16	0.06	0.09	0.08	0.43
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household structure	No	Yes	No	Yes	No	Yes	No	Yes
Total expenditure	No	No	No	Yes	No	Yes	No	Yes

Note: Data are from the UHS 2002-2009. The sample includes only women of Han ethnicity. The basic controls and household structure have the same definitions as those in Table 5. Robust standard errors are in parentheses and are clustered at the province level. Robust standard errors in parentheses are clustered at the province level.

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

Table 7: Effects of Fertility Restrictions in Early Life on Subjective Welfare and Opinions, in the CFPS sample

	(1)	(2)	(3)	(4)	(5)
	Happiness score	Satisfied with		Agreement with	
Variables	(1-10, higher for happier)	Marriage (Yes =1)	Spousal housework duty (Yes =1)	"Marriage is important for women" (Yes = 1)	"Child is important for women" (Yes = 1)
Panel A: Women					
Sample mean	*7.6*	*0.83*	*0.63*	*0.62*	*0.83*
Fines at ages 6-20	0.208**	0.030*	0.056*	-0.059**	-0.045*
	(0.097)	(0.017)	(0.032)	(0.029)	(0.022)
Panel B: Men					
Mean	*7.5*	*0.89*	*0.80*	*0.54*	*0.74*
Fines at ages 6-20	-0.103	-0.008	-0.035	-0.032	-0.029
	(0.113)	(0.018)	(0.027)	(0.028)	(0.023)
Observations	46,064	19,628	21,606	21,606	21,606
R-squared	0.036	0.031	0.065	0.037	0.034

Note: Data are from the CFPS 2010-2014. The number of observations varies across columns, because the corresponding questions were not asked in every survey, and there are some missing values. Happiness was collected in 2010 and 2014 in column 1. The valid observations for columns 2-5 are only available in CFPS 2014. The covariates in all columns include dummies for birth year, survey year, and interactions of the two, and province dummies, as well as the provincial-specific linear trends in birth cohort.

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

Appendix

A. Theory Appendix

Based on the settings, the consumption in the two periods are $c_1 = \alpha h(T - N\tau) - Nf - C(h) - s$ and $c_2 = s + Nb$. The problem becomes

$$\max_{h,N,S} u[\alpha h(T - N\tau) - Nf - C(h) - s] + u(s + Nb) + v(N)$$

The first order conditions:

$$\begin{aligned} h: &\quad u'(c_1^*)[\alpha(T - N^*\tau) - C'(h^*)] = 0 \\ N: &\quad u'(c_1^*)(\alpha h\tau + f) = u'(c_2^*)b + v'(N^*) \\ S: &\quad u'(c_1^*) = u'(c_2^*) \end{aligned}$$

Since $u'(.) > 0$, we have $C'(h^*) = \alpha(T - N^*\tau)$ from equation (h). Then, we have $c_1^* = c_2^*$ from (S) equation. Under equilibrium:

$$\begin{aligned} C'(h^*) &= \alpha(T - N^*\tau) \\ u'(c^*)q^* &= v'(N^*) \end{aligned}$$

where $c^* = c_1^* = c_2^*$ (constant consumption over lifecycle) and $q^* = \alpha h^*\tau + f - b$ (the net cost of a child over lifetime). The first one shows the marginal cost in human capital should be equal to its marginal benefit. The second equation shows substitution between marginal utility gained from number of children and that from the consumption goods. The optimal level of consumption, fertility, and human capital are determined by the above two equations.

Let the absolute risk averse coefficients for $u(.)$ and $v(.)$ be η_u and η_v, respectively, and take derivatives with respect to f for the two equations:

$$\frac{\partial h^*}{\partial f} = -\frac{\alpha\tau}{C''(h^*)}\frac{\partial N^*}{\partial f} \tag{A.1}$$

$$\eta_u \frac{\partial c^*}{\partial f} - \eta_v q^* \frac{\partial N^*}{\partial f} = 1 + \alpha\tau\frac{\partial h^*}{\partial f} \tag{A.2}$$

which suggests that the signs of $\frac{\partial h^*}{\partial f}$ and $\frac{\partial N^*}{\partial f}$ are opposite because $C''(h^*) > 0$. Note that $c^* = \alpha h^*(T - N^*\tau) - N^* f - C(h^*) - s* = s^* + N^* b$ and denote the lifetime total net income or consumption $Y^* = \alpha h^* T - C(h^*) - N^* q^*$, and thus it implies $s^* = \frac{1}{2}Y^* - N^* b$ and $c^* = \frac{1}{2}Y^*$. Intuitively, people use saving in the first period to distribute to each period to smooth consumption. Because $C'(h^*) = \alpha(T - N^*\tau)$, we have following two comparative statics for s^* and c^*:

$$\begin{aligned} \frac{\partial s^*}{\partial f} &= -\frac{1}{2}[(q^* + 2b)\frac{\partial N^*}{\partial f} + N^*] \\ \frac{\partial c^*}{\partial f} &= -\frac{1}{2}(q^*\frac{\partial N^*}{\partial f} + N^*) \end{aligned} \tag{A.3}$$

Suppose the One Child Policy increases f exogenously.[25] Under equilibrium, we will have $\frac{\partial h^*}{\partial f} > 0$, $\frac{\partial N^*}{\partial f} < 0$. We also have $\frac{\partial c^*}{\partial f} > 0$ if $1 + \alpha\tau\frac{\partial h^*}{\partial f} + \eta_v q\frac{\partial N^*}{\partial f} > 0$, which should hold right intuitively, as η_v is small or $C''(h^*)$ is not large.

For male and female (subscription m and f), we have $\tau_f > \tau_m$ based on the fact that mothers spend more time at home with children. Keeping all the other parameters the same, we will have $\frac{\partial h_f^*}{\partial f} > \frac{\partial h_m^*}{\partial f}$, $\frac{\partial c_f^*}{\partial f} > \frac{\partial c_m^*}{\partial f}$ and $\frac{\partial s_f^*}{\partial f} > \frac{\partial s_m^*}{\partial f}$, implying women gain more from it.

Under household settings, human capital is pre-determined and given, indicating that $h \equiv \bar{h}$ and $q \equiv \bar{q} = \alpha\bar{h}\tau + f - b$. Then we will have

$$\begin{aligned} \eta_u\frac{\partial c_h^*}{\partial f} - \eta_v\bar{q}\frac{\partial N_h^*}{\partial f} &= 1 \\ \frac{\partial c_h^*}{\partial f} &= -\frac{1}{2}(\bar{q}\frac{\partial N_h^*}{\partial f} + N_h^*) \end{aligned} \tag{A.4}$$

Assuming $N_h^* = N^*$ and $\bar{h} = h^*$ when optimization, we have $|\frac{\partial N_h^*}{\partial f}| < |\frac{\partial N^*}{\partial f}|$, $\frac{\partial c_h^*}{\partial f} < \frac{\partial c^*}{\partial f}$ and $\frac{\partial s_h^*}{\partial f} < \frac{\partial s^*}{\partial f}$. Indicating that the the behavioral response to the OCP is smaller if household has been formed.

[25] Because the OCP set penalties for unauthorized births, it would be more accurate if we let the fertility cost be $cN + \delta_{N-\bar{N}}(N - \bar{N})f$, where c is the fixed cost for each birth, $\bar{N}$ is the birth quota, and $\delta_{N-\bar{N}}(N - \bar{N})f$ is the penalties for unauthorized births. By doing so, we actually assume that there is always an interior solution for optimal number of births, which is above the birth quota. Under the assumption, the two cases are equal.

