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Research Article

The power of the government: China's Family Planning Leading Group and the fertility decline of the 1970s

Yi Chen

Yingfei Huang

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The power of the government: China's Family Planning Leading Group and the fertility decline of the 1970s

Yi Chen[1]

Yingfei Huang[2]

Abstract

BACKGROUND
China introduced its world-famous One-Child Policy in 1979. However, its fertility appears to have declined even faster in the early 1970s than it did after 1979. The fertility rate declined by three children, from 5.7 in 1969 to 2.7 in 1978.

OBJECTIVE
What accounts for such a rapid decline in fertility rate during the 1970s? In this study, we highlight the importance of the Family Planning Leading Group (FPLG) in understanding China's fertility decline since the early 1970s.

METHODS
From 1969 to 1975, provinces gradually established agencies of the FPLG to implement family planning policies. We construct a difference-in-difference (DID) model to estimate the policy effect by exploiting the provincial variation in establishment years. We also develop a measure of policy exposure based on the province and the mother's birth cohort that is applicable to many publicly available household-level data.

CONCLUSIONS
Our DID model explains about half of China's total fertility rate decline from 5.7 in 1969 to 2.7 in 1978. Additionally, despite its simple construction, our proposed policy measure aptly explains China's rapid decline in family sizes.

CONTRIBUTION
We provide simple and practical approaches that characterize the causal effect of China's

[1] Institute for Economic and Social Research, Jinan University, Tianhe District, China.
Email: chenyiecon@163.com.
[2] Jinhe Center for Economic Research, Xi'an Jiaotong University, Xi'an, China.
Email: fayhuang.econ@gmail.com.

family planning policies during the early 1970s. Our approaches can be easily implemented on province-year panel data and typical household surveys.

1. Introduction

Since being incorporated into mainstream economic thought by Solow (1956), fertility has played an important role in economic growth models. A large body of literature has documented the importance of fertility to various economic measures, including, but not limited to, economic growth (Romer 1986; Wang, Yip, and Scotese 1994), technological change (Kremer 1993), migration (Coleman 2006), taxation (Apps and Rees 2004), employment (Blau and Robins 1989), labor force participation (Macunovich 1996; Goldin and Katz 2002), gender inequality (Galor and Weil 1996), and savings rate (Modigliani and Cao 2004; Banerjee et al. 2014). However, identifying the causal impacts of fertility can be difficult because of inherent endogeneity, as disentangling the effects of fertility from the impacts of other variables is complex. This challenge reiterates the need to find an exogenous shock to fertility for the purpose of identification.

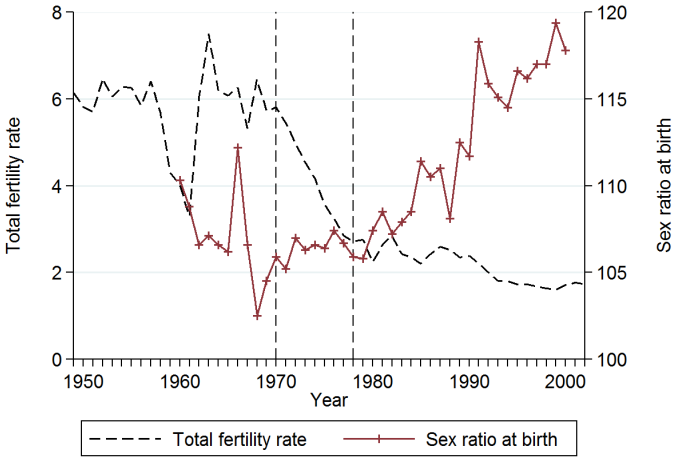
China's experience provides a rare opportunity to identify the effects of fertility rate changes. China, which is currently the most populous country and the second largest economy in the world, has experienced an unprecedented decline in its fertility rate since the 1970s. Figure 1 shows the time series data for this decline.[3] In the mid-1960s, China's total fertility rate was around six children. Three decades later, the fertility rate had dropped by more than two-thirds to an average of fewer than two children. The majority of the existing literature on changes to China's fertility rate references the One-Child Policy (OCP) since 1979. This policy set a quota on the number of children a couple were allowed to have,[4] and exceeding the quota resulted in a heavy penalty.[5] Overall, the OCP has received significant scholarly attention, in part because it was the first time in human history that a government attempted to control its population using such extreme measures.

[3] Data sourced from Lu and Zhai (2009). Other data sources, including the United Nations Population Division, the World Bank, and the OECD, reveal a similar pattern, as shown in Figure A-1.

[4] More specifically, the policy permitted only one child per couple in urban China, whereas in rural China a second child was sometimes allowed, depending on the local policy. Some counties allowed all couples to have a second child, while others permitted a second birth only if the firstborn child was female.

[5] This penalty included a one-time fine varying from one to five times the annual income, which has been widely discussed in the literature (McElroy and Yang 2000; Ebenstein 2010; Wei and Zhang 2011; Liu 2014; Huang, Lei, and Zhao 2016). This punishment could be even more severe for urban residents working in state-owned enterprises since they could lose their jobs and their related social welfare (Scharping 2003).

Figure 1: Trends in China's total fertility rate and the sex ratio at birth, 1949–2002



Source: Total fertility rate 1949–2002 comes from Lu and Zhai (2009). Sex ratio at birth 1960–1988 comes from Liang and Chen (1993). Sex ratio at birth 1989–2000 comes from the *China Population Statistics Yearbook*.

However, China's fertility decline started before the introduction of the OCP. In fact, Figure 1 reveals that a majority of the decline actually occurred before enforcement of the OCP, as the fertility rate declined from 5.7 in 1969 to 2.7 in 1978. Over the decade following the OCP's enforcement, the fertility rate dropped only marginally to 2.5 children. We therefore ask: What factors produced such a rapid decline in the fertility rate during the 1970s? We find that a raft of family planning policies prior to the introduction of the OCP, which were enforced by the Family Planning Leading Group (FPLG), explains about half of China's fertility decline from 1969 to 1978. These pre-OCP policies have, however, received much less attention from scholars.[6] Knowing that China's effective family planning policies were in place ten years before the introduction of the OCP has two important implications. First, it helps us to understand China's fertility transition and predict China's future population aging. With fertility falling rapidly prior to 1979, China's aging society has arrived sooner than it would under a solely OCP-driven fertility

[6] To validate this point, we searched all articles published since 2000 in two influential demography and population economics journals – *Demography* and the *Journal of Population Economics* – for the key phrase "China Family Planning." We found 11 articles in *Demography* (including four comments and reply articles) and three articles in the *Journal of Population Economics*. After reviewing these articles to ascertain whether the term "family planning" actually refers to the One-Child Policy, we find that most of those papers associate family planning with the OCP. Two papers – Wang, Zhao, and Zhao (2017) and Goodkind (2017) – acknowledge the existence of pre-OCP family planning policies but retain their focus on the OCP.

decline. Second, it provides insights into the connection between fertility rate and other socioeconomic outcomes. To provide an example, the OCP has served as an important potential explanation for China's present high savings rate (Choukhmane, Coeurdacier, and Jin 2016; Ge, Yang, and Zhang 2018; İmrohoroğlu and Zhao 2018). This hypothesis is supported by the fact that China's savings rate started to rise only after 1979 (Modigliani and Cao 2004). Therefore, if we acknowledge that China's decline in fertility began in the 1970s instead of in 1979, it is unclear whether a demographic change on its own can explain the evolution of China's savings rate.

Our empirical analysis is conducted in two steps. In the first step, we exploit different establishment years for the provincial FPLG and estimate its causal impact on the provincial fertility rate. One specific and well-known policy that the leading group was responsible for enforcing was the "later (marriage), longer (intervals), fewer (children)" (LLF, *wan*, *xi*, *shao*) policy. Using a difference-in-difference (DID) method, we empirically demonstrate that the leading group is closely related to the decline in fertility. Our model explains about half of the decline in China's total fertility rate from 5.7 in 1969 to 2.7 in 1978. We also test the assumptions required by the DID approach, demonstrating that there are no preexisting heterogeneous trends before the establishment of the leading group. Our results are also robust following the recognition of historical events, namely the Cultural Revolution, the "sent-down youth" program, the school expansion program in rural China, and economic developments. In the second step, we develop a measure of households' exposure to family planning policies based on the province of residence and the mother's birth cohort, thereby identifying the micro effects of family planning policies. Due to provincial variation in the establishment years of the FPLG, members of the same birth cohort in different provinces were exposed differently to the policy, which allows us to identify the policy effect at the household level. We test the performance of this policy exposure using China's 2005 One-Percent Population Census and the 2010 China Family Panel Studies (CFPS). Exposure to the policy explains a drop of 1.29 children from 1969 to 1978.

Our study contributes to a growing literature on China's family planning policies during the early 1970s. While numerous studies have estimated the effect of the OCP on various outcomes,[7] the studies that focus on pre-OCP policies, including the LLF approach, are much fewer in number. Scharping (2003), Cai (2010), and Whyte, Wang, and Cai (2015) emphasize the effects of LLF policies in curbing the fertility rate. Banerjee, Meng, and Qian (2010) and Banerjee et al. (2014) treat 1972 as the year in which "family

[7] Studied impacts include the savings rate (Wei and Zhang 2011; Curtis, Lugauer, and Mark 2015; Choukhmane, Coeurdacier, and Jin 2016; Ge, Yang, and Zhang 2018), marriage (Huang and Zhou 2015), the labor supply (Huang 2016; Zhang 2017), children's development (Li, Zhang, and Zhu 2008; Qian 2009; Liu 2014; Li and Zhang 2017; Qin, Zhuang, and Yang 2017), parental health (Chen and Lei 2009; Wu and Li 2012; Islam and Smyth 2015), rural–urban migration (Wang, Zhao, and Zhao 2017; Zhang 2017), and female empowerment (Huang 2016).

planning policies shifted from a pro-fertility agenda to one that focused on curbing fertility" and link the policy to China's high household savings rate. We contribute to this literature by introducing the provincial variation in policy implementation and further quantifying the policy impact.

In a study conducted independently from ours,[8] Babiarz et al. (2018) explore provincial heterogeneity in the implementation of LLF policies and find that the policies reduced the fertility rate by around 0.9 while increasing the use of the male-biased stopping rule. Our study differs from that of Babiarz et al. (2018) in two ways. First, we choose different starting years for policy implementation, as we use the establishment years of FPLGs, which were responsible for implementing a raft of policies. Babiarz et al. (2018) choose a specific policy: "later, longer, fewer." The difference is nontrivial, which probably explains why our estimates are slightly larger than those of Babiarz et al. (2018). Second, we provide simple and practical approaches that identify the causal effects of China's family planning policies during the early 1970s. Our approaches can be easily implemented using province-level yearly panel data and typical household surveys. At the household level, we propose a measure of policy exposure that only requires data on the province and the mother's birth cohort and does not require an entire birth history. Therefore, this method can be easily applied to publicly available datasets, such as the CFPS and the China Health and Retirement Longitudinal Study.[9]

The remainder of this paper is organized as follows. In Section 2, we provide background information on China's family planning policies. Section 3 introduces the datasets used in the study. Section 4 discusses the empirical strategy. Sections 5 and 6 detail the impact of the FPLG at the province level and household level, respectively. Section 7 further discusses the mechanism by which the fertility rate is reduced. Section 8 concludes.

2. Family planning policy in the early 1970s

China's family planning policy has a much longer history than the OCP, dating back to December 1962 with the release of the No. [62]698 document: "Instructions on Seriously Advocating Family Planning." In 1964, the State Family Planning Commission was established, and commissions at the province, prefecture, and county levels were gradually set up across the country. However, the outbreak of the Cultural Revolution negatively affected these family planning institutions, most of which ceased to function in 1966.

In early 1970, Premier Enlai Zhou emphasized that family planning operations should

[8] A preliminary version of this study was initially circulated in December 2016. The fixed-version working paper became available online in April 2018.

