Family Planning Policy in China: Measurement and Impact on Fertility *

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Abstract

The extent to which China's family planning policy has driven its fertility transition over the past decades is debatable. The disagreement is partly sourced from the different ways of measuring the policy. Most existing measures, constructed on the policy history, generally, do not include complete secular and cross-sectional policy variations, fail to heterogeneously reflect people's exposure to the policy, and often suffer from endogeneity. This paper reviews the entire history of China's family planning policy and accordingly, proposes a new policy measure that integrates the policy variations more completely, heterogeneously, and exogenously by using the cross-sectional data of the China Health and Nutrition Survey. The new measure estimates the effect of policy on fertility and generates negative regression coefficients that well reproduce the history. As for the contribution of the policy to fertility transition, the measure explains a sizable level shift of fertility for major cohorts, but only accounts for a small portion of the fertility decline over generations. In addition, a more-educated woman, a woman residing in a better-developed coastal province, or a woman whose first child is a son tends to desire fewer children and thus, receives lighter pressure from the policy. Other than fertility, a woman would delay her marriage in response to the policy, particularly when it is strongly enforced. Finally, the paper shows that using an incomplete measure could systematically underestimate the effect of policy on fertility and adopting an endogenous measure or a measure lacking heterogeneity could even produce a positive effect of the policy.

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1 Introduction

China's total fertility rate (TFR), a measure of the number of children born through a woman's life, has dropped from about six to below two during the last half-century. Meanwhile, China has been enforcing family planning policies (FPP), which intend to control the size of population, since 1960s.

The contribution made by FPP to China's fertility transition is debatable. Many papers concluded that FPP explained a sizable portion of China's fertility decline, including Lavely and Freedman (1990), Yang and Chen (2004), and Li et al. (2005). However, other studies argued that the impact of FPP on fertility had been overstated (Schultz and Zeng (1995), McElroy and Yang (2000), Narayan and Peng (2006), and Cai (2010)).

Such discord may have originated from the use of disparate data, various empirical strategies and, more essentially, different ways of measuring FPP. Other than the direct effect on fertility, different measures also generate various second-stage results in studies that have used FPP to instrument fertility, sex ratio, etc. (Li and Zhang (2007), Li and Zhang (2008), Edlund et al. (2008), Qian (2009), Banerjee et al. (2010), Islam and Smyth (2010), and Wu and Li (2011)). Therefore, a reliable result of policy evaluation and relevant studies requires the appropriate measurement of FPP.

Most studies constructed the measure of FPP according to its history, which is shown in Section 2. Over time, FPP has experienced four periods: the period without FPP (1949–1963), the period with mild and narrowly implemented FPP (1963–1971), the period with strong and widely enforced FPP (1971–1980), and the period with the strictest one-child policy (1980–present). The strength and enforcement of FPP differ between urban and rural areas and vary from the ethnic majority, known as Hans, to the minority, denoted by non-Hans. Based upon the historical policy variations over periods and across groups, most studies assembled easily obtainable variables, such as birth year, living area, and ethnicity, to create a measure of FPP.

However, most of such constructed measures are inaccurate. First, they focus on a portion of the history of FPP and fail to completely utilize the policy variations. Second, the constructed measures are sometimes endogenous and may bias the estimations. Third, most measures fail to heterogenize people's exposure to FPP so that intuitively different policy exposures could be improperly assigned the same value for measurement. Section 3 offers a more detailed review of existing measures.

This paper tries to construct a new measure that is more complete, exogenous, and heterogeneous. The "completeness" means integrating the secular and cross-sectional policy variations as completely as possible. Furthermore, the measure is produced with relatively exogenous variables such as birth year, survey year, urban dummy, and Han dummy. Finally, the heterogeneity of the measure is inspired by the intuition that a woman's exposure to FPP, i.e., the measure of FPP for a woman, deserves a greater value if her exposure time is longer or if she is more physiologically likely to bear a child during the policy period. The heterogeneity will be technically built on the probability distribution of childbearing age. Section 4 provides the step-by-step procedure of constructing the measure of FPP.

This paper uses the cross-sectional data of the China Health and Nutrition Survey (CHNS) to generate the new measure and accordingly, estimates the impact of FPP on fertility. The regression coefficients of FPP are, generally, negative and statistically significant. Moreover, the derived partial effect of FPP on fertility, robust to various specifications, well reproduces the history of FPP, and thus, justifies the measurement. According to the regression results, this paper further evaluates the contribution of FPP to China's fertility transition; without FPP, the fertility level of major cohorts, cohorts 1943–1960, would shift up by over 50% on average, but the over-generation decline of fertility would only be a bit slower than the scenario with FPP. Sections 5.1 to 5.3 have more details.

Furthermore, Section 5.4 separately estimates the partial effect of FPP on fertility for women with different characteristics. A more-educated woman, a woman whose first child is a son, or a woman living in a better-developed coastal province tends to desire fewer children and, thus, receives lighter pressure from FPP. Additionally, Section 5.5 analyzes the impact of FPP on the age of first marriage. The probability of early marriage falls under FPP, particularly when the FPP is strongly enforced.

Finally, Section 6 checks the sensitivity of results to the use of different measures of FPP. Section 6.1 shows that the impact of FPP on fertility is robust as the heterogeneity of the measure is characterized by different probability distributions of childbearing age. Section 6.2 further shows that, given the data and empirical strategies to be constant, using an incomplete measure would systematically underestimate the impact of FPP on fertility and adopting an endogenous measure or a measure lacking heterogeneity would even generate a positive effect of the policy. Section 7 concludes the findings of the paper.

This paper can hardly close the debate, but still makes significant contributions to the field. First, it highlights the importance of the measurement of FPP and improves the existing measures according to a more complete history of FPP. Second, it thoroughly analyzes the effect of FPP on fertility and the age of first marriage based on the new measure and checks the sensitivity of estimation to the use of different measures.

2 A History of China's Family Planning Policy

China's Population and Family Planning Law[1] points out:

> China being a populous country, family planning is a fundamental State policy. The State adopts a comprehensive measure to control the size and raise the general quality of the population.

Literally, controlling the size of population is the primary purpose of China's FPP, which has been achieved mainly by setting a "quota" of children allowed per family.

Over time, the quota became smaller and relevant measures got tougher from the point of view of promotion towards a mandate. Particularly, China's FPP has experienced four periods: the period without FPP (1949–1963), the period with mild and narrowly implemented FPP (1963–1971), the period with strong and widely enforced FPP (1971–1980), and the period with the strictest one-child policy (1980–present).

In each period of FPP, the policy was tougher for urban people than for rural people because the tradition of big family and son preference has been more deep-rooted in rural areas. Moreover, the policy was stronger for Han people[2] than for non-Han people as family planning was less urgent for the non-Hans with a smaller size of population.

The rest of this section introduces more historical details of the evolution of China's FPP over periods[3] and the policy differences between urban and rural people and between Han and non-Han people in each period, as reflected in Figures 1 and 2[4]. Both figures include the overall TFR of China, the circle-connected line, over the calendar years. Figure 1 further shows both the urban and rural TFR and Figure 2 adds the TFR for Han and non-Han people. Different periods of FPP are segmented by dashed lines.

[Figure 1 and 2 are inserted here.]

Most of the history presented below is cited or summarized from Yang (2004) and Yang (2010).

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[1] `http://english.gov.cn/laws/2005-10/11/content_75954.htm`. This paper studies the family planning policy of the People's Republic of China, which was founded in 1949.

[2] The 2010 Census of China indicated that 91.51% of Chinese were Hans (`http://en.wikipedia.org/wiki/Sixth_National_Population_Census_of_the_People%27s_Republic_of_China`).

[3] For convenience, denote the four periods by period 0 to 3.

[4] Figure 1 and 2 will not be used to prove the causal effect of FPP on fertility, but will only be used to show the consistency between history and TFR.

2.1 Period 0: Without family planning policy (1949–1963)

On the eve of the foundation of the People's Republic of China, the supreme leader Mao Zedong publicly argued that China preferred a large population,[5] which also fit China's traditional concept of fertility, *Duo Zi Duo Fu* (more children, more happiness). Moreover, China was deeply influenced by a birth-encouraging policy of the Soviet Union.[6] Consequently, from 1949 to 1953, China strictly limited birth control and financially subsidized large families.[7]

With a rapid population growth, China began to abolish or relax certain restrictions on birth control in 1954.[8] Meanwhile, some influential scholars like Shao Lizi and Ma Yinchu, publicly promoted FPP.[9] Thereafter, the knowledge of birth control spread through public media to some extent.[10] However, no FPP was officially conceived.

In 1958, with the onset of the Great Leap Forward campaign that aimed to use China's vast population to rapidly transform the country from an agrarian economy into a modern communist society,[11] the discussion on FPP was politically incorrect.[12] The campaign was followed by a great famine (1959–1962), which led to a dramatic decline in TFR, from 5.679 in 1958 to 3.287 in 1961.[13] Under such circumstances, FPP was rarely discussed. When the famine ended in 1962, women began to make up fertility and the TFR rose back to 6.023 in 1962 and even to 7.502 in 1963.[14]

Figures 1 and 2 well support this history. In this period, the overall TFR remained high in the beginning, largely dropped during 1959–1961, started to recover in 1962, and reached to an even higher level in 1963. Figure 1 further shows that urban and rural TFRs co-moved in the period, with the urban TFR being slightly lower. No Han or non-Han TFR for this period was found.

[5] Mao said: "A large population is preferred in China. No matter how large it is, we can always handle it with production... Human being is the most valuable resource of the world... Human can create any miracle." (Yang, 2004, pp. 43)

[6] A mother bearing a large family in the Soviet Union would be awarded an honorary title Mother Heroine (Yang, 2004, pp. 44). Also see `http://en.wikipedia.org/wiki/Mother_Heroine`.

[7] China strongly restricted sterilization and abortion, and strictly controlled the production and sale of contraceptives whose import was banned (Yang, 2004, pp. 44–45).

[8] In 1954, China canceled the restriction on contraception and the sale of contraceptives and relaxed the restriction on abortion. Sterilization was, however, still under strong control (Yang, 2004, pp. 47–48).

[9] Shao and Ma both supported contraception and late marriage, but held different views on abortion (Yang, 2004, pp. 48–50, 52).

[10] The knowledge of birth control only spread to some cities of some provinces (Yang, 2004, pp. 50, 53, 54, 58).

[11] `http://en.wikipedia.org/wiki/Great_Leap_Forward`.

[12] Yang (2004, pp. 59).

[13] Yang (2004, pp. 61).

[14] Yang (2004, pp. 61–62).

2.2 Period 1: Mild and narrowly implemented family planning policy (1963–1971)

Pressured by the make-up fertility in 1962, the Chinese government issued an instruction on the implementation of family planning on December 18th, 1962, known as the No. [62]698 document, which marked the start of China's FPP.[15]

The period-1 FPP, in general, featured the setting of a population growth target,[16] late marriage,[17] the establishment of family planning institutions,[18] and the dissemination of family planning knowledge and technology.[19] Specific FPP varied by province. For instance, Shandong's FPP could be informally stated as "one (child) is not few, two are just right, three are too many". Shanghai's policy suggested that a couple should not bear more than three children, the birth spacing should be at least four years, and a woman's age of bearing the first child should exceed 26 years.[20] Despite of differences, the quota of children allowed per family was generally set to be three. Although bearing more than three children was not mandatorily prohibited, having a large family would result in political or social pressure because the FPP was being promoted mainly through effective political or social movements. Economic measures were also adopted; for example, small families would be subsidized in some way.[21]

The period-1 FPP was designed to be narrowly implemented only for urban Han people as they were the majority of urban people. The urban TFR was expected to fall in this period, which is supported by Figure 1. Contrarily, the rural TFR remained high in period 1. Since urban Han people only took a small proportion of the entire population of China,[22] the overall TFR stayed at high levels in this period. Figure 2 implies that both Han and non-Han TFRs were high in period 1 although both of them were missing before 1971. One of the reasons is that rural areas, where the majority of Han or non-Han people lived, were not covered by FPP in this period.

Two exceptions should be noted. First, the urban Han people living in the five autonomous regions were not covered by FPP in this period.[23] Second, the urban non-Han

[15] Yang (2010, pp. 27). Because the document was released in the late 1962, I have assumed that it came into effect from 1963.

[16] The annual population growth rate targets were 2%, 1.5%, and 1% for the Recovery period (1963–1965), the third Five-year plan (1966–1970), and the fourth Five-year plan (1971–1975), respectively (Yang, 2004, pp. 62).

[17] The Ministry of Health proposed late marriage in a national conference in 1963, and later received approval from the central government (Yang, 2004, pp. 62).

[18] The national family planning institution was established in 1964 and local agencies were founded from 1963 (Yang, 2004, pp. 65).

[19] Contraceptive knowledge and devices were available in local hospitals. Restrictions on abortion and sterilization were basically removed (Yang, 2004, pp. 65–67).

[20] Yang (2004, pp. 68).

[21] Yang (2004, pp. 64, 74).

[22] Rural people took over 80% of the total population (Yang, 2004, pp. 69). Therefore, urban Han people should take less than 20%.

[23] Yang (2004, pp. 144–145). The five autonomous regions, including Xinjiang, Inner Mongolia, Tibet, Ningxia,

people living outside the five autonomous regions might be impacted by FPP in this period, particularly when they identified the ethnicity of their children as Han.[24]

From 1966, the Cultural Revolution negatively shocked the function of family planning institutions and the implementation of FPP. However, the FPP was not abolished and the urban TFR remained at relatively low levels.[25] Meanwhile, contraceptive pills were actively researched and developed.[26]

2.3 Period 2: Strong and widely implemented family planning policy (1971–1980)

Concerned for the negative impact of the Cultural Revolution, the Chinese government issued a report on family planning in 1971, known as the No. [71]51 document, to re-emphasize the importance of FPP. The report signified that FPP recovered from the Cultural Revolution and stepped into a new stage.[27]

Similar to period 1, the period-2 policy also involved a population growth target and technological supports. Moreover, the FPP became more nationally uniform, known as "late, long, few". "Late" means late marriage and childbearing. The recommended age of marriage was 25 years or above for men and was 23 years or above for women; women were suggested to have children after 24 years of age. "Long" means the birth spacing should be at least three years. "Few" means a couple can at most bear two children.[28]

The period-2 policy was stronger than that in period 1. First, a couple could at most have two children in period 2, while three children were allowed, though not encouraged in period 1. Second, the enforcement of period-2 policy was stronger. Mao Zedong, the supreme leader, promoted FPP harder in period 2,[29] and thus, greatly strengthened its enforcement. Other than subsidizing small families as in period 1, certain penalties against too many births were further applied in period 2. For example, rural people who did not comply with FPP would face a loss in food distribution in 1970s.[30]

In 1971, the FPP began to spread to the urban Han people living in the five autonomous regions[31] and to all rural Han people,[32] literally covering all Han people, as reflected in

and Guangxi, are provincial administrative areas of China, primarily for non-Han people. See `http://en.wikipedia.org/wiki/Autonomous_regions_of_the_People%27s_Republic_of_China` for more details.

[24]Yang (2004, pp. 144–145).

[25]The urban TFR kept falling in this period only expect in 1968. Moreover, family planning institutions started to recover in 1969 (Yang, 2004, pp. 75).

[26]Yang (2004, pp. 70).

[27]Yang (2004, pp. 73).

[28]The policy was first implemented in some parts of China, and then was extended to the whole nation in 1973 (Yang, 2004, pp. 73).

[29]For example, in 1974, Mao said: "We must control the population." (Yang, 2004, pp. 73)

[30]Yang (2004, pp. 80, 135).

[31]Yang (2004, pp. 144–145).

[32]Yang (2004, pp. 77–79).

Figure 1. As the majority of rural people were affected by FPP from 1971, the rural TFR started to drop in 1971. The declining of both urban and rural TFRs drove the overall TFR to decrease, as well. However, the population growth target differed between urban and rural areas. By 1975, the urban population annual growth rate was set to fall to 1% and the rural growth rate was designed to drop to 1.5%.[33] As all Han people were covered by FPP in this period, Figure 2 shows that the Han TFR largely dropped after 1971 and the TFR gap between Han and non-Han people widened. Although non-Han people were not officially constrained by FPP in period 2,[34] other factors, such as improved health conditions and easier access to family planning service, might have pulled down the non-Han TFR in this period, as shown in Figure 2.

2.4 Period 3: One-child policy (1980–present)

As a natural evolution of the period-2 FPP, the one-child policy was conceived in 1979 and was intensively propagandized in 1980.[35] The one-child policy, as the name suggests, restricted a family to have only one child, particularly designed for Han families. This policy was apparently stricter than the previous versions.