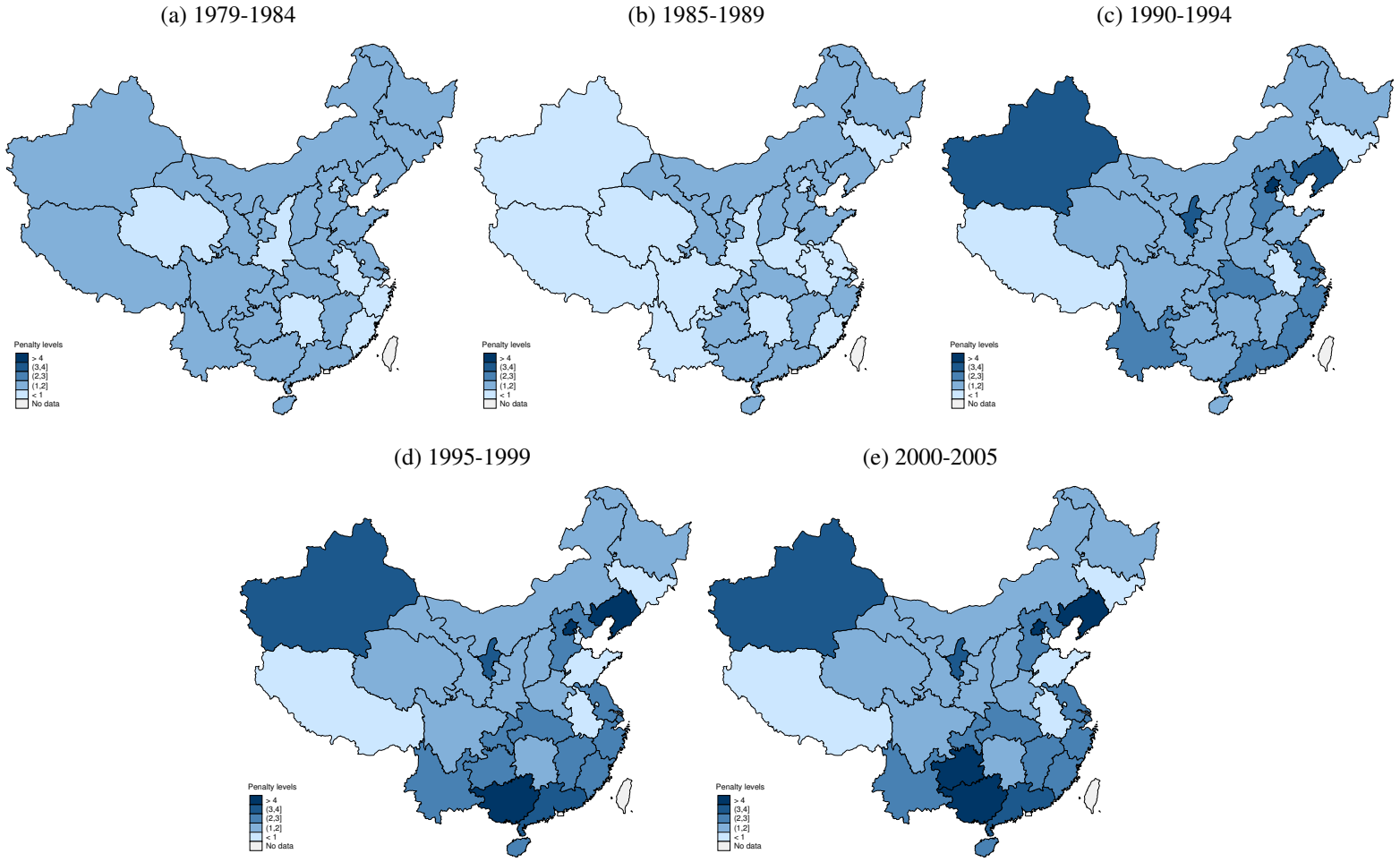
B. Fertility Penalties of the One Child Policy

The fertility penalties are from Ebenstein (2010). The penalties are measured in multiples of local household annual income. Figure 1 in main text shows how the penalties change over time by provinces. Additionally, Figure B.1 presents how the penalties change geographically over time in different province, Similar Figure 1, panels in Figure B.1 also show that the penalties increased most from panel b to panel c. According to the There is no systematic pattern for which provinces are more likely to raise the fines during that time. For example, richer regions such as Beijing and Shanghai increased the fines dramatically, but poorer regions such as Shanxi and Yunnan also remarkably increased the fines during this period.

To examine whether the fertility fines were correlated with other policies, I use 28 province-year level macroeconomic indices from four large categories to examine their correlation with the OCP fines. Specifically, the four sets of factors are shown in different panels in Table B.1. I choose these four categories because previous studies have shown that these may have long-term impact on individual life cycle outcomes.

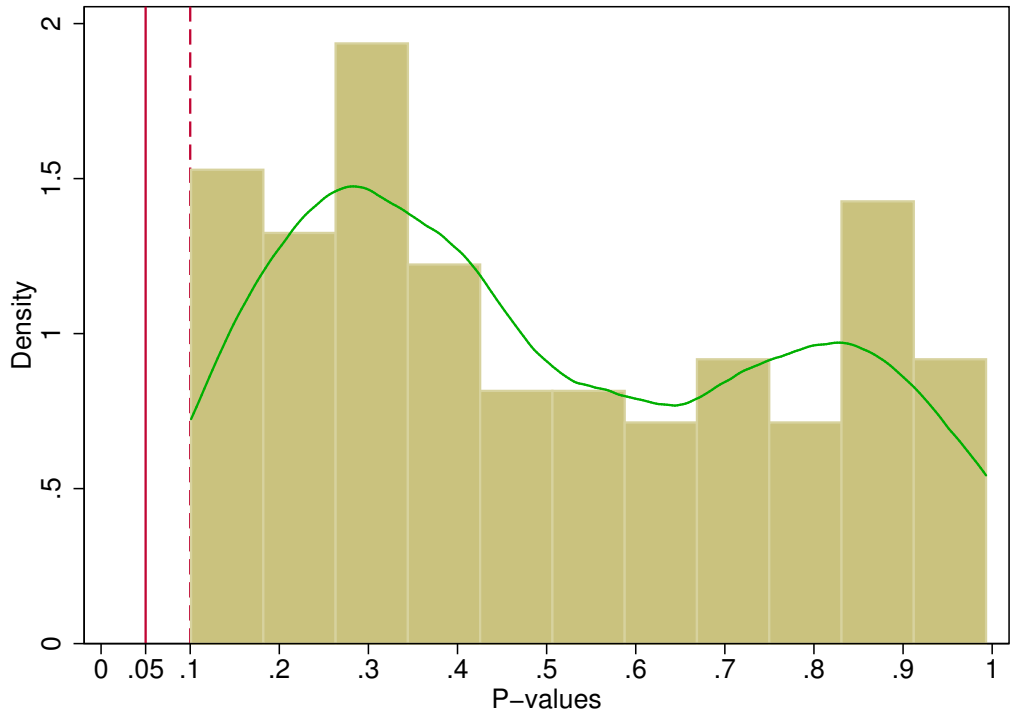
For each index, I use its average levels in previous one, two, three years to predict the fertility fine rate, with controlling for dummies for years, provinces, and provincial linear trends in years. The first three columns in Appendix Table B.1 report the P-values for the coefficients on the indices, respectively. In addition, I also conduct the same regressions to test whether the changes in fines are correlated with the changes in these indices and report the p-values in the fourth column. For the p-values in the last column, I classify the variables into several subgroups, put them together in the regression, and then test the joint significance of their correlations with the fertility fines. Accordingly, Figure B.2 shows the distribution of the P-values presented in Table B.1. As both the table B.1 and figure B.2 show, none of the p-values are smaller than 0.10.

Figure B.1: Fertility penalties change across provinces over time



Note: The fertility penalties are from Ebenstein (2010). The penalties are measured in multiples of local household annual income. The figure presents how the penalties change geographically over time in different province. The mean value of the fines in local province in each period is calculated.

Figure B.2: P-value distribution



Note: The figure plot the distribution of the p-values reported in Table B.1. The solid and dashed vertical lines are for p-values being 0.05 and 0.10, respectively. As the figure shows, none of the p-value is smaller than 0.10.