[9] As a comparison, the empirical approach used in Babiarz et al. (2018) requires the entire birth history of each child. Therefore, they use China's 1988 Two-per-Thousand National Survey of Fertility and Contraception. However, the microdata used in this survey are difficult to access for most researchers.

not stop. In 1971, the State Council released document [71]51, "Report on Better Implementing Family Planning Policy," signaling the recovery of family planning from the Cultural Revolution. The document required provinces to set up FPLGs, which would organize and lead family planning work. A pilot structure was initiated in 1970, and by 1975, all provinces had set up a leading group. The leading group was an important and influential provincial institution. In most cases, its leader was also the main leader of the provincial party committee, and its primary duty was to promote the implementation of the family planning policy under the guidance of the central government. The leading group's work could be categorized into the following three aspects (descriptions are summarized from Peng 1997).

The first aspect was to promote the "later, longer, fewer" policy and to design rewards and punishments.[10] "Later" means marriage at a later age – 23 years for women and 25 years for men.[11] "Longer" refers to the norm of waiting more than three years between births. "Fewer" means that one couple could not have more than two children. The second aspect was in organizing professional teams to promote family planning. Broadcast information included the LLF policy, contraception and sterilization, the advantages of birth control, and experiences of family planning. The team also supported the publication of popular scientific texts related to birth control, and relevant information was added to middle-school textbooks. The size of the broadcasting team in each province varied from 10,000 to more than 200,000 workers. The third aspect was to provide technical support for birth control. This support included training technical staff to conduct research on contraception and sterilization measures, introduce technology and equipment for sterilization, and distribute contraception pills. To ensure enforcement of the family planning policy, both the central government and provincial governments raised their budgets, from 59.5 million RMB in 1971 to 197.6 million RMB in 1979 (The National Population and Family Planning Commission of P.R. China 2007).

The pre-OCP programs of the 1970s were technically voluntary, but there were punishments associated with violations and benefits for compliance. Although narrative evi-

[10] Because LLF was one of a number of policies aimed at reducing fertility, the FPLG should be considered related to, but separate from, LLF. Comparing the FPLG years in this study to LLF years in Babiarz et al. (2018), we note that the two policies overlapped significantly from 1969 to 1975. The gap is either zero or one years for 14 out of the 28 provinces in our sample. We therefore consider which event had the greater impact on fertility decline for the rest of the provinces. Whereas it is entirely possible that both events could have led to a decline in the fertility rate, Figure A-2 provides suggestive evidence that the FPLG produced a larger decline. We observe a kink when employing the establishment year of an FPLG as the reference year, meaning that the fertility rate started declining more quickly after its establishment. No such kink is observed for the LLF.

[11] The threshold for late marriage (age 23 for women and age 25 for men) does not vary across rural China. The situation for urban China is more complicated, with some provinces setting higher ceilings for late marriage (e.g., 25 for women and 28 for men in Shanxi, Heilongjiang, Anhui, Fujian, Hunan, Guangdong, and Guizhou). Nevertheless, this disparity is unlikely to affect our main results because China was predominantly rural throughout the 1970s. We also conduct a robustness check by excluding three municipalities directly under the control of the central government (Beijing, Shanghai, and Tianjin).

dence suggests that the campaign had several coercive elements (Whyte, Wang, and Cai 2015), overall, the enforcement of the policy was much more lenient during this time than in the OCP period (Zhang 2017), when a quota-violating birth could result in large fines and even the loss of one's job. Local population chronicles note that punishments for violating the family planning policies during the 1970s were generally minor and only applied to the third or fourth child. The punishment mainly took the form of a reduction in subsidies. For example, policies in Shandong province documented that "starting from April 1, 1974, the government would stop covering the medical costs for the delivery of third (or higher) children and reduce subsidies." Only 9 of the 28 provinces in our sample explicitly documented punishments in the early 1970s,[12] and three of them started punishing couples only from the fourth birth (Jiangxi, Qinghai, and Xinjiang). The opportunity costs of unplanned births also included the forgone reward for obeying policies. Regularly documented rewards included the reduction (or waiving) of fees for sterilization operations, priority for unmarried people in employment and education services, priority in housing arrangements for couples who married later, and paid vacations after a sterilization operation. Because of the generally vague documentation and not-so-stringent policy enforcement (compared with OCP), it is not practical to apply the seemingly attractive strategy that exploits the regional variation in penalties. Existing studies have adopted this approach for the analysis of the OCP (McElroy and Yang 2000; Ebenstein 2010; Wei and Zhang 2011; Huang, Lei, and Zhao 2016). The above-quota fines (also known as social child-raising fees) first appeared in 1979 and experienced a round of rapid increase around 1990 – such fines did not exist during our period of analysis. We detail in Section 4 our empirical approach of identifying the policy effect during the early 1970s prior to the implementation of OCP in 1979.

3. Data and variables

To understand the effect of China's family planning policies during the early 1970s, we compile a province-level dataset, focusing on the total fertility rate, which measures the average childbearing behavior of a given population. We also complement the province-level analysis with micro-level household survey data. Note that province-level and household-level data contribute equally to understanding the consequences of the FPLG. Both datasets come with advantages and disadvantages. While the household-level data could naturally be considered superior, it has important limitations in identifying the policy effect, as it is difficult to precisely define the extent to which a household was affected by family planning policies. The definition either relies on a child's year of birth, which is endogenous to the policies, or makes strong assumptions about fertility behavior un-

[12] These nine provinces are: Shanxi, Liaoning, Jilin, Jiangxi, Shandong, Guangdong, Yunnan, Qinghai, and Xinjiang.

der the counterfactual (as we do in this study). On the contrary, panel data separated by province and year provides a clear definition of policy treatment: whether the FPLG has been established in a given year. However, this advantage comes at a cost, as it aggregates the fertility behavior of a given population in a specific year to generate a provincial total fertility rate.

3.1 Province-level data

We collect province-level data over the period 1969–1978 from various sources. We begin with the year 1969, because the provincial FPLGs were first established in this year in Guangdong. The last groups to be established were in Guizhou and Xinjiang in 1975. Our analysis ends in 1978 to avoid any possible influence from the succeeding OCP and the Reform and Opening-Up Policy, after which China initiated an unprecedented period of economic growth.

3.1.1 Establishment years of FPLGs

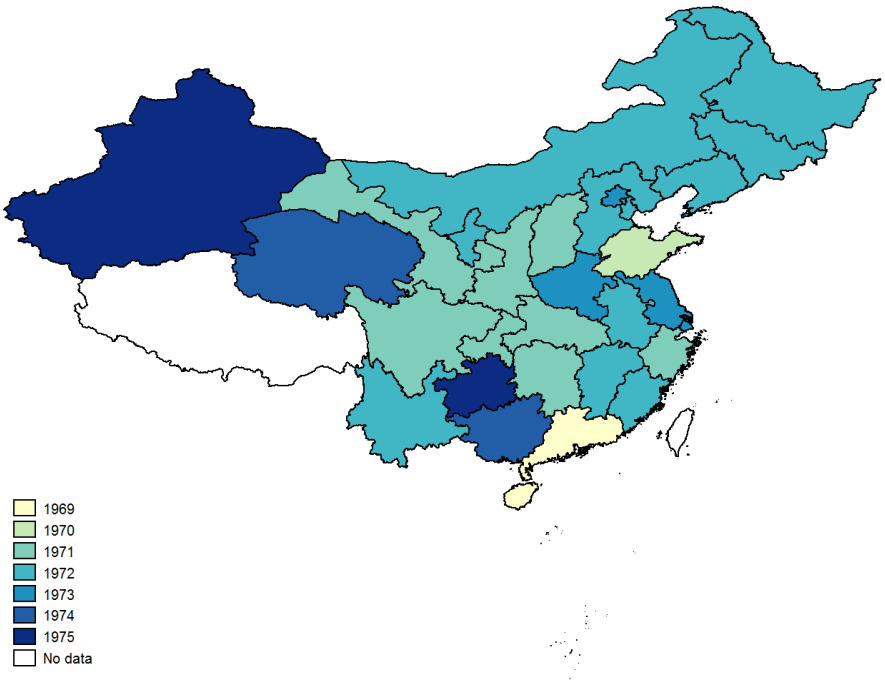
We collect data on the establishment years of FPLGs (*jihua shengyu lingdao xiaozu*) from population chronicles in various provinces and from the *Encyclopedia of Chinese Family Planning* (Peng 1997). Since the establishment of an FPLG is a major event in a province's family planning history, it is clearly documented in most province chronicles. According to the background description, a major policy shift in the early 1970s was the recovery of family planning functions from the chaos of the Cultural Revolution. We view the establishment of a major leadership team as a symbol of such a recovery and define the first reference to the establishment (or recovery) of a provincial FPLG in the early 1970s as the policy's years of implementation. Table A-1 provides the original documentation.[13]

We exclude Tibet because of the lack of fertility data. We also exclude Hainan and Chongqing because these provinces were established at a later date. We include four

[13] This definition is unambiguous for 23 out of 28 provinces in our sample. In the early 1970s, those 23 provinces either established an FPLG or set up a commission first and made it an FPLG later, in which scenario we believe the two institutions are equivalent. The choice of policy year may be subject to debate for the remaining five provinces (Heilongjiang, Jiangxi, Sichuan, Guizhou, and Ningxia). Three provinces (Heilongjiang, Jiangxi, and Guizhou) did not record an FPLG, but they do record the establishment of a Family Planning Commission, whose major roles were also to implement local family planning policies. Sichuan established its FPLG as early as 1963 (a commission was set up in 1971). But as mentioned in the background section, the institutions set up in the 1960s were not effective because of the later outbreak of the Cultural Revolution. Ningxia province set up a commission in 1972 and an FPLG in 1978. We believe the year 1978 is too late for our analysis because it was close to the OCP. Therefore, we use the establishment of the commission instead of the leading group for those five provinces. We provide a robustness check that excludes those five provinces in Appendix B.

minority autonomous regions (Inner Mongolia, Guangxi, Ningxia, and Xinjiang) in our baseline specification. It is true that ethnic minorities are subject to different policies than their Han counterparts. However, most of the people in the four provinces are still Han ethnics (64.17% according to our imputation based on the 1982 census), suggesting that those provinces are still largely affected by family planning. In Appendix B, we try a robustness check that excludes the four minority autonomous regions. Thus, our final sample comprises 28 provinces. Figure 2 plots the geographical variation in the years of establishment, which range from 1969 to 1975.

Figure 2: The establishment year of the FPLG in each province



Source: Authors' collection from population chronicles in various provinces and from the *Encyclopedia of Chinese Family Planning* (Peng 1997).

3.1.2 Total fertility rate

Our data on total fertility rates is taken from China's 1982 One-per-Thousand Sample Fertility Survey, which was conducted by the State Family Planning Commission. Using this survey, Coale and Li (1987) compute the total fertility rate for each province in China from 1940 to 1982. The total fertility rate is not a variable that can be defined at the household level. Instead, it aggregates the fertility behavior of a group of people at a given time. Coale and Li (1987) divide women of child-bearing age (15–49 years) into several five-year age groups, as dividing the number of children born to women of a specific age group by the number of women in that group generates the age-specific fertility rate. Summing the age-specific fertility rates and multiplying them by five provides the total fertility rate, which represents the number of children born to a hypothetical woman under the fertility pattern of the current population.

While concerns about the quality of the data used by Coale and Li (1987) can be raised, to our knowledge there is no other readily available data on China's total fertility rate at the provincial level. Therefore, we cannot directly compare our data sources with other data sources at the provincial level. However, comparison at the national level suggests that Coale and Li (1987) provide convincing estimates (see Figure A-1). The estimate of Coale and Li (1987) is not only close to estimates from recent Chinese studies, such as Lu and Zhai (2009), but is also close to estimates from the United Nations Population Division, which have been adopted by the World Bank and the OECD.