The strictness of the one-child policy was also reflected by its enforcement. The enforcement of the previous FPPs before 1980 was mainly driven by political, social, or administrative forces, but not laws. In 1978, FPP appeared in the Constitution for the first time and came up with more details in the 1982 amended Constitution. From the late 1980s, central and local governments successively legislated on FPP.[36] Legal measures, such as monetary penalties and subsidies,[37] ensured the effective enforcement of the one-child policy.

In the early 1980s, the one-child policy was successfully implemented in urban Han families, but received large resistance from rural Han people.[38] Subsequently, in the mid-1980s, the one-child policy was relaxed for rural Han families and they were allowed to have a second child in certain cases; for example, when the first child was a daughter.[39] As a result, both the urban and rural TFRs stayed at low levels and their gap always existed, as shown in Figure 1.

In 1982, the FPP started to cover most non-Han people, but in more relaxed forms. In

[33]Yang (2004, pp. 72).

[34](Yang, 2004, pp. 143–145). The urban or rural non-Han people who were living outside the five autonomous regions might be affected by the period-2 FPP, particularly when they identified the ethnicity of their children as Han.

[35]In September 1980, the CPC central committee wrote an open letter to expound the necessity of the one-child policy. This event was usually considered as the starting point of the one-child policy (Yang, 2004, pp. 86).

[36]Yang (2004, pp. 161).

[37]McElroy and Yang (2000), and Li and Zhang (2008) discussed relevant topics.

[38]Yang (2004, pp. 86).

[39]Yang (2004, pp. 87). This case reflects a strong son preference in rural areas.

general, an urban non-Han family could conditionally have two children and a rural non-Han couple was conditionally allowed to have three or even more children. For an ethnic group with a small population size, the policy was even further relaxed.[40] In Figure 2, the Han TFR remained low and the non-Han TFR clearly dropped during the period of 1980 to 1989. The Han and non-Han TFR gap, though smaller, still existed.

2.5 Summary

Section 2.1 to 2.4 briefly introduced the history of FPP by emphasizing the secular and cross-sectional policy variations. Over time, the general FPP got stronger in terms of the number of births allowed per family and the strength of enforcement. Cross-sectionally, the FPP spread from urban to rural areas and from Han to non-Han people, with weaker policies for rural or non-Han people in all the periods, as supported by Figures 1 and 2.

Since the paper focuses on the impact of FPP on fertility, Table 1 summarizes the number of children allowed per family over periods and across different groups of people[41] and will be used to test if the results of this paper match well with the history of FPP.

[Table 1 is inserted here.]

3 A Short Review of Existing Measures of Family Planning Policy

Quantitative analysis of FPP requires the appropriate measurement of FPP. Presently, relevant studies primarily take advantage of the history of FPP to construct measures. Particularly, they utilize basic demographic variables, such as birth year, living area, ethnicity, etc., which are easy to obtain in regular survey data, to construct variables to express the secular and/or cross-sectional policy variations. This will be termed as "constructed measures" in the paper.

Generally, existing constructed measures have several problems: incompleteness, endogeneity, and lack of heterogeneity.

An incomplete measure ignores part of the history and therefore, captures only a part of the policy variations and tends to under-estimate the impact of FPP.

[40] Yang (2004, pp. 146–148).

[41] Through this paper, I will mainly use urban/rural and Han/non-Han to capture the cross-sectional variations of FPP. FPP also varied across provinces, but information is insufficient to specify the provincial differences, particularly for earlier periods. Instead, the following econometric analysis will simply control for province dummies and their interactions with cohort variables to capture the provincial policy variations. Some recent policy change is not considered in the paper. For example, a couple who are both the only child in *their* families can have a second child.

Some constructed measures reflect a part of the secular policy variation, but fail to take cross-sectional variations into account. Yang and Chen (2004) used the 1992 Household and Economy Fertility Survey (HESF) sample to assess the effect of FPP on fertility. They applied the year dummies of being married, from 1970 to 1989, to capture the various impacts of FPP for different marriage cohorts. Narayan and Peng (2006) used time series data and models to estimate the effect of FPP on fertility. They measured FPP with time dummies for two periods, 1970-1979 and 1980-2000. Similarly, Edlund et al. (2008) measured FPP with a dummy variable of being exposed to the one-child policy one year prior to a mother's childbearing.

Some studies utilized cross-sectional policy variations, but failed to capture secular variations. Cai (2010) used a county level cross-sectional data of Jiangsu and Zhejiang province, collected from the 2001 statistical year books of the two provinces and the 2000 census compilations, to estimate the effect of FPP on fertility. He measured FPP by using the percentage of population with agricultural hukou[42] and the percentage of Han population in each county.

More studies took both secular and cross-sectional policy variations into account, but either missed a part of the urban-rural or Han-non-Han variations or a part of the policy change over time. Li et al. (2005) applied a difference-in-difference approach to assess the impact of the one-child policy on fertility. The treatment and control groups were Han and non-Han people. The pre-treatment and post-treatment samples were taken from the 1982 and 1990 census, respectively. Li and Zhang (2007) used a provincial panel data involving 28 provinces over 20 years (1978–1998) to estimate the effect of birth rate on economic growth. In the first stage regressions, they used the percentage of non-Han people in each province/year to instrument the birth rate. Li and Zhang (2008) also adopted a difference-in-difference approach in the first stage regressions, similar to Li et al. (2005). Qian (2009) used an individual level cross-sectional sample from the 1990 census and the 1989 CHNS to test the quantity-quality trade-off hypothesis. In the first stage regressions, she made use of cross-region policy variations and the policy evolution after 1970 to instrument family size. Islam and Smyth (2010) used the 2008 China Health and Retirement Longitudinal Survey (CHARLS) data to estimate the effect of number of children on parental health. In the first stage regressions, they took advantage of urban-rural policy variations and the policy change after 1970 to instrument the number of children. Banerjee et al. (2010) used an individual level cross-sectional data, collected in the 2008 Urban-Rural Migration in China and Indonesia Survey (RUMiCI), to study the impact of number of children on parental saving behaviors. In the first stage regressions, they used a dummy variable to capture the policy change in the early 1970s and included

[42]Hukou is a household registration system in China. In general, urban and rural people have non-agricultural and agricultural hukou, respectively. Rural people who temporarily migrate to urban areas generally keep the agricultural hukou as before.

the interaction between the dummy and the gender of the first child to capture the effect of son preference. Wu and Li (2011) used an individual level panel sample with five waves from the CHNS data to assess the effect of family size on maternal health. In the first stage regressions, they constructed a time variable about the one-child policy to interact it with urban dummy and Han dummy and used them to instrument family size.

Some measures are endogenously constructed, which may bias the effect of FPP on fertility or invalidate the role of FPP as an instrumental variable for fertility. As reviewed above, Yang and Chen (2004) used the year dummies of being married to capture secular policy variations, but the year of marriage is endogenous and might be correlated with unobserved factors related to fertility. Similarly, Edlund et al. (2008), Qian (2009), Islam and Smyth (2010), and Banerjee et al. (2010) considered whether some child was born in some period of FPP to measure the exposure to the policy, but the timing of childbearing may be endogenous.

Other than endogeneity, the dummy variables also lack heterogeneity. For example, a 20-year-old woman and a 40-year-old woman both bear a child in the beginning of the one-child policy. If a dummy variable is used to measure the exposure to the policy, then both values are set to be 1. However, intuitively, the younger woman should have larger exposure to the policy because she will be affected by the policy nearly through out her entire childbearing period, while the older woman almost physiologically finishes childbearing when the policy just starts.

Wu and Li (2011) constructed a more heterogeneous measure, which was proportional to the length of time exposed to the policy, but it still needed improvements. For example, if a woman is exposed to the policy between 20 and 30 years of age and another is exposed between 30 and 40 years of age, their measure will be assigned the same value. However, the first woman is supposed to have larger exposure because 20–30 years is the interval of peak age for childbearing, while 30–40 years is not. Their measure did not consider such heterogeneity.

This paper will try to improve the constructed measure to make it more complete, exogenous and heterogeneous. Further, Section 6 shows how results may change if incomplete, endogenous, or homogeneous measures are used. A few studies have also used specific measures for FPP other than the constructed measures.

Specific measures directly come from a data set that contains specific information on FPP. Schultz and Zeng (1995) used a specific individual level cross-sectional data for some rural areas of three provinces in China, which were collected in the 1985 In-Depth Fertility Survey (IDFS), to assess the effect of local family planning and health programs on fertility. FPP is measured by the availability of a family planning service station, a family planning outreach worker, a doctor or nurse, and a local clinic in a rural village.[43] McElroy and Yang (2000) used a specific household level cross-sectional data for some rural areas across ten provinces, which were collected in the 1992 HESF, to estimate the intensity of county-level FPP on the number of children per family. The HESF sample provides county-level monetary penalties imposed on "over-quota" births and they are used to measure the county-level intensity of FPP. Li and Zhang (2008) used an individual level cross-sectional data, collected in the 1989 CHNS, to study how birth behaviors of a woman are affected by the birth behaviors of her neighbors. In the first stage regressions, they measured the one-child policy with community-level monetary penalties on "over-quota" births and subsidies for one-child families and used it to instrument the fertility of neighbors, which is similar to McElroy and Yang (2000).

Specificity is one of the most notable advantages of such measures as they are so detailed that they can hardly be contaminated by irrelevant factors. However, the problems are similar to the ones of constructed measures. For example, information of monetary penalties is available only for the year of survey and variations only occur across, but not within communities. Moreover, such data sets are relatively exclusive and difficult to acquire.[44] Therefore, this paper will not discuss specific measures.

4 Data, New Measure of Family Planning Policy, and Empirical Specifications

4.1 Data: Introduction, descriptive statistics, and representativeness

The paper mainly uses the birth history data from the CHNS.[45] The ongoing CHNS is one of the most widely used micro-data about China. Conducted by an international team, the CHNS collected information on household and individual economic, demographic, and social variables, particularly the factors about health and nutrition, in 1989, 1991, 1993, 1997, 2000, 2004, 2006, and 2009, across nine provinces.[46] A large group of interviewees have been followed longitudinally.

The CHNS surveyed ever-married women, who were below 52[47] years of age, about their

[43]The availability was measured by dummy variables. The interactions of the dummy variables were also controlled in regressions.

[44]This paper will use a data set from the CHNS for empirical analysis, like Li and Zhang (2008). However, the data used here does not include the community level sample from which Li and Zhang obtained the information on monetary penalties and subsidies. Different from other parts of the CHNS data, the community level sample can only be obtained after a formal application is approved.

[45]More information about the CHNS can be found on the official website: `http://www.cpc.unc.edu/projects/china`.

[46]Before wave 2000, the survey covered eight provinces: Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong. Heilongjiang was included in wave 2000 and thereafter.

[47]The surveyed women were under 50 in wave 1991. Although only the women under 52 (or 50) should

birth history, in 1991, 1993, 2000, 2004, 2006, and 2009. A woman may be tracked wave-wise. The CHNS team combined the birth history data of all waves, kept only the latest wave of record for each woman who has ever been survey, and released the refined cross-sectional data online.[48] In other words, the data contains the birth history of a woman up to the latest wave of survey for her. The data was restricted to women aged 15 or above during the survey. To rule out extreme cases, women who ever bore a child when they were aged below 15 or above 49 years were dropped from the data.[49]

The birth history data includes the date of birth, gender, living arrangement, and date of death of every child that a woman has ever given birth to and allows us to map the history of FPP onto the entire childbearing process. Variables other than birth history of those ever-married women, such as education, ethnicity, marriage, and living area, can be found from other modules of the CHNS. For the currently-married women, the information of their husband can be further obtained.

Only ever-married, but not all women were asked about their birth history because marriage is traditionally and legally regarded as a pre-condition for childbearing in China. Based on the data used in the paper, the proportion of non-marital childbearing is below 5% and has no rising trend over cohorts, which is different from what Hotz et al. (1997) presented about the non-marital childbearing in the U.S.[50]

Table 2 shows descriptive statistics of selected variables for the ever-married women. The statistics for husbands correspond to currently-married women only.

[Table 2 is inserted here.]

The cohort ranges over 1931–1991, with cohorts 1951–1970 being the majority. Observations are balanced across nine provinces.

The average age of the surveyed women and their husbands is about 43. The women of cohorts 1931–1960 basically finished childbearing in survey years, while the rest younger cohorts were still at childbearing ages when they were surveyed. This is considered to be important for interpreting the number of children ever born over cohorts.

Ignoring the column of cohorts 1931–1940, the rest cohorts show that the average number of children ever born falls from about three to below one. The proportion of bearing zero or one child greatly rises, while the proportion of bearing two, three, or above

be surveyed, around 13% women in the sample were above the supposed age during the survey. I kept those observations to enlarge the sample, after checking their validity.

[48] The data is named "m10birth", and was released in July 2011 on the official website of the CHNS. The data doesn't contain the information of wave for any woman, therefore I merged the data to other ever-married women data (for example, the marriage history data for the same set of women) with the information of wave, and mapped the latest wave to each woman in the birth history data.

[49] Only 0.4% observations were dropped.

[50] They pointed out, in the U.S., less than 6% of births were out-of-wedlock in 1963, while this proportion rose to 30% in 1992.

three children decreases rapidly. Meanwhile, the sex-ratio at birth increases over the cohorts of mothers. As warned above, the trends should not be simply interpreted as the evolution of the total fertility because younger cohorts have not physiologically finished childbearing during surveys. The trends from cohort 1941–1950 to cohort 1951–1960, the older cohorts who have basically finished childbearing, are consistent with the trends through all cohorts.

However, the statistics for cohorts 1930–1941, the oldest cohorts in the data, fight against the trends. These cohorts generally feature low levels of fertility in the data. It might be true because these cohorts were around 20–30 years old, i.e., their peak ages for childbearing, during the great famine that greatly pulled down the level of fertility. It might also not be true because these cohorts of women could be non-randomly selected due to some reasons. As Lam and Duryea (1992) pointed out, the fertility level of older cohorts is expected to have, if any, a downward bias because higher mortality among women is associated with the highest fertility and women with smaller family sizes are more likely to survive to the survey. This point will be further discussed when interpreting the effect of FPP on fertility.

As for other variables, the age of first marriage has no certain trend over cohorts, partly because a large group of younger cohorts had not got married. The proportion of women living in urban areas during the surveys rises first and then decreases. The rising part reflects the process of urbanization, while the declining part implies that rural young cohorts tend to get married earlier and thus, enter the sample earlier. The proportion of Han women and their husbands stays steady over cohorts, i.e., it lies between 80 to 90%. The years of schooling shows clear increasing trends for both women and their husbands.

FPP, according to its content, may not only lower fertility, but also affect the age of first marriage. To further study the impact of FPP on the probability of getting married at some age, I combined the data of ever-married women, which was described above, and the data of never-married women up to the latest wave of surveys.

Given the possibly problematic fertility levels of the oldest cohorts and under-sampling of northwestern provinces of China, it's necessary to check the representativeness of the data. The only population indicator available to the paper is the period TFR, as shown in Figure 1 and 2. Therefore, I calculated a sample period TFR, based on the entire birth history of the women in the sample, to see how it matches with the population counterparts.

The formula of the TFR used is

$$TFR_t = 5 \sum_{ag=1}^{7} B(ag,t)/W(ag,t) \tag{1}$$

where TFR_t means the TFR in year t; ag means age group, with 7 5-year age groups through 15 to 49; $B(ag,t)$ means the total number of children born in year t and to the women of age group ag in that year; $W(ag,t)$ means the total number of women of age group ag in year t.

Since the cohort ranges from 1931 to 1991 in the data, I can only calculate the TFR for years 1980–2006.[51] This part of fertility rate well fits the population indicator and their correlation coefficient reaches 0.88. As a result, the data proves to be representative at least in terms of the period TFR.[52]

4.2 New measurement of family planning policy and model specifications for the impact of family planning policy on fertility

Based on the cross-sectional data introduced in the previous subsection, this paper will focus on the static analysis of the impact of FPP on fertility. According to Hotz et al. (1997), a married couple maximizes their utility by choosing the number (and the quality) of children and consumption subject to budget and time constrains, and will accordingly have the following demand function for the number of children n:

$$n = N(\boldsymbol{p}, w, I, \boldsymbol{\theta}), \tag{2}$$

where $\boldsymbol{p}$ is a vector of various prices which directly or indirectly affects n; w is the wage of mothers (the price of mothers' time); I is the household income; and $\boldsymbol{\theta}$ is a vector of attributes that affects n, including parental preferences, technologies influencing the production of children and services related to children, parental fecundity, etc.

China's FPP is a package involving birth quota, and family planning technologies, tools and services, and thus, can enter the demand function through various channels.[53] With an appropriate measure of FPP which integrates different channels, the demand function can be expressed as

$$n = N(\boldsymbol{FPP}, \boldsymbol{p}, w, I, \boldsymbol{\theta}), \tag{3}$$

where $\boldsymbol{FPP}$ is a vector of FPP measures of the three periods and the function arguments other than $\boldsymbol{FPP}$ will not explicitly include the content of FPP.

