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The Long-term Consequences of Having Fewer Children in Old Age: Evidence from China's "Later, Longer, Fewer" Campaign.

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THE LONG-TERM CONSEQUENCES OF HAVING FEWER CHILDREN IN OLD AGE: EVIDENCE FROM CHINA'S "LATER, LONGER, FEWER" CAMPAIGN

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ABSTRACT

Family planning plays a central role in contemporary population policies. However, little is known about its long-term consequences in old age because of the identification challenge. In this study, we examine how family planning affects the quality of life of the Chinese elderly. The direction of the effect is theoretically unclear. On the one hand, having fewer children allows parents to reallocate more resources to themselves, improving their well-being. On the other hand, having fewer children also leads to less care and companionship from children in old age. To empirically probe the effect of family planning, we identify the causal impact by exploiting the provincial heterogeneity in implementing the "Later, Longer, Fewer" policies in the early 1970s. We find that the policies greatly reduced the number of children born to each couple by 0.85. Parents also receive less support from children in terms of living arrangements, inter vivos transfers, and emotional support. Finally, we find that family planning has drastically different effects on elderly parent's physical and mental well-being. Whereas parents who are more exposed to the family planning policies consume more and enjoy slightly better physical health status, they report more severe depression symptoms. Our study calls for greater attention to the mental health status of the Chinese elderly.

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1 Introduction

Family planning policies play a central role in contemporary population policies. According to the World Population Policies Datasets published by the United Nations, Population Division, the number of countries with direct government support for family planning reached 166 in 2015.[1] Some also claim that family planning played a fundamental role in the global fertility decline in recent decades (de Silva and Tenreyro 2017). Plenty of studies have been devoted to the immediate or short-term effects of family planning policies; however, there are surprisingly few studies on the long-term consequences of declining fertility as a result of family planning policies (Schultz 2008).[2] The dearth of such studies probably originates from the identification challenge. Decades after the enforcement of the family planning policies, there were numerous simultaneous changes in other factors that reshaped people's fertility behavior, such as socioeconomic factors (Poston and Gu 1987; Zhang 1990; Schultz and Zeng 1995; Cai 2010), birth-control technology (Goldin and Katz 2002; Bailey 2006; Bailey 2010), abortion policies (Pop-Eleches 2006; Myers 2017), and women's empowerment (Upadhyay et al. 2014).

China provides an excellent opportunity to study the long-term consequences of family planning. They are among the earliest countries to implement family planning, and their policies have been recognized as the most stringent in the world (Cleland et al. 2006).[3] Note that China initiated its stringent family planning policies in the early 1970s, which was ahead of the well-known one-child policy (OCP henceforth) that came into effect in 1979. The total fertility rate (TFR) declined drastically from 5.7 in 1969 to 2.7 in 1978 (Figure 1).[4] Chen and Huang (2018) show that the decline is closely related to the establishment of the Family Planning Leading Group who was in charge of a raft of intensified family-planning policies, including the famous "*Later, Longer, Fewer*" campaign. For ease of interpretation, we use the term "Later, Long, Fewer" (or LLF) to represent the whole raft of policies. Forty years later, the first group of the affected cohorts is moving into their sixties. Different from their predecessors, they will have fewer offspring who can take care of them; therefore, unveiling the long-term effects of family planning helps to understand the quality of life of this growing population.

[1] https://esa.un.org/poppolicy/wpp_datasets.aspx

[2] See Schultz (2008) for a comprehensive review of the effects of family planning (mostly short-term effects). He categorizes the effects into five categories: human capital formation (both mothers and children); family labor supply or time allocation; saving rate of parents; transfers of cash, goods, and time to and from household members; household living arrangements.

[3] Ross and Stover (2001) published the Family Planning Program Effort Index to measure program intensity, and China is the only country with a score higher than 80. The index measures 30 features of program efforts that can be further organized into four groups: policy and stage-setting activities; service and service-related activities; evaluation and recordkeeping; and availability of fertility control methods.

[4] Total fertility rate aggregates the fertility behavior of a group of people at a given time. Women of child-bearing age (15–49 years) are divided into several five-year age groups. 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 up the age-specific fertility rates and multiplying them by five gives us the total fertility rate. The total fertility rates represent the number of children a hypothetical woman would give birth to if she immediately went through her entire fertile history given the fertility pattern of the current population.

It is theoretically unclear how family planning affects the quality of life in old age. There is no doubt that children play critical roles in providing old-age support, especially in developing countries (including China). However, the reduction in the number of children does not necessarily lead to a worsening of the quality of life for seniors for three reasons. First, having fewer children spares resources that can be redirected to the parents. The reallocation of resources leads to an improved nutritional intake (Wu and Li 2012) and higher body mass index (Canning and Schultz 2012). Moreover, child-raising can be stressful for parents. Having fewer children also reduces parents' burden of childbearing, which may benefit their physical and mental health (Gove and Geerken 1977; Umberson and Gove 1989; Cáceres-Delpiano and Simonsen 2012). Secondly, parents can potentially turn to other measures of old-age support to substitute for having fewer children. For example, it has been well documented that Chinese households increased their savings in response to the family planning policies (Banerjee, Meng, and Qian 2010; Curtis, Lugauer, and Mark 2015; Choukhmane, Coeurdacier, and Jin 2016; Ge, Yang, and Zhang 2018). Finally, we should not simply interpret the effect of China's family planning policies as mechanically reducing households' welfare by imposing fertility restrictions. It also provides new technologies that allow households to manage better their childbirth. Access to birth-control technologies in countries without any restriction on fertility (e.g., the United States) also results in a reduced number of children (Goldin and Katz 2002; Bailey 2006; Bailey 2010). Interestingly, those studies claim the effect of contraceptive measures to be mostly positive. This indicates that people tend to have too many children if they have no access to birth-control technologies.

[Figure 1 About Here]

In this study, we examine the *long-term* consequences of China's family planning policy on the well-being of the elderly who are aged 60 and above. We examine a set of outcomes, including their living arrangements, received support from children, consumption, and physical and mental health. Our identification relies on the provincial variation in the establishment year of the Family Planning Leading Group in the early 1970s. Previous studies largely refer to the 1979 one-child policy as an exogenous shock to the fertility rate.[5] However, recent studies point out that the one-child policy has a fairly limited impact on lifetime fertility (McElroy and Yang 2000; Whyte, Wang, and Cai 2015; Wang 2016; Chen and Huang 2018; García 2018). Instead, a majority of the fertility decline in China actually took place during the 1970s prior to the enforcement of the one-child policy. Figure 1 plots the time series of China's total

[5]There are several ways to exploit the one-child policy as an exogenous shock. Some examples include comparing fertility behavior before and after 1979 (Ahn 1994; Ding and Hesketh 2006; Whyte, Wang, and Cai 2015), using the year 1979 as the cut-off for a regression discontinuity design (Qin, Zhuang, and Yang 2017), analyzing fines imposed on above-quota births (McElroy and Yang 2000; Ebenstein 2010; Wei and Zhang 2011; Liu 2014; Huang, Lei, and Zhao 2016), examining the *ex-post* violations of the policy (Li and Zhang 2017; Zhang 2017), treating the minority as a control group (Li, Zhang, and Zhu 2005; Li, Yi, and Zhang 2011), and exploiting the rollout of family planning stations (Edlund et al. 2013; Jia and Persson 2017).

fertility rate and sex ratio at birth (the number of male children per 100 female children). The fertility rate declined by three children from 5.7 in 1969 to 2.7 in 1978. During the succeeding decade, however, the rate dropped only marginally to 2.5 children in 1988. Additionally, the one-child policy resulted in 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, the sex ratio at birth deteriorated rapidly and steadily exceeded 115 after 1990. The biased sex ratio can directly affect parents' well-being through their children's marriage (Rose 2000; Wei and Zhang 2011). Chen and Huang (2018) show that China's "Later, Longer, Fewer" campaign during the 1970s can explain about half of the decline in fertility rate; yet, during that period there was not a simultaneous increase in the sex ratio. Another advantage of utilizing earlier policy shocks is that it allows us to study the elderly that are "old enough." People aged 20 in 1979 would be only 52 in 2011. In contrast, people aged 20 in 1970 would be 61 in 2011—the age at which people are much more likely to be the care-receivers rather than the caregivers (to their grandchildren).

Using three waves (2011, 2013, 2015) of the panel data from the China Health and Retirement Longitudinal Study (CHARLS), our empirical analysis suggests that China's family planning policies have very different effects on parents' physical and mental well-being. Regarding physical well-being, we find that parents with greater exposure to the family planning policies maintain a higher level of consumption. Their physical health is slightly better, and they spend less on medical services. We further investigate the source of such positive effects. First, their children become better educated and earn more as a result of the quantity-quality tradeoff. Children transfer more to parents even conditional on their "quality." Another source of financing is parents' accumulated wealth before they get old. Briefly speaking, there is no evidence suggesting that family planning makes the elderly's physical well-being worse off.

In contrast, the prospect of the elderly parents' mental well-being is not so optimistic. We find that parents more exposed to the family planning policies are more likely to be depressed. The effect is even larger for women and rural parents. Why is the effects of family planning different on physical and mental well-being? One explanation is that the two above-mentioned channels that may offset the negative effect of having fewer children on the parents' physical well-being do not necessarily apply for mental well-being. First, the elderly who are more affected by the family planning not only have fewer children to accompany them but also receive fewer contacts and visits per child. What makes things worse is that children with better education and higher income are even less attached to their parents. That is to say, the quantity-quality tradeoff is pushing children further away from parents in terms of geographic proximity. Second, whereas parents can save their earned income when they are young to prepare for old-age, they can never "save up" children's company. Because of this, our study calls for greater attention to the elderly's mental health. We would like to emphasize that the mental health status of the elderly is of first-order policy

importance. China's national elderly suicide rates are four to five times higher than the general Chinese population and more than twice the global average (Li, Xiao, and Xiao 2009). The share of suicides committed by the elderly aged 65 or above monotonically increases from 16.9% in 1987 to 41.2% in 2014 (Zhong, Chiu, and Conwell 2016).

This study contributes to the existing literature in two ways. First, it contributes to understanding the causal effect of the number of children on parents' well-being in the old age. Whereas there is a large body of literature investigating the correlation between children and old-age well-being, few of them address the endogeneity of the fertility choice.[6] Other studies use arguably exogenous shocks to fertility, including family planning (Schultz 2008; Miller 2010; Canning and Schultz 2012; Joshi and Schultz 2013; Miller and Babiarz 2016), access to oral contraceptives (Goldin and Katz 2002; Bailey 2006; Bailey 2010; Ananat and Hungerman 2012; Bailey, Hershbein, and Miller 2012; Steingrimsdottir 2016), and abortion policies (Pop-Eleches 2006; Myers 2017). Those studies focus either on women's short-term performance or on the outcome of the second generation. Studies on how having fewer children reshape parents' old-age life are sparse. Second, this paper contributes to understanding the consequences of China's "Later, Longer, Fewer" campaign. There is a huge literature estimating the effect of China's family planning policies on various outcomes, including: savings rate (Banerjee, Meng, and Qian 2010; Wei and Zhang 2011; Curtis, Lugauer, and Mark 2015; Choukhmane, Coeurdacier, and Jin 2016; Ge, Yang, and Zhang 2018), marriage (Huang and Zhou 2015), labor supply (Huang 2016; Zhang 2017), children's outcomes (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). However, the term "family planning policies" in those studies is almost identical to the "one-child policy." The effect of "Later, Longer Fewer" policies in the early 1970s, which played a more important role in China's demographic transition than did the one-child policy (Whyte, Wang, and Cai 2015; Wang 2016; Chen and Huang 2018), remains mostly unexplored.[7]

To the best of our knowledge, there are three studies closest to ours that estimate the causal effect of the number of children on parents' physical and mental health in old age using an instrumental variable approach. Chen and Lei (2009) instrument the number of living children and the number of children ever born with exposure to the Great Famine and gender composition of children. Kruk and Reinhold (2014) use multiple births and the sex composition of the first two children as a natural experiment. Islam and

[6] See Hurt, Ronsmans, and Thomas (2006) for a review of the literature. More recent studies in this strand of literature include Buber and Engelhardt (2008); Spence (2008); Chen and Lei (2009); Hank (2010); Read, Grundy, and Wolf (2011); Kruk and Reinhold (2014); Islam and Smyth (2015).