A second challenge is the underreporting of children. Previous studies argued that because parents would be fined for above-quota births and local officials would be penalized for failing to limit fertility levels in their jurisdictions, powerful incentives for underreporting the number of children existed (Feeney and Jianhua 1994; Smith 1994; Merli 1998; Scharping 2007). However, concrete evidence for child underreporting begins only with China's 1990 population census. In 1991, the central government listed family planning among three basic state policies, and local officials became personally responsible for implementing family planning rules. Fines for above-quota births (also known as social child-raising fees) increased significantly between 1989 and 1992 (Scharping 2003). Note that Coale and Li (1987) derive their estimates from a survey conducted in 1982. Goodkind (2011) estimates the underreporting of children in the 1982 census based on back projections from the 1990 and 2000 censuses and finds an overcount of 0.4% (from 1990 census back projections) and 0.8% (from 2000 census back projections) for children between 5 and 9.[14] These numbers are fairly comparable to those of other Asian countries. Therefore, we conclude that underreporting should not significantly bias our empirical analysis.

[14] The sample period in our analysis is 1969–1978. Children born during this period would have been between 4 and 13 in 1982.

3.1.3 Sex ratio at birth

We compute the provincial sex ratio at birth for cohorts born between 1969 and 1978 for each province using a 1% sample of China's 1982 population census. This census collected information on the *hukou* province in which the household was registered, such that data on the birth province is not available. Collecting this data was not considered necessary in 1982 because of the lack of migration. Obtaining *hukou* in the destination province remains a challenge even nowadays.[15] A second possible concern is the underreporting of daughters if parents have stronger incentives to "hide" girls than boys. We argue that although such underreporting was likely the case in the 1990 census and onward, it should have had a limited impact on the sex ratio in the 1982 census because the motivations to hide girls were weak at that time. Figure 1 shows that the rapid escalation in the sex ratio did not start until 1980. Goodkind (2011) finds that sex ratios in areas with a "1.5-child" policy are especially distorted because of excess daughter underreporting since the OCP came into effect in 1979.

3.1.4 Economic control variables

Because economic conditions can also affect fertility rates, we control for a set of variables, including GDP per capita, the share of the nonagricultural population, the share of primary industry in GDP, and the share of secondary industry in GDP. The provincial economic variables can be found in National Bureau of Statistics of China (2010). Panel A of Table 1 reports the summary statistics at the province-year level.

[15] Using the 2010 CFPS, which contains information on both current *hukou* province and birth *hukou* province, we find that only 5.01% of the sample born between 1969 and 1978 changed their registration province. This rate should be expected to be much lower in 1982.

Table 1: Summary statistics

Variable	Mean	S.D.	Min	Max
Panel A: Province-level data				
year of FPLG establishment	1972.071	1.337	1969	1975
total fertility rate	4.299	1.537	1.174	7.038
sex ratio at birth	105.985	3.788	87.067	120.614
population (10,000)	2975.628	1810.994	264.970	7160
GDP per capita (RMB)	369.075	345.125	101	2498
share of nonagricultural population	0.225	0.183	0.073	0.858
share of primary industry in GDP	0.356	0.139	0.035	0.654
share of secondary industry in GDP	0.446	0.136	0.196	0.778
Observations	280			
Panel B: Mini-census 2005 (cohort 1940–1965)				
age	49.954	6.943	40	65
number of children	2.403	1.272	0	18
urban *hukou*	0.306	0.461	0	1
ethnic minority	0.083	0.276	0	1
M's exposure to FPLG	4.877	1.341	0.277	6.735
M's exposure to OCP	3.581	1.771	0.036	6.555
less than primary school	0.238	0.426	0	1
primary school graduate	0.336	0.472	0	1
junior high graduate	0.274	0.446	0	1
senior high graduate	0.115	0.319	0	1
some college or above	0.037	0.188	0	1
Observations	375,484			
Panel C: CFPS (mother's cohort 1940–1965)				
age	31.673	8.091	16	54
number of siblings	2.006	1.435	0	13
urban *hukou*	0.312	0.463	0	1
ethnic minority	0.121	0.326	0	1
M's age at birth	25.730	4.306	16	47
M's exposure to FPLG	4.595	1.438	0.277	6.735
M's exposure to OCP	3.137	1.870	0.05	6.555
M less than primary school	0.479	0.500	0	1
M primary school graduate	0.261	0.439	0	1
M junior high graduate	0.173	0.378	0	1
M senior high graduate	0.077	0.267	0	1
M some college or above	0.011	0.103	0	1
Observations	11,609			

3.2 Micro-level data

In addition to the aggregated province-level data, we use household-level data to identify the micro-level responses to the establishment of the leading group. We analyze the policy effect from two perspectives: parent and child. Adopting these different perspectives is useful because each approach can be used to answer different questions, since we are interested in both the impact of family planning policies on parents (e.g., does having fewer children lead to higher savings?) and the effect of the policy on children (e.g., does a smaller family size lead to better-educated children?).

3.2.1 Mini-census 2005

For the parents' perspective, we use a 20% sample of the 2005 1% Inter-Decennial Population Census (mini-census 2005) to understand how a household's exposure to the policy affects its fertility choices. For mini-census 2005, we restrict our sample to women born between 1940 and 1965. Cohort 1965 would be aged 15 in the year 1980, such that cohorts born after 1965 were universally exposed to the stringent OCP throughout their entire period of fertility. It should also be noted that the women in our sample were at least 40 years of age and therefore had almost completed their reproductive phases by 2005. Their present number of children can then be taken as an effective proxy of their lifetime fertility. The cohorts of analysis start from 1940 because fertility history information is available only for women below age 65 in mini-census 2005. We produce a sample of 375,484 observations. Panel B of Table 1 reports the summary statistics for mini-census 2005, showing that women in the sample are, on average, aged 50 and have 2.4 lifetime births.

3.2.2 CFPS 2010

The micro-level effect of the FPLG can also be analyzed from the child's perspective (i.e., how parents' exposure to the policy affected a child's number of siblings). To analyze this effect, we use the 2010 wave of the CFPS, which was conducted by the Institute of Social Science Survey of Peking University in China. The CFPS is a national representative survey, covering 25 out of 34 provinces in China and sampling 162 counties. The CFPS also provides sample weightings, which lead to nationally representative results. One important advantage of the CFPS is that it contains information on interviewees' parents regardless of co-residence status. The sample selection process of CFPS 2010 mimics that of mini-census 2005, as we restrict the sample to those whose mothers were born between 1940 and 1965. The final sample contains 11,609 observations. Panel C of Table 1 reports the summary statistics for CFPS 2010.

3.3 Household exposure to the policies

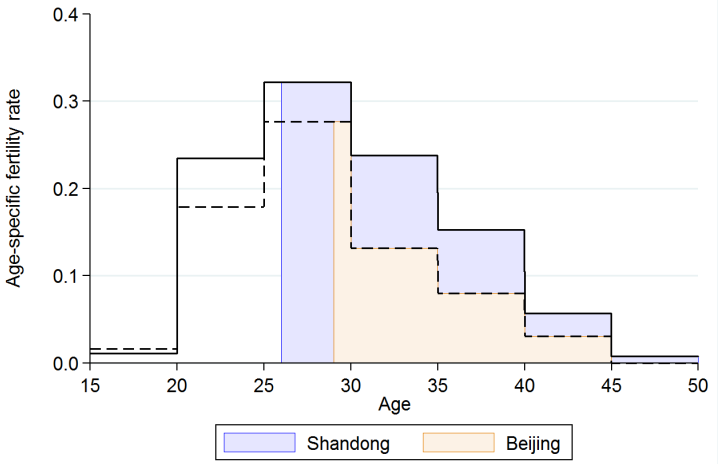
To evaluate the effect on a set of family planning policies, a new measure of exposure to the family planning policy is required. In this study, we adopt the structure used by Wang (2016), who defines exposure according to the mother's birth cohort. Such measures are more exogenous than more traditional measures, which are constructed according to the children's years of birth and can endogenously respond to family planning policies. However, we also improve Wang's (2016) measure by introducing provincial variation, which provides a better source of identification.[16] More specifically, we define policy exposure as follows:

$$\text{FPP}_{p,c} = \sum_{a=15}^{49} \text{AFR}_p\left(a\right) \times I\left[c + a \geq T_p\right]. \tag{1}$$

$\text{FPP}_{p,c}$ defines the exposure to the family planning policy for cohorts born in year c in province p. $\text{AFR}_p\left(a\right)$ is the age-specific fertility rate at age a of province p in 1969, prior to the enforcement of any effective family planning policy. T_p is the year of enforcement, which can vary by province. $I\left[c + a \geq T_p\right]$ is an indicator variable that equals one if the policy is effective in province p when cohort c turn age a and equals zero otherwise. This measurement can be interpreted as the number of children a woman would have given birth to under the influence of the policy when retaining the pre-policy fertility pattern at the province level. The introduction of the family planning policy in the early 1970s is defined by the establishment year of the FPLG. Therefore, the provincial variation within each cohort derives from: (1) different years of establishment of the FPLG and (2) different initial fertility profiles. Figure 3 illustrates how exposure to the policy is computed, using the examples of Shandong and Beijing. Women born in 1945 are more exposed to the policy in Shandong than in Beijing because: (1) Shandong formed its FPLG in 1970, three years earlier than Beijing, and (2) Shandong had a higher initial fertility rate.

[16] Although defined in a similar fashion, our measurement relies on a different source of identification from that in Wang (2016). Since Wang (2016) does not introduce provincial heterogeneity, identification rests on differential policy effects according to households' *hukou* and ethnic status. As a comparison, our identification is based on provincial variations in the years of establishment of the FPLG and initial fertility profiles.

Figure 3: Example construction of policy exposure (for women born in 1945)



Note: Shandong established its FPLG in 1970; Beijing established its FPLG in 1973. The solid (Shandong) or dashed (Beijing) line represents the profile of age-specific fertility rates in 1969. A woman born in 1945 had been exposed to the policy since the age of 26 in Shandong and the age of 29 in Beijing. The shaded areas represent our defined exposure to the policy, which can be interpreted as the number of children a woman would have given birth to if retaining the original fertility pattern at the province level.

Such a definition naturally applies to the OCP by defining T_p according to the rollout of the OCP (Jia and Persson 2019), an umbrella term for a raft of family-planning policies officially launched in 1979 (Peng 1997). Jia and Persson (2019) focus on three programs: Family Planning Science and Technology Research Institutes, Family Planning Propaganda and Education Centers, and Associations for Population Studies,[17] which are originally documented in Peng (1997). Following Jia and Persson (2019), we set T_p according to the earliest effective year among the three programs. We also conduct robustness checks using the latest and average effect years of the three programs.

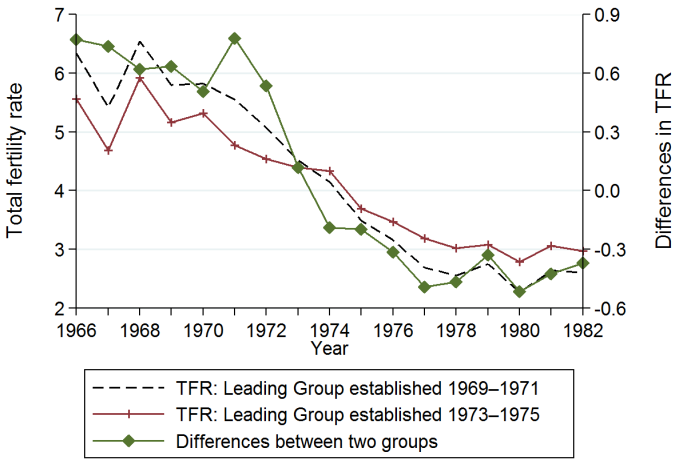
4. Empirical strategy

This section discusses the empirical strategy for identifying the causal impact of the FPLG. Figure 4 compares the total fertility rate of the provinces in which leading groups

[17] Jia and Persson (2019) use the term "Family Planning Associations". We checked Peng (1997) and confirmed that "Family Planning Associations" and "Associations for Population Studies" are two different programs. The data used in their studies actually correspond to the latter program.

were established from 1969 to 1971 (nine provinces) to those that established a leading group from 1973 to 1975 (seven provinces). Figure 4 suggests that the leading groups are closely related to declines in provincial total fertility rates. The difference in the fertility rates between the two sets of provinces is around 0.6 before 1971. Between 1971 and 1974, when the FPLGs were established in the first set of provinces but not in the second, fertility rates dropped more in the first set. After 1975, when leading groups had been established in all provinces, the difference in the total fertility rate between the two sets remained fairly constant at around -0.3.