[51] The older cohorts are absent for the calculation of the TFR before 1980, while the younger cohorts are not complete for calculating the TFR after 2006.

[52] A more standard way of computing the period TFR is based on year-by-year surveys. However, during the period when the population TFRs were available, CHNS only carried out five waves of surveys among which only two waves of cross-sectional data, wave 1993 and 2000, contain the information of birth history and are available from the CHNS website. Nevertheless, the 1993 and 2000 TFRs, calculated based on the two waves of cross-sectional data, are close to the population counterparts, and are even closer than the figures derived from equation (1).

[53] For example, the birth quota brings in a quota constraint; family planning tools and services can affect n through their prices; family planning technologies can be part of the attributes.

Easterlin and Crimmins (1985) proposed a different analytical framework for fertility and specified three channels, the demand for children, the supply of children and fertility regulation, through which various factors affect the number of children ever born. Function (3) also matches well with their framework and all function arguments can be mapped onto the three channels. Other than the arguments specified earlier in this section, their supply channel highlighted the survival rate (or mortality rate) of children which will be further added to $\boldsymbol{\theta}$ in (3).

As the effect of $\boldsymbol{FPP}$ on n is the major interest of the paper, other variables will be reduced to exogenous variables such that a reduced-form equation will be estimated, as in (4).

$$n_i = \alpha + \sum_{j=1}^{3} \beta_j FPP_j + \sum_k \gamma_k X_{ki} + \sum_{\substack{l=c,urban,\\ Han,prov,t}} \zeta_l + \sum_{\substack{m=urban,\\ Han,prov,t}} \eta_{c,m} + \varepsilon_i. \tag{4}$$

In equation (4), i indicates woman i. n_i is the number of children ever born to woman i. FPP_j measures the period-j FPP, with period 0 as the base period. X_k's involve a set of variables of women and their husbands, such as years of schooling, age at survey, etc. ζ_l's capture various group effects, including cohort effects (ζ_c), urban/rural effects (ζ_{urban}), Han/non-Han effects (ζ_{Han}), province effects (ζ_{prov}) and survey year effects (ζ_t). $\eta_{c,m}$'s further consider different cohort effects for urban and rural people, for Hans and non-Hans, across provinces and for the people surveyed in different years.

Variables $\boldsymbol{p}$, w, I and $\boldsymbol{\theta}$ are assumed to be characterized by the X_k's, ζ_l's and $\eta_{c,m}$'s. For example, prices, mortality rate and technologies exhibited trends over cohorts, and the trends differed between groups of people. Other than the associations with group variables, wages, household income, parental preferences and parental fecundity were also affected by years of schooling, age, etc. All other uncontrolled factors go to the error term ε_i, and are assumed to be uncorrelated with covariates.

Since FPP evolves over time and varies between urban and rural areas and between Han and non-Han people, I have expressed FPP_j as a function of c, t, $urban$, and Han, as in equation (5). The first two capture the secular variations of the policy,[54] and the last two help measure the cross-sectional variations of the policy. Further, I have assumed a quasi-separable form for $FPP_j(c, t, urban, Han)$, as in equation (6)

$$\begin{aligned} FPP_j &= FPP_j(c, t, urban, Han) && (5)\\ &= \delta_0 FPP_j(c,t) + \delta_1 D_{urban} FPP_j(c,t) + \delta_2 D_{Han} FPP_j(c,t), && (6) \end{aligned}$$

[54] Different cohorts were exposed to FPP differently; the survey year helps measure the length of time exposed to the ongoing one-child policy.

where D_{urban} and D_{Han} stand for urban dummy and Han dummy. In one word, secular policy variations are captured by a cohort-year specific policy measure $FPP_j(c,t)$ and cross-sectional policy variations are reflected by interacting $FPP_j(c,t)$ with group dummies.

$FPP_j(c,t)$ can be further specified as follows. For an individual from a given cohort, the degree of exposure to period-j FPP depends on how physiologically possible it is for the individual to bear a child in period j. For example, if an individual was at her peak age of childbearing in period j, she was more likely to be affected by FPP than individuals at other ages and thus, should have a larger value for $FPP_j(c,t)$. Therefore, I was required to first figure out the probability of childbearing at every age.

Figure 3 plots the probability distribution of childbearing age, denoted by $f(age)$. At each age, $f(age)$ is the total number of children born to the women at that age divided by the total number of children ever born to all women in the data. I have assumed the probability of childbearing to be zero for the women aged below 15 or above 49 years. Clearly, probabilities sum up to one. Figure 3 shows that the probability rapidly climbs up after the age of 15 years and reaches the peak at around the age of 24 years and then gradually falls.

[Figure 3 is inserted here.]

$age_j^b(c,t)$ and $age_j^e(c,t)$ are defined as the age of a cohort-c woman, i.e., a woman born in year c, at the beginning and ending of the period-j FPP, respectively. Then, $FPP_j(c,t)$ is defined as

$$FPP_j(c,t) = \sum_{age=age_j^b(c,t)}^{age_j^e(c,t)} f(age) \tag{7}$$

with

$$age_1^b(c,t) = 1963 - c,\ age_2^b(c,t) = 1971 - c,\ age_3^b(c,t) = 1980 - c;$$
$$age_1^e(c,t) = 1971 - c,\ age_2^e(c,t) = 1980 - c,\ age_3^e(c,t) = t - c.$$

Figure 4 presents $FPP_1(c,t)$, $FPP_2(c,t)$, and $FPP_3(c,t)$, as defined above, over cohorts.

[Figure 4 is inserted here.]

Clearly, the women born in 1940s, 1950s, and 1960s were mostly affected by the period-1, period-2, and period-3 FPP, respectively. Since the period-3 FPP, i.e., the one-child policy, is still active, the interval exposed to the policy for a woman born after 1960 is the interval between the age of 15 years (or the age at the beginning of the one-child policy) to the age at the latest survey.

Notably, if $f(age)$ in equation (7) is differently defined, the values of FPP_j and subsequent results may change. Section 6 will discuss the sensitiveness of results to various choices of $f(age)$.

Finally, the empirical specification becomes

$$n_i = \alpha + \sum_{j=1}^{3} \big(\beta_{j0} FPP_j(c,t) + \beta_{j1} D_{urban} FPP_j(c,t) + \beta_{j2} D_{Han} FPP_j(c,t)\big) + \sum_k \gamma_k X_{ki} + \sum_{\substack{l=c,urban,\\ Han,prov,t}} \zeta_l + \sum_{\substack{m=urban,\\ Han,prov,t}} \eta_{c,m} + \varepsilon_i. \quad (8)$$

where $\beta_{j0} = \beta_j \delta_0$, $\beta_{j1} = \beta_j \delta_1$, and $\beta_{j2} = \beta_j \delta_2$. Since FPP aims to reduce fertility and is stricter for urban or Han people through periods, β_{j0}, β_{j1}, and β_{j2} are expected to be negative or at least non-positive.

The newly constructed measure improves in completeness, exogeneity, and heterogeneity, compared to existing measures. First, the new measure takes the secular and cross-sectional policy variations of all three periods into account, thus, capturing the history more completely. Second, the new measure is constructed based on birth cohort, survey year, urban dummy and Han dummy and is sufficiently exogenous.[55] Third, the new measure largely allows women's heterogeneous exposures to FPP.

To complete the regression specification, I have added three more variables to X_k's: the exposure to the great famine in 1959-1962, the exposure to the post-famine period and the exposure to the pre-People's Republic of China (PRC) period.

In order to capture the fertility drop caused by the great famine in 1959-1962, I have defined an exposure to the famine by using equation (7), with age^b being the age in 1959 and age^e being the age in 1962. Right after the famine, during 1962-1963, fertility was largely made up. I have defined an exposure to this period by using equation (7), with age^b being the age in 1962 and age^e being the age in 1963.

I have only discussed the FPP in the PRC since 1949, as little information on population related policies is available for the pre-PRC period. Women born in 1934 or later became fertile (aged 15 years) in the PRC period, and therefore, are assigned value zero on the pre-PRC exposure. For women born before 1934, I have defined the exposure by using equation (7), with age^b being 15 years and age^e being the age in 1949.

In equation (8), ζ_{urban}, ζ_{Han}, ζ_{prov} and ζ_t are all dummy variables. ζ_c can be specified in two ways: a high order polynomial of cohort trend, and cohort dummies. By construction, $FPP_1(c,t)$ and $FPP_2(c,t)$ are constant within a cohort. Therefore, for including these two variables, the high order polynomial of cohort trend should be used. The cohort trend is defined as the difference between birth year and 1931 - the oldest cohort in the sample.

[55] FPP_j is also constructed based on the function $f(.)$, which is endogenously derived from the sample. However, the function is equally imposed on all observations, and thus, will not lead to a problem of endogeneity.

Empirically, I will include the cohort trend and its second, third, and fourth order terms. Furthermore, to specify the $\eta_{c,m}$'s, the cohort trend will be interacted with urban dummy, Han dummy, province dummies and survey year dummies.[56] Cohort dummies will also be considered in regressions.[57]

5 Main Empirical Results

5.1 Regressions of fertility on family planning policy

Table 3 shows regression results of fertility on FPP by using the data of ever-married women. Robust standard errors are reported in squared brackets through all columns.

[Table 3 is inserted here.]

Column [1] is the regression on which further analysis is mainly based upon. FPP_j ($j = 1, 2, 3$) is the $FPP_j(c,t)$ in equation (8). Other than FPP related variables, it controls for urban dummy (D_{urban}), Han dummy (D_{Han}), years of schooling and squared demeaned years of schooling (divided by 2), age at survey and squared demeaned age at survey (divided by 2), exposure to the great famine, exposure to the post-famine period, exposure to the pre-PRC period, the polynomial of cohort trend up to the fourth order, survey year dummies, province dummies, and interactions of cohort trend with urban dummy, Han dummy, survey year dummies and province dummies. As indicated below equation (8), coefficients of FPP related variables are expected to be negative. Column [1] shows that, almost all such coefficients are negative and most of them are statistically significant at 5% level. Partial effects of FPP will be computed in Section 5.2.

By adding $D_{urban} \times D_{Han} \times FPP_j$ to Column [1], Column [2] additionally captures more cross-sectional policy variations. Column [2] implies that the three-term interactions are not statistically significant determinants of fertility and the coefficients of other FPP related variables are quite similar to Column [1].

Columns [1] and [2] only control for women's variables. As Section 4.2 suggests, variables of women's husbands may be the determinants of fertility. Based on Column [1], Column [3] further controls for variables of husbands, including their ethnicity and interactions with FPP_1, FPP_2 and FPP_3,[58] husbands years of schooling and its squared demeaned

[56]Only the linear cohort trend out of the fourth-order polynomial will be interacted with those dummy variables.

[57]In such regressions, cohort dummies will be interacted with province dummies and survey year dummies. Correspondingly, $FPP_j(c,t)$ will be dropped due to perfect collinearity, but their interactions with urban dummy and Han dummy will be kept for the sake of analysis. To avoid dropping all FPP related variables, cohort dummies will not be interacted with urban dummy or Han dummy in such regressions.

[58]The information of husbands will never enter the data and match with the record of their wives unless the couple lived together during the survey, so the urban dummy always takes the same value for women and their husbands. As a result, no urban dummy or its interactions with FPP_j, or province or survey year dummies for husbands need to be further added to Column [3].

term, husbands age at survey and its squared demeaned term, the fourth-order polynomial of husbands cohort trend as well as the cohort trend interacted with husbands urban dummy, Han dummy, province dummies and survey year dummies. Since only currently-married women could be matched with her husband's record, quite a few observations are dropped from Column [3]. So Column [3] regression will mainly be used for robustness check rather than for further analysis. As the results show, almost all the FPP related variables are negative and a part of them are statistically significant. Section 5.2 will show how robust the partial effects of FPP derived from Column [3] will be compared to those from Columns [1] and [2].

Based on Columns [1]-[3], Columns [4]-[6] replace the polynomial of cohort trend with cohort dummies and substitute cohort dummies$\times$province dummies and cohort dummies$\times$survey year dummies for previous interactions involving cohort trend.[59] FPP_1, FPP_2, FPP_3, exposure to the great famine and exposure to the pre-PRC period are dropped due to perfect collinearity.[60] These three columns are used to check the robustness of the coefficients of FPP related variables after cohort trends are replaced by cohort dummies which are stronger measures of cohort effects. Compared to Columns [1] and [2], Columns [4] and [5] have robust coefficients of $D_{urban} \times FPP_j$; the coefficients of $D_{Han} \times FPP_j$ have changed a bit, but generally preserve the signs. While compared to Column [3], the coefficients of $D_{Han} \times FPP_j$ in Column [6] are quite robust; the effects of $D_{urban} \times FPP_j$ in Column [6] become a bit larger and more statistically significant than Column [3].

Columns [7] and [8] are logit regressions with specifications similar to Column [1]. The dependent variable of Column [7] regression is a dummy variable: whether the number of children ever born to a woman is greater or equal to two. The dependent variable of Column [8] regression is a dummy variable: whether the number of children is greater or equal to three. All the coefficients in Columns [7] and [8] are marginal effects. We can see that, FPP related variables, particularly the interactions, negatively impact the probability of having more children.

As analyzed above, the coefficients of FPP related variables are robust through most columns. Likewise, other control variables show similar patterns through columns. Years of schooling negatively and significantly affect fertility, and the effect is even bigger when education increases, while fertility is an increasing concave function of age at survey. The great famine negatively shocked fertility, though statistically insignificant, and its partial effect will also be computed in Section 5.2.

The "F stat. for FPP" stands for the F statistics for the joint significance test for the variables involving FPP. Through almost all columns, F statistics are fairly large with p

[59]In Column [6], cohort dummies related variables of both women and their husbands are controlled for.

[60]By construction, they are perfectly collinear with cohort dummies, survey year dummies and their interactions.

values nearly 0, even when FPP_1 to FPP_3 are dropped in Columns [4]-[6]. For Columns [1] to [3], F tests were applied separately for FPP_j only and for interactions related to FPP_j only. Similarly, almost all p values are nearly 0.[61] The Chi-squared statistics for the joint significance test for the variables involving FPP are also sufficiently large with p values nearly 0, and the statistical significance is mainly reflected by interactions related to FPP_j. The R-squared and pseudo R-squared signify nice goodness-of-fit of all specifications.

As pointed out in Section 4.1, the fertility of older cohorts may be underestimated. As they are mainly the base cohorts for FPP, the underestimation of their fertility will bias the coefficients of FPP related variables towards 0. Even in this situation, the effect of FPP on fertility is strong. Therefore, the downward bias of fertility for older cohorts will not essentially change the conclusion.

5.2 Partial effects of family planning policy on fertility

Based on the regression results from Table 3, Table 4 calculates the partial effect of FPP on fertility, i.e., the fertility change attributed to the full exposure to some FPP provided that other variables are constant.

[Table 4 is inserted here.]

Table 4 consists of three panels of results, representing the partial effects of FPP on fertility derived from Columns [1]-[3] of Table 3. In each panel, women are categorized and the entire period of FPP is segmented, as in Table 1. Along each group (row), the number below "Period j" ($j = 1, 2, 3$) indicates the change in fertility of a woman in that group if she had been fully exposed to the period-j FPP, keeping other factors constant. For example, in Panel 1, the number -0.82, corresponding to "Rural Han" and "Period 2", means a rural Han woman would have 0.82 fewer children if she had been fully exposed to the period-2 FPP, keeping all the other variables constant.

The method of calculation is explained as follows. Take the -0.82 again as an example. It is calculated in the following way: $\big(-0.471+(-0.631)\big)\times max(FPP_2|D_{urban}=0, D_{Han}=1) = \big(-0.471+(-0.631)\big)\times 0.745 = -0.82$, where -0.471 and -0.631 are the coefficients of FPP_2 and $D_{Han} \times FPP_2$, and 0.745 is the maximum value of FPP_2 for the rural Han women. In Panel 2, the calculation considers the three-term interactions, and in Panel 3, the FPP variables involving husbands's information are taken into account for calculation. For comparison, the average partial effect of the great famine on fertility is also listed for each panel, using a similar method. The symbols ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

[61] The only exception is the F stat. for interactions only in Column [3]; its p value is 0.061.

Through the three panels, some features are highlighted. First, for any group of women, the partial effect of FPP on fertility generally gets larger and larger over periods. Second, within almost any period, the partial effect for urban women is larger than rural women and the partial effect for Han women is larger than non-Han women. Third, for Panel 1 and 2, partial effects start to be statistically significant from the period in which women of the group began to be exposed to FPP.[62] These three features are perfectly consistent with what Table 1 implies, and thus, to some degree justify the measure constructed in the paper.

Furthermore, the partial effects of FPP are quite robust through panels. Panels 1 and 2 show that full exposure to the great famine would have reduced fertility by 0.6; while the effect in Panel 3 is a bit larger; but the three effects are all statistically insignificant and smaller than most partial effects of FPP.