Table B.1: P-values for Correlations of Fertility Fines with Macro Indices

	(1)	(2)	(3)	(4)	(5)
			P-values		
Provincial level indices	Prev. 1 year	Prev. 2 years	Prev. 3 years	First Difference	Prev. 1 year
Panel A: Demographic variables					
Population	0.15	0.13	0.11	0.91	
Urban population	0.27	0.28	0.29	0.26	0.18
Rural population	0.86	0.92	0.97	0.39	
Birth rate	0.99	0.89	0.85	0.45	0.81
Death rate	0.52	0.38	0.32	0.37	
Panel B: Macro economic indexes					
Employment	0.89	0.79	0.70	0.48	
Urban employment	0.60	0.45	0.45	0.50	0.24
Rural employment	0.14	0.13	0.14	0.29	
Wage of workers	0.37	0.31	0.24	0.16	
Wage of urban workers	0.64	0.80	0.87	0.82	0.16
Wage of rural workers	0.71	0.68	0.65	0.25	
GDP /capita	0.12	0.15	0.21	0.16	
Unemployment rate	0.27	0.23	0.14	0.32	0.12
Urban unemployment rate	0.92	0.88	0.79	0.86	
Panel C: Government behaviors					
Pension scheme participants	0.76	0.88	0.97	0.42	
Medical ins. participants	0.86	0.85	0.85	0.31	0.54
Unemployment ins. participants	0.84	0.69	0.74	0.53	
Dibao participants	0.26	0.23	0.26	0.10	
Gov. exp.	0.88	0.99	0.98	0.47	
Gov. exp. (Administrative)	0.28	0.34	0.40	0.91	
Gov. exp. (Agriculture)	0.42	0.30	0.28	0.43	0.61
Gov. exp. (Education)	0.25	0.28	0.24	0.77	
Gov. exp. (Social Security)	0.45	0.52	0.60	0.22	
Panel D: Sanitary and Education conditions					
Beds in hospitals	0.41	0.35	0.31	0.33	0.66
Doctors in hospitals	0.56	0.60	0.58	0.55	
Teachers in primary schools	0.74	0.75	0.74	0.30	
Teachers in secondary schools	0.53	0.41	0.42	0.35	0.72
Teachers in higher level schools	0.32	0.28	0.21	0.96	

Note: The data for provincial macroeconomic indices are from China Compendium of Statistics (CCS) in 60 years. Each p-value tests the significance of the correlation between fertility fines and the indices. The covariants in the regressions include dummies for year, province, and provincial specific linear trends in calendar year. P-values in column 4 shows the joint significance of the macroeconomic indices in the regressions.
Dibao means "Minimum guaranteed income".

C. Additional Results

C.1. Additional Time-Series Evidence for the Effects of Fertility Restrictions

Appendix Figure 4 shows the descriptive evidence for the effects of exposure of fertility restrictions in early life on fertility outcomes. Panel a plots the mean values of number of children ever born by treated and control group and the difference between the two over the year of birth of women. Panels b and c show the patterns for mortality and education of the children, respectively. The pattern in difference consistently shows that fertility restrictions in early life will reduce fertility and enhance the quality of the children.

Following the same methodology, I plot the mean values of log household income per capita, expenditure per capita, consumption per capita, and saving rate, over birth cohort, by treated and control group in Figure C.1. The patterns show that fertility restrictions in early life increases household income, expenditure, consumption, as well as saving rate.

Figure C.2 uses the same way to show the evidence in the CFPS data. Because of smaller sample size, the trends shown by the dashed lines are really noisy. Even though, patterns also consistently show that fertility restrictions in early life increases the satisfaction with marriage, satisfaction with spousal housework duty, and less agreement on that marriage or children is important for women.

C.2. Effects of Fertility Restrictions in Census Data, under Different Specifications

Table C.1 shows the results using different minimum and maximum ages for measuring the OCP strictness in early life. Each coefficient is produced by an independent regression as shown by equation (1). The results show that there is no material change if using different measures for fertility restrictions in early life.

Table C.2 shows how the fertility fines at ages 6-20 affect marital status in different ages. The estimates in first column show that one unit increase in the fines in early life decreases the married rate by 4.1 percentage points and 6.2 percentage points for women and men, respectively. The next

two columns divide the sample by whether the respondents were aged over 30 at survey, and find that the effects only exist among those aged 30 or below. This shows that, if exposed to stricter fertility policies in early life, the individuals are more likely to delay their marriage rather than to keep single all the time.

Table C.3 and Table C.4 use fines at ages 6-15 (i.e., the ages for primary and junior high school), fines at ages 16-20 (i.e., the ages for senior high and early college), and fines at ages 21-25 (i.e., the ages for college or ages for most marriages) as the main regressors to examine the effects on different outcomes. The results are comparable to those in Table 2 and Table 3. Except for college and white collar job, I do not find any significant effects of fines at 21-25. It is also noteworthy that the effects of the fines in early life are also consistent with those shown in the main text.

Table C.5 and Table C.6 present the effects of the fertility fines on various outcomes in census among the minorities. Different from those of Han people, there is no significant effect in this group. This is reasonable because minorities were not subject to the strict restrictions of the OCP.

Appendix Table C.7 shows the *hukou*-specific results. Overall, for education and white-collar job, estimates for urban people have larger magnitude at absolute scale but smaller at relative scale. For example, one unit increase in fines at ages 6-20 leads to a 5.9 percentage points or 12 percent increase in senior high school completion rate for urban people, but a 2.0 percentage points or 28 percent increase for rural people. For the fertility outcomes, estimates for rural people have larger magnitude at absolute scale, and have the same or larger relative scale. Specifically, one unit increase in fines at ages 6-20 leads to 0.16 or 11 percent fewer births for urban women, but -0.2 or 9 percent fewer births for rural women. Similarly, the same fine increase also leads to a 0.15 percentage points or 13 percent lower child mortality for urban sample, but -0.79 percentage points or 27 percent lower child mortality for rural sample. The differential effects for urban and rural *hukou* may reflect different aspects between urban and rural regions as discussed in the paper.

C.3. Short Term Effects in Census Data

To analyze the short-term effects of the OCP on fertility and child outcomes, I combined the data of the 1982, 1990, and 2000 population censuses and the 2005 One-Percent Population Survey. First, I keep only households with at least one child and with information available for the mother, then restrict the sample to those whose household heads and spouses are their first marriage and further restrict the sample to households with equal numbers of reported living children, children ever born, and children observed in the survey. I further drop households with children over age 17 in the survey as these households may be selective. To make this analysis consistent with that in the main text, I further restrict the sample to the children whose mothers were born between 1940 and 1980.

To identify the short term effects of the OCP, I match the fertility penalties based on the the provinces and year of birth of the children. Then, following the identification in the main text, I conduct the following regressions:

$$Y_{ijbt} = \beta_0 + \beta fine_{jb} + \delta_{bt} + \delta_j + T_j + \varepsilon_i \tag{A.5}$$

In the equation above, Y_{ijbt} denotes the outcome of the child i born in province j in year b in survey year t, and $fine_{jb}$ denotes the fertility penalties in province j in year b. Table C.8 shows the results and all the standard errors are clustered at province level.

The first column of Table C.8 restrict the first births and investigate whether the fertility restrictions leads to fewer siblings. The estimate suggests a small and insignificant effect. This is consistent with the findings in the main text - there is no significant impact of the fines at ages 21-25 on fertility.

The next two columns examines the contemporary effects of the penalties on the quality of the children, measured by receiving normal education and education attainment. The effects are also insignificant and much smaller than the effects of the fertility fines in early life.

C.4. Robustness checks in Census

To test the robustness of the results, I additionally control for the above potential confounding factors by including province-year fixed effects (contemporary conditions), number of siblings, sex ratio at birth in the local province, logarithm of GDP per capita of local province at age 15 (economic development), logarithm of the number of teachers in primary school and secondary school (education resources), and the CSL-eligibility in the local province, respectively. Then, for each dependent variable, I plot the point estimate of the effects of fertility penalty level and corresponding 90 percent confidential intervals in Appendix Figure C.4 for each additional set of covariates. As the figures show, there is no material change in the coefficients of main interests, indicating the results are fairly robust to controlling for the these potential confounding factors.

C.5. Additional Results in the UHS

This section first shows how the fertility restrictions in early life affect the different shares of income, expenditure, and consumption, then presents the parallel results in male sample to those in main text.