Figure 4: Trends in the total fertility rate (early-establishment provinces versus late-establishment provinces)



4.1 The DID strategy

Figure 4 provides support for the common-trend assumption before 1969 and after 1975. The difference between the two groups changes only when leading groups are established in one group but not in the other. Exploiting this fact, we construct the following econometric model using a difference-in-difference setting:

$$\begin{aligned} \text{TFR}_{p,t} &= \beta \text{Y\_After}_{p,t} + \gamma \mathbf{X}_{p,t} + \text{Prov}_p + \text{Year}_t + \varepsilon_{p,t}, \\ &\text{where } \text{Y\_After}_{p,t} = \max\left(0, t - T_p\right). \end{aligned} \tag{2}$$

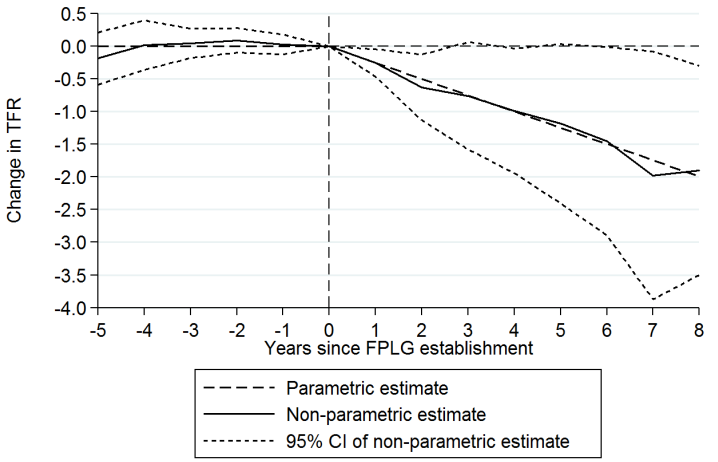
$\text{TFR}_{p,t}$ is the total fertility rate for province p in year t; $\text{Y\_After}_{p,t} = \max(0, t - T_p)$ is the number of years since the establishment of the FPLG in province p, which takes a value of one if the group has been established and zero otherwise; $\mathbf{X}_{p,t}$ is a vector of economic control variables; and Prov_p and Year_t are the province and year fixed effects, respectively. The parameter β captures the incremental effect of the FPLG on the total fertility rate. We call this the linear-trend specification.

Equation (2) implicitly assumes that the effect of the family planning policy is gradual rather than immediate. We also argue that the linear-trend specification is more appropriate than a dummy variable setting that uses $\text{After}_{p,t} = I[t > T_p]$. In Figure 1, we observe continuously decreasing fertility rates with no sudden decline during our sample period (1969–1978). To provide further support for our empirical structure, we follow Lafortune, Rothstein, and Schanzenbach (2018) and estimate a non-parametric specification:

$$\text{TFR}_{p,t} = \sum_{r=k_{\min}, r\neq 0}^{k_{\max}} \beta_r I(t = T_p + r) + \gamma \mathbf{X}_{p,t} + \text{Prov}_p + \text{Year}_t + \varepsilon_{p,t}. \tag{3}$$

We exclude $r = 0$, such that β_r captures the change in the fertility rate r years from the establishment of the FPLG. We set $k_{\min} = -5$ and $k_{\max} = 8$. Figure 5 compares the coefficients from equation (2) and those from equation (3). It is evident that our linear-trend specification appropriately approximates the non-parametric specification.

Figure 5: Determining the proper functional form of the econometric model



An alternative specification is the first-difference approach, which tests whether the total fertility rate drops at a faster rate than the control group after the formation of the leading group, as shown in Figure 4:

$$\Delta \text{TFR}_{p,t} = \beta \text{After}_{p,t} + \gamma \Delta \mathbf{X}_{p,t} + \text{Year}_t + \varepsilon_{p,t}, \tag{4}$$

$\text{After}_{p,t}$ is an indicator variable that equals one if province p had already established the FPLG in year t. Here the coefficient β captures to what extent the TFR starts dropping at a faster rate after the establishment of the FPLG.

Similarly, household-level analysis can be undertaken using the following equation:

$$N_{i,p,c} = \beta \text{FPP}_{p,c} + \gamma \mathbf{X}_i + \text{Prov}_p + \text{Cohort}_c + \varepsilon_{i,p,c}, \tag{5}$$

where $N_{i,p,c,t}$ denotes the number of children (from the parents' perspective) or the number of siblings (from the children's perspective) of mother's cohort c in province p. $\text{FPP}_{p,c}$ is our defined exposure to the family planning policy according to equation (1). Cohort_c represents cohort fixed effects.

Because our study focuses on provincial FPLG, we cluster the standard errors at the province level. Moreover, since our number of clusters (≈30) is relatively small, we compute the clustered standard errors using the wild bootstrap method with 99,999

replications (Cameron, Gelbach, and Miller 2008) with the *boottest* command in Stata (Roodman et al. 2019).[18]

It is noteworthy that our empirical specification identifies the additional effect of the provincial FPLG instead of the aggregate effect of the family planning policy. Figure 4 shows that from 1970 to 1974, there was also a decline in the total fertility rate even for provinces without a leading group, which can be explained either by national income growth, better educational attainment, or other policy changes at the national level. What we identify is that provinces with an FPLG experience an even faster decline in the total fertility rate because the leading group facilitates the enforcement of the family planning policy. Therefore, our results serve as a conservative lower-bound estimate of the aggregate effect of China's family planning policy. It should also be noted that what we identify is an "intent-to-treat" effect. We do not observe the actual implementation of the family planning policies. Instead, we assume that the establishment of the leading group facilitates policy enforcement.

4.2 Identification requirements

Regarding the identification requirement, our empirical strategy is essentially a DID specification exploiting the differential timing in the establishment of a leading group. For identification purposes, we do not require the years in which the FPLG was founded to be random.[19] The central requirement for identification is the common-trend assumption (Angrist and Pischke 2008) that in the absence of the treatment, the trends in fertility should not be related to the timing of FPLG establishment.

We present three sets of evidence supporting this assumption. First, Figure 5 shows that prior to the foundation of the leading group, the impact is close to zero and no sign of a preexisting trend is detected. Figure 4 conveys similar sets of information by comparing the fertility time series in provinces that established an FPLG early to those that established an FPLG late. The difference in the fertility rates between the two sets of provinces remained stable at 0.6 prior to 1970. Second, in the next section, we show that randomizing policy years cannot generate our main results (Figure 6). If our results are purely driven by heterogeneous trends, the actual policy years should not be so important. Third, we discuss in Appendix B the robustness against other contemporaneous events. The concurrence of other events around the same period can also violate the common-trend assumption. Therefore, we evaluate the potential impact of other historical events

[18] The bootstrap method originally produces p-values instead of standard errors. For ease of interpretation, we transform the p-values to standard errors under a student-t distribution.

[19] Nevertheless, we run a regression of establishment years on a set of initial provincial conditions in 1969, including the total fertility rate, sex ratio, GDP per capita, share of the nonagricultural population, share of primary industry in GDP, and share of secondary industry in GDP. We find no evidence that these factors jointly predict the establishment year. The joint F-value is 1.39 with a p-value of 0.266.

in the 1970s, including the Cultural Revolution, the Sent-Down Movement, rural school expansion programs, and economic developments.

5. The effects of the FPLG at the province level

5.1 The effect on total fertility rate

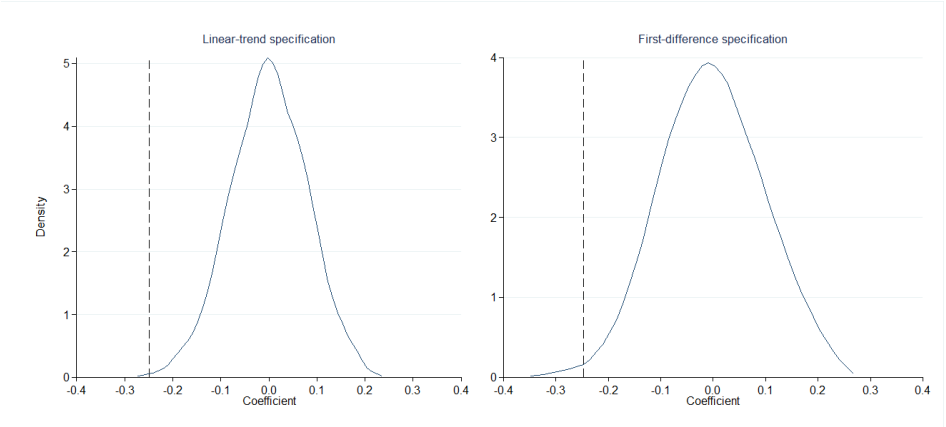
Table 2 reports the main results of this study. Columns (1) and (2) report the effect of FPLG establishment with and without provincial covariates, respectively, using the linear trend specification. Columns (6) and (7) present the corresponding results with the first difference specification. Controlling for these covariates has a limited effect on our estimates, suggesting that the timing of policy implementation is not strongly correlated with local economic conditions and that political factors can also play important roles. Provincial governments in China do not want to fall behind each other when the central government issues an instruction, an attitude known as the political tournament for promotion (Li and Zhou 2005).

If we choose Column (2) as our preferred specification, the coefficient of -0.249 implies that the establishment of the family planning leading group led to an additional fertility drop of 0.249 every year during our sample period. Therefore, the leading group can explain a decline in the fertility rate of 1.49 ($= 0.249 \times 6$) during our sample period (1969–1978).[20] The national total fertility rate dropped from 5.72 in 1969 to 2.72 in 1978, such that the family planning leading group explains half of this decline. The first-difference specification (Column (6)) yields an identical result, with a coefficient of -0.247.

To confirm that the variation in the establishing years plays an important role in our identification, we perform a set of permutation tests to show that random years of establishment would not generate the same results. That is, our identification source does not simply come from a before–after comparison. Nor does it come from heterogeneous provincial trends in fertility. In the permutation tests, we generate placebo interventions by assuming that all provinces have equal probabilities of setting up the leading group from 1969 to 1975. Figure 6 shows the distributions of 1,000 counterfactual simulations for both the linear-trend and first-difference specifications and demonstrates that random establishment years generate coefficients that distribute around zero.

[20] The average year of establishment is 1972. Thus, in 1978, the average length of exposure was around six years.

Figure 6: The simulated coefficients if the years of establishment distribute evenly from 1969 to 1975 for all provinces



Note: 1,000 simulations for each specification. The vertical dashed lines represent the coefficients using the actual years of establishment.

Table 2: The effect of the FPLG on the total fertility rate at the province level

Specification:	linear-trend					first-difference				
Dependent variable:	total fertility rate									
Period:	1969–1978									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
years since FPLG establishment	−0.268***	−0.249**	−0.249**	−0.238***	−0.289**	−0.250**	−0.247**	−0.245**	−0.247***	−0.265**
	(0.095)	(0.098)	(0.098)	(0.072)	(0.129)	(0.098)	(0.098)	(0.096)	(0.089)	(0.112)
years since FPLG establishment $\times \left(\text{TFR}_{p,1969} - \overline{\text{TFR}}_{1969}\right)$			−0.066					−0.086**		
			(0.039)					(0.032)		
years since FPLG establishment $\times \left(\%\text{EarlyMarry}_{p,1969} - \overline{\%\text{EarlyMarry}}_{1969}\right)$				−0.577*					−0.615**	
				(0.325)					(0.264)	
years since FPLG establishment $\times$ (PolicyYear − 1972)					−0.013					−0.018
					(0.027)					(0.031)
province controls	N	Y	Y	Y	Y	N	Y	Y	Y	Y
R-squared	0.929	0.934	0.938	0.938	0.934	0.198	0.209	0.230	0.223	0.211
observations	280	280	280	280	280	252	252	252	252	252

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the provincial level using the wild cluster bootstrap method (Cameron, Gelbach, and Miller 2008). Year dummies and province dummies are controlled in all specifications. Control variables include GDP per capita, share of the nonagricultural population, share of primary industry in GDP, and share of secondary industry in GDP.