[7] Banerjee, Meng, and Qian (2010) is a notable exception who also explore the changes in the population policies in the early 1970s. They treat the year 1972 as the turning point at which "family planning policies shifted from a pro-fertility agenda to one that focused on curbing fertility" and define the treatment and control groups by whether the first child is born after 1972.

Smyth (2015) explore the exemption rule under China's one-child policy.[8] Our study complements theirs in two ways. First, we propose an arguably better exogenous shock to the number of children to study the long-term consequences of family planning. As previously mentioned, the one-child policy does not yield a significant decline in fertility and simultaneously bias the sex ratio at birth. Multiple births and sex composition of children are also problematic in the context of developing countries (Schultz 2008).[9] Second, we extend their research agenda by going beyond health outcomes and further exploring the underlying mechanisms. For example, we not only separately estimate family planning's effect on physical and mental health but also try to understand the origins of the differential effects.

The remainder of this paper is organized as follows. In Section 2, we provide background information on China's family planning policies and old-age support system. In Section 3, we build a simple theoretical framework that will guide our empirical analysis. Section 4 introduces the datasets used in this study and discusses the empirical strategy. In Section 5, we present our main results, that is, the effect of the family planning policies on the quality of life in old age. Finally, Section 6 concludes.

2 Institutional Background

2.1 China's Family Planning Policies during the 1970s

In this subsection, we briefly describe China's family planning policies during the 1970s, prior to the enforcement of the well-known one-child policy (see Zhang (2017) for a recent review of the one-child policy). China's family planning has a much longer history than that of the one-child policy, dating back to December 1962 with the release of the No. [62]698 document "Instructions on Seriously Advocating Family Planning" (*guanyu renzhen tichang jihua shengyu de zhishi*). In 1964, the State Family Planning Commission was established after which commissions at the province, city, and county levels were gradually set up. However, the outbreak of the Cultural Revolution in 1966 severely interrupted the government's functioning including the family planning institutions, most of which ceased to work in 1966.

In early 1970, Premier Enlai Zhou emphasized that the implementation of family planning policies should not stop. In 1971, the State Council released document [71]51, "Report on Better Implementing Family Planning Policy" (*guanyu zuohao jihua shengyu gongzuo de baogao*), signaling the recovery of family planning from the Cultural Revolution. The document required provinces to set up a Family Planning

[8] In rural China, depending on the local policy, a second child may be permitted only if the first-born child is female.

[9] Schultz (2008) pointed out that twin births impose two additional burdens—no spacing between two births and lower birth weight. Sex composition of births can directly affect family lifetime wealth because dowries are generally involved when children get married. Those two instruments can be even more worrisome in the context of China. There is abundant evidence that the strict birth-quota imposed by the one-child policy distorted children's gender composition (Hull 1990; Ding and Hesketh 2006; Ebenstein 2010; Bulte, Heerink, and Zhang 2011; Li, Yi, and Zhang 2011; Loh and Remick 2015). More interestingly, recent evidence suggests that even the birth of "twins" can be endogenous to the one-child policy (Huang, Lei, and Zhao 2016).

Leading Group to organize and lead the implementation of family planning policies. A pilot run was initiated in 1970, and by 1975, all provinces had set up a leading group, an important and high-level provincial institution. In most cases, its leader is also the main leader of the provincial party committee.

One central responsibility of the leading group is to enforce the "Later, Longer, Fewer" (*wan, xi, shao*) policies. "Later" means marriage at a later age—23 years for women and 25 years for men. "Longer" means a birth planning rule of waiting for more than three years between births. "Fewer" means that one couple could have at most two children. China's family planning campaign in the 1970s was technically voluntary, although there is anecdotal evidence suggesting that the campaign had several coercive elements (Whyte, Wang, and Cai 2015). Overall, the policy enforcement was much more lenient during this period compared to that of the one-child policy period (Zhang 2017), when an above-quota birth could result in huge fines and even the loss of one's job.[10]

The leading groups could not curb the fertility rate by simply "asking" people to have fewer children. They had to complement the LLF policies with concrete measures of birth control. Therefore, another responsibility of the leading groups was to provide technical support for birth control. This support included training technical staff to conduct research on contraception and sterilization measures, introducing technology and equipment for sterilization, and making contraceptive methods more widely available (e.g., distributing contraception pills) (Peng 1997).

[Figures 2 and 3 About Here]

Figure 2 plots the geographic variation in the establishment years of the provincial Family Planning Leading Group. The data comes from the population chronicles in various provinces. The groups were first established in 1970 in Shandong and Guangdong and were last set up in Guizhou and Xinjiang in 1975. Figure 3 sketches the effect of the provincial Family Planning Leading Group on the fertility decline. We take provincial total fertility rates from Coale and Li (1987) and separate provinces into different groups according to the establishment years of the leading groups. Figure 3 compares the total fertility rate of the provinces in which the leading groups were established between 1970 and 1971 (nine provinces) to those that established the leading group between 1973 and 1975 (also nine provinces). Before 1970, when no provinces established leading groups or after 1975 when all provinces had established the leading groups, the difference in the total fertility rate between the two sets of provinces remained almost constant. Only during 1971–1974, when the family planning leading groups were established in the first set of provinces but not in the second, did the fertility rates drop more rapidly in the first set. Readers can refer to Chen

[10]The stringent one-child policy was officially announced in 1979. In 1991, the central government listed family planning among three basic state policies, and local officials became personally responsible for implementing family planning rules. The fine rate for out-of-quota births (also known as the "social child-raising fee") increased substantially from 1989 to 1992 (Scharping 2003).

and Huang (2018) for a more comprehensive analysis of the causal effect of the Family Planning Leading Group on curbing China's total fertility rate.

2.2 Old-Age Support in China

China is well known for its Confucian model and filial piety family system (Li and Tracy 1999; Whyte 2005). The Classic of Filial Piety (*xiaojing*) is listed among the Thirteen Classics of the Confucian tradition, giving people advice on filial piety since the 4th century BC. One famous quotation from the Classic of Filial Piety is "there is no greater actions than the filial piety" (*renzhixing, mo dayu xiao*). Such value persisted into modern China, and filial piety is even written into the constitution and the marriage law.[11] Traditions presume that children should respect and care for their elderly parents. Compared to western countries, where the social security system is more developed, China relies more heavily on families as the main providers of old-age support (Zimmer and Kwong 2003). In China, children's support for their parents mainly takes the form of co-residence (Logan and Bian 1999; Zhang 2004; Zimmer and Korinek 2010; Oliveira 2016), financial or in-kind support (Lee and Xiao 1998; Sun 2002; Cai, Giles, and Meng 2006; Lei et al. 2012; Oliveira 2016), and time transfer (or informal care) (Lee and Xiao 1998; Lu, Liu, and Piggott 2015).

It is true that filial piety may erode over time with economic development, and China is developing its public system of old-age support. The two most important systems of social support are the Urban Employees Basic Pension Insurance and the Basic Pension Insurance for Urban and Rural Residents.[12] In 2015, the former covered a population of 353.6 million and the latter covered a population of 504.7 million (Ministry of Human Resources and Social Security 2016). Despite the wide coverage, the monthly pension per capita was as low as 119 RMB (19.1 USD) in 2015. Moreover, there are increasing concerns over the financial sustainability of the system as China is aging rapidly (Cai, Giles, and Meng 2006).[13] At this stage, the basic pension system is more supplementary than a substitute of family support for the elderly. Nursing homes also fail to accommodate an important share of the elderly. Chu and Chi (2008) estimate that only 1.49% of the Chinese older population lived in nursing homes in 2006. The share is less than one-fifth of that in the United States.[14] The dearth of nursing homes in China can originate both from the supply side and demand side. On the supply side, administrative approval procedures are complicated

[11]Both Article 49 of the Constitution and Article 21 of the marriage law state: "Parents have the duty of raising and educating their minor children. Adult children have the duty of supporting and caring for their parents."

[12]The Basic Pension Insurance for Urban and Rural Residents combined the New Rural Pension Scheme (since 2009) and the Urban Residents Pension Scheme (since 2011) in 2014.

[13]The revenue of the Basic Pension Insurance for Urban and Rural Residents failed to cover the expenses on pensions in 23 out of 31 mainland provinces in 2015 (Ministry of Human Resources and Social Security 2016). The gap is expected to become even larger in the future along with China's aging process.

[14]Using various sources of data (Census, American Community Survey, Health and Retirement Survey), Mommaerts (2018) find that about 8% of the U.S. elderly live in nursing homes. She also provides evidence that nursing homes are important substitutes for co-residence by exploiting arguable exogenous changes in Medicaid eligibility for long-term care benefits.

and lengthy, and the threshold for private elderly care agencies remains high.[15] On the demand side, there is still a social stigma for parents living in a nursing home because of filial piety.[16]

CHARLS asks the question: "If you were too old to work in the future, who do you think you can rely on financially for old-age support?" Figure 4 presents the answers in different years for people aged 60 or above. In urban areas, where the pension programs are more generous, the elderly report to rely financially more on a pension (69.9% in 2015). In contrast, children remain the dominant forces for old-age support in rural China (72.6%), despite an increasing share of reporting to rely on pensions because of the expansion of China's public pension system (from 8.3% to 21.5%). It is important to note that the question only asks about "financial" old-age support. We believe children are playing even more important roles in non-financial old-age support, such as caring and company. To conclude, neither the government nor the market can fully replace children's role for the provision of elderly care in China in the foreseeable future.

[Figures 4 About Here]

3 Theoretical Framework

In this section, we first build a simple three-period life-cycle model to guide our empirical analysis, but our later empirical analysis only focuses on the long-term consequences in old age. Therefore, to complement our model, in the second part of this section, we briefly review evidence from the existing literature on the short-term effects of family planning.

3.1 A Simple Model

Forward-looking households experience three periods: having children, young, and old. In the first period, a couple plans how many children they "want" to have. The final number can be affected by the availability of birth-control technologies and fertility restrictions. People do not derive direct utility in this period. In the second period (young), they earn labor income, raise children, and build up savings. In the third period (old), they retire from the labor market and receive financial transfers and care from their children. We do not model children's decisions for simplicity. In the latter two periods, the household derives utility from three sources: consumption, physical health, and mental health. Without loss of generality, we assume away discounting.