Figure C.5 shows the components in income, expenditure, and consumption. In general, labor income and consumption are the largest part of income and expenditure, respectively. The two parts compose 78 percent of household income and 79 percent of household expenditure, respectively. The largest part of consumption is food, which captures 33 percent. The second largest consumption category is clothing and beauty goods, which is 13 percent of the total consumption.

Table C.9 shows how fertility restrictions in early life affect different sources of income and different categories of expenditure, and there is no significant and robust effect. The only exception is transfer out. Without controlling for the household structure, fertility restrictions increases the share of transfer out significantly but the effects diminish if including household structure as further controls. One possible explanation is that those who experiencing stricter fertility restrictions are more likely to live by themselves and thus they need to give money to parents to support their lives.

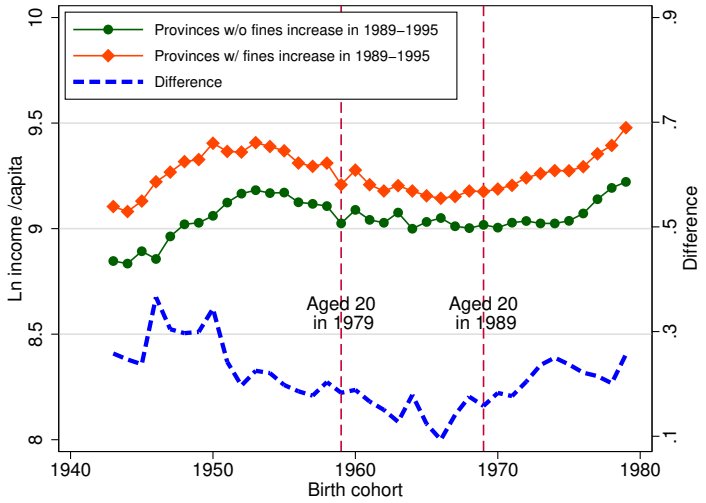
Table C.10 show the effects on different consumption categories. The first three columns are

the same with those in main text. There is no significant effects among the other consumption categories, except for the results for transportation and communication. Exposure to fertility restrictions in early life leads to more consumption in this category, as the estimates in Panel a shows. Household composition and expenditure explain half of the effect, when comparing the estimate in Panel b to that in Panel a. However, different from the results in first two columns, the change caused by fertility restrictions in transportation and communication is smaller - 0.28 percentage point (2.7 percent).

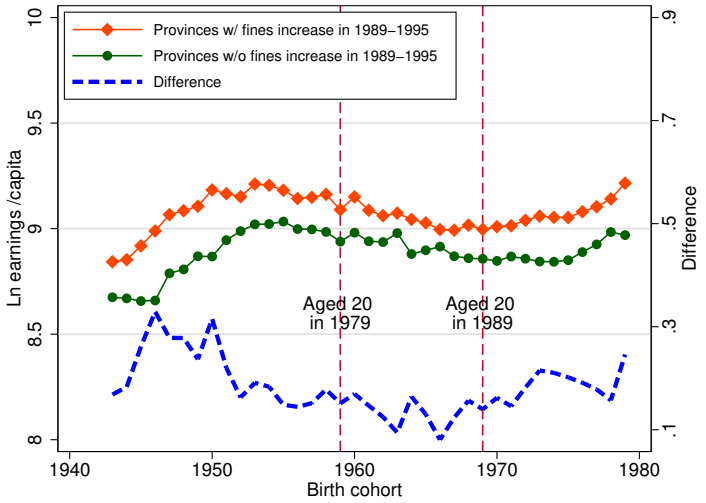
Then Appendix Tables C.11, C.12, and C.13 show the analogous results in male sample to those in Table 4, 5, and 6. Overall, the results for men are consistent with those for women, but the coefficients here are smaller and less significant.

Figure C.1: Descriptive evidence: Income, Expenditure, Consumption and Saving

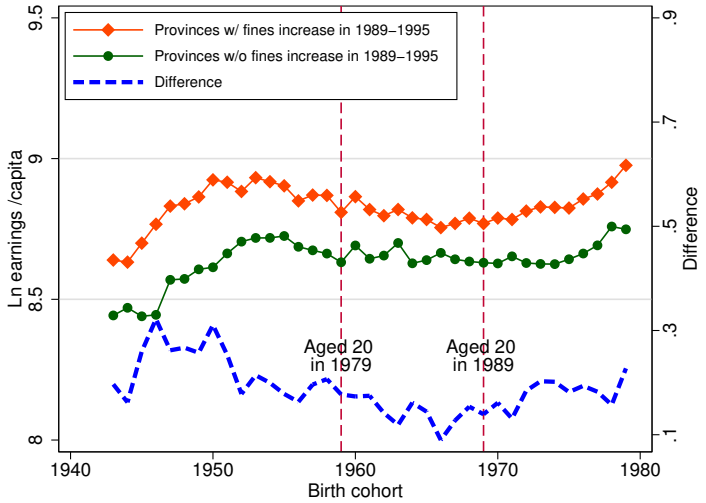
(a) Household income per capita



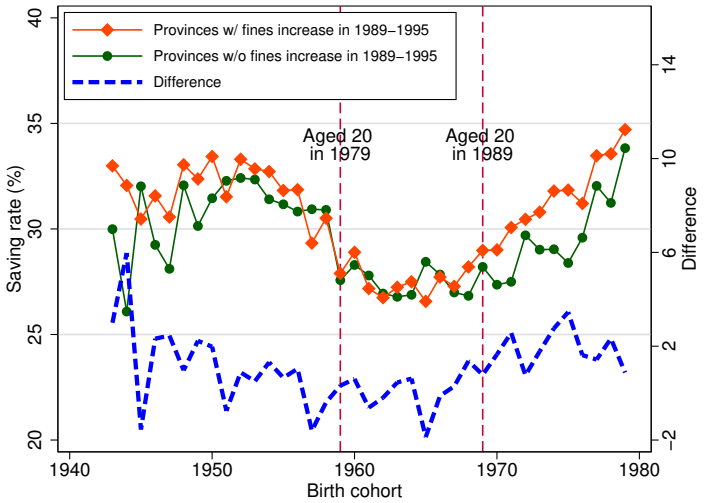
(b) Household expenditure per capita



(c) Household consumption per capita



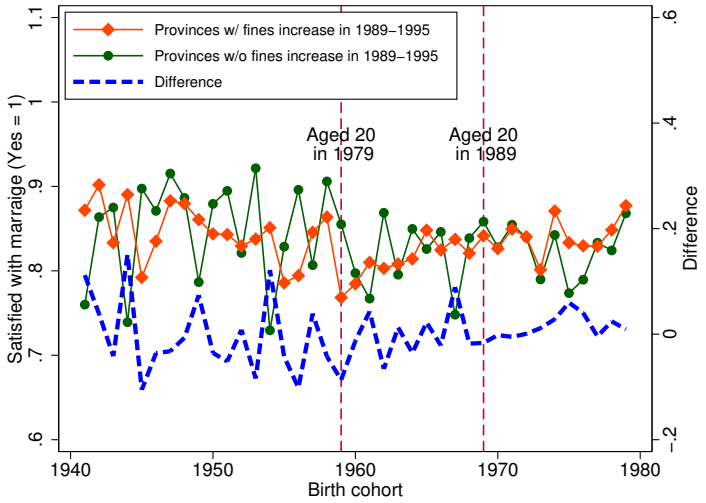
(d) Saving rate



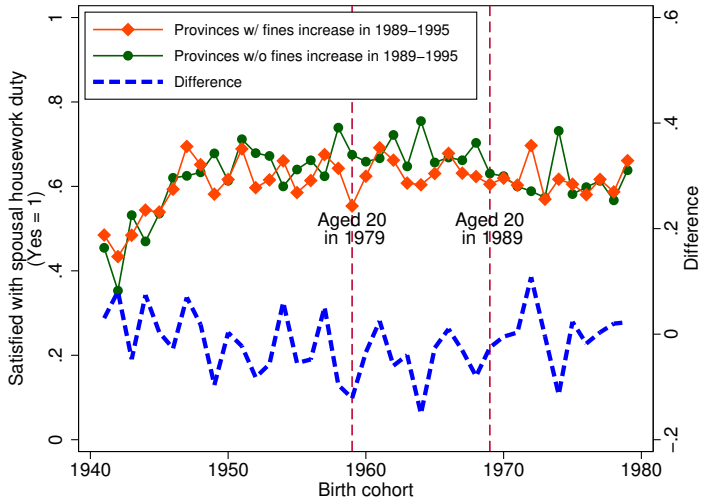
Note: Data are from the UHS 2002-2009. The descriptive evidence for household outcomes is presented. The settings are the same as those in Figure 3.