In Appendix B, we carry out a number of robustness checks. First, our definition of policy year comes from our subjective reading of the policy documents. However, the policy years in five provinces (Heilongjiang, Jiangxi, Sichuan, Guizhou, and Ningxia) are subject to debate, as discussed in footnote 13. We exclude those five provinces as a robustness check. Second, we exclude some "special" provinces, such as minority-populated autonomous regions (Inner Mongolia, Guangxi, Ningxia, and Xinjiang) and the municipalities directly under the control of the central government (Beijing, Shanghai, and Tianjin). Third, we examine the influence of four historical events as possible confounding factors that both took place during the early 1970s and could affect people's fertility behavior. The four events include the Cultural Revolution, the Sent-Down Movement, rural school expansion programs, and economic developments. The estimated effect of the FPLG remains almost unchanged, indicating that the local intensity of the those events was not systematic with respect to the establishment of the leading group.

5.2 Policy intensity and heterogeneous effects on fertility

Quantifying the intensity of the effect that policies have on fertility is a challenging task. One approach is to assume that the intensity is proportional to the gap between the policy target and the current situation. The rules of family planning in the 1970s were mostly equal across provinces regardless of initial fertility level. The policies recommended later marriage (age 23 for women and age 25 for men) and fewer births (a maximum of two children per couple). We hypothesize that the leading group's effect is larger among provinces that initially started with higher fertility and a higher prevalence of "early" marriage. The following equation formally tests this hypothesis:

$$\begin{aligned} \text{TFR}_{p,t} = \beta_1 \text{Y\_After}_{p,t} + \beta_2 \text{Y\_After}_{p,t} \times \left(\text{TFR}_{p,1969} - \overline{\text{TFR}}_{1969}\right) \\ + \gamma \mathbf{X}_{p,t} + \text{Prov}_p + \text{Year}_t + \varepsilon_{p,t}, \\ \text{where } \text{Y\_After}_{p,t} = \max\left(0, t - T_p\right). \end{aligned}$$

$\text{TFR}_{p,1969}$ is the initial provincial total fertility rate of province p in 1969 and $(\text{TFR}_{p,1969} - \overline{\text{TFR}}_{1969})$ captures the deviation from the national mean. Alternatively, we can replace $\text{TFR}_{p,1969}$ with the share of early marriages between 1965 and 1969 for each province.[21]

Columns (3), (4), (8), and (9) of Table 2 report the estimations, which support the hypothesis that the effect of the family planning policies during the early 1970s was larger among provinces with higher initial fertility or higher early marriage rates. In

[21] We calculate the values as follows. We first retain the sample from the 2000 census that reported a first marriage between 1965 and 1969 and then define early marriage as those in which men and women were younger than 25 and 23.

1969, the highest fertility rate was 6.730 in Guizhou province and the national average fertility rate was 5.554. Taking the estimates from Column (3), we find the effect in Guizhou province was 31.2% larger than the national average effect.[22] Early marriage was most prevalent in Ningxia (at 82.9%, versus a national average of 69.5%). Estimates from Column (4) indicate that the effect on Ningxia was 32.5% higher than the national average.[23] Columns (8) and (9) yield quantitatively similar findings with the alternative first-difference specification.

People may wonder whether the treatment effect is stronger among provinces that were eager to set up the FPLG early. This question is also possibly related to the determination of the policy year. In Columns (5) and (10), we include the interaction between the treatment variable and the year of FPLG establishment (minus 1972, which is the average year of establishment). We find that the coefficients are small and statistically insignificant, suggesting that there is no heterogeneous effect across the timing of FPLG establishment.

5.3 The effect on sex ratio at birth

One well-known result of China's OCP is that it led to a biased sex ratio (Hull 1990; Ding and Hesketh 2006; Ebenstein 2010; Bulte, Heerink, and Zhang 2011; Li, Yi, and Zhang 2011; Loh and Remick 2015). Figure 1 suggests that after 1979, there was a rapid escalation in the sex ratio at birth (the number of male children per 100 female children). The sex ratio consistently exceeded 115 after 1990. We therefore ask the question: Did the family planning policies of the early 1970s also result in a biased sex ratio? Columns (1) and (2) of Table 3 estimate the linear-trend and first-difference specifications with the birth year-province sex ratio as the dependent variable. The coefficients are positive but statistically insignificant. These findings do not contradict those of Babiarz et al. (2018), who conclude that the LLF policies coincided with increased sex selection in China. This could be because the vast majority of "sex selection" in their study derives from male-biased stopping rules, which should not affect sex ratio at birth.

[22] $\frac{-0.249-0.066\times(6.73-5.554)}{-0.249}-1=0.312$

[23] $\frac{-0.238-0.577\times(0.829-0.695)}{-0.238}-1=0.325$

Table 3: The effect of the FPLG on other provincial outcomes

Dependent variable:	sex ratio at birth		FPP funds (millions RMB)	
Specification:	linear-trend	first-difference	linear-trend	first-difference
Period:	1969–1978		1971–1978	
	(1)	(2)	(3)	(4)
years since FPLG establishment	0.561	1.050	80.199*	37.363
	(0.377)	(1.098)	(45.546)	(27.796)
R-squared	0.257	0.066	0.892	0.328
observations	280	252	224	196

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the provincial level using the wild cluster bootstrap method (Cameron, Gelbach, and Miller 2008). Year dummies and province dummies are controlled in all specifications. Control variables include GDP per capita, share of the nonagricultural population, share of primary industry in GDP, and share of secondary industry in GDP.

Two explanations can be given for why a decreasing fertility rate did not lead to an escalating sex ratio in the early 1970s even though a son preference may have been prevalent. First, the family planning policy was mostly voluntary during the early 1970s or was at least significantly less coercive than the OCP that followed (Zhang 2017). Although explicit quotas on how many children a couple could bear existed, the punishment for a violation was quite limited. Gender selection involved risks and costs. As a result, the incentive for gender selection in the absence of a strict birth quota was limited. Second, gender selection technology (mainly ultrasound B) did not become widely available in China until the late 1980s (Zeng et al. 1993; Chu 2001; Li and Zheng 2009; Chen, Li, and Meng 2013), and son preference on its own cannot generate a biased sex ratio without the means for choosing a child's gender (Li, Yi, and Zhang 2011). Even if households have the desire to have more sons, they are not able to do so without gender selection technology.[24] Coale and Banister (1996) find that an escalation in the proportion of young women missing since the 1980s has been largely caused by the rapid escalation in sex-selective abortions. Li and Zheng (2009) and Chen, Li, and Meng (2013) demonstrate that improved local access to ultrasound technologies resulted in a substantial increase in the sex ratio at birth.

[24] The literature also documents two other approaches for gender selection: female infanticide and misreporting (or hiding) (Zeng et al. 1993; Coale and Banister 1996). However, the incentive to use such extreme methods without a strict birth quota, such as the OCP, is limited.

6. The effect of policy exposure at the household level

The previous section highlights the large effect of the FPLG on total fertility rate at the provincial level, aggregated from household fertility behavior (Coale and Li 1987). However, it would also be helpful to understand the household-level response to changes in the family planning policies that took place in the early 1970s.

Yet, shifting from province-level analysis to household-level analysis is not as easy as it may seem, because it is difficult to find an exogenous and clear policy treatment. Two reasons account for this difficulty. First, the measure should not rely on information on children because both the number and the timing of childbirths directly respond to family planning policies. Second, there is no clear-cut treatment and control group. Taking Shandong province, which formed a leading group in 1970, as an example, a woman aged 18 in 1970 was affected because her entire reproductive period was influenced by family planning, but a woman aged 35 might also be affected because she could have given birth to more children in the absence of family planning. To identify the causal impact of family planning policies at the household level, we develop a measure of policy exposure (Equation (1)) that relies on the mother's province and birth cohort. In the remainder of this section, we first present the micro effect from the mother's and child's perspective, respectively, followed by a discussion on the comparison between province-level and household-level effects.

6.1 The micro effect from the mother's perspective

The first three columns in Table 4 provide the results for the parents' perspective using mini-census 2005 and estimate the effect of a household's exposure to the policies on its total fertility. Column (1) suggests that exposure to the family planning policy during the early 1970s is associated with a smaller number of births.

One potential limitation with our construction of policy exposure is that it uses provincial variation in both the establishment year of an FPLG and initial fertility profiles in 1969. This first variation is arguably clean; however, the second variation is potentially more problematic. One alternative way of defining exposure is to rely solely on different establishment years for leading groups. As a robustness check, we provide results with the following definition of policy exposure:

$$\text{FPP}^{N}_{p,c} = \sum_{a=15}^{49} \text{AFR}_{\text{national}}\left(a\right) \times I\left[c + a \geq T_p\right].$$

The key difference from equation (1) is that we apply the national fertility pattern

$\text{AFR}_{\text{national}}(a)$ to all provinces. Therefore, after being conditional on the cohort fixed effects c, the remaining variations only originate from T_p – the establishment year of the FPLG. Column (2) of Table 4 uses this alternative policy exposure. The coefficient changes slightly from -0.384 to -0.345, but the statistical significance declines because the standard errors more than double. This is understandable because the new policy exposure shuts down the provincial variation in initial fertility, which can serve as a proxy for policy intensity, as suggested in Section 5.2. A comparison between Columns (4) and (5) from the child's perspective, which will be discussed in detail later in this section, also suggests that using only the variation in FPLG establishment generates similar results.

Column (3) of Table 4 estimates the effects of exposure to the 1970s policy and to the OCP separately.[25] The results suggest that the 1970s policies capture most of the decline in family size and that the additional effect of the OCP is quite small. Despite being statistically significant, the coefficient of the OCP is about one-fourth the size of the FPLG (-0.085 versus -0.328). This finding is consistent with the observations from Figure 1 and the findings from Wang (2014) and Wang, Zhao, and Zhao (2017), who also identify a small additional effect of the OCP conditional on previously existing policies.

6.2 The micro effect from the child's perspective

Columns (4)–(6) of Table 4 provide the child's perspective using the CFPS and estimate how parents' exposure to the policy affects their number of siblings. We reach almost identical findings despite using very different datasets and adopting different perspectives. The strength of our results further supports the importance of the pre-OCP family planning policies' effects.

To understand the performance of our proposed policy measure, we adopt an alternative measure that defines treatment status according to children's birth year, as shown by Columns (7) and (8) in Table 4. This exercise speaks to the question, What if we define policy treatment according to children's birth years? Column (7) suggests that children born later generally have fewer siblings. However, once children's cohort fixed effects are controlled for in Column (8), we find no evidence of a significant effect on the number of siblings for children born after the introduction of family planning. As previously discussed, a child's year of birth is not a good measure of exposure to family planning, but our proposed measure provides robust results when both mother's and children's cohort fixed effects are controlled (Columns (4)–(6)).

[25] The coefficient of exposure to the OCP should be interpreted as the additional effect of the OCP. Table 4 uses the earliest establishment year among three OCP-related institutions. As a robustness check, Table A-2 instead uses the latest (and the average) establishment years and produces similar results.