5.3 Percentage change of fertility explained by family planning policy

Other than the *magnitude* of the partial effect of FPP shown in Section 5.2, it is also of interest to know what *percentage* the FPP has explained the fertility change for each cohort and over cohorts. Section 5.3 will target the cohorts of which some women had physiologically finished childbearing by the survey. The TFR over these cohorts is shown in Figure 5.

[Figure 5 is inserted here.]

This TFR is derived from the formula

$$TFR_c = \sum_{a=15}^{49} B(c,a)/W(c,a), \tag{9}$$

where TFR_c means the TFR of cohort c; a means age, from 15 to 49 years. $B(c,a)$ means the total number of children born to cohort-c women when they were aged a; $W(c,a)$ means the total number of cohort-c women when they were aged a. As no women born after 1960 had physiologically completed childbearing by the survey,[63] Figure 5 only ranges from cohort 1931 to 1960. The cohort TFR is widely estimated (for example, Lam and Duryea (1992), Olsen (1994), Lam and Duryea (1999), etc.), and surpasses the period TFR in the sense that the period TFR uses the fertility level of current older women to measure the fertility of current younger women when they get older in the future and would be inaccurate when fertility is experiencing great transitions.

[62] The statistically significant effects of FPP for urban non-Han women in period 1 and 2 imply that exceptions, listed in the note of Table 1, have dominated. This domination may result from that 84.6% urban non-Han women in the sample lived outside the autonomous regions.

[63] In other words, none of the women of those cohorts were 49 years old or above by the survey.

Clearly, Figure 5 is similar to what Table 2 shows: over cohorts, fertility first rises and then falls. As pointed out in Section 4.1, the rising part of fertility may be problematic; therefore, this subsection will only focus on the falling part, namely, cohorts 1943 to 1960. Table 5 shows the percentage change of fertility explained by FPP for each cohort. The left panel uses all the women of cohorts 1943–1960, while the right panel selects the women of cohorts 1943–1960 who were aged 45 years or above, i.e., the women who had largely finished childbearing, by the survey.

[Table 5 is inserted here.]

In each panel, the first column predicts the fertility for each cohort based on the Column-[1] regression of Table 3. The second column predicts the fertility by letting the variables involving FPP_j's to be 0; in other words, it predicts the fertility for each cohort of women had they never been exposed to FPP. The third column calculates the fertility increase from the first to the second column in percentage.

According to the left panel, for all women of these cohorts, the predicted fertility with actual FPP exposure is 2.31, while the predicted fertility with zero FPP is 3.55, which is 53.7% higher. Through cohorts 1943 to 1960, the percentage varies from about 25% to 76%. As a comparison, Table 5 also predicts the fertility had the women never received schooling. Clearly, the increase of fertility in the absence of schooling, 17.3%, is much smaller than the fertility change without FPP. The right panel proves the robustness of the results.

Table 6 further shows how much percentage of fertility decline over cohorts can be explained by FPP.

[Table 6 is inserted here.]

Similar to Table 5, Table 6 consists of two panels. Take the left panel as an example. The first row shows the predicted fertility of cohorts 1943 and 1960, based on the Column-[1] regression of Table 3, and gives the fertility decline over cohorts, 1.95 ($3.56-1.61$). Following the first row, the second row preserves the predicted fertility of cohort 1943, but replaces the predicted fertility of cohort 1960 with the predicted fertility of cohort 1943 by setting the values of FPP_j's to be the same with those for cohort 1960. In other words, the number 3.33 is the predicted fertility of cohort 1943 had they been exposed to the FPP which cohort 1960 was actually exposed to. Therefore, 0.23 ($3.56-3.33$) is a measure of fertility decline from cohort 1943 to 1960 attributed to the evolution of FPP, and it accounts for about 11.8% ($0.23/1.95 \times 100\%$) of the total decline.

As a comparison, the fourth row predicts the fertility of cohort 1943 by setting their years of schooling to be the one of cohort 1960, to calculate what the fertility level of cohort 1943 would be had they received the same schooling with cohort 1960. The fertility difference, 0.28 (3.56-3.28), is a measure of fertility decline over cohorts attributed to increasing schooling. It accounts for 14.4%, greater than the percentage associated with FPP. Since the second and third rows are both based on cohort 1943, the fifth and sixth rows are based on cohort 1960. In other words, it compares the predicted fertility of cohort 1960 under their actual FPP exposure and the FPP exposure of cohort 1943.

Similar to Table 5, the right panel further proves the results are robust. Overall, FPP accounts for about 10–13% of the fertility decline from cohort 1943 to 1960, while increasing schooling can explain a bit more, about 14–16%. FPP and schooling together can only explain about a quarter of the over-cohort fertility decline, leaving the rest three quarters explained by other factors.

However, table 6 should be cautiously interpreted. First, since cohort 1943 was exposed to some FPP (as shown in Figure 4), the percentage shown in Table 6 is associated with part of but not the entire evolution of FPP. Nevertheless, FPP only accounts for a small part of the biggest drop of cohort TFR in the data. Second, given the possible underestimation of the coefficients of FPP related variables, the direction of bias for the percentage in Table 6 is unclear. Unless the bias is negative and huge, the weak role that FPP has played in the over-cohort fertility decline will not change.

Combining Tables 5 and 6, we can make up what would happen had there been no FPP: the fertility levels of all cohorts of mothers will greatly shift up, but the downward secular trend of fertility will certainly appear with declining rate not much slower than the scenario with FPP.

5.4 Impact of family planning policy on women of different types

Section 5.2 has shown that women of different types, distinguished by urban/rural and Han/non-Han, face different effects of FPP on fertility. This subsection further classifies women according to their years of schooling, the gender of their first child, and whether they reside in better-developed coastal provinces to reveal how the effect of FPP varies along the new types. Table 7 presents subsample regressions for women of different types.

[Table 7 is inserted here.]

Columns [1] and [2] group women based on whether they received nine years of schooling.[64] Columns [3] and [4] categorize women by the gender of their first child. Columns [5] and [6] distinguish women by whether they live in coastal provinces of China.[65] Model specifications through all columns are identical to Column [1] of Table 3. The Chow test strongly rejects equal coefficients of regressions between groups. Indeed, the coefficients, in particular the coefficients of FPP related variables, seem different across groups.

[64] Nine years of schooling marks the graduation from junior high school and is also the current compulsory level of schooling in China.

[65] Jiangsu, Liaoning and Shandong are identified as coastal provinces in the data.

Table 8, derived from Table 7 using the same approach for Table 4, shows the partial effect of FPP on fertility for each type of women. At first glance, Table 8 exhibits similar patterns to Table 4. Regardless schooling, gender of the first child, and province of living, the impact of FPP gets stronger along periods, with bigger effects for urban or Han women than for rural or non-Han women within each period.

[Table 8 is inserted here.]

Additionally and more interestingly, less-educated women are more heavily impacted by FPP. The reason could be that more-educated women tend to desire fewer children and thus, face lighter shocks from FPP. Furthermore, a woman whose first child is a daughter confronts greater impact from FPP compared to a woman whose first child is a son, possibly because she tends to bear more children so as to eventually get a son, given the deep-rooted son preference in China. Finally, women from coastal provinces are less affected by FPP, probably because coastal provinces represent better-developed areas in China and people residing there tend to desire fewer children.

5.5 Impact of family planning policy on the age of first marriage

According to the history, other than influencing the childbearing behaviors of married women, FPP may also play a significant role in the decision of marriage age. Table 9 assesses how the probability of getting married by some age responds to the presence of FPP.

[Table 9 is inserted here.]

The dependent variables are dummies indicating whether a woman's age of first marriage was below some level. Logit models are used through all columns, with the same set of independent variables as in Column [1] of Table 3. Marginal effects and their robust standard errors are reported.

Table 10, derived from Table 9, reports the odds ratio of being married over being unmarried by some age for some group of women who are fully exposed to some single period of FPP (left panel), and the change in odds ratio over periods of FPP (right panel).

[Table 10 is inserted here.]

Take the numbers corresponding to "Urban non-Han" and "≤ 22" as an example. The odds ratio of being married over being unmarried by age 22 for an urban non-Han woman who has never been exposed to any FPP is 220.28; while if she has ever been fully exposed to the period-2 FPP (but not exposed to the period-1 or period-3 FPP), her odds ratio will fall to 3.26. The right panel accordingly shows the full exposure to (only) the period-2 FPP will make the odds ratio of being married over being unmarried a fraction 0.01

(3.26/220.28) of the odds ratio in the absence of FPP. Non-FPP variables take the mean values within that group of women.

Table 10 shows the following patterns. First, in the left panel, given a group of women and a period of FPP, the odds ratio of being married over being unmarried increases as the reference age of marriage rises. Second, in the left panel, given a group of women and a reference age of marriage, the odds ratio decreases from Period 1 to Period 3, implying that marriage is more likely to be delayed if the FPP is more strongly enforced. Third, in the left panel, given a reference age of marriage and a period of FPP, urban women have smaller odds ratio than rural women, while the results between Han and non-Han women are mixed. Fourth, in the right panel, given a group of women and a specific ratio of odds ratios, the impact of FPP on marriage delay is stronger for the women who initially got married later.

6 Sensitivity of Results to Alternative Measures

6.1 Construct measures using different probability distributions of child-bearing age

The measure of FPP used for the above analysis is constructed based upon the probability distribution of childbearing age of all women in the data, as shown in Figure 3. However, the distribution may have been shaped by the FPP. The ideal distribution, the pre-FPP distribution, can not be derived from the data, but it is feasible to check the sensitivity of the results to the usage of different distributions.

Figure 6 shows separately the distributions of childbearing age for urban Han, rural Han, urban non-Han, and rural non-Han women and Figure 7 shows the distributions for women of cohort 1931–1950, 1951–1960, 1961–1970, and 1971–1991, respectively.

[Figure 6 and 7 are inserted here.]

Women across groups have similar distributions, while women of different cohorts clearly diverge in the distribution. In particular, older cohorts of women have flatter distributions, implying active childbearing through all ages. Table 11 shows the regression results using the measures of FPP constructed on different distributions of childbearing age.

[Table 11 is inserted here.]

Column [1] is the base regression, identical to the Column [1] of Table 3. Through Columns [2] to [9], the measures of FPP are constructed based upon different distributions of childbearing age, as shown in Figure 6 and 7. The results support strong robustness of almost all coefficients over columns. Table 12 further calculates the partial effect of FPP for all columns with the top panel, for reference, identical to panel 1 of Table 4. Clearly, the partial effects are robust, as well.

[Table 12 is inserted here.]

6.2 Use measures lacking heterogeneity, or incomplete or endogenous measures

As Section 1 states, the discord of results between this paper and other papers may originate from the usage of different measures of FPP or reasons other than measurement, such as the choice of data set or model specification. This subsection answers to what extent different measurement of FPP will lead to different estimations of the partial effect of FPP on fertility, given all the other factors fixed.

Table 13 shows the regressions using measures of FPP lacking heterogeneity or exogeneity. Column [1] is still the base regression. Columns [2] and [3] use the following formula for $FPP_j(c,t)$, rather than equation (7),

$$FPP_j(c,t) = \sum_{age=age_j^b(c,t)}^{age_j^e(c,t)} \frac{1}{49-15+1}, \tag{10}$$

which essentially treats $f(age)$ in equation (7) as a uniform distribution over $[15,49]$. For the great famine exposures and pre-PRC period exposure, Column [2] still uses formula (7), while Column [3] adopts formula (10).

[Table 13 is inserted here.]

Columns [4] and [5] define FPP_j as a dummy variable: whether a woman gave birth to a child during the period-j FPP. Similarly, Column [4] uses formula (7) to define great famine and pre-PRC exposures, while Column [5] uses formula (10).

Although most FPP related interactions through Columns [2] to [5] have strongly negative coefficients, the FPP_j's themselves exhibit big and strong positive effects on fertility. Table 14 further shows the partial effect, and apparently, after losing heterogeneity and exogeneity, the effect of FPP on fertility gets reversed.[66]

[Table 14 is inserted here.]

Finally, Table 15 shows what would happen if only a part of the FPP variations are considered for measurement. Table 16 calculates the partial effect of FPP based on Table 15.

[66] This result appears with the data and model specification of this paper. It can not be naturally generalized to other data and specifications.

[Tables 15 and 16 are inserted here.]

Column [1] is the base regression. Column [2] omits the period-1 FPP, and Column [3] ignores both the period-1 and period-2 FPP. Table 16 shows that Columns [2] and [3] regressions do not only neglect the effect of FPP that is excluded, but also systematically underestimate the effect of FPP that is included.

Column [4] ignores the cross-sectional policy variation between Han and non-Han women, and Column [5] drops the policy variation between urban and rural areas. Partial effects for these two columns do not deviate much from the top panel, but sacrifice the Han/non-Han and urban/rural effect variations.

Columns [6] to [9] ignore both the secular and cross-sectional policy variations, and result in the partial effects involving both underestimation and lack of cross-sectional variations.

7 Conclusions and Further Study

FPP in China has been widely studied yet its impact on fertility is under debate. Many papers have concluded that FPP explains a sizable portion of China's fertility decline, while others have argued that the role of China's FPP in population control has been overstated.

One reason is the different measures of FPP, which might not only lead to various effects on fertility, but could also cause indefinite second-stage results in studies where FPP is treated as an instrumental variable. Roughly, FPP can be measured by specific or constructed variables. The former comes from specific information on FPP of some specific data sets, such as the availability of family planning services, monetary penalties on "over-quota" births, and subsidies for one-child families. The latter, more widely used, is relatively easier to construct and relies on the history of FPP. However, most existing measures fail to completely capture policy variations, insufficiently express people's heterogeneous exposures to FPP, and sometimes, suffer from endogeneity.

This paper tries to construct a new measure of FPP that can improve on the above three aspects. Historically, FPP varies over time and differs between urban and rural areas and between Han and non-Han people. The measure adopted in the study embodies the secular and cross-sectional policy variations as completely as possible. The basic idea of constructing the new measure comes from the intuition that a woman is more likely to be affected by the FPP of some period if she is more physiologically capable to bear a child during the period. The method of constructing the new measure implies a progress in heterogeneity and exogeneity.

A cross-sectional data of the CHNS is used to construct the measure and to estimate the impact of FPP on the number of children ever born to a ever-married woman and on the probability of early marriage. First, the empirical analysis supports the appropriateness of the newly constructed measure because its empirical features well fit the history. Second, based on the new measure, FPP can explain a sizable fertility level shift for all cohorts, but can only explain a small portion of the fertility decline over cohorts. Third, the age of first marriage tends to be largely delayed under FPP, particularly when it is strongly enforced. Fourth, the women who are more educated, living in more-developed coastal provinces, or whose first child is a son, tend to desire fewer children and face fewer restrictions from FPP.

The study also has some limitations. First, FPP differs cross provinces. Since little information on the provincial-level policy variations is available, only variations across urban/rural and Han/non-Han are considered. Second, the sample used in the paper might have problems of reliability for older generations. Third, income is not controlled in regressions due to its endogeneity and measurement problem. However, it may simultaneously lead to an omitted variable bias, even though many other variables have been included. Last but not least, a more general form, rather than a quasi-separable form, is desirable to measure the FPP.

Several directions can be further explored. First, the paper analyzes the impact of FPP on the *total* number of children ever born up to the survey. It could be more precise to observe the dynamic effects of FPP of some period on the childbearing behavior in that specific period. Second, a thorough review on how different measures of FPP could affect second stage regression results could be done.