In the first period, a household plans to have an optimal number of N^* children based on their expectation about the future. We assume that people cannot fully control their fertility behavior and will have

[15] http://www.chinadaily.com.cn/china/2017-03/29/content_28716504.htm
[16] http://www.china.org.cn/english/2002/Mar/29603.htm

η ($\eta > 0$) more children in the end—the final number of children would be $N = N^* + \eta$. This assumption is justified by the effectiveness of contraceptive measures and human behavior. The introduction of family planning brings two effects. First, it helps households to better control their fertility ($\eta = 0$), and second, it imposes a fertility restriction ($N \leq \overline{N}$). Both effects reduce the number of children N, but the welfare implications of these effects are vastly different. The reduction in η makes the actual number closer to the optimal number, while the restriction of $\overline{N}$ may force households to have too few children.[17]

Given the number of children N, a representative household solves the following problem in the second period:

$$\begin{aligned} \max_{C_y} \; & U_y\left(C_y|N\right) = u\left(C_y\right) + \delta_1 h_{1,y} + \delta_2 h_{2,y} + U_o \\ s.t. \; & h_{1,y} = H_1\left(C_y\right), \; h_{2,y} = H_2\left(C_y\right), \\ & A_y = I - C_y - \tau\left(N\right). \end{aligned}$$

C_y is consumption when young. The function $u(.)$ is concave and strictly increasing with $u' > 0$ and $u'' < 0$. $h_{1,y}$ represents physical health and $h_{2,y}$ represents mental health when young with relative utility weights $\delta_1 > 0$ and $\delta_2 > 0$. Both types of health can be improved by more consumption. $H_j, \; j = 1, 2$, is the health production function with $H_j' > 0$ and $H_j'' < 0$. $\tau\left(N\right)$ represents the total resources devoted to raising children. For simplicity, we embed the quantity-quality tradeoff inside the function $\tau\left(.\right)$, and we assume $\tau' > 0$. This implies that when N becomes smaller, we expect total expenses on children to decrease despite the fact that per-child expenses might increase as a result of the quantity-quality tradeoff. Finally, I is the labor income, and A_y is the wealth that will be transferred to the next period.

In the third period, the household solves the following problem

$$\begin{aligned} \max_{C_o} \; & U_o\left(C_o|N, h_{1,y}, h_{2,y}\right) = u\left(C_o\right) + \delta_1 h_{1,o} + \delta_2 h_{2,o} \\ s.t. \; & h_{1,o} = \lambda h_{1,y} + \left(1 - \lambda\right) H_1\left(C_o\right) + F_1\left(S\left(N\right)\right), \\ & h_{2,o} = \lambda h_{2,y} + \left(1 - \lambda\right) H_2\left(C_o\right) + F_2\left(S\left(N\right)\right), \\ & 0 = A_y + T\left(N\right) - C_0. \end{aligned}$$

There are two notable differences from the second period. First, the health of the elderly is not only affected by current consumption. Health status when young partially persists into old age, with a persistence rate $0 < \lambda < 1$, and health in old age is further shaped by the care received from the elderly's children, denoted

[17] In our model, we assume away the uncertainties in childbirth for simplicity, but the welfare implications naturally apply to the case with childbirth uncertainties in which η becomes a random number. Family planning reduces the randomness in η, which is welfare-improving if households are risk-averse.

as $S(N)$. We assume $F_j' > 0$. Second, the elderly do not earn income from the labor market. Instead, they rely on their accumulated wealth (A_y) and the financial transfer from their children ($T(N)$). We assume $T' > 0$.

If the utility in the latter two periods is weighted equally, the first-order condition would be:

$$u'(C_y) + (1+\lambda)\left(\delta_1 H_1'(C_y) + \delta_2 H_2'(C_y)\right) = u'(C_o) + (1-\lambda)\left(\delta_1 H_1'(C_o) + \delta_2 H_2'(C_o)\right).$$

To let the model have a closed-form solution, we further assume functions $u(.)$, $H_1(.)$, and $H_2(.)$ to follow a quadratic form. More specifically,

$$u(C) = C - \frac{a_c}{2}C^2,$$
$$H_1(C) = C - \frac{a_{h_1}}{2}C^2, \text{and } H_2(C) = C - \frac{a_{h_2}}{2}C^2.$$

With the above assumptions, we can solve for optimal consumption,

$$\begin{aligned} C_y^* &= \frac{I - (\tau(N) - T(N))}{1+K}, \\ C_o^* &= K\frac{I - (\tau(N) - T(N))}{1+K}, \\ A_y &= \frac{K}{1+K}(I - \tau(N)) - T(N), \end{aligned}$$

where

$$K = \frac{a_c + (1+\lambda)(\delta_1 a_{h_1} + \delta_2 a_{h_2})}{a_c + (1-\lambda)(\delta_1 a_{h_1} + \delta_2 a_{h_2})} > 0.$$

With the above simple model, we can describe how consumption, savings, and physical and mental health respond to an exogenous decrease in N as a result of family planning policies.

Proposition 1 *If we assume* $\frac{\partial(\tau(N)-T(N))}{\partial N} > 0$*, that implies fewer children free up a household's lifetime budget, savings* (A_y) *and consumption in both period* (C_y *and* C_o) *increases as* N *decreases.*

Proof.

$$\begin{aligned} \frac{\partial A_y}{\partial N} &= -\frac{K}{1+K}\frac{\tau(N)}{\partial N} - \frac{T(N)}{\partial N} < 0, \\ \frac{\partial C_y^*}{\partial N} &= -\frac{1}{1+K}\frac{\partial(\tau(N) - T(N))}{\partial N} < 0, \\ \frac{\partial C_o^*}{\partial N} &= -\frac{K}{1+K}\frac{\partial(\tau(N) - T(N))}{\partial N} < 0. \end{aligned}$$

Therefore, all three variables will increase when N decreases. ■

The intuition behind this proposition is clear. If lower N increases a household's lifetime resources, households would increase their consumption in both periods because they wish to smooth their consumption. Moreover, a reduction in N effectively reallocates the household's disposable income from the third period to the second.[18] Households need to increase savings at the end of the second period to achieve the goal of consumption smoothing.

Proposition 2 *Whereas the health status when young ($h_{j,y}$) would be unambiguously improved with a reduction in N, the effect is less clear on the health status of the elderly ($h_{j,o}$).*

Proof. For $j = 1, 2$,

$$\begin{aligned}\frac{\partial h_{j,y}}{\partial N} &= \frac{\partial H_j}{\partial C_y}\frac{\partial C_y}{\partial N} < 0, \\ \frac{\partial h_{j,o}}{\partial N} &= \lambda\frac{\partial H_j}{\partial C_y}\frac{\partial C_y}{\partial N} + (1-\lambda)\frac{\partial H_j}{\partial C_o}\frac{\partial C_o}{\partial N} + \frac{\partial F_j(S)}{\partial S}\frac{\partial S}{\partial N}.\end{aligned}$$

The first two terms of $\frac{\partial h_{j,o}}{\partial N}$ are negative while the third term is positive; therefore, the sign of the aggregate effect remains ambiguous. ■

$\frac{\partial h_{j,y}}{\partial N} < 0$ captures the quantity-quality tradeoff between children and parents. The extra resources spared from having fewer children can be used not only to increase the quality of the remaining children but also to increase parent's consumption, further improving their health status. We call it the "nutrition effect." The third term in the expression ($\frac{\partial F_j(S)}{\partial S}\frac{\partial S}{\partial N}$) represents the negative consequences of a smaller N that there are fewer children to take care of the elderly, which we call the "caring effect." If children's care positively affects their elderly parents, the relationship between $h_{j,o}$ and N is less clear.

Proposition 3 *If we assume that mental health is less sensitive to consumption compared with physical health, i.e. $\left|\frac{\partial H_1(C)}{\partial C}\right| > \left|\frac{\partial H_2(C)}{\partial C}\right|$, but more sensitive to children's company, i.e. $\left|\frac{\partial F_1(S)}{\partial S}\right| < \left|\frac{\partial F_2(S)}{\partial S}\right|$, a lower N has a more negative effect on the elderly's mental health.*

Proof. Given the expression of $\frac{\partial h_{j,o}}{\partial N}$, we can see that for mental health, the first two terms are less negative while the third term is more positive:

$$\begin{aligned}\frac{\partial h_{1,o}}{\partial N} &= \lambda\frac{\partial H_1}{\partial C_y}\frac{\partial C_y}{\partial N} + (1-\lambda)\frac{\partial H_1}{\partial C_o}\frac{\partial C_o}{\partial N} + \frac{\partial F_1(S)}{\partial S}\frac{\partial S}{\partial N} \\ &< \lambda\frac{\partial H_2}{\partial C_y}\frac{\partial C_y}{\partial N} + (1-\lambda)\frac{\partial H_2}{\partial C_o}\frac{\partial C_o}{\partial N} + \frac{\partial F_2(S)}{\partial S}\frac{\partial S}{\partial N} = \frac{\partial h_{2,o}}{\partial N}.\end{aligned}$$

■

[18] In the second period, $\frac{\partial(I-\tau(N))}{\partial N} < 0$. In the third period, $\frac{\partial T(N)}{\partial N} > 0$

Lower fertility affects the elderly's health status through a nutrition effect and a caring effect. If we believe physical health is more affected by consumption and mental health is more affected by children's care and company, family planning policies are expected to exert a more negative effect on mental health than on physical health. Table 1 summarizes the predictions of our theoretical framework.

[Table 1 About Here]

3.2 Supporting Evidence from the Existing Literature

Our theoretical framework involves both the young and the old. Although our empirical analysis will focus on the effect of family planning in old age, there are abundant existing studies that support our framework when households are young. This subsection briefly reviews this strand of literature.

Health When Young

Medical literature has long been interested in the biological influence of childbearing on maternal health. Because giving birth to a child is a risky event in developing countries, having fewer children mechanically lowers mothers' mortality rate (Chen et al. 1974; Boerma 1987; Menken, Duffy, and Kuhn 2003). Other biological consequences include: breast cancer (Kelsey, Gammon, and John 1993), heart disease (Ness et al. 1994), obesity (Weng et al. 2004), and stroke (Zhang et al. 2009). Economic literature puts a greater emphasis on the channel of the budget constraint, which we also highlight in our theoretical framework. Canning and Schultz (2012) find an anthropometric gain of 1 kg/m^2 in the body-mass index for reproductive-age women in treatment areas in the Matlab experiment.[19] Wu and Li (2012) further discuss the source of the BMI gain, finding that it originates from more nutrition intake and that the father's health is also improved as a consequence of the one-child policy.

Savings When Young

With fewer children to rear, households would realize that they can spare more resources when young but will receive fewer inter vivos transfers when old. In response to such expectation, households should increase their savings according to a standard life-cycle model. In the context of China, it has been argued that family planning is an important candidate explanation for China's high household savings rate. Curtis, Lugauer, and Mark (2015) propose two channels through which having fewer children increases the savings rate: a "dependent children effect" and an "intergenerational family transfer effect." The dependent children effect means that "a household with relatively few children devotes a smaller share of household

[19]The Matlab experiment was a randomized experiment designed to document the efficiency of family planning. It was initiated in 149 villages in a relatively remote rural district of Matlab, Bangladesh. 70 villages became the treatment village, with government community clinics offering a range of methods and instructions on fertility control.

income to support dependents and, therefore, has more to save." The intergenerational family transfer effect states that "the current working-age population should save more aggressively because they will be supported in retirement by relatively few working people." Those two effects are similar in spirit to our theoretical framework. Exploiting the plausibly exogenous decline in fertility in China caused by family planning programs that began in the early 1970s, Banerjee, Meng, and Qian (2010) find that having one less child increases the savings by over 14,000 RMB (or 2258 USD). Choukhmane, Coeurdacier, and Jin (2016) also argue that the one-child policy contributes to the rise in China's household savings rate because the lower expected support from children induces parents to increase saving.