Figure C.2: Descriptive evidence: Subjective Welfare and Opinions

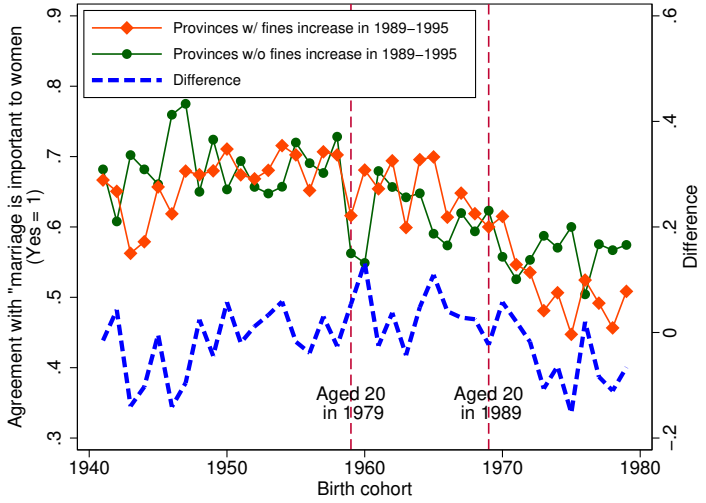
(a) Satisfaction with Marriage



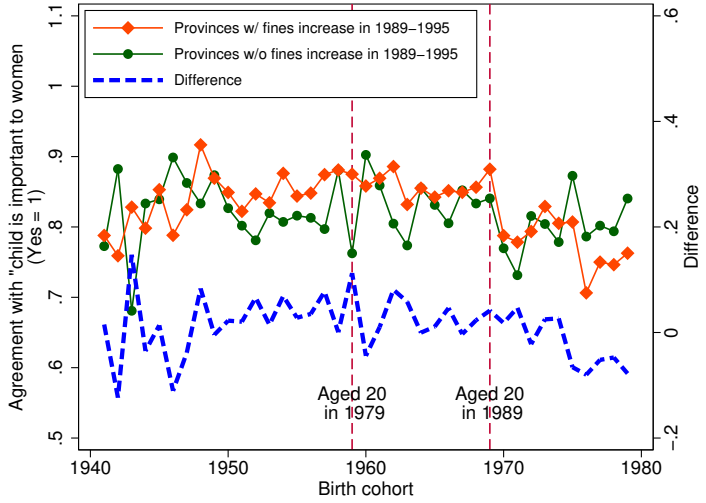
(b) Satisfaction with Spousal Housework Duty



(c) Agreement on "Marriage is important for women"

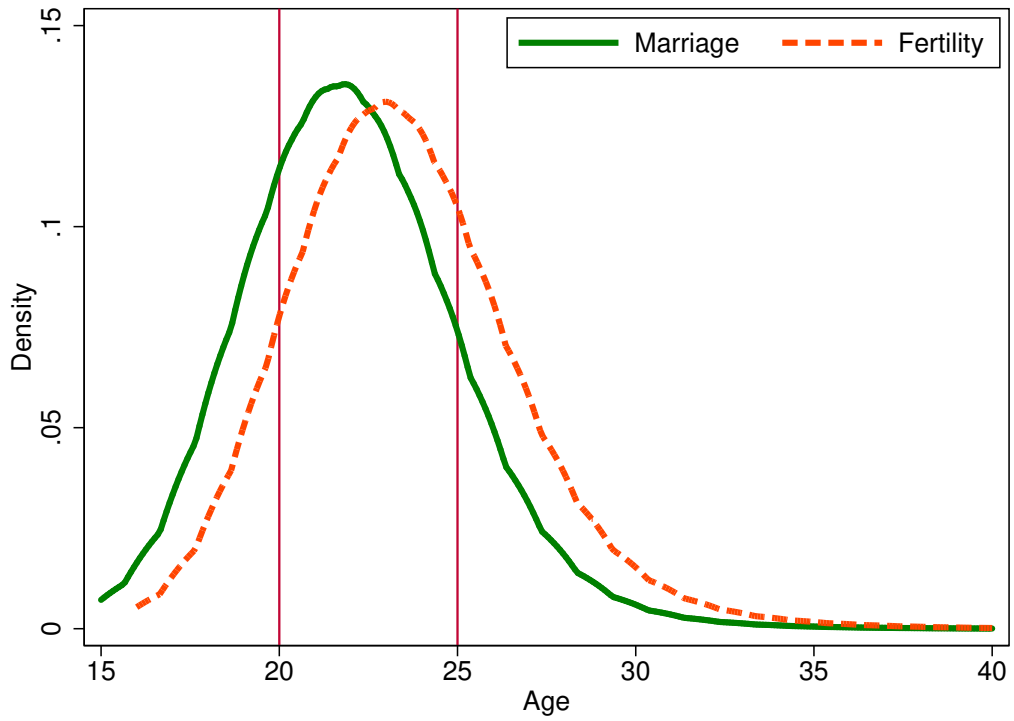


(d) Agreement on "Child is important for women"



Note: Data are from the CFPS 2010-2014. The descriptive evidence for subjective welfare and opinions is presented. The settings are the same as those in Figure 3.

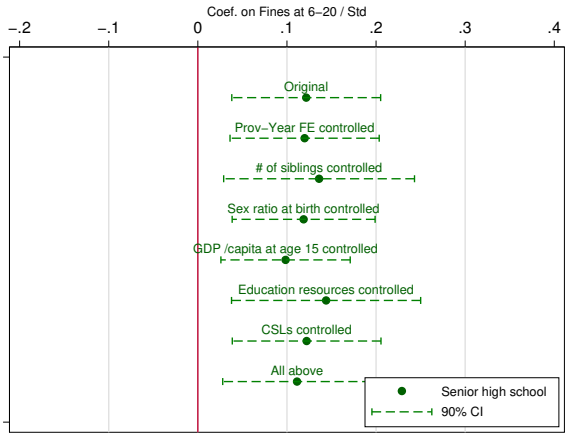
Figure C.3: Distribution of age at first marriage and age of birth



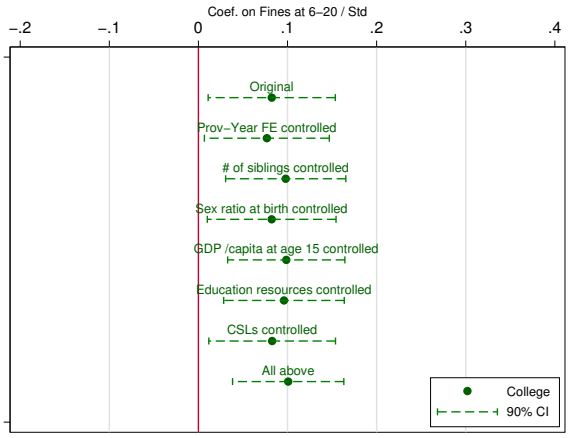
Note: Data are from the census 1982, 1990, 2000, and 2005. The distribution of age at first marriage is plotted by the solid line, and that of age of births is plotted by the dashed line.