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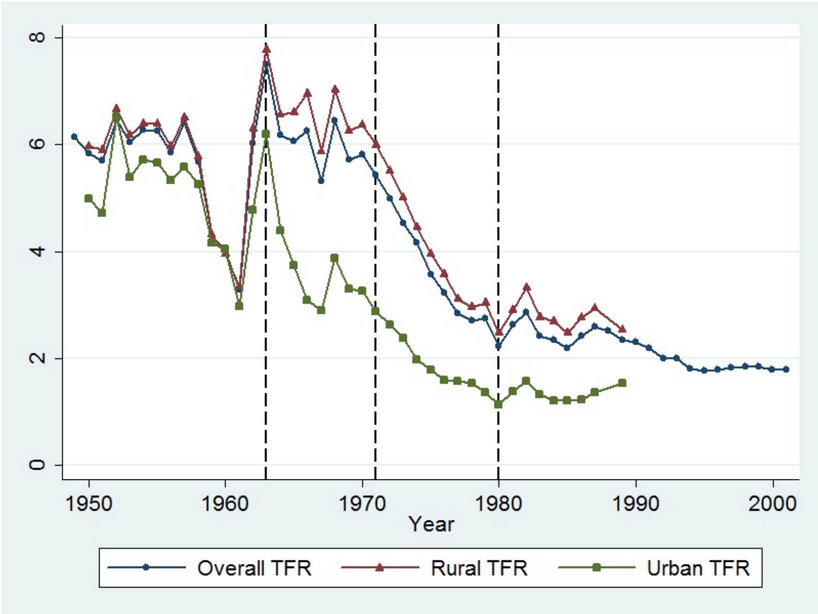
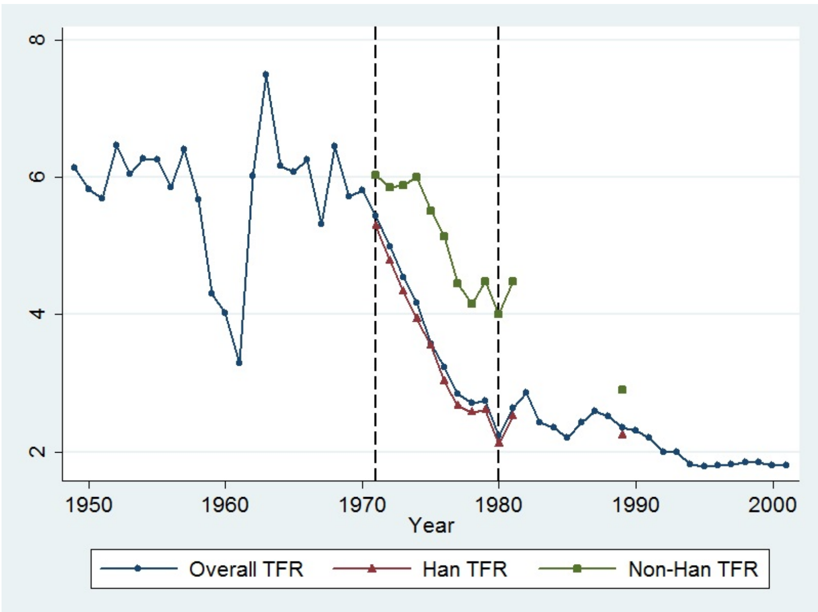
Figure 1: Urban and rural total fertility rates over time



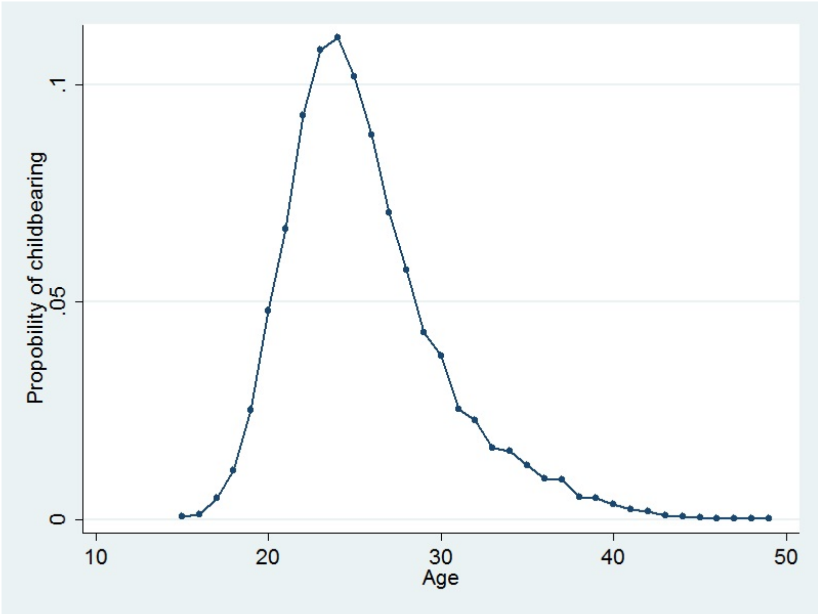
The overall total fertility rate is cited from Yang (2004, pp. 264–265), and urban and rural total fertility rates are cited from Yang (2004, pp. 134, 135, 139). All figures originally come from various national surveys conducted by China's statistical authority. The left, middle and right dashed lines mark the years of 1963, 1971 and 1980, segmenting the entire history into four periods.

Figure 2: Han and non-Han total fertility rates over time



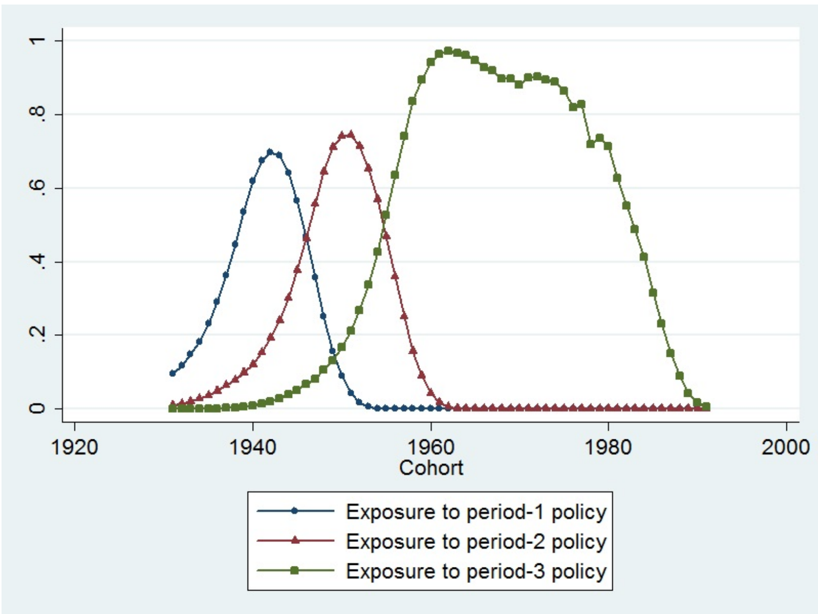
The overall total fertility rate is cited from Yang (2004, pp. 264–265). The Han (ethnic majority) and non-Han (ethnic minority) total fertility rates are cited from Yang (2004, pp. 145, 150). All figures originally come from various national surveys conducted by China's statistical authority. The left and right dashed lines mark the years of 1971 and 1980, the starting points of the period 2 and 3 family planning policies.

Figure 3: Probability distribution of childbearing age



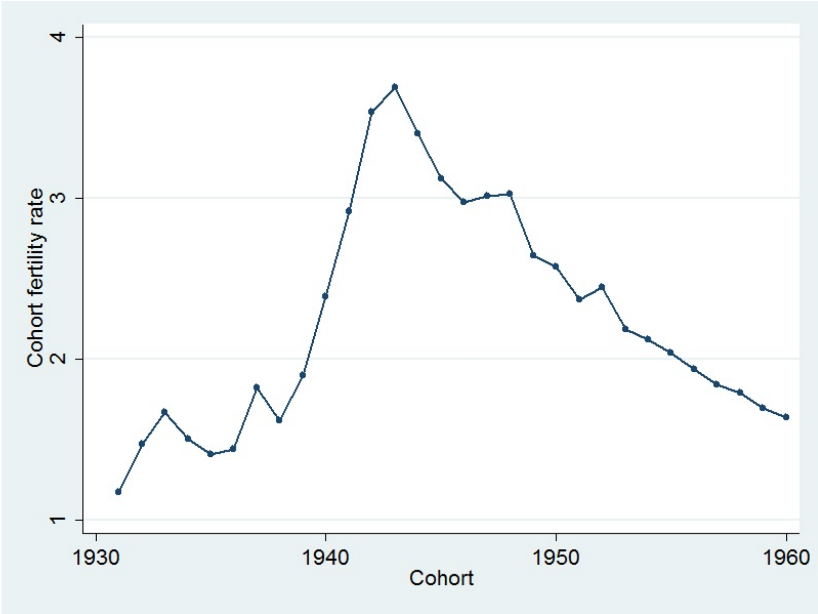
The probability of childbearing at an age is calculated as the ratio of the total number of children born to the women at that age and the total number of children ever born in the entire data. The distribution takes positive values though age 15 to 49, and 0 for other ages. Clearly, probabilities sum up to 1.

Figure 4: Exposure to family planning policy over cohort



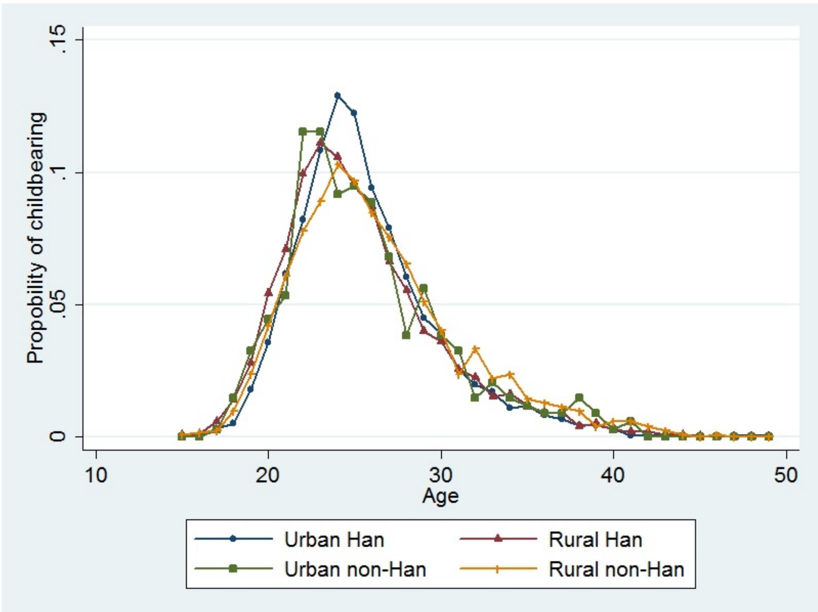
The exposure to the three periods of family planning policies are calculated based on equation (3). Clearly, the 1940s, 1950s, and 1960s cohorts are mostly exposed to the period-1, period-2 and period-3 policy, respectively. For the one-child policy is ongoing, the interval exposed to it for the younger cohorts is the interval through age 15 (or the age at which they started to be affected by the policy) to the age at the latest interview.

Figure 5: Total fertility rate over cohorts



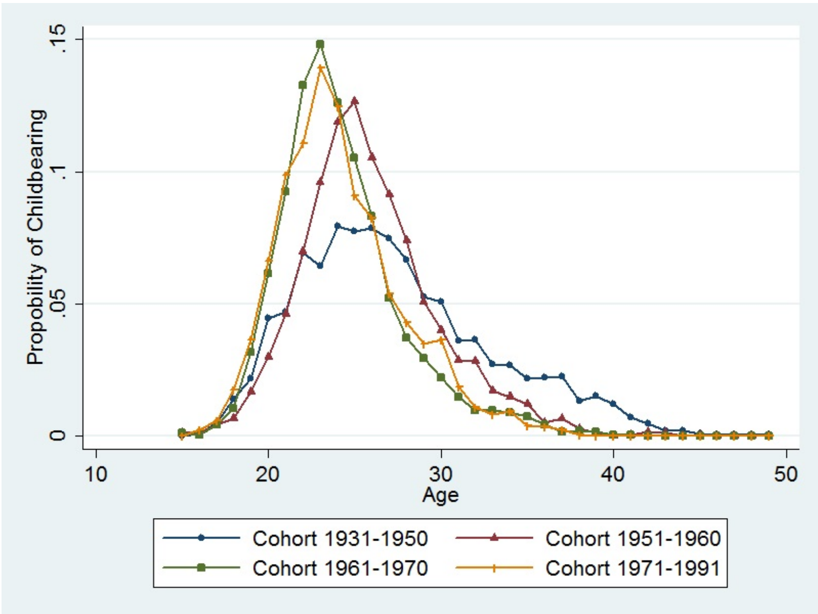
For each cohort of mothers, the fertility rate is the summation of average number of children born at each mother's age through 15 to 49 for that cohort. Because the women born after 1960 had not physiologically completed childbearing by the last wave 2009, Figure 5 only ranges from cohort 1931 to 1960.

Figure 6: Probability distribution of childbearing age for different groups of women



The approach of deriving the distributions is the same with Figure 3, just replacing the whole sample of women with a specific subgroup of women.

Figure 7: Probability distribution of childbearing age for different cohorts of women



The approach of deriving the distributions is the same with Figure 3, just replacing the whole sample of women with a specific subgroup of women.

Table 1: Number of children allowed per family over periods and across groups[a]

	Period 0[b]	Period 1[b]	Period 2[b]	Period 3[b]
Urban Han	No restriction	Mild FPP allowed, though not encouraged, three children[c]	Strong FPP allowed, though not encouraged, two children	One-child policy allows only one child
Rural Han	No restriction	No restriction	Milder policy than the upper cell	One-child policy conditionally allows two children
Urban non-Han	No restriction	No restriction[d]	No restriction[d]	Specific FPP conditionally allows two children
Rural non-Han	No restriction	No restriction	No restriction[d]	Specific FPP conditionally allows three or even more children

[a] The table is summarized based on the history introduced in Section 2. Other content of FPP, such as the age of marriage, not listed in the table.
[b] As stated at the beginning of Section 2, period 0 to 3 indicate the period without FPP (1949–1963), the period with mild and narrowly implemented FPP (1963–1971), the period with strong and widely implemented FPP (1971–1980), and the period of the one-child policy (1980–present).
[c] The urban Han people living in the five autonomous regions were not covered by FPP in period 1.
[d] Part of the non-Han people might be affected by FPP, particularly when they were living outside the five autonomous regions, and/or identified the ethnicity of their children as Han.

Table 2: Descriptive statistics of selected variables

	Full	Subsample by cohort					
	sample	1931–40	1941–50	1951–60	1961–70	1971–80	1981–91
# of children ever born							
Mean	1.76	1.72	3.01	2.01	1.49	1.23	0.75
	[1.12]	[1.10]	[1.40]	[1.05]	[0.78]	[0.64]	[0.61]
0 (%)	4.33	0.38	0.45	0.91	3.52	6.34	33.73
	[20.35]	[6.14]	[6.67]	[9.49]	[18.44]	[24.38]	[47.35]
1 (%)	46.37	55.09	11.62	35.15	54.77	68.81	57.61
	[49.87]	[49.83]	[32.06]	[47.76]	[49.78]	[46.35]	[49.49]
2 (%)	29.80	28.30	27.04	37.71	32.83	21.18	8.36
	[45.74]	[45.13]	[44.44]	[48.48]	[46.97]	[40.88]	[27.72]
3 (%)	12.32	10.94	29.61	18.29	7.33	3.17	0.30
	[32.87]	[31.28]	[45.68]	[38.67]	[26.06]	[17.53]	[5.46]
> 3 (%)	7.180	5.280	31.28	7.95	1.55	0.50	0.00
	[25.82]	[22.41]	[46.39]	[27.06]	[12.36]	[7.06]	[0.00]
% sons	52.22	52.63	50.61	51.61	53.23	54.31	52.38
	[49.95]	[49.99]	[50.01]	[49.98]	[49.90]	[49.83]	[50.04]
Age at first marriage	22.32	24.09	21.53	23.17	22.02	22.42	21.39
	[3.22]	[10.14]	[3.98]	[3.19]	[2.75]	[2.84]	[2.28]
Urban (%)	34.13	26.79	32.29	38.05	35.98	30.69	24.78
	[47.42]	[44.37]	[46.78]	[48.56]	[48.01]	[46.14]	[43.24]
Han (%)							
woman	87.59	82.64	86.15	89.10	89.24	84.57	87.76
	[32.97]	[37.95]	[34.57]	[31.18]	[30.99]	[36.14]	[32.82]
husband	88.05	84.62	85.85	88.97	89.67	85.91	87.65
	[32.44]	[36.25]	[34.88]	[31.34]	[30.45]	[34.80]	[32.95]
Years of schooling							
woman	7.98	2.73	5.28	7.54	9.12	9.30	9.76
	[3.82]	[3.67]	[3.68]	[4.01]	[3.02]	[2.91]	[2.73]
husband	9.30	6.40	7.49	9.17	9.90	9.76	10.11
	[3.13]	[3.93]	[3.61]	[3.18]	[2.77]	[2.66]	[2.38]
Age at survey							
woman	42.51	70.49	49.63	48.16	40.00	32.23	24.42
	[10.66]	[6.69]	[5.02]	[5.15]	[6.35]	[4.16]	[2.51]
husband	43.32	67.96	50.96	49.84	41.60	34.07	26.88
	[10.02]	[10.83]	[5.43]	[5.87]	[7.01]	[5.13]	[3.80]
Province (%)							
Gaungxi	11.97	16.98	12.07	10.85	11.23	12.68	15.82
	[32.46]	[37.62]	[32.59]	[31.11]	[31.58]	[33.29]	[36.55]
Guizhou	12.04	23.77	14.64	10.96	9.68	14.18	8.96
	[32.55]	[42.65]	[35.37]	[31.25]	[29.57]	[34.90]	[28.60]
Heilongjiang	8.66	0.00	3.69	8.63	10.47	11.18	8.36
	[28.12]	[0.00]	[18.86]	[28.09]	[30.63]	[31.52]	[27.72]
Henan	12.79	16.98	13.07	10.68	12.87	14.01	14.93
	[33.40]	[37.62]	[33.73]	[30.89]	[33.49]	[34.73]	[35.69]