4 Data and Empirical Strategy

4.1 Data and Variables

The main data used in this study is the China Health and Retirement Study (CHARLS), which is a nationally representative sample of Chinese residents aged 45 and older and is the sister study of the U.S. Health and Retirement Study (HRS) (Zhao et al. 2013). The survey covers 150 counties/districts in 28 provinces in mainland China. Each wave includes about 10,000 households and 17,500 individuals. The individuals are followed up every two years. We use three waves of the panel data from CHARLS: 2011, 2013, and 2015.

Because we wish to understand the effect of China's family planning policies on a wide range of outcomes, we construct three levels of data accordingly: individual, household, and child. Some variables are naturally defined at the individual level such as health status, but others are more suitable to be defined at the household level such as consumption. We exclude samples from Inner Mongolia because we fail to find information about its family planning leading group. We also drop households with either spouse being an ethnic minority, as ethnic minority households are subject to less stringent policies compared with their *Han* counterparts (Peng 1997; Li, Zhang, and Zhu 2005; Li, Yi, and Zhang 2011). We further restrict our analysis to those who were ever married and aged 60 and above in the year 2011. The age restriction serves two purposes. First, we wish to alleviate the concern that elderly parents remain the caregivers instead of care-receivers. There is increasing evidence suggesting elderly parents in China are still helping their adult children through providing residence and taking care of the grandchildren (Chen, Liu, and Mair 2011; Lee and Bauer 2013; Zeng and Xie 2014; Lumsdaine and Vermeer 2015; Ma and Wen 2016). Second, we wish to exclude the effect of family planning on parents' human capital accumulation and focus on the consequences of having fewer children. Those who were aged 60 in 2011 would be at age 20 in 1971, by which time most of them had already completed their education.[20] Readers can refer to

[20] According to a 1 percent sample of China's 1990 population census, only 2.2% of cohorts born between 1941 and 1950

Huang (2016) and Huang, Lei, and Sun (2016) for a discussion on how the expectation of having fewer children influences young women's educational outcomes.

Individual-level data covers demographics (e.g., age, gender), socioeconomic status (e.g., *Hukou* status, education), and health status, both physical and mental health. More specifically, we include the following nine measures to proxy the elderly parents' physical and mental well-being:

1. Self-rated life satisfaction: CHARLS asks the interviewee how satisfied they are with their life as a whole. The variable ranges from 1 (completely satisfied) to 5 (not at all satisfied).

2. Self-rated health: Ranges from 1 (Excellent) to 5 (Poor).

3. Self-perceived probabilities of living for another 11–15 years: CHARLS interviews the elderly at age a about their self-perceived chances of reaching age $a + x$, where x ranges between 11 and 15.[21] There are five options: 1 (almost impossible); 2 (not very likely); 3 (maybe); 4 (very likely); 5 (almost certain). For ease of interpretation, we convert those values to probabilities 0.1, 0.3, 0.5, 0.7, and 0.9, respectively.

4. Body mass index (BMI): One important feature of CHARLS is that it provides a physical examination of the interviewees. We, therefore, have access to measured numbers instead of self-reported numbers on anthropometric data (height and weight) and blood pressure. Body mass index is calculated by dividing one's weight in kilograms by the square of one's height in meters.

5. Underweight: This is a dummy variable indicating that a person's BMI is lower than 18.5.

6. Limitations in Activities of Daily Living (ADL): Our definition of ADL measures people's difficulty in doing the following daily activities: dressing, bathing and showing, self-feeding, getting into or out of bed, toilet hygiene, controlling urination and defecation. The original questions have four choices: no difficulty, have difficulty but can still do it, have difficulty and need help, cannot do it. We define the latter two choices as having ADL limitations.

7. Limitations in Instrumental Activities of Daily Living (IADL): These include doing household chores, preparing meals, shopping for groceries, making phone calls, and taking medications. The definition of IADL limitation is the same as that of ADL limitation.

received some post-secondary education. If an individual receives at most senior high education, he should have left school by the age of 19.

[21] More specifically, CHARLS asks people aged 65–69 about their perceived probabilities of reaching age 80 and asks people aged 70–74 about their perceived probabilities of reaching age 85, etc.

8. Hypertension: Defined by either systolic pressure exceeding 140 mmHg or diastolic pressure exceeding 90 mmHg.[22]

9. Center for Epidemiologic Studies Depression Scale (CES-D scale): CES-D is a brief self-report questionnaire to measure the severity of depressive symptoms. CHARLS asks ten questions related to depression with eight being negative behaviors and two being positive behaviors.[23] For the eight negative behaviors, we assign 0 points to "rarely or none of the time"; 1 point to "some or a little of the time (1–2 days a week)"; 2 points to "occasionally or a moderate amount of the time (3–4 days a week)"; 3 points to "most or all of the time (5–7 days a week)." Points are assigned in the opposite order (from 3 to 0 points) for the two positive behaviors. Summing up the points from ten questions gives us the CES-D scale.

The left panel of Table 2 reports the summary statistics at the individual level.

[Table 2 About Here]

The household level data covers age structure, net transfers (including in-kind transfers) from children, living arrangements, and household expenditures. Whereas the definition of age is straightforward at the individual level, defining the age at the household level is more complicated. Both the husband's and wife's age are important in household decision making. Moreover, we also need to take into account the possibility that one part of the couple is deceased. We, therefore, use three variables to control for the age structure of the couple: widow or not, age of the oldest, and the age gap between the individuals in the couple.[24] Living arrangement is defined as whether there is at least one child living within a locality (household, village/community, district/county). CHARLS also contains detailed information on household expenditures, the categories of which are generally consistent with the definition used by the National Bureau of Statistics in China.[25] We highlight three categories that may be especially important for the elderly: food expenditures, living expenditures (e.g., communication, transportation, utilities, household items), and health expenditures. The three categories together account for about 70.0% of the total household expenditures. The right panel of Table 2 reports the summary statistics at the household level.

[22]CHALRS conduct the blood pressure measurements three times for each individual. Following the standard practice in the literature, we drop the first measurement in case people are not ready and take the means of the latter two measurements.

[23]The eight negative behaviors include: was bothered by things that don't usually bother me; had trouble keeping my mind on what I was doing; felt depressed; felt everything I did was an effort; felt fearful; sleep was restless; felt lonely; could not get "going." The two positive behaviors include felt hopeful about the future; was happy.

[24]Because CHARLS surveys information regarding the deceased spouse, this variable can be constructed for all those who ever get married.

[25]CHARLS asks some categories of expenditures on a weekly basis (e.g., food), some on a monthly basis (e.g., utilities), and others on a yearly basis (e.g., health). We transform all expenditures to annual expenditures.

CHARLS uses a loop structure to ask information about each child, allowing us to construct child-level data regardless of whether he/she co-reside with the parents. Our child level data covers children's demographics (e.g., age, gender), socioeconomic status (e.g., education and income), net transfer to parents, and monthly frequency of contacting and visiting parents.[26] Table 3 reports the summary statistics at the child level.

[Table 3 About Here]

4.2 Empirical Strategy

To evaluate the effects of "Later, Longer, Fewer" policies, we first need to develop a measure of policy exposure. We define the exposure according to the province and mothers' birth cohort, regardless of whether mothers are currently alive or not. Such approach alleviates the concern of endogenous timing of childbirth that would arise if we defined the exposure according to children's year of birth. More specifically, we define the exposure to the "Later, Longer, Fewer" policies as follows:

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

$\text{FPP}_{p,c}$ defines the exposure to the family planning policies for cohorts born in year c in province p. In equation (1), $I\left[\cdot\right]$ is an indicator function that takes a value of 1 if the argument is true and 0 otherwise; a is age; $\text{AFR}_p\left(a\right)$ is the age-specific fertility rate of province p in 1969, *prior to* the enforcement of any effective family planning policy in any province; T_p is the year of the enforcement, which can vary by province. For the "Later, Longer, Fewer" policies in the early 1970s, T_p is defined by the establishment year of the provincial Family Planning Leading Group. The provincial variation within each cohort then comes from (1) different years of establishment of the Family Planning Leading Group (T_p) and (2) different initial fertility profiles (AFR_p). Figure 5 illustrates how exposure to the policy is computed, using the examples of Shandong and Beijing. Women born in 1945 are more exposed to the policies in Shandong than in Beijing because Shandong (1) formed the Family Planning Leading Group in 1970, three years earlier than Beijing and (2) has a higher initial fertility rate. Note that such a definition naturally applies to the one-child policy by defining T_p as 1979 for all provinces.

[Figure 5 About Here]

The mean exposure to the LLF policies in our household level data is 3.47 with a standard deviation of 1.88. The policy exposure ranges from 0 to 6.73. A household would remain unaffected if the wife were

[26] Because it is difficult for parents to know children's income precisely, CHARLS asks the parents whether their children's annual income falls into one of the following ranges: under 2,000 RMB, 2,000–20,000 RMB, 20,000–50,000 RMB, above 50,000 RMB. We are aware that this measurement is quite coarse, but there are no better alternatives.

passed the age of 49 prior to the enforcement of the family planning policies. On the contrary, a household would be fully exposed if the wife was younger than age 15 at the time of enforcement. The exposure equals the provincial total fertility rate in 1969 in this scenario. Guizhou had the highest TFR (6.73) at that time.

After defining the exposure to family planning policies, we run the following regressions:

$$y_{i,p,c,t} = F\left[\beta_0 + \beta_1 \text{FPP}_{p,c} + \boldsymbol{\beta}_2 \mathbf{X}_{i,p,c,t} + f\left(\text{Age}_{i,c,t}\right) + \text{Prov}_p + \text{Year}_t + \varepsilon_{i,p,c,t}\right]. \tag{2}$$

Note that the age effects, $f\left(\text{Age}_{i,c,t}\right)$, and the year fixed effects, Year_t, effectively capture the cohort effects. $\mathbf{X}_{i,p,c,t}$ represent a list of control variables. To avoid bad-control issues (Angrist and Pischke 2008), we carefully choose our control variables to only include those that are pre-determined before households make their fertility decision. $F[.]$ is a functional form that varies according to the dependent variable of interest, $y_{i,p,c,t}$. If the dependent variable is continuous, we use a linear regression model. If the dependent variable is binary, a Probit model will be used. We cluster the standard errors at the province-by-cohort level because this is the unit at which exposure to policies is defined. Sample weight is applied in all regressions.

Parameter β_1 is of primary interest in equation (2). With cohort effects and province fixed effects both controlled for, the identification of β_1 relies on the remaining variations in $\text{FPP}_{p,c}$, which originates from the interaction between differential timing in the establishment of the Family Planning Groups and the initial fertility profiles prior to the groups' establishment.

Following Miller (2010), we rely exclusively on a reduced-form approach because family planning may affect socioeconomic outcomes through pathways other than completed lifetime fertility, despite our best effort to rule out other channels. For example, we arguably rule out the channel of parental human capital accumulation through (1) controlling for parents' completed education and (2) restricting to cohorts who were most likely to have completed their education prior to the enforcement of the "Later, Longer, Fewer" policies.

5 Empirical Results

We present our main results in four steps. In the first step, we provide evidence that the "Later, Longer, Fewer" campaign had powerful effects in curbing fertility. In the second step, we investigate the policy effect on parents' aggregate support from children as well as the per-child support. We are also interested in whether the quantity-quality tradeoffs of children alleviate or exaggerate the effect of having fewer children. Thirdly, we look into a set of outcomes that can proxy parents' well-being in old age, including consumption, subjective well-being, physical health, and mental health. Finally, we present the heterogeneity in the effect

of family planning policies—households with higher initial fertility prior to policy enforcement are more affected.