Figure C.4: Robustness to adding other controls

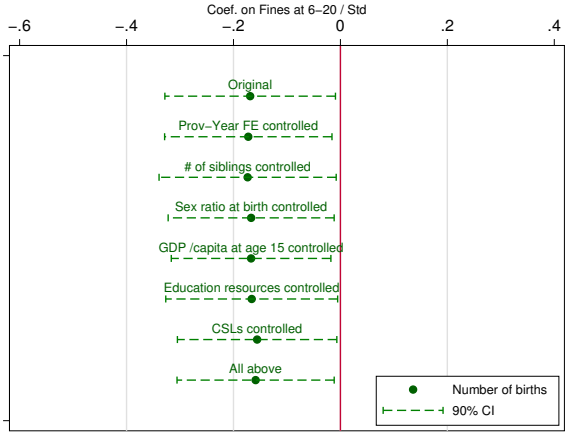
(a) Senior high school completion



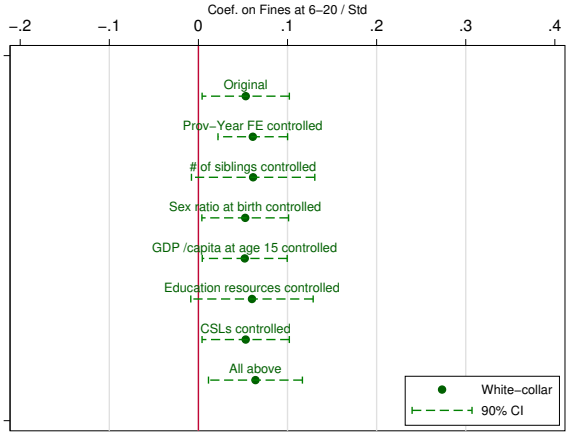
(b) College completion



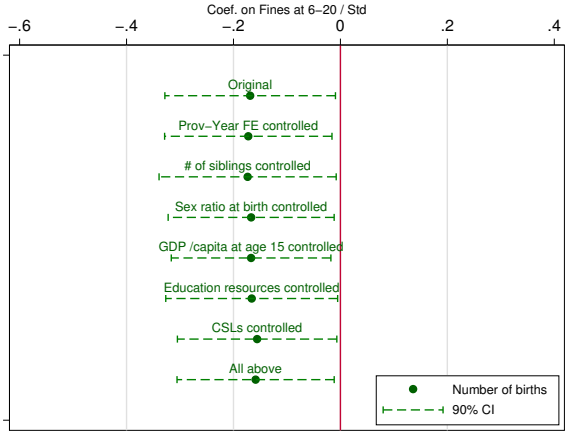
(c) Married before 25



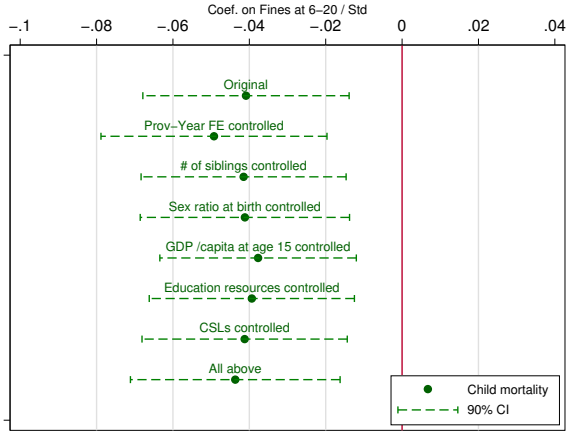
(d) White-collar job



(e) Number of births



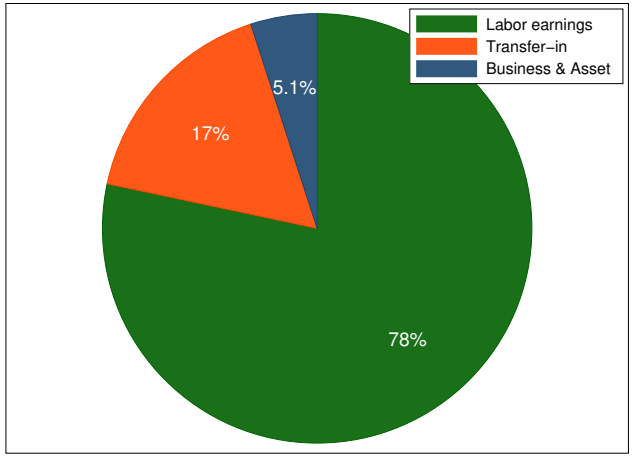
(f) Children mortality rate



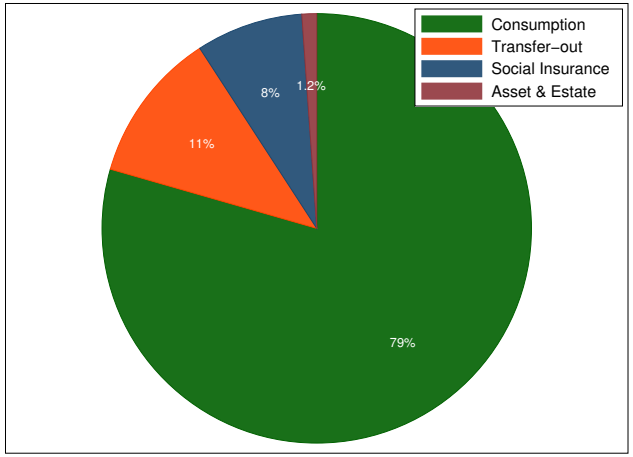
Note: Data are from censuses. Equation (1) with additional covariate is estimated, and coefficients and 90 percent confidential intervals are plotted. The additional covariate is marked in the figure. All the standard errors are clustered at the province level.

Figure C.5: Shares of income, expenditure and consumption

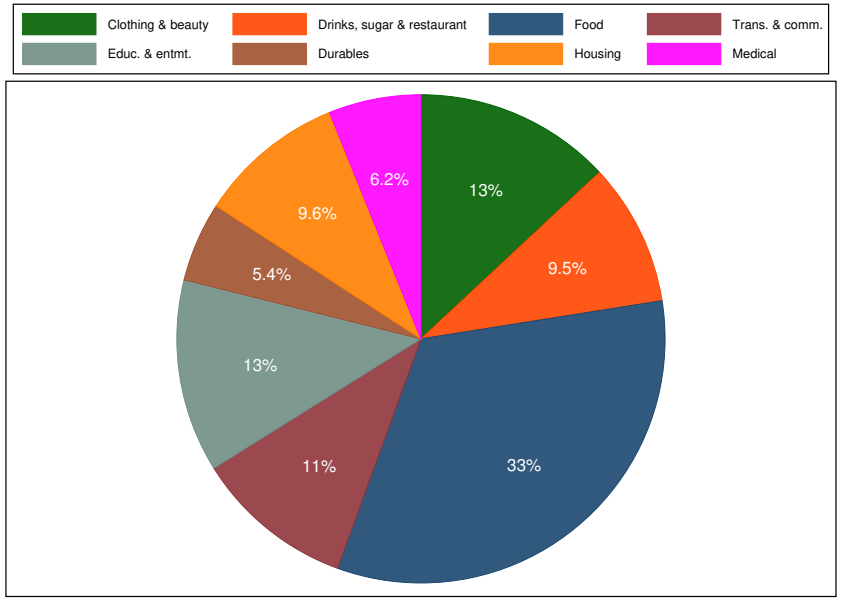
(a) Income sources



(b) Shares of expenditure



(c) Shares of consumption



Note: Data are from the UHS 2002-2009. Only women of Han are kept. Panel a shows the shares of different income sources, panel b shows those of different expenditure categories, and panel c shows shares of different consumption categories.