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	Full sample	1931–40	1941–50	1951–60	1961–70	1971–80	1981–91
		Subsample by cohort					
Hubei	10.05	7.17	11.17	9.65	10.94	9.34	8.36
	[30.08]	[25.85]	[31.52]	[29.54]	[31.23]	[29.11]	[27.72]
Hunan	10.98	10.94	9.39	12.15	10.43	10.59	14.03
	[31.27]	[31.28]	[29.18]	[32.68]	[30.57]	[30.79]	[34.78]
Jiangsu	11.56	6.04	14.53	10.56	11.41	11.51	14.33
	[31.97]	[23.86]	[35.26]	[30.74]	[31.81]	[31.93]	[35.09]
Liaoning	11.50	6.42	9.83	14.48	12.54	8.26	9.25
	[31.90]	[24.55]	[29.79]	[35.20]	[33.13]	[27.53]	[29.02]
Shandong	10.45	11.70	11.62	12.04	10.43	8.26	5.97
	[30.59]	[32.20]	[32.06]	[32.55]	[30.57]	[27.53]	[23.73]
Year of survey (%)							
1991	4.24	6.04	11.40	3.69	4.32	0.33	0.00
	[20.15]	[23.86]	[31.79]	[18.86]	[20.34]	[5.77]	[0.00]
1993	13.35	5.66	53.30	10.16	8.83	1.67	0.00
	[34.01]	[23.15]	[49.92]	[30.23]	[28.38]	[12.81]	[0.00]
2000	12.36	1.13	27.93	17.26	8.03	7.09	0.30
	[32.92]	[10.60]	[44.89]	[37.80]	[27.19]	[25.68]	[5.46]
2004	6.42	0.00	0.22	9.37	5.73	10.18	3.58
	[24.52]	[0.00]	[4.72]	[29.15]	[23.25]	[30.24]	[18.61]
2006	18.06	0.38	0.11	37.88	12.35	16.93	16.12
	[38.47]	[6.14]	[3.34]	[48.52]	[32.91]	[37.52]	[36.83]
2009	45.57	86.79	7.04	21.64	60.73	63.80	80.00
	[49.81]	[33.92]	[25.59]	[41.19]	[48.85]	[48.08]	[40.06]
Observations	6584	265	895	1761	2129	1199	335

Standard deviations are in squared brackets.

Table 3: Regressions of fertility on family planning policy

	Dep. var.: # of children ever born						Dep. var. = 1 if children ever born ≥ 2	Dep. var. = 1 if children ever born ≥ 3
	[1]-OLS	[2]-OLS	[3]-OLS	[4]-OLS	[5]-OLS	[6]-OLS	[7]-LOGIT	[8]-LOGIT
FPP_1	-0.814	-0.744	-1.476**				-0.407	-0.246
	[0.576]	[0.583]	[0.585]				[0.652]	[0.257]
FPP_2	-0.471	-0.516	-0.947***				0.117	-0.235
	[0.350]	[0.353]	[0.364]				[0.409]	[0.184]
FPP_3	-0.733***	-0.766***	-0.933***				0.137	-0.161
	[0.224]	[0.224]	[0.218]				[0.303]	[0.159]
$D_{urban} \times FPP_1$	-0.547**	-0.763	-0.406	-0.607***	-0.506	-0.728**	0.312	-0.138
	[0.245]	[0.548]	[0.319]	[0.225]	[0.539]	[0.300]	[0.235]	[0.097]
$D_{urban} \times FPP_2$	-0.991***	-0.704*	-0.561**	-1.075***	-0.692*	-0.980***	-0.400***	-0.183**
	[0.144]	[0.360]	[0.240]	[0.120]	[0.364]	[0.162]	[0.131]	[0.079]
$D_{urban} \times FPP_3$	-0.443***	-0.313**	-0.235	-0.468***	-0.384***	-0.454***	-0.237**	-0.134*
	[0.099]	[0.135]	[0.151]	[0.100]	[0.136]	[0.142]	[0.117]	[0.074]
$D_{Han} \times FPP_1$	0.101	0.030	-0.448	0.837**	0.825*	-0.284	-0.150	0.028
	[0.400]	[0.416]	[0.706]	[0.416]	[0.438]	[0.774]	[0.382]	[0.139]
$D_{Han} \times FPP_2$	-0.631***	-0.567**	-0.306	-0.134	-0.050	-0.284	-0.524**	-0.020
	[0.220]	[0.227]	[0.393]	[0.198]	[0.207]	[0.388]	[0.229]	[0.104]
$D_{Han} \times FPP_3$	-0.350**	-0.308**	-0.305	-0.039	-0.016	-0.349	-0.344*	-0.043
	[0.153]	[0.153]	[0.254]	[0.165]	[0.166]	[0.337]	[0.191]	[0.100]
$D_{urban} \times D_{Han} \times FPP_1$		0.234			-0.093			
		[0.539]			[0.530]			
$D_{urban} \times D_{Han} \times FPP_2$		-0.319			-0.418			
		[0.355]			[0.365]			
$D_{urban} \times D_{Han} \times FPP_3$		-0.141			-0.088			
		[0.095]			[0.094]			

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	Dep. var.: # of children ever born						Dep. var. = 1 if children ever born ≥ 2	Dep. var. = 1 if children ever born ≥ 3
	[1]-OLS	[2]-OLS	[3]-OLS	[4]-OLS	[5]-OLS	[6]-OLS	[7]-LOGIT	[8]-LOGIT
D_{urban}	0.071	0.076	-0.454	0.177**	0.172*	0.178	-0.141	0.143
	[0.150]	[0.150]	[0.276]	[0.089]	[0.089]	[0.125]	[0.143]	[0.158]
D_{Han}	0.419*	0.432*	0.194	0.0140	0.016	0.348	0.073	-0.010
	[0.252]	[0.252]	[0.429]	[0.144]	[0.144]	[0.296]	[0.226]	[0.138]
Years of schooling	-0.064***	-0.064***	-0.057***	-0.063***	-0.062***	-0.053***	-0.058***	-0.014***
	[0.003]	[0.003]	[0.004]	[0.003]	[0.003]	[0.005]	[0.003]	[0.001]
$Demeaned\ years\ of\ schooling^2/2$	-0.003**	-0.003**	-0.002	-0.003**	-0.003**	-0.001	-0.006***	-0.002***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.000]
Age at survey	0.119	0.124	-0.126	0.033***	0.033***	0.084***	0.007**	0.007***
	[0.100]	[0.100]	[0.155]	[0.005]	[0.005]	[0.025]	[0.003]	[0.002]
$Demeaned\ age\ at\ survey^2/2$	-0.011***	-0.011***	-0.002	-0.006***	-0.006***	-0.006**	-0.004***	-0.001***
	[0.004]	[0.004]	[0.005]	[0.001]	[0.001]	[0.003]	[0.001]	[0.000]
Exposure to famine period	-1.828	-1.815	-3.073				-0.129	-0.234
	[1.343]	[1.342]	[2.381]				[1.199]	[0.467]
Exposure to post-famine period	-1.604	-1.628	-1.054				-1.293	-0.101
	[2.678]	[2.678]	[3.568]				[2.309]	[0.529]
Exposure to pre-PRC period	25.200	25.221	4.833				28.749	-88.267
	[48.863]	[48.671]	[125.833]				[49.354]	[160.573]
Husband variables	No	No	Yes	No	No	Yes	No	No
Other control variables	A	A	A	B	B	B	A	A
Constant	-2.034	-2.285	12.821	3.520***	3.511***	2.253		
	[5.547]	[5.554]	[8.637]	[0.578]	[0.578]	[1.849]		
Observations	6533	6533	5575	6533	6533	5575	6533	6533
R-squared	0.507	0.507	0.517	0.573	0.573	0.649		

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		Dep. var.: # of children ever born						Dep. var. = 1 if children ever born ≥ 2	Dep. var. = 1 if children ever born ≥ 3
		[1]-OLS	[2]-OLS	[3]-OLS	[4]-OLS	[5]-OLS	[6]-OLS	[7]-LOGIT	[8]-LOGIT
F stat. for FPP	all	13.89	10.77	4.39	15.99	11.37	6.36		
	w/t interactions	4.12	4.47	6.21					
	interactions only	10.99	7.79	1.81	15.99	11.37	6.36		
Pseudo R-squared								0.36	0.40
Chi-squared stat. for FPP	all							42.86	28.06
	w/t interactions							2.82	2.01
	interactions only							35.51	12.55

Robust standard errors are in squared brackets. *** p<0.01, ** p<0.05, * p<0.1. Demeaned years of schooling = years of schooling − its sample mean; demeaned age at interview = age at interview − its mean. "Other control variables A" includes cohort trend, (cohort trend)^2, (cohort trend)^3, (cohort trend)^4, survey year dummies, province dummies, cohort trend×urban dummy, cohort trend×Han dummy, cohort trend×province dummies, and cohort trend×survey year dummies. "Other Control Variables B" includes cohort dummies, province dummies, survey year dummies, cohort dummies×survey year dummies, and cohort dummies×province dummies. FPP_1–FPP_3, Exposure to 1959–1962 famine, Exposure to the post-famine period, and Exposure to pre-PRC period are dropped from Columns [4] to [6], because they are perfectly collinear with cohort dummies, survey year dummies and cohort dummies×survey year dummies. Husband variables in Column [3] include husband cohort trend, (husband cohort trend)^2, (husband cohort trend)^3, (husband cohort trend)^4, husband cohort trend×urban dummy, husband cohort trend×husband Han dummy, husband cohort trend×province dummies, and husband cohort trend×survey year dummies. Husband variables in Column [6] includes husband cohort dummies, husband cohort dummies×survey year dummies, and husband cohort dummies×province dummies. R-squared and Pseudo R-squared are reported for OLS and logit regressions, respectively. The F statistics for the joint significance test of all the FPP related variables are reported for the OLS regressions, and the Chi-squared statistics for the joint significance test of all the FPP related variables are reported for the logit regressions. All the p values related to the F and Chi-squared statistics are nearly 0.

Table 4: Partial effects of family planning policy on fertility

Panel 1. Derived from regression [1]

	Period 1	Period 2	Period 3	Great famine
Urban Han	-0.88***	-1.56***	-1.52***	
Rural Han	-0.50	-0.82***	-1.08***	-0.59
Urban Non-Han	-0.92**	-1.09***	-1.17***	
Rural Non-Han	-0.57	-0.35	-0.73***	

Panel 2. Derived from regression [2]

	Period 1	Period 2	Period 3	Great famine
Urban Han	-0.87***	-1.57***	-1.52***	
Rural Han	-0.50	-0.81***	-1.07***	-0.58
Urban Non-Han	-1.02**	-0.91***	-1.08***	
Rural Non-Han	-0.52	-0.38	-0.76***	

Panel 3. Derived from regression [3]

	Period 1	Period 2	Period 3	Great famine
Urban Han	-0.85**	-1.36***	-1.32***	
Rural Han	-0.56	-0.94***	-1.09***	-0.99
Urban Non-Han	-1.27***	-1.12***	-1.17***	
Rural Non-Han	-1.03**	-0.71***	-0.93***	

Three panels represent the partial effects of FPP on fertility derived from Columns [1]-[3] of Table 3. In each panel, women are categorized and the entire period of FPP is segmented, as in Table 1. Along each group (row), the number below "Period j" ($j = 1, 2, 3$) indicates the change in fertility of a woman in that group if she had been fully exposed to the period-j FPP, keeping other factors constant. For example, in Panel 1, the number -0.82, corresponding to "Rural Han" and "Period 2", means a rural Han woman would have 0.82 fewer children if she had been fully exposed to the period-2 FPP, keeping all the other variables constant. The number -0.82 is calculated in the following way: $\big(-0.471 + (-0.631)\big) \times max(FPP_2|D_{urban} = 0, D_{Han} = 1) = \big(-0.471 + (-0.631)\big) \times 0.745 = -0.82$, where -0.471 and -0.631 are the coefficients of FPP_2 and $D_{Han} \times FPP_2$, and 0.745 is the maximum value of FPP_2 for the rural Han women. In Panel 2, the calculation considers the three-term interactions, and in Panel 3, the FPP variables involving husbands's information are taken into account for calculation. For comparison, the average partial effect of the great famine on fertility is also listed for each panel, using a similar method. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Percentage change of fertility explained by family planning policy within each cohort

	Left panel. All age at survey				Right panel. Age at survey ≥ 45			
Cohort	Predicted fertility	Predicted fertility: $FPP_j = 0$	Fertility increase (%)	Obs.	Predicted fertility	Predicted fertility: $FPP_j = 0$	Fertility increase (%)	Obs.
1943	3.56	4.46	25.3	67	3.56	4.46	25.3	67
1944	3.44	4.35	26.5	60	3.44	4.35	26.5	60
1945	3.16	4.24	34.2	83	3.16	4.24	34.2	83
1946	3.09	4.26	37.9	106	3.09	4.26	37.9	106
1947	3.00	4.19	39.7	92	3.00	4.17	39.0	80
1948	2.91	4.05	39.2	113	2.92	4.04	38.4	99
1949	2.67	3.94	47.6	137	2.64	3.92	48.5	102
1950	2.54	3.87	52.4	114	2.52	3.86	53.2	90
1951	2.45	3.78	54.3	164	2.47	3.78	53.0	135
1952	2.34	3.69	57.7	159	2.34	3.67	56.8	141
1953	2.16	3.47	60.6	186	2.19	3.48	58.9	158
1954	2.11	3.43	62.6	211	2.14	3.45	61.2	184
1955	2.04	3.33	63.2	183	2.09	3.36	60.8	157
1956	2.03	3.29	62.1	207	2.07	3.31	59.9	164
1957	1.93	3.19	65.3	188	1.98	3.23	63.1	151
1958	1.69	2.96	75.1	177	1.70	2.98	75.3	150
1959	1.71	2.94	71.9	142	1.80	3.03	68.3	106
1960	1.61	2.83	75.8	144	1.66	2.88	73.5	108
1943–60	2.31	3.55	53.7	2533	2.36	3.59	52.1	2141
Cohort	Predicted fertility	Predicted fertility: schooling = 0	Fertility increase (%)	Obs.	Predicted fertility	Predicted fertility: schooling = 0	Fertility increase (%)	Obs.
1943–60	2.31	2.71	17.3	2533	2.36	2.75	16.5	2141

The left panel uses all the women of cohorts 1943–1960, while the right panel is only based on the women of cohorts 1943–1960 who were 45 or above at survey. In each panel, the first column of numbers represent the predicted fertility for each cohort from the Column-[1] regression of Table 3. The second column records the predicted fertility by setting all FPP related variables to be 0. In other words, the second column shows the predicted fertility for each cohort of women had they never been exposed to FPP. The third column calculates the fertility increase from the first to the second column in percentage. As a comparison, this table also shows the predicted fertility if the years of schooling is 0, and calculates the percentage change of fertility attributed to schooling.

Table 6: Percentage of fertility decline over explained by family planning policy

Left panel. All age at survey			Right panel. Age at survey ≥ 45		
Predicted n of cohort 1943	Predicted n of cohort 1960	Decline of n	Predicted n of cohort 1943	Predicted n of cohort 1960	Decline of n
3.56	1.61	1.95	3.56	1.66	1.90
Predicted n of cohort 1943	Predicted n of cohort 1943 with FPP of cohort 1960	Decline of n [% of total decline]	Predicted n of cohort 1943	Predicted n of cohort 1943 with FPP of cohort 1960	Decline of n [% of total decline]
3.56	3.33	0.23 [11.8%]	3.56	3.31	0.25 [13.2%]
Predicted n of cohort 1943	Predicted n of cohort 1943 with schooling of cohort 1960	Decline of n [% of total decline]	Predicted n of cohort 1943	Predicted n of cohort 1943 with schooling of cohort 1960	Decline of n [% of total decline]
3.56	3.28	0.28 [14.4%]	3.56	3.29	0.27 [14.2%]
Predicted n of cohort 1960 with FPP of cohort 1943	Predicted n of cohort 1960	Decline of n [% of total decline]	Predicted n of cohort 1960 with FPP of cohort 1943	Predicted n of cohort 1960	Decline of n [% of total decline]
1.80	1.61	0.19 [9.7%]	1.86	1.66	0.20 [10.5%]
Predicted n of cohort 1960 with schooling of cohort 1943	Predicted n of cohort 1960	Decline of n [% of total decline]	Predicted n of cohort 1960 with schooling of cohort 1943	Predicted n of cohort 1960	Decline of n [% of total decline]
1.92	1.61	0.31 [15.9%]	1.96	1.66	0.30 [15.8%]

Like Table 5, Table 6 consists of two panels. Take the left panel as an example. The first row shows the predicted fertility of cohort 1943 and 1960, based on the Column-[1] regression of Table 3, and gives the fertility decline over cohorts, 1.95 ($3.56-1.61$). Following the first row, the second row preserves the predicted fertility of cohort 1943, but replaces the predicted fertility of cohort 1960 with the predicted fertility of cohort 1943 by setting the values of FPP_j's to be the same with those for cohort 1960. In other words, the number 3.33 is the predicted fertility of cohort 1943 had they been exposed to the FPP which cohort 1960 was actually exposed to. Therefore, 0.23 ($3.56-3.33$) is a measure of fertility decline from cohort 1943 to 1960 attributed to the evolution of FPP, and it accounts for about 11.8% ($0.23/1.95 \times 100\%$) of the total decline. As a comparison, the fourth row predicts the fertility of cohort 1943 by setting their years of schooling to be the one of cohort 1960, to calculate what the fertility level of cohort 1943 would be had they received the same schooling with cohort 1960. The fertility difference, 0.28 (3.56-3.28), is a measure of fertility decline over cohorts attributed to increasing schooling. It accounts for 14.4%, greater than the percentage associated with FPP. Since the second and third rows are both based on cohort 1943, the fifth and sixth rows are based on cohort 1960. Namely, it compares the predicted fertility of cohort 1960 under their actual FPP exposure and the FPP exposure of cohort 1943.