5.1 Effect on Completed Fertility

[Table 4 About Here]

Table 4 presents how households' exposure to family planning affects their number of children. Panel A reports the effect on the number of currently living children. The first column suggests that a one unit exposure to the "Later, Longer, Fewer" policies reduce the number of currently living children by 0.245. Because the national average exposure to the policies is 3.47 in our sample, the LLF policies reduce the number of living children by 0.85. Columns (2) and (3) estimate the additional effect of the one-child policy.[27] If we only include the exposure to the one-child policy (OCP) in the regression, its coefficient would be strongly negative, which seemingly suggests the one-child policy also has a strong effect in reducing fertility. However, once exposure to LLF policies is also controlled for (column (3)), the additional effect of OCP becomes small and insignificant. This is not a surprising finding if we look back to Figure 1, which reveals that the majority of China's historical fertility decline took place prior to the enforcement of the one-child policy. In Appendix A, we present the robustness of our results against other contemporaneous events that took place around the period of the "Later, Longer, Fewer" campaign, such as the Cultural Revolution and the Sent-Down Movement.

Columns (4) and (5) lend support to the accuracy of our measurement of policy exposure. A couple's ability to have children is more affected by the mother than by the father. In column (4), we define a household's exposure according to the father's birth cohort instead of the mother's. The coefficient remains statistically significant but smaller than that in column (1). This is not surprising because the couple's ages are generally close to each other. However, once the mother's exposure is controlled for, the father's exposure no longer shows any sign of significance.

Columns (6) and (7) look into the policy's heterogeneous effects. LLF affects rural residents more than urban residents. Different from the one-child policy that imposes different rules upon urban and rural residents,[28] the implementation of the "Later, Longer, Fewer" policies is uniform across the country to the best of our knowledge. Because rural households had a much higher fertility rate before 1970 (6.2 in rural China versus 3.3 in urban China), they needed to reduce child births more after the government recommended a maximum quota of two children.

[27] The coefficient in front of the exposure to the one-child policy should be interpreted as the additional effect conditional on pre-existing "Later, Longer, Fewer" policies.

[28] More specifically, the policy permits only one child per couple in urban China, whereas in rural China, depending on the local policy, a second child may be permitted. Some counties allow for a universal second birth and others permit a second birth only if the first-born child is female.

Panel B of Table 4 uses the number of children ever born as the dependent variable. The general implications derived from panel B are consistent with those from panel A, but the coefficients in panel B are larger, suggesting the policy effect is larger on the number of births. This is because the family planning policies directly target child births. The number of living children is further influenced by adoption and children's premature death. In principle, the number of birth children and that of living children should affect parents' well-being differently. While the former affects the resources that can be allocated to parents when they are young more, the latter is a more important determinant for the amount of care that parents can receive in old age (Chen and Lei 2009). However, separately identifying the effects of the two numbers is a demanding task. The challenge not only comes from the high correlation between the two numbers (0.92 in our sample) but also from the fact that the gap between the two numbers generates a third effect—the early death of a child is undoubtedly a catastrophic shock to parents and therefore has a huge impact on them, both physically and emotionally. In the remainder of this paper, we will loosely use the term "number of children" without distinguishing the number of living children from that of birth children. We leave the identification of the two separate effects for future research.

5.2 Effect on Support from Children

Living Arrangements

Co-residence is an important form of old-age support (Logan and Bian 1999; Zhang 2004; Zimmer and Korinek 2010; Oliveira 2016)—it enables children to provide care for elderly parents if necessary; however, only looking at co-residence (or living in the same dwelling) is not enough. Zimmer and Korinek (2008) show that a large fraction of Chinese elderly who do not live with their adult children have children living within the same neighborhood. Lei et al. (2015) show that the recent decline in the co-residence rate is China is fully compensated by the increasing share of adult children living nearby. Such living arrangement serves both the needs of privacy and that of family support; therefore, we explore three outcomes: whether parents have at least one child living in the same dwelling, have at least one child living in the same village/community, have at least one child living in the same county/district.

[Table 5 About Here]

Table 5 estimates the effect of LLF policies on the elderly parents' living arrangements. Panel A shows that there is no evidence that family planning affects households' decision of co-residency; however, panels B and C suggest family planning reduced the probabilities of having at least one child living nearby. LLF policies reduce the probabilities of having children in the same village/community by 8.8 percentage points (0.0254×3.47) and those of having children in the same county/district by 7.6 percentage points

(0.0220×3.47). Our findings are consistent with those of Holmlund, Rainer, and Siedler (2013), who use multiple births as the instruments for family sizes and also find having fewer children reduces the likelihood of having at least one child close-by in old age. Similar to the effect on fertility, the LLF's effect on living arrangements is also more salient for the rural elderly.

Intergenerational Transfers

Whereas some recent studies question the importance of children's financial support as a form of old-age support for the current generation of urban families in China (Rosenzweig and Zhang 2014) in which the pension payments are more generous, other studies claim that children's financial support still plays an important role, especially in rural China (Lee and Xiao 1998; Sun 2002; Cai, Giles, and Meng 2006; Lei et al. 2012; Oliveira 2016). For example, Cai, Giles, and Meng (2006) find evidence that the transfers help to insure against parents' risk of falling below the poverty line. The studies of Lee and Xiao (1998) and Sun (2002) suggest that parents' need is the most important reason driving intergenerational transfers.

[Table 6 About Here]

Table 6 estimates the effect of LLF policies on inter vivos transfers. Panel A presents the parents' perspective and explores aggregate net transfers from children. Column (1) of panel A suggests that the magnitude of the effect is sizable despite its statistical insignificance. Such discrepancy might originate from the large volatility of inter vivos transfers. The LLF policies reduce elderly parents' net annual transfers from children by 395.9 RMB, about 18.6% of the sample average.

Elderly parents' aggregate transfers received can be decomposed into the number of children and net transfers per child. Panel B of Table 6 looks into how children's transfers to parents change in response to the policies from the children's perspective. The results suggest that per child transfers slightly increase and therefore partially offset the effect of a smaller number of children. Two reasons can potentially explain the increase in per-child transfers. The first is children's quantity-quality tradeoffs.[29] Family planning can improve the quality of children by reducing the family size. Children of higher quality can earn more and therefore can better support their parents. The second possibility is children's behavioral adjustments. For example, children born under the LLF policies realize they have fewer siblings, and they need to take greater responsibilities in taking care of their parents. Panel C probes the two possibilities by additionally controlling for children's characteristics, including education and income. The difference between the two panels reflects the quantity-quality tradeoff, and the remaining effect in panel C reflects the behavioral adjustment. The coefficients in panel C are universally smaller than those in panel B, suggesting that children's higher quality helps to alleviate the negative effect of having fewer children.

[29]For evidence of quantity-quality tradeoffs in China, see Li, Zhang, and Zhu (2008); Rosenzweig and Zhang (2009); Li and Zhang (2017); Qin, Zhuang, and Yang (2017)

Visits and Contacts from Children

Whereas the existing literature has paid great attention to children's financial transfers to parents, few studies have focused on the role of children's company. In the model section, we highlight two potential risks in old age when parents have fewer children: lower transfers, $T(N)$, and less company from children, $S(N)$. Note that parents can self-insure the former risk by increasing savings (A_y), but there is no way to insure against the latter risk. Moreover, children's company can be a more important determinant of parents' mental health status, such as depression. Bures, Koropeckyj-Cox, and Loree (2009) stress the importance of children within the social network of parents and in preventing loneliness in old age.

[Table 7 About Here]

Table 7 shows how the exposure to the "Later, Longer, Fewer" policies affects children's frequency of contacting and visiting parents. We find that family planning policies reduce children's monthly contacts with parents by 3.08 times per month and monthly visits to parents by 3.00 times per month. The decline is larger for rural children than urban children. Note that from parents' perspectives, the effect is further exaggerated by a smaller number of children.

The decline in frequencies of contacting and visiting parents can be further decomposed into a quantity-quality effect and a behavioral adjustment effect. In columns (4)–(6), we additionally control for children's characteristics and observe a large decline in the estimated effects of the family planning policies (about 36%). This suggests that children with more advanced education and higher income are even less attached to their parents. Two reasons can potentially explain the negative correlation between children's achievements and their attention to their parents. First, better education raises children's accessibility to migration (Zhao 1997). As a result, better-educated children can live further away from their parents thereby increasing the costs of visiting. This echoes our previous finding that the LLF policies reduce parents' chances of having children live nearby. Second, children of higher quality earn a higher wage rate in the labor market, so their opportunity costs of visiting are higher. The study of Ma and Wen (2016) lends support to this conjecture. They find that when parents are healthy and can help children with house-work, they will co-reside with higher-educated children. On the contrary, when parents are unhealthy and need help from children, they will co-reside with lower-educated children.

What explains the remaining effects in columns (4)–(6) of Table 7 after controlling for children's observable characteristics? On the one hand, our controls of children's quality are not complete, and the remaining effects may simply capture the residuals. "Quality" is a very complex measure that covers a much broader scope than human capital and labor market performance. On the other hand, having fewer siblings can directly reshape people's personalities. One concrete example is the "Little Emperor" syndrome. Blake (1981) and Cameron et al. (2013) document that an only child tends to be self-centered,

less cooperative, and less conscientious; therefore, children born under the family planning policies may be more selfish and less altruistic toward their parents.

Summary

In this subsection, we estimate the effect of the "Later, Longer, Fewer" policies on children's provision of old-age support to their parents. We use three measures of support: co-residence, financial transfer, and visits (or contacts). LLF policies have negative impacts on all three measures. These findings confirm our assumption in the theoretical framework that financial transfers and psychological support are increasing functions of the number of children ($\frac{\partial T(N)}{\partial N} > 0$ and $\frac{\partial S(N)}{\partial N} > 0$).

Another important finding is that the quantity-quality tradeoffs of children play different roles in financial support and in psychological support. In terms of financial support, better-educated children earn more in the labor market and also transfer more income to their parents. This alleviates the financial consequences of having fewer children. However, the opposite is true for the psychological support. Children of higher "quality" are contacting their parents less often, either because of higher opportunity costs, more selfish personalities, or both.

5.3 Effect on Parental Well-being in Old Age

Our theoretical framework generates three testable implications when the number of children declines as a result of the family planning policies (see Table 1): (1) the elderly parents consume more; (2) the effect on physical health in old age is less positive than that in young age; (3) the effect on old-age mental health is less positive than that on old-age physical health. This subsection discusses the causal impacts of family planning policies on a set of indirect welfare measures and tests the three implications.

Consumption

[Table 8 About Here]

Table 8 reports the influence of LLF policies on household expenditures in old age. We restrict our sample to the elderly parents who are not co-residing with their children. In the case of co-residency, we will not be able to distinguish the expenditures of the parents from those of their children. Table 5 suggests that the LLF policies do not affect the decisions of co-residing, despite the finding that the policies make children live further away from parents conditional on non-coresidence.

Although panel A of Table 8 seemingly suggests there is no overall policy effect on expenditures, some interesting patterns emerge when we further decompose total expenditures into smaller categories.