Table 4: The effect of exposure to family planning policies on the number of children (or siblings) at the micro level

	Mother's perspective (census 2005)			Children's perspective (CFPS 2010)				
Dependent variable:	Number of Children			Number of Siblings				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mother's exposure to FPLG	−0.384***		−0.328***	−0.308***		−0.285***		
	(0.088)		(0.081)	(0.043)		(0.036)		
mother's exposure to FPLG (only variation in FPLG)		−0.345*			−0.306***			
		(0.195)			(0.041)			
mother's exposure to OCP			−0.085**			−0.101		
			(0.031)			(0.065)		
children born after FPLG							−0.908***	−0.065
							(0.051)	(0.087)
children born after earliest OCP inst.							−0.565***	0.027
							(0.056)	(0.053)
urban *Hukou*	−0.689***	−0.692***	−0.688***	−0.487***	−0.492***	−0.484***	−0.460***	−0.501***
	(0.047)	(0.047)	(0.047)	(0.071)	(0.071)	(0.070)	(0.076)	(0.075)
ethnic minority	0.230***	0.231***	0.230***	0.318	0.314	0.319	0.291	0.313
	(0.077)	(0.077)	(0.076)	(1.457)	(1.468)	(1.433)	(2.005)	(1.590)
children's cohort fixed effects	N	N	N	Y	Y	Y	N	Y
mother's cohort fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
mother's education	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.415	0.412	0.415	0.406	0.404	0.406	0.359	0.395
observations	375375	375375	375375	11311	11311	11311	11311	11311

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the provincial level using the wild cluster bootstrap method (Cameron, Gelbach, and Miller 2008). Province dummies are controlled in all specifications.

6.3 Provincial effect versus micro effect

Women's average exposure to FPLG scores 3.94 in 1978.[26] Multiplying by a coefficient of -0.328 (from Column (3)) suggests that the policy leads to a reduction of 1.29 children from 1969 to 1978.

This micro-level analysis provides further insight into the decline in the total fertility rate. Since the total fertility rate captures the aggregated fertility behavior of a group of people in a given year, its decline can be disaggregated into two parts: a delaying effect and a reduction effect. The delaying effect means that people do not have children in the current year and instead delay childbirth. In that scenario, even without a decline in the eventual number of children, we can still observe a temporary decline in the total fertility rate. The "later" (marriage) and "longer" (intervals) policies are expected to postpone the arrival of children.[27] The reduction effect refers to a decrease in the total number of children that a woman gives birth to during her lifetime. If the delaying effect explains most of the decline in the total fertility rate, then we should expect no long-run impact on China's demographic structure, despite a rapid decline in fertility within a short period. However, the reduction effect can permanently modify the demographic structure. A comparison between the estimates from provincial-level data (Table 2) and those from micro-level data (Table 4) suggests that a reduction in the total number of children explains most the decline. Table 2 suggests that the early 1970s policies explain a decline in the fertility rate of 1.49. Table 4 reveals that exposure to the early 1970s policies (conditional on exposure to the OCP) accounts for a reduction in total fertility of 1.29. Comparing these two results suggests that 86.6% of the fall is due to the reduction effect.

7. Mechanisms of the FPLG

In Section 2, we explain that the leading group had three main duties: enforcing "later, long, fewer" policies, broadcasting family planning policies, and providing technical support for birth control. In this section, we ask: What government actions contributed to population control? We explore three channels using both statistical and qualitative evidence: pressure from high-level officials, intensified propaganda programs, and increased use of birth control measures (either voluntary or coercive).

[26] This number is calculated as follows: The average exposure in 1969 is zero by construction. Computing the average policy exposure in 1978 requires analyzing women distributed across provinces and ages. We approximate this distribution using the 1982 census and reducing by four years of age. Women's reproductive periods range from ages 15 to 49, during which mortality rates are low. Therefore, a shift of four years should not bias the age structure.

[27] Those two policies can also have an indirect effect on the number of children. Given that a woman's fertile period is fixed, later marriage and longer intervals naturally shrink the time in which she can have children.

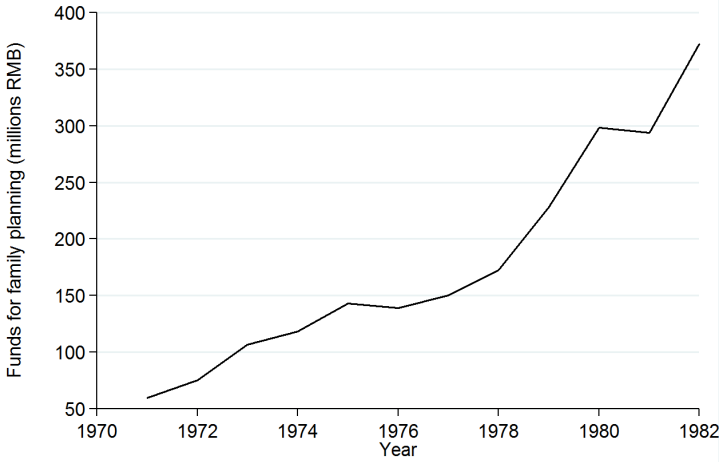
First, the FPLG was an important institution at the province level; its group leader was typically the first or the second chair of the provincial government. Therefore, the establishment of the leading group symbolized a greater emphasis on family planning. For example, the Shanxi FPLG held a conference in June 1971 shortly after its establishment to emphasize that family planning was a priority for the government:

> *Enforcing family planning involves every household. We must inspire a broad population and give family planning a big buildup on press. [. . .] The Revolutionary Committee should put family planning on calendar and assign specific persons in charge of studying, inspecting, and enforcing family planning policies. Responsible cadres at all levels must take the lead in studying, advocating, and practicing the policies. [. . .] Departments of propaganda, commerce, technology, planning, finance, and public health must put family planning into routine works and coordinate together to enforce the work of family planning.* (Peng 1997: 1276)

Support comes together with pressure. We observe increasing funds for family planning affairs after the establishment of a provincial leading group.[28] The National Population and Family Planning Commission of P.R. China (2007) documents the funding for family planning at the national and provincial levels since 1971, which is displayed in Figure 7. Family planning funding experienced two rounds of rapid expansion. The first expansion took place between 1971 and 1975 (the period when provinces gradually established the leading group), and the second expansion period was the post-1978 increase that accompanied the enforcement of the more stringent OCP. To verify that leading group establishment caused an increase in funding for family planning, Columns (3) and (4) of Table 3 adopt a regression framework similar to that used in the analysis of the total fertility rate. The results provide weak evidence that provinces with established leading groups received more funds in support of family planning activities from the central government.

[28] In total, 30–35% of the funds were used for administrative affairs, and 60–65% were used for distributing contraceptive pills and covering fees for birth control operations (National Family Planning Committee of P.R. China, Comprehensive Planning Department 1983).

Figure 7: Funding trends for family planning



Source: The National Population and Family Planning Commission of P.R. China (2007).

Second, the policies in the early 1970s were accompanied by intensified propaganda programs, spreading at the province level and county level. For example, the chronicles of Henan province document that:

> *In January 1975, Henan advocated a movement named 'Family Planning Awareness Month.' Henan Office of Family Planning held a conference of over 7,000 people to broadcast the family planning policies and to criticize old thoughts and ideas. The activity was endorsed by the state FPLG and was promoted to the whole country. Since then, 'Family Planning Awareness Month' was held every year in Henan for 13 times from 1975 to 1987.*

The county government also attached great importance to the propaganda programs. For example, local gazetteers of Shanggao, a county located in Jiangxi province, document that family planning was promoted in every village:

> *In 1975, Shanggao county held over 360 classes and over 42,400 cadres and masses participated in the study. The classes selected activists to form family planning report groups, whose goal is to educate people down to the village. Shanggao county also transferred bare-foot doctors and medical staffs to form 19 teams of family planning. The teams went down to each village to advocate family planning policies and introduce knowledge about birth control. They*

> *also helped to fulfill the need for birth control. Shanggao county was chosen as an advanced national model of family planning.*

The propaganda programs not only penetrated to the village level but also involved the revision of the school curriculum. For example, the chronicles of Jiangsu province document that:

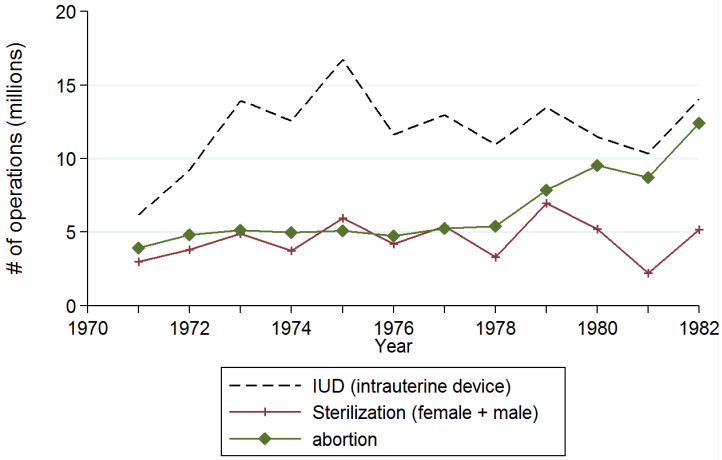
> *Starting from 1975, the province requested middle schools to offer courses on physiological hygiene and encourage late marriage. [. . .] The province printed over two million family planning booklets between 1972 and 1978.*

Therefore, the propaganda programs quickly raised awareness of family planning policies and birth control measures.

Third, the policy promoted the use of fertility control measures. The National Family Planning Committee of P.R. China, Comprehensive Planning Department (1983) records the number of family planning operations, including IUD insertions, sterilizations, and abortions from 1971 to 1982; that are shown in Figure 8. IUD insertion was the most important birth control measure at the time and experienced a rapid increase in prevalence in the early 1970s.[29] In 1971, there were 6.2 million IUD insertion operations, but by 1975, this number had almost tripled to 16.7 million. The number of IUD insertion operations remained reasonably stable thereafter. However, the OCP period saw a rapid increase in abortions, reiterating the relative tolerance of the family planning policies of the early 1970s compared to the OCP.

[29] In 1982, 114 million women adopted at least one birth control measure: 57 million (50.0%) had an IUD inserted; 42 million (36.8%) were sterilized (or their husband was sterilized); and 13 million (11.4%) used condoms or took contraceptive pills (National Family Planning Committee of P.R. China, Comprehensive Planning Department 1983).

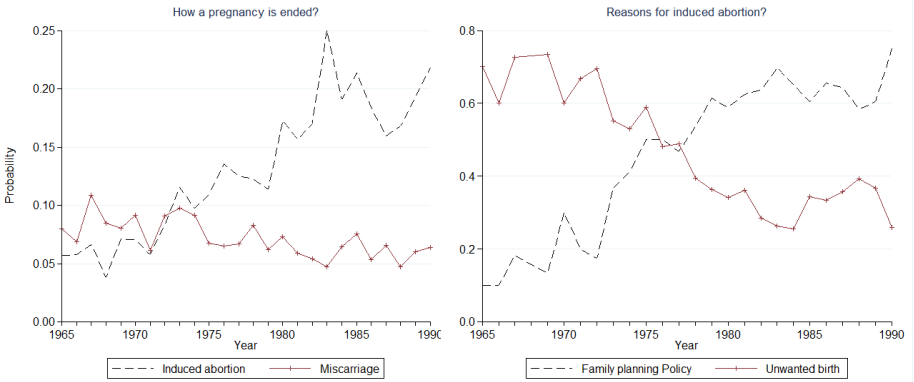
Figure 8: Methods of birth control



Source: National Family Planning Committee of P.R. China, Comprehensive Planning Department (1983).