Table 7: Separate regressions of fertility on family planning policy for women of different types

	Dep. var.: # of children ever born					
	[1] Years of schooling < 9	[2] Years of schooling >= 9	[3] First child is a son	[4] First child is a daughter	[5] Coastal provinces	[6] Non-coastal provinces
FPP_1	-1.263	0.353	-0.937	-1.628**	1.152	-1.523**
	[0.827]	[1.256]	[0.776]	[0.741]	[0.913]	[0.727]
FPP_2	-1.160**	0.010	-0.565	-1.661***	0.485	-1.141**
	[0.529]	[0.502]	[0.468]	[0.459]	[0.619]	[0.453]
FPP_3	-0.858***	-0.587**	-0.897***	-1.386***	-0.054	-1.137***
	[0.323]	[0.293]	[0.298]	[0.298]	[0.422]	[0.279]
$D_{urban} \times FPP_1$	-0.456	-0.799**	-0.541	-0.796**	-0.591*	-0.565*
	[0.317]	[0.407]	[0.329]	[0.362]	[0.340]	[0.325]
$D_{urban} \times FPP_2$	-0.742***	-0.798***	-0.909***	-1.178***	-1.053***	-0.993***
	[0.180]	[0.264]	[0.178]	[0.221]	[0.204]	[0.178]
$D_{urban} \times FPP_3$	-0.322**	-0.424***	-0.491***	-0.811***	-0.523***	-0.463***
	[0.160]	[0.163]	[0.125]	[0.155]	[0.165]	[0.117]
$D_{Han} \times FPP_1$	-0.402	1.049	0.064	0.194	-1.408**	0.466
	[0.460]	[0.945]	[0.537]	[0.547]	[0.703]	[0.458]
$D_{Han} \times FPP_2$	-0.503**	-0.179	-0.882***	-0.172	-0.881*	-0.390
	[0.255]	[0.420]	[0.281]	[0.285]	[0.510]	[0.249]
$D_{Han} \times FPP_3$	-0.541**	0.309	-0.544***	-0.129	-0.605*	-0.183
	[0.214]	[0.229]	[0.195]	[0.196]	[0.348]	[0.174]
D_{urban}	0.095	-0.029	-0.020	0.268	0.129	0.085
	[0.185]	[0.286]	[0.185]	[0.225]	[0.207]	[0.181]
D_{Han}	0.833***	-0.808*	0.689**	-0.046	0.559	0.261
	[0.314]	[0.441]	[0.325]	[0.309]	[0.598]	[0.282]
Years of schooling	-0.137***	-0.122***	-0.060***	-0.069***	-0.045***	-0.076***
	[0.018]	[0.017]	[0.004]	[0.004]	[0.004]	[0.004]
Demeaned years of schooling$^2/2$	-0.023***	0.014***	0.002	-0.006***	0.001	-0.005***
	[0.004]	[0.004]	[0.001]	[0.002]	[0.002]	[0.001]

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	Dep. var.: # of children ever born					
	[1] Years of schooling < 9	[2] Years of schooling >= 9	[3] First child is a son	[4] First child is a daughter	[5] Coastal provinces	[6] Non-coastal provinces
Age at survey	0.246*	-0.044	0.502***	0.010	0.188	0.067
	[0.136]	[0.146]	[0.130]	[0.154]	[0.138]	[0.135]
Demeaned age at survey^2/2	-0.016***	-0.002	-0.024***	-0.007	-0.012**	-0.009*
	[0.005]	[0.005]	[0.005]	[0.006]	[0.005]	[0.005]
Exposure to famine period	-1.881	-0.272	-2.157	-2.393	-1.794	-2.267
	[1.575]	[4.488]	[1.660]	[1.989]	[1.917]	[1.662]
Exposure to post-famine period	-1.816	-1.788	0.800	-3.434	-1.367	-1.887
	[3.048]	[5.917]	[3.517]	[3.997]	[4.053]	[3.420]
Exposure to pre-PRC period	55.778	847.280	40.886	34.095	-73.631	46.922
	[52.236]	[1,223.692]	[58.697]	[68.961]	[61.653]	[58.716]
Constant	-8.314	6.357	-23.791***	4.943	-6.311	1.446
	[7.526]	[8.388]	[7.164]	[8.570]	[7.750]	[7.449]
Observations	2780	3753	3209	2996	2200	4333
R-squared	0.502	0.388	0.525	0.492	0.470	0.510
F stat. for FPP	5.71	3.36	11.81	9.12	6.05	10.19
F stat. for equal coefficients test	3.18	3.18	4.38	4.38	1.67	1.67

Robust standard errors are in squared brackets. *** p<0.01, ** p<0.05, * p<0.1. Model specifications are the same with Column [1] of Table 3. Coastal provinces are Jiangsu, Liaoning and Shandong. All p values related to the F statistics for equal coefficients test and for joint significance test are nearly 0.

Table 8: Partial effects of family planning policy on fertility for women of different types

Panel 1

	Years of schooling	Period 1	Period 2	Period 3
Urban Han	< 9	-1.48***	-1.79***	-1.72***
	>= 9	0.42	-0.72***	-0.70***
Rural Han	< 9	-1.16**	-1.24***	-1.40***
	>= 9	0.98	-0.13	-0.28
Urban Non-Han	< 9	-1.16**	-1.42***	-1.18***
	>= 9	-0.30	-0.59	-1.01***
Rural Non-Han	< 9	-0.88	-0.86**	-0.86***
	>= 9	0.23	0.01	-0.59**

Panel 2

	Gender of first child	Period 1	Period 2	Period 3
Urban Han	Son	-0.99**	-1.76***	-1.93***
	Daughter	-1.56***	-2.24***	-2.32***
Rural Han	Son	-0.61	-1.08***	-1.44***
	Daughter	-1.00**	-1.37***	-1.51***
Urban Non-Han	Son	-1.00*	-1.10***	-1.39***
	Daughter	-1.63***	-2.12***	-2.19***
Rural Non-Han	Son	-0.65	-0.42	-0.90***
	Daughter	-1.13**	-1.24***	-1.38***

Panel 3

	Province	Period 1	Period 2	Period 3
Urban Han	Costal	-0.59	-1.08***	-1.18***
	Non-coastal	-1.13***	-1.88***	-1.78***
Rural Han	Costal	-0.18	-0.29	-0.66***
	Non-coastal	-0.74*	-1.14***	-1.32***
Urban Non-Han	Costal	0.38	-0.37	-0.58
	Non-coastal	-1.41***	-1.59***	-1.60***
Rural Non-Han	Costal	0.74	0.36	-0.05
	Non-coastal	-1.06**	-0.85**	-1.13***

Calculation approach is similar to that for Table 4. Just need to replace the sample maximum of FPP_j with subsample maximum of FPP_j. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Regressions of marriage age on family planning policy

	[1] Dep. var. = 1 If age at first marriage ≤ 20	[2] Dep. var. = 1 If age at first marriage ≤ 22	[3] Dep. var. = 1 If age at first marriage ≤ 24
FPP_1	0.093	-0.705	-0.855**
	[0.356]	[0.520]	[0.410]
FPP_2	-0.232	-1.200***	-1.467***
	[0.222]	[0.320]	[0.254]
FPP_3	-0.704***	-1.411***	-1.359***
	[0.136]	[0.206]	[0.187]
$D_{urban} \times FPP_1$	0.248*	-0.143	0.188
	[0.145]	[0.199]	[0.151]
$D_{urban} \times FPP_2$	0.043	-0.203	0.119
	[0.113]	[0.146]	[0.110]
$D_{urban} \times FPP_3$	0.136*	0.038	0.213**
	[0.070]	[0.098]	[0.083]
$D_{Han} \times FPP_1$	0.514***	1.119***	0.399
	[0.191]	[0.302]	[0.259]
$D_{Han} \times FPP_2$	0.395***	0.717***	0.276
	[0.147]	[0.233]	[0.185]
$D_{Han} \times FPP_3$	0.254***	0.541***	0.347**
	[0.090]	[0.155]	[0.148]
D_{urban}	-0.142	0.172	-0.207
	[0.122]	[0.169]	[0.168]
D_{Han}	-0.665***	-0.569***	-0.219***
	[0.159]	[0.053]	[0.054]
Years of schooling	-0.037***	-0.047***	-0.024***
	[0.002]	[0.002]	[0.002]
Demeaned years of schooling$^2/2$	-0.006***	-0.006***	-0.002***
	[0.001]	[0.001]	[0.001]
Age at survey	0.006**	0.012***	0.009***
	[0.002]	[0.003]	[0.002]
Demeaned age at survey$^2/2$	-0.001***	-0.002***	-0.002***
	[0.000]	[0.001]	[0.000]
Exposure to famine period	-1.401	-2.374	-0.220
	[1.563]	[2.134]	[1.365]
Exposure to post-famine period	1.310	-0.017	-1.807
	[1.464]	[2.235]	[1.455]
Exposure to pre-PRC period	349.254	-46.147	560.783
	[404.512]	[638.417]	[534.439]
Observations	6258	6143	6059
Pseudo R-squared	0.128	0.135	0.131
Chi-squared stat. for FPP	66.74	75.91	99.03

All coefficients are marginal effects. Robust standard errors are in squared brackets. *** p<0.01, ** p<0.05, *p<0.1. Model specifications are the same with Column [1] of Table 3. All p values related to the Chi-squared statistics are nearly 0.

Table 10: Partial effects of family planning policy on age of first marriage

	Age at first marriage	Odds ratio (married/unmarried)				Change in odds ratio		
		Period 0	Period 1	Period 2	Period 3	Period 1/Period 0	Period 2/Period 0	Period 3/Period 0
Urban Han	≤ 20	0.85	28.41	2.11	0.14	33.26	2.47	0.16***
	≤ 22	20.54	44.09	2.62	0.72	2.15	0.13***	0.04***
	≤ 24	1067.27	291.32	4.20	4.22	0.27	0.00***	0.00***
Rural Han	≤ 20	3.12	37.60	6.38	0.22	12.04	2.04	0.07***
	≤ 22	39.29	125.96	9.22	1.18	3.21	0.23***	0.03***
	≤ 24	6493.65	714.67	13.81	5.88	0.11***	0.00***	0.00***
Urban Non-Han	≤ 20	5.15	19.86	2.25	0.18	3.86	0.44	0.04***
	≤ 22	220.28	22.08	3.26	0.88	0.10***	0.01***	0.00***
	≤ 24	8588.75	380.90	8.13	3.07	0.04***	0.00***	0.00***
Rural Non-Han	≤ 20	22.34	32.70	8.07	0.36	1.46	0.36*	0.02***
	≤ 22	282.83	39.03	7.71	0.97	0.14***	0.03***	0.00***
	≤ 24	44827.99	717.91	22.92	3.68	0.02***	0.00***	0.00***

Table 10, derived from Table 9, reports the odds ratio of being married over being unmarried by some age for some group of women who are fully exposed to some single period of FPP (left panel), and the change in odds ratio over periods of FPP (right panel). Take the numbers corresponding to "Urban non-Han" and "≤ 22" as an example. The odds ratio of being married over being unmarried by age 22 for an urban non-Han woman who has never been exposed to any FPP is 220.28; while if she has ever been fully exposed to the period-2 FPP (but not exposed to the period-1 or period-3 FPP), her odds ratio will fall to 3.26. The right panel accordingly shows the full exposure to (only) the period-2 FPP will make the odds ratio of being married over being unmarried a fraction 0.01 (3.26/220.28) of the odds ratio in the absence of FPP. Non-FPP variables take the mean values within that group of women.

Table 11: Sensitivity of regressions to the use of different probability distributions of childbearing age

	Dep. var.: # of children ever born								
	[1] Distr. of all	[2] Distr. of urban Han	[3] Distr. of rural Han	[4] Distr. of urban non-Han	[5] Distr. of rural non-Han	[6] Distr. of cohort 1931–50	[7] Distr. of cohort 1951–60	[8] Distr of cohort 1961–70	[9] Distr. of cohort 1971–91
FPP_1	-0.814	-0.525	-0.928	-0.976*	-0.964	-1.307*	-0.368	-0.695	-0.857*
	[0.576]	[0.549]	[0.565]	[0.549]	[0.629]	[0.699]	[0.612]	[0.464]	[0.484]
FPP_2	-0.471	-0.275	-0.545	-0.598*	-0.532	-0.743	-0.182	-0.374	-0.461
	[0.350]	[0.327]	[0.351]	[0.355]	[0.385]	[0.456]	[0.334]	[0.294]	[0.306]
FPP_3	-0.733***	-0.582***	-0.769***	-0.843***	-0.890***	-1.368***	-0.552***	-0.491**	-0.569***
	[0.224]	[0.204]	[0.228]	[0.234]	[0.247]	[0.309]	[0.199]	[0.196]	[0.204]
$D_{urban} \times FPP_1$	-0.547**	-0.448*	-0.607**	-0.584**	-0.409	-0.179	-0.272	-0.730***	-0.715***
	[0.245]	[0.237]	[0.244]	[0.251]	[0.268]	[0.314]	[0.243]	[0.206]	[0.213]
$D_{urban} \times FPP_2$	-0.991***	-0.928***	-1.005***	-1.019***	-1.030***	-1.139***	-0.887***	-0.916***	-0.932***
	[0.144]	[0.141]	[0.143]	[0.147]	[0.153]	[0.174]	[0.142]	[0.130]	[0.131]
$D_{urban} \times FPP_3$	-0.443***	-0.410***	-0.458***	-0.466***	-0.424***	-0.402***	-0.356***	-0.469***	-0.463***
	[0.099]	[0.095]	[0.101]	[0.101]	[0.097]	[0.098]	[0.091]	[0.104]	[0.103]
$D_{Han} \times FPP_1$	0.101	0.110	0.086	0.112	0.166	0.323	0.160	-0.014	0.016
	[0.400]	[0.385]	[0.397]	[0.402]	[0.441]	[0.518]	[0.394]	[0.326]	[0.338]
$D_{Han} \times FPP_2$	-0.631***	-0.564***	-0.655***	-0.655***	-0.629***	-0.661**	-0.513**	-0.630***	-0.645***
	[0.220]	[0.215]	[0.218]	[0.224]	[0.241]	[0.283]	[0.219]	[0.190]	[0.193]
$D_{Han} \times FPP_3$	-0.350**	-0.330**	-0.356**	-0.356**	-0.354**	-0.350**	-0.314**	-0.343**	-0.345**
	[0.153]	[0.147]	[0.155]	[0.155]	[0.155]	[0.164]	[0.143]	[0.153]	[0.154]
D_{urban}	0.071	0.003	0.098	0.103	0.054	0.049	-0.079	0.074	0.080
	[0.150]	[0.147]	[0.150]	[0.153]	[0.157]	[0.171]	[0.148]	[0.137]	[0.139]
D_{Han}	0.419*	0.380	0.432*	0.433*	0.417	0.415	0.341	0.422*	0.420*
	[0.252]	[0.247]	[0.250]	[0.254]	[0.274]	[0.310]	[0.253]	[0.218]	[0.223]
Years of schooling	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Demeaned years of schooling$^2/2$	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

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	Dep. var.: # of children ever born								
	[1] Distr. of all	[2] Distr. of urban Han	[3] Distr. of rural Han	[4] Distr. of urban non-Han	[5] Distr. of rural non-Han	[6] Distr. of cohort 1931–50	[7] Distr. of cohort 1951–60	[8] Distr of cohort 1961–70	[9] Distr. of cohort 1971–91
Age at survey	0.119	0.119	0.119	0.120	0.114	0.109	0.116	0.117	0.113
	[0.100]	[0.101]	[0.099]	[0.100]	[0.100]	[0.100]	[0.101]	[0.099]	[0.099]
Demeaned age at survey^2*/2*	-0.011***	-0.010***	-0.011***	-0.011***	-0.011***	-0.011***	-0.010***	-0.010***	-0.010***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Exposure to famine period	-1.828	-0.759	-2.279*	-2.000**	-2.461	-3.560	0.229	-1.753**	-2.260***
	[1.343]	[1.151]	[1.262]	[0.904]	[1.958]	[2.711]	[1.749]	[0.762]	[0.827]
Exposure to post-famine period	-1.604	-3.011	-0.782	-1.303	-1.639	-0.285	-4.347	-0.646	-0.165
	[2.678]	[2.267]	[2.534]	[1.900]	[3.609]	[5.105]	[2.803]	[1.480]	[1.734]
Exposure to pre-PRC period	25.200	46.833	23.530	85.968	-29.863	-4.537	45.982	57.104	34.975
	[48.863]	[72.747]	[38.165]	[83.400]	[87.565]	[50.943]	[74.033]	[47.772]	[31.031]
Constant	-2.034	-2.220	-1.999	-2.009	-1.223	-0.398	-2.230	-2.493	-2.071
	[5.547]	[5.588]	[5.527]	[5.539]	[5.585]	[5.593]	[5.646]	[5.479]	[5.476]
Observations	6533	6533	6533	6533	6533	6533	6533	6533	6533
R-squared	0.507	0.506	0.507	0.507	0.507	0.509	0.506	0.506	0.506
F stat. for FPP	13.89	13.35	14.02	14.67	13.63	14.48	13.12	13.19	13.92

Robust standard errors are in squared brackets. ***, p<.01; **, p<.05; *, p<.1. Model specifications are the same with Column [1] of Table 3. Column [1] is the base regression, same with the Column [1] of Table 3. Through Column [2] to [9], the measures of FPP are constructed based upon different probability distributions of childbearing age shown in Figure 6 and 7.