Strictly speaking, what our theoretical model predicts is about consumption, not expenditures. The life-cycle hypothesis also predicts "consumption smoothing," not "expenditure smoothing." There exists a gap between expenditure and consumption—people do not derive utility from all types of expenditures (e.g., health expenditures). Panels B and C suggest that households who are more exposed to the LLF policies spend more on food and living expenses (e.g., communication, transportation, utilities, household items). Previous literature finds that the one-child policy induces more food consumption for parents when they are young (Wu and Li 2012). The persistently positive effect on old age simply echoes the wisdom of consumption smoothing and is consistent with the first testable implication of our model.

Our findings of the negative policy effect on health expenditures also call for attention. So far, our empirical evidence has not yet pinned down the specific reasons of this decline: is it because elderly parents become healthier or because they are less likely to seek treatment in case of illness (e.g., no children are taking them to hospitals)? Note that the two scenarios yield vastly different welfare implications. In the subsequent analysis, we find some evidence that family planning positively affects parents' (especially mothers') physical health status; however, we still cannot rule out the possibility of the second unfortunate scenario.

Physical Health

[Table 9 About Here]

Table 9 reports the effect of LLF policies on a set of health outcomes. Column (1) finds no effect on self-rated life satisfaction. Columns (2) and (3) look at two other subjective health measures: self-rated health and self-perceived life expectancy. Self-rated health has been shown to be an independent predictor of future mortality, despite the inclusion of numerous other health indicators (Idler and Benyamini 1997). The estimations suggest that exposure to family planning prolongs mother's perceived life expectancy. Previous studies highlight the immediate or short-term effects of family planning on reducing maternal mortality (Chen et al. 1974; Boerma 1987; Menken, Duffy, and Kuhn 2003). Our results suggest that such an effect persists into old age. No similar effect is observed among fathers.

Columns (4)–(8) of Table 9 use more objective health measures as the dependent variables: BMI, underweight, limitations in ADL, limitations in IADL, and hypertension. We find no significant effects on most of those outcomes, except that mothers experience a decline in hypertension. Anthropometric gains that are generally observed when parents are young (Canning and Schultz 2012; Wu and Li 2012) do not show up in old age. This finding is consistent with our second testable implications, and our theoretical framework offers a possible explanation. On the one hand, the positive effect on the physical health in young age partially translates into better old-age health because health is an accumulative outcome (Strauss

and Thomas 1998). On the other hand, reduced support from children as a result of family planning may offset the positive effect to some extent.

Mental Health

[Table 10 About Here]

The most surprising finding from Table 9 is that family planning greatly worsens parents' symptoms of depression measured with the CES-D scale (column (9)). Table 10 further breaks the CES-D scale into ten smaller questions. Interestingly, if we list the top four contributors to the increased degree of depression for mothers and fathers separately, three out of four top contributors are common: feel everything they are doing is an effort; feel lonely; feel unhappy. Our previous analysis suggests that the elderly parents suffer from neither reduced consumption nor worse physical health; therefore, a lower amount of children's company becomes a candidate explanation.

Our theoretical framework shows that if mental health is more sensitive to children's support than physical health, family planning would have more negative effects on parents' mental well-being. Sociologists stress the importance of children within a social network of elderly parents (Bures, Koropeckyj-Cox, and Loree 2009) and identify social isolation as an important risk factor for depression (Cappeliez and Flynn 1993). Two pieces of evidence further support this conjecture. The first is that the effect on women is more than twice that on men (Table 9, column (9)). Psychological literature shows that women are more likely to feel negative emotions (Fischer et al. 2004; Else-Quest et al. 2012) and react more negatively to unpleasant experiences (Grossman and Wood 1993; Bradley et al. 2001; Chentsova-Dutton and Tsai 2007). Therefore, if we view China's coercive family planning as an unpleasant experience that restricts households' ability to have their desired number of children, women can react more negatively to the policies. Second, the last column of Table 11 suggests rural parents, who experience greater declines in the number of children (Table 4), are more negatively affected in terms of mental health. The reductions in having children living nearby and in contacts and visits from children are also larger for rural parents (Table 7). The mental health status of the rural elderly, therefore, calls for special attention. Rural suicide rates among the elderly are three to five times higher than the urban rates (Li and Zheng 2009).

[Table 11 About Here]

5.4 Heterogeneous Effect of Family Planning

So far, our analysis has focused on the average treatment effect of family planning policies. A natural next step would be understanding its heterogeneity—who is more affected by family planning? Because the "Later, Longer, Fewer" policies impose uniform rules upon all households, we expect households with

higher initial fertility rates to experience greater shocks. We test this conjecture in two steps. In the first step, we generate a counterfactual number of children for each household if there were no family planning policies using the following equations:

$$N_{i,p,c,t} = \gamma_0 + \Gamma\left(\text{Urban}_i, \text{Edu}_i, \text{FPP}_{p,c}\right) + \boldsymbol{\gamma}_2 \mathbf{X}_{i,p,c,t} + \text{Year}_t + \varepsilon_{i,p,c,t}, \quad (3)$$

$$\widehat{N}_{i,p,c,t} = \widehat{\gamma}_0 + \widehat{\Gamma}\left(\text{Urban}_i, \text{Edu}_i, 0\right) + \widehat{\boldsymbol{\gamma}}_2 \mathbf{X}_{i,p,c,t} + \text{Year}_t. \quad (4)$$

$N_{i,p,c,t}$ represents the number of children that the household ever give birth to,[30] and function $\Gamma(.)$ represents all possible interactions among the three elements. By doing this, we allow the exposure to family planning policies to have differential effects according to household's *hukou* and education. Note that we purposefully leave cohort fixed effects and provincial fixed effects uncontrolled for in equation (3) because including them would absorb all the variations in $\text{FPP}_{p,c}$. We, therefore, are only using the fertility variations generated by Urban_i and Edu_i (and their interactions). After estimating equation (3), we can obtain the counterfactual number of children ($\widehat{N}_{i,p,c,t}$) by setting $\text{FPP}_{p,c}$ to zero (equation (4)). In our sample, $\widehat{N}$ has a mean of 4.38, which is 0.82 higher than the average number of children ever born, with a standard deviation of 0.63. $\widehat{N}$ is higher for rural households (4.67, versus 3.62 for urban households) and for those who did not finish a junior high education (4.60, versus 3.78 for junior high graduates and above).

In the second step, we can exam the heterogeneous effect of family planning using the following specification:

$$\begin{aligned} y_{i,p,c,t} = F\big[&\beta_0 + \beta_1 \text{FPP}_{p,c} + \beta_2 \widehat{N}_{i,p,c,t} + \beta_3 \text{FPP}_{p,c} \times \widehat{N}_{i,p,c,t} \\ &+ \boldsymbol{\beta}_4 \mathbf{X}_{i,p,c,t} + f\left(\text{Age}_{i,c,t}\right) + \text{Prov}_p + \text{Year}_t + \varepsilon_{i,p,c,t}\big]. \end{aligned} \quad (5)$$

Table 12 and Table 13 report the coefficients β_3 for various outcomes. The analysis is consistent with our conjecture that households with higher initial fertility are more affected (Table 12, column (1); Table 13, columns (1) and (3)). Despite that they experience a greater increase in household consumption, they suffer from a greater reduction in the probability of having children living nearby. Women with higher initial fertility report greater increases in mental health issues. The heterogeneity is sizable. For example, if we take having at least one child in a county/district as the dependent variable, we find that households that have one more "initial" child ($\widehat{N}$ increased by one) would experience a greater decline of 2.43 (0.007×3.47) percentage points in that probability. The magnitude is about one-third of the average treatment of "Later, Longer, Fewer" policies (Table 5). Following a similar calculation, we find that the effect of family planning on women's depression symptoms (measured by CES-D scale) would be amplified by 25% for a woman

[30] Using the number of living children yields identical implications.

with one more initial child.

[Table 12 and Table 13 About Here]

Those pieces of findings are very close to previous rural-urban comparisons. Is the heterogeneity solely driven by households' *hukou* status? To answer this question, we add the interaction term $\text{Urban}_i \times \text{FPP}_{p,c}$ to equation (5). Table 12 column (2) shows that the heterogeneous effects on living arrangements are fully explained by rural-urban differences. However, regarding physical and mental health, the heterogeneity persists or even become more salient when we control for the interaction between policy exposure and *hukou* status (Table 13, columns (2) and (4)). Moreover, two additional results show up: if people have higher initial fertility, men would report greater increases in depression symptoms and women would subjectively rate her health poorer if they are more exposed to family planning policies.

We would like to add one additional remark here. If there were no family planning policies, households with lower socioeconomic status (e.g., rural, less-educated) would tend to have more children. Children also play a more important role in old-age support for this group of people because of their less accessibility to public old-age security systems. Figure 4 shows that in 2015, only 25.7% of the urban elderly report to financially rely on their children. The ratio is 72.6% for the rural elderly. Those people with higher initial fertility rates who tend to be generally less able to handle external shocks, turn out to be the most-constrained group when family planning policies impose some birth restrictions. We can see that family planning may bring unintended consequences on welfare inequality.

6 Conclusions

What are the long-term consequences of family planning policies? Understanding this question is crucial in designing population policies as an increasing number of countries start to adopt some kind of family planning policy. China is among the earliest countries to initiate family planning, and its policies were considered the most stringent in the world. China's experience provides valuable opportunities for case studies. By exploiting provincial heterogeneity in implementing the "Later, Longer, Fewer" policies, we evaluate how exposure to the family planning policies changes people's life in old age. Previous studies generally find positive effects of family planning policies on parents' consumption and health status, either because the policies reduce a mother's risk during childbirth or because they free up family resources as a result of having fewer children to rear. However, the negative side gradually emerges as parents turn older—there are fewer children that can take care of and accompany the elderly parents. This will negatively affect the elderly's physical and mental well-being.

Our empirical analysis brings good and bad news. The good news is that the physical well-being of the

elderly becomes slightly better as a consequence of family planning. We find that elderly parents spend more on food and living expenditures. Mothers expect themselves to live longer and are less likely to suffer from hypertension. Household medical expenditures also become smaller. Why does a smaller number of children not necessarily threaten elderly parents' material well-being? Because there are two channels that can neutralize the effect of having fewer children. The first channel is the quantity-quality tradeoff. The financial support from each child actually increases because children become better educated and earn a higher income. The second channel is self-insurance through higher savings. Anticipating that they will receive fewer transfers from children, parents can save more when young to prevent the downfall of consumption in old age.

The bad news is that the mental well-being of the elderly parents becomes more worrisome. Under the influence of the family planning policies, together with the rapid economic growth, children live further away from and interact less frequently with their parents. Despite the better material conditions, elderly parents feel more depressed. The negative effect on mental health is even more salient among mothers and rural parents. What makes things worse is that children with higher "quality" provide even less psychological support to their parents, probably because of their higher opportunity costs. To conclude, our study calls for greater attention on elderly people's social network and mental health status.