In recognizing these mechanisms, it is natural to ask the question: Were these fertility control measures voluntary or coercive? To address this, we use data from the 2014 Life History Survey of the China Health and Retirement Longitudinal Study (CHARLS), which is a nationally representative survey of Chinese residents aged 45 and older and serves the needs of scientific research on the elderly. In 2014, CHARLS surveyed respondents' life histories, including pregnancy histories. The data include 1,871 women who reported being pregnant at least once between 1965 and 1990. The left panel of Figure 9 plots how each pregnancy ended. Prior to 1970, the rate of induced abortion fluctuated at around 6%. This rate then rose rapidly to 11% in 1975 but was still significantly lower than the rate of 20% following the implementation of the OCP in 1979. However, the right panel reveals that family planning was not the only reason for induced abortion. Prior to 1975, unwanted birth remained the dominant reason. After 1979, as the policies became stricter, policy-related abortions accounted for more than two-thirds of total abortions. Therefore, we conclude that at least part of the decline in the fertility rate can be attributed to households' greater ability to control their fertility and to avoid unwanted births during the early 1970s. This echoes the results of Goldin and Katz (2002) and Bailey (2006) suggesting that access to the oral contraceptive pill improved women's ability to plan childbearing in the United States.

Figure 9: Retrospective history of pregnancy termination



Source: Authors' calculation based on the China Health and Retirement Longitudinal Study, 2014.

Finally, we compare the effect of China's family planning policies in the 1970s to those adopted by other countries. Miller and Babiarz (2016) review empirical studies of family planning programs in developing countries and find that the effects of programs on fertility vary substantially, ranging between fertility reductions of 5% and 35%. Therefore, our estimates are close to the upper bound of this range.[30] Three reasons can potentially explain why family planning has been more effective in China. First, China's family planning policies were more stringent than those in other countries in the early 1970s, although less coercive than those of the OCP. Ross and Stover (2001) imputed the Family Planning Program Effort Index, which measures program intensity and is available for 1972, 1982, 1989, 1994, and 1999. China received the highest (most intensive) score in 1972.[31] Second, propaganda programs in China can be especially effective in inducing people to have fewer children because of the country's political regime. Cantoni et al. (2017) show that a change in the school curriculum between 2004 and 2010 successfully shaped students' attitudes toward the government. This propaganda effect could reasonably have been even larger in the 1970s, when China was still a planned economy and people had limited access to information. Finally, the hierarchical structure of the Chinese government creates strong incentives for local officials to achieve the goal set by the central government, which is known as the political tournament for promotion (Li

[30] Our estimates suggest a decline of 1.49 births from 5.72 births in 1969 – a 26.0% reduction in total fertility rate.

[31] The index measures 30 features of program efforts, which can be organized into four groups: policy and stage-setting activities; service and service-related activities; evaluation and recordkeeping; and availability of fertility control methods.

and Zhou 2005). In a recent study, Serrato Suárez, Wang, and Zhang (2019) show that self-reported performance in enforcing the OCP predicts mayoral promotion in China.

8. Conclusions

In this study, we highlight the importance of the FPLG in explaining the rapid decline in China's total fertility rate during the 1970s. From 1969 to 1975, provinces gradually began forming Family Planning Leading Groups, whose responsibility was to promote the implementation of the family planning policy under the guidance of the central government. This establishment symbolized the recovery of family planning from the Cultural Revolution and proved to be quite effective. The total fertility rate declined from 5.7 in 1969 to 2.7 in 1978. Exploiting different years of establishment for the provincial FPLGs across the country, we estimate that they explain around half of the decline in fertility during the period. We also develop a new measure of households' exposure to the family planning policies, based on the province and mothers' birth cohorts. The new measure overcomes the endogeneity of the timing of childbirth, and the policy's impact on households can be identified by provincial variation in the establishment year of the FPLG.

The central result of this study is that 1970 should be considered the starting point of effective family planning policy and the gradual transition of the fertility pattern in China, rather than 1979 with the introduction of the OCP. Researchers should not model China's fertility change as an abrupt decline in the fertility rate from 1979, as this would lead to incorrect forecasts of China's demographic transition.

However, our study has limitations. Perhaps the most important of these is that we treat family planning as a policy bundle and do not identify the contribution of each policy within the bundle separately. This hinders our understanding of how China's family planning policies of the 1970s were implemented and restricts the external validity of our findings. Nevertheless, the main purpose of our study is to highlight and quantify the policy impact of China's family planning before the implementation of the OCP. We leave the challenging task of disentangling the policy bundle to future researchers.

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Appendix A: Additional figures and tables

Figure A-1: China's total fertility rate from various sources

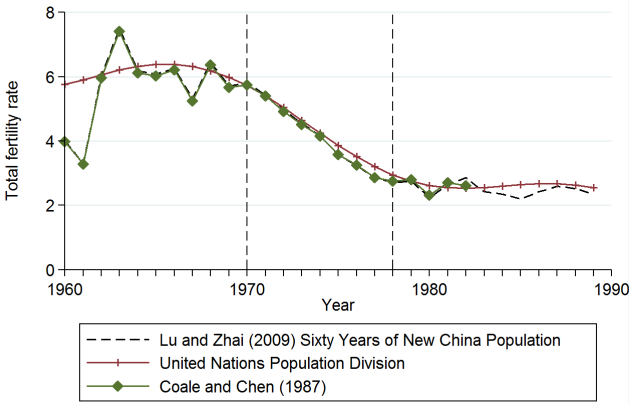
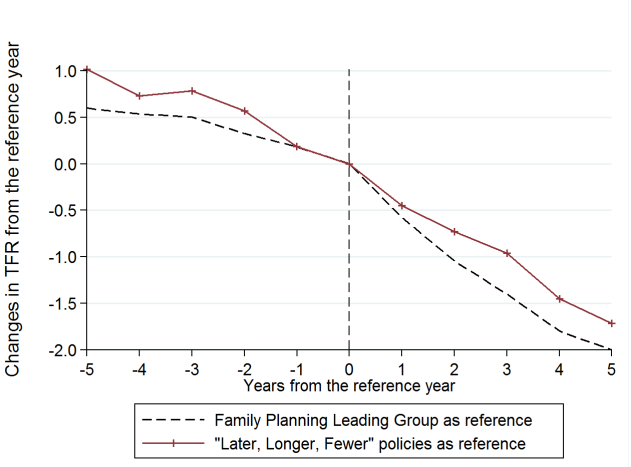


Figure A-2: FPLG or LLF policies?



Note: This figure plots the changes in total fertility rate from the reference year. The dashed line uses the establishment year of the FPLG as the reference point. The solid line uses the effective year of the LLF policies from Babiarz et al. (2018) as the alternative reference year.

Table A-1: The establishment years of the FPLG

Province	Policy Year	Details
Beijing	1973	In 1973 FPLGs or Family Planning Commissions were formed at various levels (city, district, county, bureau, office, department, and firm).
Tianjin	1972	In April 1972, the Tianjin Family Planning Commission was established. (It later became an FPLG.)
Hebei	1972	In February 1972, the Hebei FPLG was formed.
Shanxi	1971	In May 1971, the FPLG of the Shanxi Revolutionary Committee was formed.
Inner Mongolia	1972	In 1972 and 1973, the FPLG and Office of Family Planning (now the Family Planning Commission) of Inner Mongolia were formed.
Liaoning	1972	On December 31, 1972, the Liaoning Revolutionary Committee rebuilt the provincial Family Planning Commission (which became an FPLG in 1975).
Jilin	1972	In 1972, the provincial FPLG was formed.
Heilongjiang	1972	On October 4, 1972, an agreement was made to establish the Family Planning Commission.
Shanghai	1973	In 1973, the same year the State Council rebuilt the FPLG and the Office of Family Planning, Shanghai restored the corresponding organizations.
Jiangsu	1973	In September 1973, the FPLG of the Jiangsu Revolutionary Committee and its offices were established.
Zhejiang	1971	In July 8, 1971, the State Council issued document [1971]51. The Zhejiang Revolutionary Committee issued the document on September 4. The main target was to restore and reinforce the FPLG.
Anhui	1972	In September 12, 1972, the Anhui Revolutionary Committee issued "A Notice on Adjusting and Replenishing Family Planning Commission," increasing the commission members from 15 to 25. The committee was renamed an FPLG in 1977.
Fujian	1972	In 1972, the provincial Revolutionary Committee rebuilt the FPLG and established an office in the province sanitary bureau.
Jiangxi	1972	On March 13, 1972, the Jiangxi Revolutionary Committee issued a document establishing the Family Planning Commission and attached its office to the sanitary bureau.
Shandong	1970	In June 1970, the Shandong Revolutionary Committee decided to form the Shandong FPLG.
Henan	1973	In August 1973, the Henan Family Planning Commission was rebuilt. (It became an FPLG in 1977.)
Hubei	1971	On August 11, 1971, the Hubei Revolutionary Committee decided to establish an FPLG.
Hunan	1971	On May 12, 1971, the provincial Revolutionary Committee issued "A Notice on Forming Provincial Family Planning Leading Group," which restored once-incapacitated family planning institutions.
Guangdong	1969	On September 10, 1969, the Guangdong FPLG was established.
Guangxi	1974	In July 1974, the FPLG of the autonomous region was established.
Sichuan	1971	In July 1971, Sichuan decided to immediately form a Family Planning Commission.

Table A-1: (Continued)

Province	Policy Year	Details
Guizhou	1975	In 1975, Family Planning Commissions (or offices) were set up at various levels (province, prefecture, and county)
Yunnan	1972	On June 24, 1972, the province-level FPLG was restored.
Shaanxi	1971	In December 1971, the Shaanxi Family Planning Commission was restored. (It became an FPLG in 1973.)
Gansu	1971	In November 1971, the FPLG of the Gansu Revolutionary Committee was formed.
Qinghai	1974	On January 16, 1974, the Qinghai Revolutionary Committee issued a document establishing the Qinghai FPLG.
Ningxia	1972	The Family Planning Commission was formed in 1972.
Xinjiang	1975	In 1975, FPLGs were established at various levels of the autonomous region.

Source: Authors' collection from population chronicles in various provinces and from the *Encyclopedia of Chinese Family Planning* (Peng 1997).

Table A-2: The effect of exposure to family planning policies on the number of children (or siblings) at the micro level, with an alternative definition for the OCP

	mother's perspective (Census 2005)		children's perspective (CFPS 2010)	
Dependent variable:	number of children		number of siblings	
	(1)	(2)	(3)	(4)
mother's exposure to FPLG	−0.368***	−0.353***	−0.318***	−0.310***
	(0.087)	(0.092)	(0.049)	(0.044)
mother's exposure to OCP (latest inst. year)	−0.091*		−0.039	
	(0.052)		(0.052)	
mother's exposure to OCP (average inst. year)		−0.091**		−0.060
		(0.043)		(0.062)
urban *hukou*	−0.688***	−0.688***	−0.486***	−0.485***
	(0.047)	(0.047)	(0.071)	(0.071)
ethnic minority	0.230***	0.230***	0.318	0.319
	(0.076)	(0.077)	(1.460)	(1.454)
children's cohort FE	N	N	Y	Y
mother's cohort FE	Y	Y	Y	Y
mother's education	Y	Y	Y	Y
R-squared	0.415	0.415	0.406	0.406
observations	375375	375375	11311	11311

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the provincial level using the wild cluster bootstrap method (Cameron, Gelbach, and Miller 2008). Province dummies are controlled in all specifications.

Appendix B: Robustness checks

B.1 Robustness of the FPLG establishment years

We treat the first reference to the establishment (or recovery) of a provincial FPLG in the early 1970s as the policy's year of implementation. As discussed in footnote 13, this definition is unambiguous for 23 out of 28 provinces in our analysis. The other five provinces (Heilongjiang, Jiangxi, Sichuan, Guizhou, and Ningxia) either did not record the establishment of the FPLG or set up the FPLG at a different time for different policy purposes. We use the establishment year of the Family Planning Commission instead for those five provinces. Therefore, it would be helpful to carry out a robustness check that excludes those five provinces. Column (1) in Table B-1 reports the results, which are almost identical to our main results (Table 2).