Table 12: Partial effect of family planning policy on fertility derived from columns of Table 11

Derived from regression [1]

	Period 1	Period 2	Period 3
Urban Han	-0.88***	-1.56***	-1.52***
Rural Han	-0.50	-0.82***	-1.08***
Urban Non-Han	-0.92**	-1.09***	-1.17***
Rural Non-Han	-0.57	-0.35	-0.73***

	Derived from regression [2]				Derived from regression [3]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-0.64**	-1.38***	-1.32***	Urban Han	-1.00***	-1.64***	-1.58***
Rural Han	-0.31	-0.66***	-0.91***	Rural Han	-0.58*	-0.89***	-1.12***
Urban Non-Han	-0.70*	-0.94***	-0.99***	Urban Non-Han	-1.01***	-1.15***	-1.23***
Rural Non-Han	-0.39	-0.22	-0.58***	Rural Non-Han	-0.64	-0.41	-0.77***

	Derived from regression [4]				Derived from regression [5]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-0.97***	-1.64***	-1.67***	Urban Han	-0.79**	-1.54***	-1.66***
Rural Han	-0.58**	-0.90***	-1.20***	Rural Han	-0.52	-0.82***	-1.24***
Urban Non-Han	-1.04***	-1.17***	-1.31***	Urban Non-Han	-0.88**	-1.10***	-1.31***
Rural Non-Han	-0.66*	-0.43*	-0.84***	Rural Non-Han	-0.63	-0.37	-0.89***

	Derived from regression [6]				Derived from regression [7]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-0.65**	-1.56***	-2.11***	Urban Han	-0.350	-1.23***	-1.22***
Rural Han	-0.55*	-0.86***	-1.71***	Rural Han	-0.150	-0.54***	-0.87***
Urban Non-Han	-0.84**	-1.15***	-1.76***	Urban Non-Han	-0.47	-0.83***	-0.91***
Rural Non-Han	-0.74*	-0.46	-1.36***	Rural Non-Han	-0.27	-0.14	-0.55***

	Derived from regression [8]				Derived from regression [9]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-1.15***	-1.61***	-1.30***	Urban Han	-1.19***	-1.65***	-1.38***
Rural Han	-0.57*	-0.84***	-0.83***	Rural Han	-0.64**	-0.90***	-0.91***
Urban Non-Han	-1.11***	-1.08***	-0.96***	Urban Non-Han	-1.18***	-1.13***	-1.03***
Rural Non-Han	-0.56	-0.31	-0.49**	Rural Non-Han	-0.66*	-0.37	-0.57***

The top panel is identical to panel 1 of Table 4. The approach of deriving the partial effects are the same with Table 4.

Table 13: Regressions with homogeneous or endogenous measures of family planning policy

	Dep. var.: # of children ever born				
	[1] Distr. of all	[2] Unif. distr. 1	[3] Unif. distr. 2	[4] Dummy FPP 1	[5] Dummy FPP 2
FPP_1	-0.814	3.410**	4.937***	1.011***	1.006***
	[0.576]	[1.417]	[1.472]	[0.136]	[0.133]
FPP_2	-0.471	4.879***	5.759***	0.852***	0.855***
	[0.350]	[0.998]	[1.004]	[0.124]	[0.120]
FPP_3	-0.733***	5.085***	5.006***	1.001***	1.006***
	[0.224]	[0.492]	[0.463]	[0.089]	[0.088]
$D_{urban} \times FPP_1$	-0.547**	-1.341**	-1.297**	-0.018	-0.005
	[0.245]	[0.546]	[0.547]	[0.108]	[0.105]
$D_{urban} \times FPP_2$	-0.991***	-2.047***	-2.051***	0.016	0.007
	[0.144]	[0.361]	[0.360]	[0.078]	[0.078]
$D_{urban} \times FPP_3$	-0.443***	-0.686***	-0.688***	-0.144**	-0.151**
	[0.099]	[0.123]	[0.123]	[0.065]	[0.065]
$D_{Han} \times FPP_1$	0.101	0.652	0.664	0.276*	0.248*
	[0.400]	[0.935]	[0.933]	[0.146]	[0.141]
$D_{Han} \times FPP_2$	-0.631***	-1.582***	-1.574***	-0.071	-0.032
	[0.220]	[0.611]	[0.610]	[0.126]	[0.123]
$D_{Han} \times FPP_3$	-0.350**	-0.526**	-0.507**	-0.085	-0.086
	[0.153]	[0.215]	[0.213]	[0.093]	[0.091]
D_{urban}	0.071	0.726***	0.723***	-0.546***	-0.528***
	[0.150]	[0.229]	[0.229]	[0.113]	[0.112]
D_{Han}	0.419*	0.790**	0.774**	0.072	-0.009
	[0.252]	[0.393]	[0.390]	[0.191]	[0.183]
Years of schooling	-0.064***	-0.063***	-0.063***	-0.051***	-0.050***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Demeaned years of schooling$^2/2$	-0.003**	-0.003***	-0.003**	-0.003***	-0.003***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Age at survey	0.119	-0.166*	-0.165	0.148*	0.123
	[0.100]	[0.099]	[0.102]	[0.087]	[0.080]
Demeaned age at survey$^2/2$	-0.011***	0.002	0.001	-0.009***	-0.007**
	[0.004]	[0.004]	[0.004]	[0.003]	[0.003]
Exposure to famine period	-1.828	-1.630*	5.156**	-3.187***	0.633**
	[1.343]	[0.984]	[2.135]	[0.884]	[0.269]
Exposure to post-famine period	-1.604	3.632	-1.397	4.984***	1.083***
	[2.678]	[2.570]	[3.962]	[1.758]	[0.179]
Exposure to pre-PRC period	25.200	-52.98	-2.880	-145.607***	
	[48.863]	[48.836]	[3.259]	[50.023]	
Constant	-2.034	10.605**	9.359*	-5.265	-5.097
	[5.547]	[5.379]	[5.671]	[4.799]	[4.441]
Observations	6533	6533	6533	6533	6533
R-squared	0.507	0.511	0.511	0.591	0.603
F stat. for FPP	13.89	19.43	22.02	115.40	119.40

Robust standard errors are in squared brackets. ***, p<.01; **, p<.05; *, p<.1. Model specifications are the same with Column [1] of Table 3. Column [1] is the base regression. Column [2] and [3] use formula (10) for $FPP_j(c,t)$. For the great famine exposures and pre-PRC period exposure, Column [2] still uses formula (7), while Column [3] adopts formula (10). Column [4] and [5] define FPP_j as a dummy variable whether a woman gave birth to a child during the period-j FPP. Similarly, Column [4] uses formula (7) to define great famine and pre-PRC exposures, while Column [5] uses formula (10).

Table 14: Partial effect of family planning policy on fertility derived from columns of Table 13

Derived from regression [1]

	Period 1	Period 2	Period 3
Urban Han	-0.88***	-1.56***	-1.52***
Rural Han	-0.50	-0.82***	-1.08***
Urban Non-Han	-0.92**	-1.09***	-1.17***
Rural Non-Han	-0.57	-0.35	-0.73***

	Derived from regression [2]				Derived from regression [3]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	0.62**	0.32	3.21***	Urban Han	0.98***	0.55***	3.16***
Rural Han	0.93***	0.85***	3.78***	Rural Han	1.28***	1.08***	3.73***
Urban Non-Han	0.47	0.73***	3.64***	Urban Non-Han	0.83**	0.95***	3.58***
Rural Non-Han	0.78**	1.25***	4.21***	Rural Non-Han	1.13***	1.48***	4.15***

	Derived from regression [4]				Derived from regression [5]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	1.27***	0.80***	0.77***	Urban Han	1.25***	0.83***	0.77***
Rural Han	1.29***	0.78***	0.92***	Rural Han	1.25***	0.82***	0.92***
Urban Non-Han	0.99***	0.87***	0.86***	Urban Non-Han	1.00***	0.86***	0.85***
Rural Non-Han	1.01***	0.85***	1.00***	Rural Non-Han	1.01***	0.85***	1.01***

The top panel is identical to panel 1 of Table 4. The approach of deriving the partial effects are the same with Table 4.

Table 15: Regressions with incomplete measures of family planning policy

	Dep. var.: # of children ever born								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
FPP_1	-0.814			-0.610	-0.957*				
	[0.576]			[0.460]	[0.574]				
FPP_2	-0.471	0.009		-0.945***	-0.704**	-0.545***	-0.174		
	[0.350]	[0.235]		[0.286]	[0.348]	[0.169]	[0.235]		
FPP_3	-0.733***	-0.573***	-0.329**	-1.003***	-0.796***	-0.863***	-0.598***	-0.431***	-0.316**
	[0.224]	[0.174]	[0.160]	[0.181]	[0.225]	[0.135]	[0.175]	[0.125]	[0.160]
$D_{urban} \times FPP_1$	-0.547**			-0.522**					
	[0.245]			[0.248]					
$D_{urban} \times FPP_2$	-0.991***	-0.785***		-1.034***		-0.836***			
	[0.144]	[0.134]		[0.146]		[0.134]			
$D_{urban} \times FPP_3$	-0.443***	-0.256***	0.057	-0.455***		-0.274***		0.052	
	[0.099]	[0.081]	[0.070]	[0.101]		[0.082]		[0.069]	
$D_{Han} \times FPP_1$	0.101				0.065				
	[0.400]				[0.399]				
$D_{Han} \times FPP_2$	-0.631***	-0.641***			-0.753***		-0.755***		
	[0.220]	[0.197]			[0.221]		[0.196]		
$D_{Han} \times FPP_3$	-0.350**	-0.345***	-0.118		-0.377**		-0.368***		-0.113
	[0.153]	[0.123]	[0.110]		[0.153]		[0.123]		[0.110]
D_{urban}	0.071	-0.253**	-0.770***	0.096	-0.755***	-0.216*	-0.757***	-0.767***	-0.768***
	[0.150]	[0.109]	[0.071]	[0.156]	[0.069]	[0.110]	[0.069]	[0.071]	[0.070]
D_{Han}	0.419*	0.466***	0.050	0.068	0.490*	0.072	0.521***	0.048	0.047
	[0.252]	[0.172]	[0.121]	[0.119]	[0.256]	[0.119]	[0.174]	[0.121]	[0.121]
Years of schooling	-0.064***	-0.064***	-0.064***	-0.064***	-0.065***	-0.064***	-0.065***	-0.064***	-0.064***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Demeaned years of schooling$^2/2$	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

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	Dep. var.: # of children ever born								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Age at survey	0.119	0.131	0.054	0.148	0.153	0.159	0.155	0.058	0.054
	[0.100]	[0.100]	[0.097]	[0.099]	[0.101]	[0.099]	[0.100]	[0.097]	[0.097]
Demeaned age at survey^2/2	-0.011***	-0.011***	-0.007**	-0.012***	-0.012***	-0.012***	-0.012***	-0.008**	-0.007**
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.003]	[0.004]
Exposure to famine period	-1.828	-0.327	-2.995***	-1.562	-2.003	-0.264	-0.424	-2.999***	-3.007***
	[1.343]	[1.052]	[1.024]	[1.368]	[1.420]	[1.052]	[1.121]	[1.023]	[1.024]
Exposure to post-famine period	-1.604	-3.080	3.109	-1.934	-1.732	-3.209	-3.362	3.138	3.160
	[2.678]	[2.357]	[1.997]	[2.700]	[2.741]	[2.361]	[2.412]	[1.996]	[1.995]
Exposure to pre-PRC period	25.200	36.256	-97.013*	26.438	13.779	36.292	28.616	-97.763*	-97.840*
	[48.863]	[47.344]	[50.150]	[51.972]	[52.477]	[49.942]	[51.005]	[50.101]	[50.214]
Constant	-2.034	-3.132	2.146	-3.433	-3.653	-4.341	-4.301	1.938	2.155
	[5.547]	[5.539]	[5.412]	[5.535]	[5.607]	[5.532]	[5.591]	[5.400]	[5.411]
Observations	6533	6533	6533	6533	6533	6533	6533	6533	6533
R-squared	0.507	0.506	0.498	0.505	0.503	0.504	0.502	0.497	0.498
F stat. for FPP	13.89	17.84	4.48	18.19	12.75	23.39	17.23	5.98	6.34

Robust standard errors are in squared brackets. ***, p<.01; **, p<.05; *, p<.1. Model specifications are the same with Column [1] of Table 3, except for the omission of certain measures of FPP.

Table 16: Partial effect of family planning policy on fertility derived from columns of Table 15

Derived from regression [1]

	Period 1	Period 2	Period 3
Urban Han	-0.88***	-1.56***	-1.52***
Rural Han	-0.50	-0.82***	-1.08***
Urban Non-Han	-0.92**	-1.09***	-1.17***
Rural Non-Han	-0.57	-0.35	-0.73***

	Derived from regression [2]				Derived from regression [3]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-	-1.06***	-1.17***	Urban Han	-	-	-0.39***
Rural Han	-	-0.47***	-0.92***	Rural Han	-	-	-0.45***
Urban Non-Han	-	-0.58***	-0.83***	Urban Non-Han	-	-	-0.270
Rural Non-Han	-	0.01	-0.57***	Rural Non-Han	-	-	-0.33**
	Derived from regression [4]				Derived from regression [5]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-0.79**	-1.47***	-1.46***	Urban Han	-0.62**	-1.09***	-1.17***
Rural Han	-0.43	-0.70***	-1.00***	Rural Han	-0.62**	-1.09***	-1.17***
Urban Non-Han	-0.76**	-1.47***	-1.46***	Urban Non-Han	-0.64*	-0.52**	-0.79***
Rural Non-Han	-0.43	-0.70***	-1.00***	Rural Non-Han	-0.67*	-0.52**	-0.79***
	Derived from regression [6]				Derived from regression [7]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-	-1.03***	-1.13***	Urban Han	-	-0.69***	-0.96***
Rural Han	-	-0.41***	-0.86***	Rural Han	-	-0.69***	-0.96***
Urban Non-Han	-	-1.03***	-1.13***	Urban Non-Han	-	-0.13	-0.60***
Rural Non-Han	-	-0.41***	-0.86***	Rural Non-Han	-	-0.13	-0.60***
	Derived from regression [8]				Derived from regression [9]		
	Period 1	Period 2	Period 3		Period 1	Period 2	Period 3
Urban Han	-	-	-0.38***	Urban Han	-	-	-0.43***
Rural Han	-	-	-0.43***	Rural Han	-	-	-0.43***
Urban Non-Han	-	-	-0.38***	Urban Non-Han	-	-	-0.32**
Rural Non-Han	-	-	-0.43***	Rural Non-Han	-	-	-0.32**

The top panel is identical to panel 1 of Table 4. The approach of deriving the partial effects are the same with Table 4.