Our research has its own limitations. The empirical analysis mainly provides reduced-form estimations without a comprehensive analysis of the mechanisms. Our study involves many variables, whose mechanisms can vary tremendously from each other. Future studies need to solve two challenges to better understand how family planning affects people's well-being in old age. First, many outcomes in old age are cumulative ones (e.g., health). Strictly speaking, any event that takes place when a person is still young can have persistent effects into his or her old age. Second, it is not sufficient to study only the elderly people themselves if we wish to understand fully their well-being status. We also need to unveil the complex parent-child interactions. Ideally, we not only need to know parents' responses to the policy changes, but we also need to know how children respond to their parents' responses, parents' higher-order responses to their children's responses, et cetera

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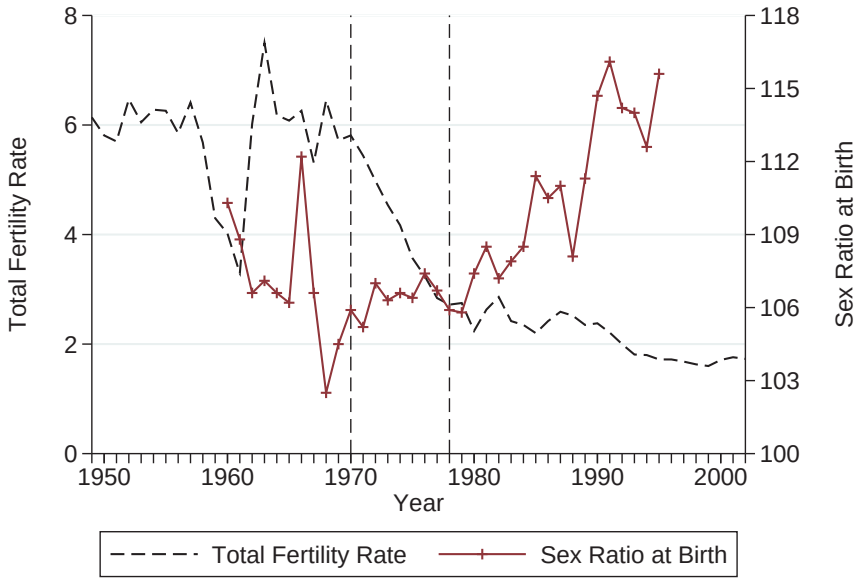
Figures

Figure 1: National Total Fertility Rate and Sex Ratio at Birth, 1949–2002



Data source:
Total fertility rate 1949–2002: Lu and Zhai (2009) "Sixty Years of New China Population."
Sex ratio at birth 1960–1988: Liang and Chen (1993).
Sex ratio at birth 1989–2000: China Population Statistics Yearbook.

Figure 2: Years of Establishment of Provincial Family Planning Leading Group

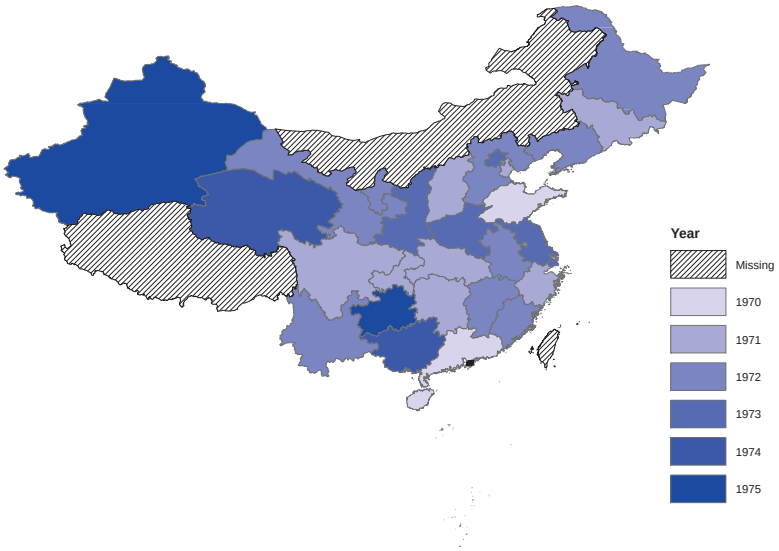


Figure 3: Trends of Total Fertility Rate, Early Establishment Provinces versus Late Establishment Provinces

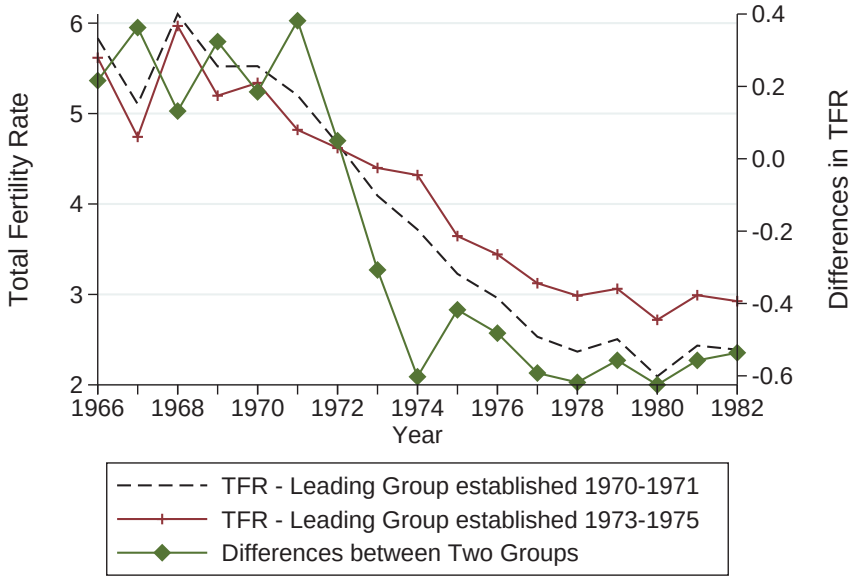
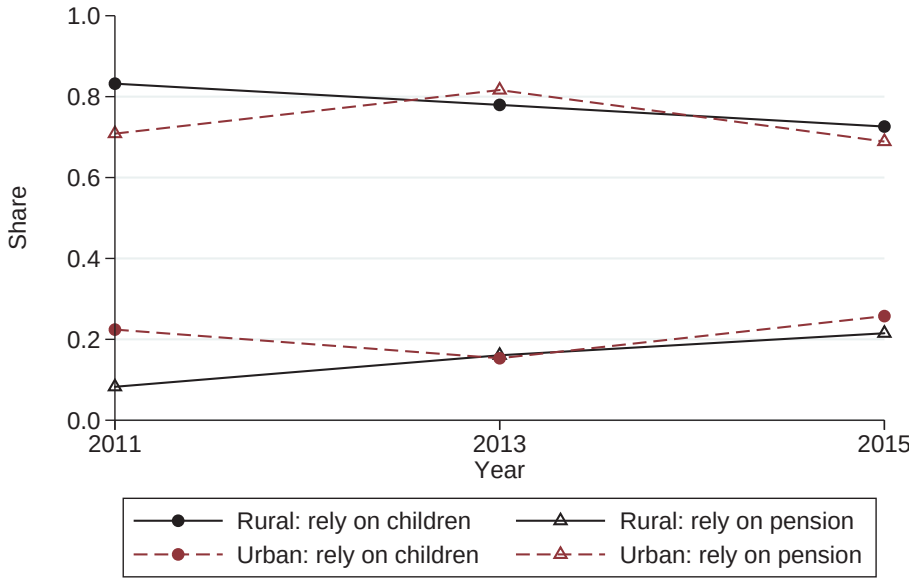
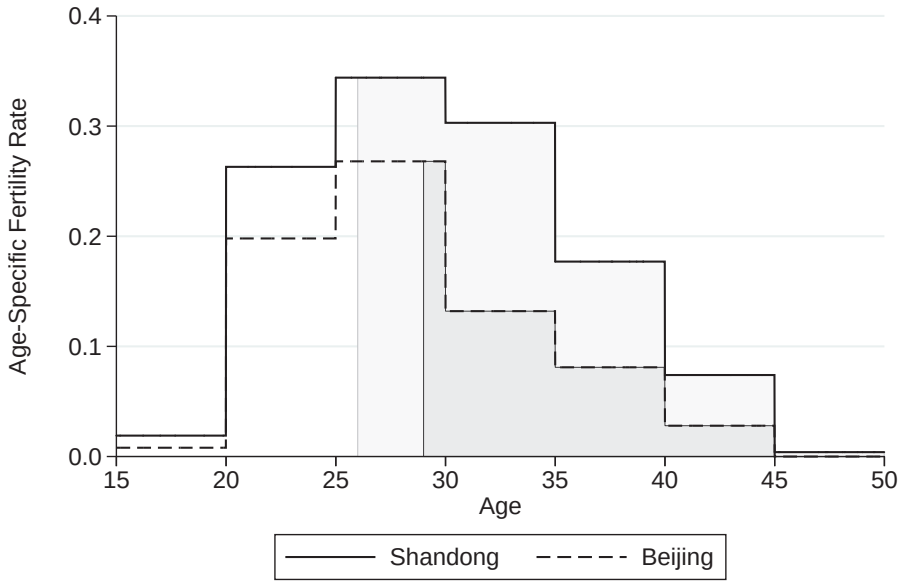


Figure 4: Answers to "Who do you think you can rely on financially for old-age support?"



Source: authors' calculations based on CHARLS.

Figure 5: Example of Constructing the Exposure to Policy (for cohort born in 1945)



Tables

Table 1: Predictions of the Theoretical Framework

	Period	Variable	Effect of Lower N
(1)	Young	Consumption (C_y)	Positive
(2)		Physical Health ($h_{1,y}$)	Positive
(3)		Mental Health ($h_{2,y}$)	Positive
(4)		Savings (A_y)	Positive
(5)	Old	Consumption (C_o)	Positive
(6)		Physical Health ($h_{1,o}$)	More negative than (2)
(7)		Mental Health ($h_{2,o}$)	More negative than (6)

Table 2: Summary Statistics of Parents

Level	Individual			Level	Household		
Variables	Mean	S.D.	Obs.	Variables	Mean	S.D.	Obs.
Age	69.909	6.767	16657	Widow	0.298	0.458	11119
Male	0.468	0.499	16694	Couple's Age Gap	2.982	4.198	11119
Education				Hukou	1.27	0.444	11119
Illiterate	0.352	0.478	16695	Number of Children Ever Born	3.558	1.647	11119
Some Elementary School	0.182	0.386	16695	Number of Living Children	3.516	1.667	11119
Elementary School	0.235	0.424	16695	Annual Net Transfer from Children (RMB)	1964.0	3511.6	10915
Middle School	0.110	0.313	16695	***Living Arrangement***			
High School and Above	0.064	0.244	16695	Children in Home	0.403	0.491	11119
Self-rated Satisfaction				Children in Village/Community	0.69	0.463	11119
Completely satisfied	0.038	0.192	14502	Children in County/District	0.885	0.32	11119
Very satisfied	0.275	0.446	14502	***Annual Household Expenditure***			
Somewhat satisfied	0.578	0.494	14502	Total Expenditure (RMB)	22169.9	23639.5	8130
Not very satisfied	0.087	0.282	14502	Food Expenditure (RMB)	8977.5	10549.7	8130
Not at all satisfied	0.022	0.148	14502	Living Expenditure (RMB)	3816.7	9438.3	8130
Self-rated Health				Health Expenditure (RMB)	2661.9	8953.5	8130
Excellent	0.033	0.180	16308				
Very good	0.101	0.302	16308				
Good	0.300	0.458	16308				
Fair	0.371	0.483	16308				
Poor	0.194	0.396	16308				
Measures of Health							
Changes of Living 10–15 More Years	0.486	0.256	12745				
BMI	23.102	3.453	12801				
Underweight	0.082	0.274	12801				
ADL	0.225	0.835	16695				
IADL	0.508	1.166	16695				
Hypertension	0.323	0.468	13242				
CES-D scale	7.631	6.428	16695				