Table C.1: Impacts of fertility restrictions when measuring , among Han people

Variables	(1) Senior high school (Yes = 1)	(2) College (Yes = 1)	(3) Married before 25 (Yes = 1)	(4) Working now (Yes = 1)	(5) White-collar job (Yes = 1)	(6) Number of births	(7) Children mortality (%)	(8) Child receiving "normal" edu (Yes = 1)	(9) Child education level
Mean	*0.11*	*0.037*	*0.11*	*0.81*	*0.067*	2.0	*2.6*	*0.72*	*2.2*
Fines at	0.049**	0.015	-0.032*	-0.000	0.016	-0.186	-0.775***	0.109**	0.135**
ages 6-18	(0.018)	(0.010)	(0.017)	(0.013)	(0.009)	(0.113)	(0.256)	(0.041)	(0.056)
Fines at	0.038*	0.018**	-0.024*	-0.005	0.016*	-0.192	-0.516*	0.052	0.072
ages 6-22	(0.019)	(0.009)	(0.014)	(0.013)	(0.009)	(0.119)	(0.262)	(0.035)	(0.048)
Fines at	0.039**	0.016*	-0.025*	-0.003	0.015*	-0.174*	-0.533**	0.063*	0.082*
ages 8-20	(0.016)	(0.008)	(0.014)	(0.011)	(0.008)	(0.096)	(0.228)	(0.033)	(0.045)
Fines at	0.050**	0.019*	-0.033*	-0.003	0.018*	-0.228*	-0.752**	0.087**	0.114*
ages 4-20	(0.021)	(0.010)	(0.017)	(0.014)	(0.011)	(0.133)	(0.292)	(0.042)	(0.059)
Fines at	0.058**	0.021*	-0.039*	-0.002	0.021	-0.265	-0.893**	0.102**	0.134*
ages 1-20	(0.025)	(0.012)	(0.020)	(0.017)	(0.012)	(0.157)	(0.338)	(0.049)	(0.069)
Fines at	0.042*	0.019**	-0.027*	-0.005	0.017	-0.214	-0.587*	0.058	0.082
ages 4-22	(0.021)	(0.010)	(0.016)	(0.014)	(0.010)	(0.134)	(0.290)	(0.039)	(0.054)
N	5,224,635	5,224,635	5,224,635	5,224,635	5,224,635	4,621,938	9,309,439	2,641,034	2,641,034

Note: Data are from the censuses 1990, 2000, and 2005. Only Han people are kept. The covariates are the same as those in Table 2. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Effects fertility restrictions in early life on marital status, by age group

	(1)	(2)	(3)
Subsamples by age	All ages	25 < Age $\leqq$ 30	Age > 30
Variables	Married ever (Yes = 1)		
Panel A: Women			
Sample mean	*0.98*	0.923	0.995
Fines at ages 6-20	-0.041**	-0.048**	-0.013
	(0.019)	(0.018)	(0.008)
Panel B: Men			
Sample mean	*0.92*	0.783	0.952
Fines at ages 6-20	-0.062**	-0.074**	-0.026
	(0.024)	(0.029)	(0.016)
N	10,645,223	2,490,868	8,154,355
R^2	0.07	0.132	0.028

Note: Data are from the censuses 1990, 2000, and 2005. Only Han people are kept. The covariates are the same as those in Table 2. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.3: Impacts of fertility restrictions in early life on education, marriage and labor market outcomes, among Han people

Variables	(1) Senior high school completion (Yes = 1)	(2) College completion (Yes = 1)	(3) Married before age 25 (Yes = 1)	(4) Working now (Yes = 1)	(5) White collar job occupation (Yes = 1)
Panel A: Women					
Sample mean	*0.11*	*0.037*	*0.11*	*0.81*	*0.067*
Fines at ages 6-15	0.041**	0.005	-0.020	0.006	0.011
	(0.019)	(0.013)	(0.018)	(0.012)	(0.009)
Fines at ages 16-20	0.013*	0.006**	-0.010**	-0.002	0.005*
	(0.006)	(0.003)	(0.005)	(0.004)	(0.003)
Fines at ages 21-25	-0.001	0.005*	0.001	-0.003	0.002
	(0.008)	(0.003)	(0.005)	(0.004)	(0.002)
Panel B: Men					
Sample mean	*0.16*	*0.054*	*0.27*	*0.91*	*0.104*
Fines at ages 6-15	0.026	0.006	-0.022	-0.013	0.006
	(0.017)	(0.014)	(0.025)	(0.011)	(0.009)
Fines at ages 16-20	0.008	0.005	-0.010	-0.003	0.004**
	(0.005)	(0.003)	(0.007)	(0.002)	(0.002)
Fines at ages 21-25	0.005	0.007**	-0.001	0.000	0.007***
	(0.007)	(0.003)	(0.006)	(0.004)	(0.002)
N	10,645,223	10,645,223	10,645,223	10,645,223	10,645,223
R^2	0.072	0.033	0.141	0.176	0.027

Note: Data are from the censuses 1990, 2000, and 2005. Only Han people are kept. The covariates are the same as those in Table 2. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.4: Impact of fertility restrictions in early life on fertility and children outcomes, among Han people

	(1)	(2)	(3)	(4)
Sample	All women	Children born to the women	Children with ages 7-16 in the households	
Variables	Number of births	Mortality (%)	Receiving "normal" education (Yes = 1)	Education level
Sample mean	*2.5*	*2.6*	*0.72*	*2.2*
Penal level at different ages (or at different mother ages)				
Penalty at ages 6-15	-0.104	-0.702***	0.139***	0.178***
	(0.125)	(0.244)	(0.045)	(0.061)
Penalty at ages 16-25	-0.072**	-0.167**	0.016	0.021
	(0.029)	(0.077)	(0.010)	(0.013)
Penalty at ages 21-25	-0.008	0.012	0.004	0.007
	(0.030)	(0.058)	(0.006)	(0.008)
N	4,621,938	9,309,439	2,641,034	2,641,034
R^2	0.418	0.022	0.521	0.574

Note: Data source is the census 1990, 2000, and 2005. Only Han people are kept. The covariates are the same as those in Table 3. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.5: Impacts of fertility restrictions in early life on education, marriage and labor market outcomes, among minorities

Variables	(1) Senior high school completion (Yes = 1)	(2) College completion (Yes = 1)	(3) Married before age 25 (Yes = 1)	(4) Working now (Yes = 1)	(5) White collar job occupation (Yes = 1)
Panel A: Women					
Sample mean	*0.11*	*0.037*	*0.11*	*0.81*	*0.067*
Fines at ages 6-20	0.010	0.003	0.014	-0.013	-0.001
	(0.010)	(0.007)	(0.016)	(0.020)	(0.009)
Panel B: Men					
Sample mean	*0.16*	*0.054*	*0.27*	*0.91*	*0.10*
Fines at ages 6-20	-0.010	-0.000	0.004	0.022	0.001
	(0.019)	(0.011)	(0.021)	(0.012)	(0.009)
N	902,343	902,343	902,343	902,343	902,343
R^2	0.036	0.036	0.121	0.167	0.029

Note: Data source is the censuses 1990, 2000, and 2005. Only minorities are kept. The covariates are the same as those in Table 3. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.6: Impact of fertility restrictions in early life on fertility and children outcomes, among minorities

	(1)	(2)	(3)	(4)
Sample	All women	Children born to the women	Children with ages 7-16 in the households	
Variables	Number of births	Mortality (%)	Receiving "normal" education (Yes = 1)	Education level
Sample mean	*2.5*	*6.8*	*0.63*	*2.04*
Fines at ages 6-20	0.015	–	–	–
	(0.109)			
Fines when mothers	–	0.713	0.074	0.084
were aged 6-20		(0.784)	(0.053)	(0.066)
N	334,611	865,761	168,374	168,374
R^2	0.406	0.037	0.526	0.453

Note: Data are from the census 1990, 2000, and 2005. The first four columns use the corresponding female sample follow the same setting as Table 1, except for the number of births is additionally controlled for in column 2. Columns 5 and 6 use a sample composed of children aged 7 to 15 at the surveys and investigate the impact of exposure to the OCP of mothers, with additional controls for the age and gender of the children.
Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.7: Effects of fertility restrictions in early life, by type of hukou

	(1)	(2)
	Hukou type specific effects of fines at ages 6-20	
Dependent variables	Urban	Rural
A. Senior high school completion	0.059*	0.020
(Yes = 1)	(0.032)	(0.018)
	[0.50]	[0.072]
B. College completion	0.012	0.007**
(Yes = 1)	(0.017)	(0.003)
	[0.20]	[0.003]
C. Married ever	-0.041*	-0.034
(Yes = 1)	(0.021)	(0.022)
	[0.94]	[0.95]
D. Married earlier than 25	-0.031	-0.020
(Yes = 1)	(0.030)	(0.013)
	[0.70]	[0.85]
E. Working now	0.019	-0.012
(Yes = 1)	(0.018)	(0.012)
	[0.72]	[0.88]
F. White collar job	0.010	0.009*
(Yes = 1)	(0.015)	(0.005)
	[0.41]	[0.035]
G. Number of births	-0.159**	-0.205
	(0.067)	(0.147)
	[1.4]	[2.2]
H. Children mortality (%)	-0.152	-0.792***
	(0.155)	(0.285)
	[1.13]	[2.94]
I. Children receiving normal	0.069	0.051
education (Yes = 1)	(0.048)	(0.034)
	[0.82]	[0.69]
J. Children education level	0.083	0.072
	(0.057)	(0.052)
	[2.4]	[2.1]