B.2 Excluding "special" provinces

China is a large country with wide geographical variation, such that the characteristics of provinces vary significantly. There are two special types of provinces in China. The first type includes the minority autonomous regions (Inner Mongolia, Guangxi, Ningxia, and Xinjiang).[32] These provinces feature a larger proportion of minorities, who were subject to different family planning policies than those enforced for the Han ethnic group during our sample period. Nevertheless, we include these autonomous regions in our data because the application of family planning policies is based on an individual's ethnicity and not their resident province. This means that the Han ethnic group is subject to stricter family planning policies even in the minority autonomous regions, implying that these provinces were also affected by the establishment of the FPLG. As a robustness check, Column (2) in Table B-1 reports the results excluding the three minority autonomous regions from the sample. The estimated coefficients remain positively significant, but the magnitude is smaller. This is consistent with our findings, shown by Table 2, that family planning's effect is larger in provinces with higher initial fertility. Excluding minority autonomous regions, which were generally less developed and had higher initial fertility rates (5.83 in Inner Mongolia, 5.95 in Guangxi, 6.35 in Ningxia, and 6.32 in Xinjiang, as opposed to a national average of 5.55), would reduce the estimated effect. The second special type includes the municipalities directly under the control of central government (Beijing, Shanghai, and Tianjin). These municipalities feature a higher level of development and play important roles in China's economic and political activities. These three municipalities also had the lowest fertility rates in 1969 (3.57 in Beijing, 3.39 in Tianjin,

[32] Tibet is also a minority autonomous region, but it is excluded from our sample due to a lack of information.

and 2.36 in Shanghai), at a time when the national fertility rate was 5.72. Column (3) in Table B-1 shows that excluding these municipalities makes the impact even larger.

B.3 Possible influence from other contemporaneous events

In this subsection, we discuss three historical events (the Cultural Revolution, the sent-down-youth program, and school expansion programs) that share two common features. First, all of these events had potentially important impacts on the fertility rate. Second, these events also took place around the early 1970s and therefore coincided with the establishment of the FPLG.

Cultural Revolution

The Cultural Revolution was a catastrophic political event in China that spanned the decade from 1966 to 1976. The estimated fatalities range from 250,000 to 1.5 million, and the number of victims (imprisoned or persecuted) has been stated as 30 million (Walder and Su 2003). In addition to widespread violence, there were also disruptions in government activities, including family planning. The Cultural Revolution could affect our empirical strategy for two reasons. First, fertility is a procyclical decision (Lindo 2010; Schaller 2016; Chevalier and Marie 2017), such that the violence and uncertainty brought by the Cultural Revolution could have suppressed fertility. Second, the severity of the Cultural Revolution might have directly affected the establishment of leading groups. Provinces with less violence might have experienced less disruption in government functioning and were able to establish leading groups earlier.

To evaluate the possible impact of the Cultural Revolution on our empirical analysis, we construct a variable indicating the local severity of the Cultural Revolution. Following Bai (2014), we use provincial fatalities, which are aggregated from regional gazetteers,[33] as a share of the 1965 population to produce a proxy measure of local intensity. Column (4) of Table B-1 reports the estimation results, which also include the interaction between the Cultural Revolution's local intensity and post–leading group establishment. The estimated coefficient of the FPLG is almost identical to that in our main results (-2.39 as opposed to -2.49 in Table 2), suggesting that the Cultural Revolution is systematically associated with the family planning policy.

Sent-Down Movement

The Sent-Down Movement, also known as rural rustication, was partially related to the attempt to end the urban unrest following the Cultural Revolution and was, in part, de-

[33] This data was obtained from the "China Political Events Dataset, 1966–1971" (Walder 2017).

signed to discharge the Red Guards (Bernstein 1977).[34] The movement resettled roughly 17.7 million urban youths to rural areas between 1967 and 1978 (Gu 2009). It should be expected that being far away from home and living in an unfamiliar place could have lifetime consequences, including delayed marriage and childbearing (Zhou and Hou 1999). Although the vast majority (more than 90%) of the sent-down youth returned to urban areas by 1980, a small proportion settled permanently in the rural areas to which they were sent. Figure B-1 briefly describes the impact of the sent-down-youth program from the 2010 wave of the CFPS, which provides information about whether individuals experienced the sent-down-youth movement, along with the start and end years. Cohorts born between 1945 and 1960, who were at the peak of their fertile period during the 1970s, were the most severely impacted.

As for the analysis of the Cultural Revolution, we construct a measure of the local intensity of the sent-down-youth program. We take the total numbers of sent-down youths from each province (both those settled within the province and those settled outside the province) from Gu (2009). We then divide this number by the provincial population born between 1945 and 1960 (as calculated using the 1982 census), cohorts who were most vulnerable to being sent-down, as a proxy for the intensity of the sent-down-youth program.[35] Column (5) of Table B-1 reports the results when accounting for the possible influence of the sent-down-youth program. Again, we find no evidence that the sent-down-youth program systematically affects our main results.

School expansion programs during the 1970s

A large body of literature has aimed to identify how the disruption of the education system in urban China during the Cultural Revolution negatively impacted people's educational attainment (Meng and Gregory 2002; Zhang, Liu, and Yung 2007; Meng and Zhao 2016; Giles, Park, and Wang 2019). The Cultural Revolution seemingly suggests a decline in school enrollment during the 1970s. However, we see an exactly opposite pattern from the data. Based on the China Compendium of Statistics 1949–2008, we compute enrollment figures in primary and secondary schools per 10,000 people from 1960 to 1990, as plotted in Figure B-2. We observe a sizable increase in secondary school enrollment per 10,000 people, from 200 in 1968 to 750 in 1977. This pattern can be mainly explained by the school expansion program in rural China, whose goal was to achieve universal primary and secondary education (Pepper 1990). The expansion in rural areas was simultaneous with the disruption in urban areas, but this is rarely studied. (See (Hannum 1999) for more detail.)

[34] The Red Guards were formed by teenagers, most of whom were junior or senior high school students. They were used as a political weapon to fight those opposed to Mao's policies during the first years of the Cultural Revolution. However, the revolution spiraled out of control and became a "red terror." To reduce the violence, Chairman Mao issued instructions to send millions of urban youths to the countryside for "reeducation."

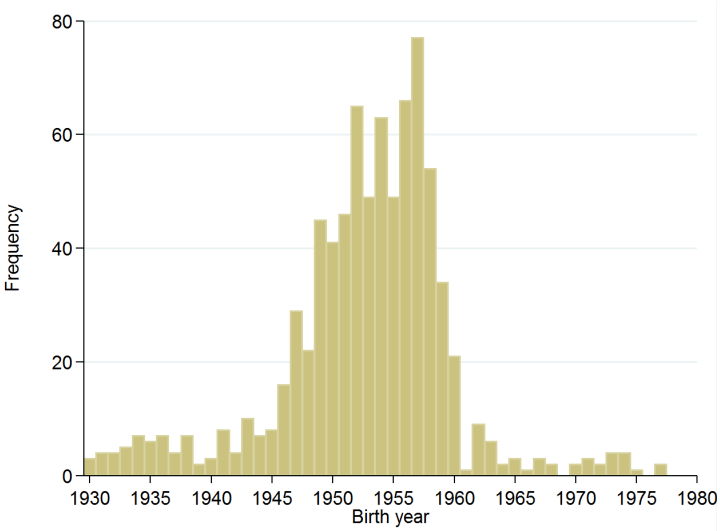
[35] Figure B-1 justifies this choice of cohort range.

Greater school enrollment can reduce the fertility rate, especially for teenage girls. Therefore, we also control for the share of primary school and secondary school attendees in a population for each province and each year. Note that this is a conservative approach, because lower fertility can inversely encourage schooling (Miller 2010; Huang, Lei, and Sun 2016). Nevertheless, Column (6) of Table B-1 suggests that greater school enrollment is indeed associated with a lower total fertility rate. However, it barely affects our estimated effect of the FPLG.

Economic development

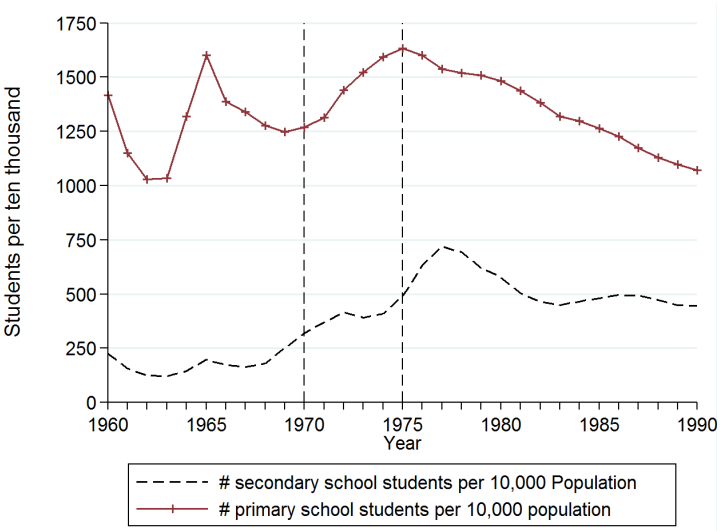
Aside from education, economic development is another decisive socioeconomic factor for fertility. People may wonder whether the Chinese economy experienced rapid changes during our sample period. We claim this is unlikely because the sample period in our analysis is 1969–1978, which is ahead of China's rapid economic growth. It is well-known that the Chinese economy started to boom in 1978, following its Reform and Opening-up Policy. The Chinese economy somewhat staggered in the early 1970s partially due to the Cultural Revolution. Moreover, we also include in our regression a wide range of economic covariates, including GDP per capita, the share of the nonagricultural population, the share of primary industry in GDP, and the share of secondary industry in GDP. Those covariates should already capture the influence of economic developments if there were any during our sample period.

Figure B-1: Cohort distribution of the sent-down-youth



Source: Authors' calculation based on the CFPS in 2010.

Figure B-2: School expansions during the early 1970s



Source: Authors' calculation based on the National Bureau of Statistics of China (2010).

Table B-1: Robustness check

Dependent variable:	total fertility rate					
Period:	1969–1978					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Linear trend specification						
years since FPLG establishment	−0.254*	−0.213	−0.268**	−0.239**	−0.236**	−0.280**
	(0.134)	(0.128)	(0.101)	(0.094)	(0.097)	(0.102)
years since FPLG establishment × Intens. of the Cultural Revolution				0.004		
				(0.005)		
years since FPLG establishment × Intens. of the Sent-down Movement					0.004	
					(0.006)	
% secondary school students in the population						−9.415
						(9.345)
% primary school students in the population						−3.204
						(6.326)
R-squared	0.944	0.937	0.918	0.934	0.935	0.939
observations	230	240	250	280	280	241
Panel B: First difference specification						
years since FPLG establishment	−0.235**	−0.230*	−0.243**	−0.245**	−0.237**	−0.279**
	(0.111)	(0.122)	(0.107)	(0.097)	(0.095)	(0.115)
years since FPLG establishment × intensity of the Cultural Revolution				0.002		
				(0.009)		
years since FPLG establishment × intensity of the Sent-down Movement					0.008	
					(0.005)	
% secondary school students in the population						−6.822
						(4.636)
% primary school students in the population						−4.962
						(4.682)
R-squared	0.281	0.266	0.209	0.209	0.217	0.211
observations	207	216	225	252	252	207
drop FPLG-vague provinces	Y	N	N	N	N	N
drop autonomous regions	N	Y	N	N	N	N
drop municipalities	N	Y	N	N	N	N

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered at the provincial level using the wild cluster bootstrap method (Cameron, Gelbach, and Miller 2008). Year dummies and province dummies are controlled in all specifications. Control variables include GDP per capita, share of the nonagricultural population, share of primary industry in GDP, and share of secondary industry in GDP.
Note: Intensities of the Cultural Revolution are approximated using provincial fatalities during the Cultural Revolution, obtained from the China Political Events Dataset, 1966–1971 (Walder 2017), as a share of the 1965 population. Intensities of the Sent-Down Movement are approximated using the number of total sent-down youth (both those settled within the province and those settled outside the province) from Gu (2009) as a share of the provincial population born between 1945 and 1960 (calculated using data from the 1982 census).