Note: Data are from censuses 1990, 2000, and 2005. Column 1 and column 2 estimate equation (1) for urban and rural people, respectively. Coefficients on fertility fines at ages 6-20 are reported. Robust standard errors in parentheses are clustered at the province level. Mean values of dependent variables are reported in brackets.
*** p<0.01, ** p<0.05, * p<0.1

Table C.8: Contemporary effects of fertility penalties on number and education attainment of the children

	(1)	(2)	(3)
Sample	Children of first births	Children with ages 7-16	
Variables	Number of siblings	Receiving normal education (Yes = 1)	Education level
Sample mean	*1.7*	*0.72*	*2.2*
Fertility penalties at birth	-0.002	-0.002	0.001
	(0.013)	(0.006)	(0.006)
N	2,701,444	2,641,038	2,641,038
R^2	0.497	0.447	0.574

Note: Data are from censuses 1982, 1990, 2000, and 2005. Sample restriction is in Appendix C.3. Only children are kept. The first column keeps first birth children and estimates the fertility penalties at the year of birth on the number of siblings. The second and third column keep the children with ages 7-16 in the sample and estimate the fertility penalties at year of birth on the education attainment of the children. Robust standard errors in parentheses are clustered at the province level. *** p<0.01, ** p<0.05, * p<0.1

Table C.9: Effects of exposure to fertility restrictions on composition of income and expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Different sources of income			Different categories of expenditure			
Variables	Labor income	Transfer income	Asset or wealth income	Consumption	Transfer out	Social insurance purchase	Asset or estate expenditure
Sample mean	*78.2*	*16.7*	*5.1*	*79.5*	*11.3*	*8.0*	*1.2*
Panel A: Only basic controls							
Fines at ages 6-20	-0.42	0.07	0.35	-0.46	0.48*	-0.01	-0.02
	(1.10)	(1.00)	(0.40)	(0.43)	(0.27)	(0.25)	(0.13)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.13	0.19	0.02	0.05	0.07	0.08	0.00
Panel B: Additionally controls for household structure							
Fines at ages 6-20	0.71	-0.63	-0.08	0.28	-0.01	-0.17	-0.12
	(1.37)	(1.23)	(0.48)	(0.67)	(0.41)	(0.37)	(0.21)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.27	0.39	0.03	0.08	0.12	0.09	0.01

Note: Data are from the UHS 2002-2009. Only women of Han ethnicity are used. The settings are the same as those in Table 5. Panel A shows the results with basic controls and Panel B shows the results with additional controls including household structure. Robust standard errors in parentheses are clustered at the province level.

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

Table C.10: Effects of exposure to fertility restrictions on consumption of different categories

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Different shares in consumption							
Variables	Clothing, adorn. & beauty	Drinks, sugar, & restaurant	Food	Durables	Transport. & Comm.	Educ. & Entertain.	Housing expenditure	Medical care
Sample mean	*12.8*	*9.3*	*32.2*	*5.3*	*10.3*	*12.6*	*9.4*	*6.1*
Panel A: Only basic controls								
Fines at ages 6-20	1.06***	-0.43*	-1.15***	0.01	0.55***	-0.00	-0.16	0.07
	(0.34)	(0.25)	(0.25)	(0.18)	(0.15)	(0.49)	(0.17)	(0.19)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.12	0.06	0.08	0.03	0.03	0.09	0.04	0.04
Panel B: Additionally controls for household structure and total expenditure								
Fines at ages 6-20	0.73*	-0.61***	0.01	-0.12	0.28*	-0.44	-0.08	0.22
	(0.35)	(0.20)	(0.30)	(0.18)	(0.13)	(0.49)	(0.15)	(0.22)
N	208,254	208,254	208,254	208,254	208,254	208,254	208,254	208,254
R^2	0.16	0.09	0.43	0.06	0.08	0.16	0.04	0.07

Note: Data are from the UHS 2002-2009. Only women of Han ethnicity are used. The settings are the same as those in Table 6. Panel A shows the results with basic controls and Panel B shows the results with additional controls including household structure and total expenditure. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.11: Effects of fertility restrictions in early life on household structure among men, in the UHS sample

Variables	(1) Married (Yes =1)	(2) Household size	(3) Cohabiting with seniors aged 60+ (Yes = 1)	(4) Cohabiting with children aged 0-18 (Yes = 1)	(5) Female proportion in the household
Sample mean	*0.94*	*3.12*	*0.12*	*0.32*	*0.49*
Fines at ages 6-20	-0.021	-0.070	-0.080***	-0.023	-0.003
	(0.027)	(0.060)	(0.016)	(0.077)	(0.006)
N	198,819	198,819	198,819	198,819	198,819
R^2	0.19	0.07	0.05	0.37	0.03
Basic controls	Yes	Yes	Yes	Yes	Yes

Note: Data are from the UHS 2002-2009. Only men of Han ethnicity are used. Only women of Han ethnicity are used. The basic controls include dummies for birth year, survey year, and interactions of the two, and province dummies as well as the provincial specific linear trends in birth cohort. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.12: Effects of fertility restrictions in early life on household balance sheet among men, in the UHS sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Log(HH income per capita)		Log(HH earnings per capita)		Log(HH exp. per capita)		Log(HH consump. per capita)		Saving rate (%)	
Sample mean	9.2		8.8		9.0		8.8		*29.9*	
Fines at ages 6-20	0.070**	0.068**	0.145***	0.103**	0.061*	0.055*	0.070**	0.059**	0.35	0.95
	(0.031)	(0.027)	(0.037)	(0.036)	(0.031)	(0.030)	(0.026)	(0.026)	(0.96)	(0.94)
N	198,819	198,819	198,819	198,819	198,819	198,819	198,819	198,819	198,819	198,819
R^2	0.25	0.33	0.14	0.23	0.17	0.27	0.19	0.27	0.05	0.06
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household structure	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note: Data are from the UHS 2002-2009. Only men of Han ethnicity are used. The basic controls include dummies for birth year, survey year, and interactions of the two, and province dummies as well as the provincial specific linear trends in birth cohort. Household structure includes marital status, household size, proportions of women, those aged over 60, and those aged below 18. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1

Table C.13: Effects of fertility restrictions in early life on household head and consumption shares, in the UHS sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Female household head		Shares of different consumption categories (%)					
			Clothing, adornments		Drinks, liquors,			
Variables	(Yes = 1)		& beauty goods		sugar & restaurant		Food	
Sample mean	*0.28*		*12.8*		*9.4*		*32.3*	
Fines at age 6-20	0.04*	0.04*	1.43***	1.08**	-0.15	-0.35*	-1.51***	-0.44
	(0.02)	(0.02)	(0.43)	(0.42)	(0.20)	(0.17)	(0.45)	(0.39)
N	198,819	198,819	198,819	198,819	198,819	198,819	198,819	198,819
R^2	0.05	0.08	0.12	0.16	0.06	0.09	0.08	0.43
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household structure	No	Yes	No	Yes	No	Yes	No	Yes
Total expenditure	No	No	No	Yes	No	Yes	No	Yes

Note: Data are from the UHS 2002-2009. Only men of Han ethnicity are used. The basic controls include dummies for birth year, survey year, and interactions of the two, and province dummies as well as the provincial specific linear trends in birth cohort. Household structure includes marital status, household size, proportions of women, those aged over 60, and those aged below 18. Robust standard errors in parentheses are clustered at the province level.
*** p<0.01, ** p<0.05, * p<0.1