Table 3: Summary Statistics of Children

Level	Children		
Variables	Mean	S.D.	Obs.
Age	42.244	8.744	40273
Male	0.531	0.499	41828
Annual Net Transfer to Parents (RMB)	597.3	1241.8	34399
Education			
Illiterate	0.079	0.269	41340
Did Not Finish the Elementary School	0.137	0.344	41340
Elementary School	0.262	0.44	41340
Middle School	0.313	0.464	41340
High School and Above	0.209	0.407	41340
Frequency of Visiting Parents			
30 times a month	0.214	0.41	33969
10–15 times a month	0.071	0.257	33969
4 times a month	0.084	0.277	33969
Twice a month	0.081	0.273	33969
Once a month	0.118	0.323	33969
Less than once amonth	0.39	0.488	33969
Almost never	0.042	0.201	33969
Frequency of Contacting Parents			
30 times a month	0.059	0.236	25549
10–15 times a month	0.104	0.306	25549
4 times a month	0.152	0.359	25549
Twice a month	0.146	0.353	25549
Once a month	0.172	0.377	25549
Less than once amonth	0.112	0.316	25549
Almost never	0.253	0.435	25549
Annual Income of Child and Child-in-law			
Under 2000 RMB	0.118	0.323	26963
2000–20000 RMB	0.359	0.48	26963
20000–50000 RMB	0.301	0.459	26963
Above 50000 RMB	0.222	0.416	26963

Table 4: Effect of Family Planning on Fertility

Sample	All					Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Number of Living Children							
M's Exposure to LLF	-0.245***		-0.242***		-0.347***	-0.292***	-0.119
	(0.0412)		(0.0679)		(0.0681)	(0.0480)	(0.0782)
M's Exposure to OCP		-0.178***	-0.00435				
		(0.0442)	(0.0689)				
F's Exposure to LLF				-0.173***	0.105		
				(0.0497)	(0.0750)		
Observations	5,115	5,115	5,115	4,822	4,822	3,733	1,381
Sample Mean	3.303	3.303	3.303	3.267	3.267	3.498	2.776
Panel B: Number of Children Ever Born							
M's Exposure to LLF	-0.325***		-0.341***		-0.428***	-0.373***	-0.175**
	(0.0450)		(0.0667)		(0.0691)	(0.0540)	(0.0779)
M's Exposure to OCP		-0.224***	0.0213				
		(0.0454)	(0.0643)				
F's Exposure to LLF				-0.227***	0.115		
				(0.0525)	(0.0746)		
Observations	5,115	5,115	5,115	4,822	4,822	3,733	1,381
Sample Mean	3.440	3.440	3.440	3.397	3.397	3.681	2.789
Other Controls	Y	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, couple's age gap, hukou, and education.

Table 5: Effect of Family Planning on Living Arrangements (conditional on having at least one living child)

Sample	All	Rural	Urban
	(1)	(2)	(3)
Panel A: Children in Home			
M's Exposure to LLF	0.00236	0.00636	-0.0130
	(0.0113)	(0.0126)	(0.0214)
Observations	10,755	7,900	2,854
Sample Mean	0.410	0.422	0.378
Panel B: Children in Village/Community			
M's Exposure to LLF	-0.0254**	-0.0326***	-0.00976
	(0.0104)	(0.0103)	(0.0221)
Observations	10,752	7,897	2,854
Sample Mean	0.699	0.727	0.622
Panel C: Children in County/District			
M's Exposure to LLF	-0.0222***	-0.0251***	-0.0127
	(0.00661)	(0.00745)	(0.0134)
Observations	10,752	7,871	2,828
Sample Mean	0.893	0.894	0.886
Other Controls	Y	Y	Y
Age FE	Y	Y	Y
Year FE	Y	Y	Y
Province FE	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are Probit model (average marginal effect reported). Standard errors are clustered at cohort-province level. Other control variables include widow, couple's age gap, hukou, and education.

Table 6: Effect of Family Planning on Inter Vivos Transfers (conditional on having at least one child outside the household)

Sample	All	Rural	Urban
	(1)	(2)	(3)
Panel A: (Parents' Perspective) Net Transfer from Children			
M's Exposure to LLF	-114.1	-12.23	-326.9
	(114.5)	(117.3)	(254.0)
Observations	10,004	7,414	2,589
Sample Mean	2127	2230	1830
Panel B: (Children' Perspective) Net Transfer to Parents			
M's Exposure to LLF	24.24	13.55	91.41*
	(20.97)	(22.46)	(49.23)
Observations	28,976	22,601	6,375
Sample Mean	599.6	592.1	626.2
Panel C: (Children' Perspective) Net Transfer to Parents Conditional on Children's Characteristics			
M's Exposure to LLF	12.22	-7.026	87.98*
	(18.52)	(19.41)	(48.10)
Observations	27,666	21,482	6,184
Sample Mean	606.3	600.4	626.8
Other Controls	Y	Y	Y
Age FE	Y	Y	Y
Year FE	Y	Y	Y
Province FE	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, parents' age gap, hukou, and education. Children's characteristics include age, gender, education, and income.

Table 7: Effect of Family Planning on Children's Attachment to Parents (conditional on having at least one child outside the household)

Sample	All	Rural	Urban	All	Rural	Urban
	Children's Characteristics Not Controlled			Children's Characteristics Controlled		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Monthly Contacts with Parents						
M's Exposure to LLF	-0.889***	-0.948***	-0.430	-0.574***	-0.546**	-0.425
	(0.216)	(0.240)	(0.439)	(0.222)	(0.242)	(0.475)
Observations	29,458	22,756	6,702	28,176	21,663	6,513
Sample Mean	9.780	9.311	11.37	9.837	9.362	11.42
Panel B: Monthly Visits to Parents						
M's Exposure to LLF	-0.867***	-0.929***	-0.687	-0.554**	-0.478*	-0.755
	(0.236)	(0.257)	(0.458)	(0.233)	(0.251)	(0.508)
Observations	28,582	22,070	6,512	27,345	21,017	6,328
Sample Mean	8.036	7.763	8.959	8.067	7.787	8.995
Children's Characteristics				Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, parents' age gap, hukou, and education. Children's characteristics include age, gender, education, and income.

Table 8: Effect of Family Planning on Household Expenditures (conditional on not co-residing with children)

Sample	All	Rural	Urban
	(1)	(2)	(3)
Panel A: log(Annual Total Expenditure)			
M's Exposure to LLF	0.0256	0.0362	-0.0268
	(0.0272)	(0.0329)	(0.0508)
Observations	4,799	3,380	1,417
Sample Mean	19132	15670	27406
Panel B: log(Food Expenditure)			
M's Exposure to LLF	0.104**	0.124**	0.0413
	(0.0466)	(0.0594)	(0.0632)
Observations	4,799	3,380	1,417
Sample Mean	8047	6219	12410
Panel C: log(Living Expenditure)			
M's Exposure to LLF	0.0728*	0.0824*	0.0485
	(0.0388)	(0.0479)	(0.0669)
Observations	4,799	3,380	1,417
Sample Mean	3185	2714	4312
Panel D: log(Health Expenditure)			
M's Exposure to LLF	-0.137**	-0.174**	-0.00541
	(0.0672)	(0.0763)	(0.127)
Observations	4,799	3,380	1,417
Sample Mean	2729	2353	3632
Other Controls	Y	Y	Y
Age FE	Y	Y	Y
Year FE	Y	Y	Y
Province FE	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, couple's age gap, hukou, and education.

Table 9: Effect of Family Planning on Parents' Health Status

Dependent Variables	Self-Rated Satisfaction	Self-Rated Health	Chances of Living 11–15 More Years	BMI	Underweight	ADL	IADL	Hypetension	CES-D Scale
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel A: Father					
M's Exposure to LLF	0.0157	0.0160	0.0135	-0.0253	-0.0109	-0.0207	-0.0159	-0.00150	0.409*
	(0.0262)	(0.0390)	(0.0116)	(0.268)	(0.0134)	(0.0295)	(0.0431)	(0.0220)	(0.235)
	6,790	7,411	6,138	5,920	5,830	7,530	7,530	6,101	7,530
Observations	2.780	3.525	0.504	22.63	0.0873	0.176	0.385	0.289	7.034
				Panel B: Mother					
M's Exposure to LLF	-0.0150	-0.00975	0.0379**	-0.0517	-0.0118	0.0128	-0.0765	-0.0626**	1.064***
	(0.0428)	(0.0557)	(0.0159)	(0.242)	(0.0154)	(0.0613)	(0.0777)	(0.0280)	(0.369)
	7,209	8,054	6,197	6,370	6,267	8,266	8,266	6,597	8,266
Observations	2.791	3.662	0.466	23.52	0.0748	0.203	0.505	0.345	8.837
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Regression model: variables underweight and hypertension use Probit regression (average marginal effect reported); other variables use OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, couple's age gap, hukou, and education.

Table 10: Effect of Family Planning on Parents' Depression Symptoms

Dependent Variables	Bothered by Trifles	Difficulty in Concentration	Felt Depressed	Difficulty in doing Everything	Felt Fearful	Insomnia	Felt Lonely	Could not Continue Life	Felt Unhappy	Felt Hopeless
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Father										
M's Exposure to LLF	0.000783	-0.00536	-0.00710	0.0339*	0.00620	0.00962	0.0210	0.0152	0.0239	-0.0189
	(0.0217)	(0.0173)	(0.0201)	(0.0190)	(0.00865)	(0.0209)	(0.0138)	(0.0110)	(0.0235)	(0.0192)
Observations	7,017	6,950	7,014	7,013	6,957	7,059	6,959	6,914	7,037	6,864
	0.233	0.239	0.232	0.287	0.0627	0.276	0.133	0.0887	0.362	0.494
Panel B: Mother										
M's Exposure to LLF	0.0132	-0.00165	0.0203	0.0643**	0.00558	-0.0491	0.0364	0.0188	0.0267	0.0218
	(0.0310)	(0.0262)	(0.0309)	(0.0278)	(0.0200)	(0.0304)	(0.0247)	(0.0197)	(0.0290)	(0.0290)
Observations	7,504	7,388	7,477	7,499	7,589	7,623	7,541	7,475	7,569	7,278
	0.341	0.328	0.343	0.367	0.135	0.441	0.220	0.142	0.402	0.509
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Regression model: variables underweight and hypertension use Probit regression (average marginal effect reported); other variables use OLS. Standard errors are clustered at cohort-province level. Other control variables include widow, couple's age gap, hukou, and education.

The ten symptoms are: was bothered by things that don't usually bother me; had trouble keeping my mind on what I was doing; felt depressed; felt everything I did was an effort; felt fearful; sleep was restless; felt lonely; could not get "going"; was unhappy; felt hopeless about the future.

Table 11: Effect of Family Planning on Parents' Health Status (Cont.)

Dependent Variables	Self-Rated Satisfaction	Self-Rated Health	Chances of Living 11–15 More Years	BMI	Underweight	ADL	IADL	Hypetension	CES-D Scale
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Father, Rural									
M's Exposure to LLF	0.0473	0.0616	0.0179	-0.390	0.00134	-0.0172	0.0262	-0.00558	0.739***
	(0.0311)	(0.0463)	(0.0119)	(0.346)	(0.0166)	(0.0328)	(0.0463)	(0.0242)	(0.278)
	4,961	5,459	4,432	4,506	4,459	5,544	5,544	4,640	5,544
Observations	2.788	3.567	0.480	22.23	0.101	0.180	0.406	0.282	7.567
Panel B: Father, Urban									
M's Exposure to LLF	-0.0615	-0.111	0.00202	0.949***	-0.0470***	0.00565	-0.100	0.00711	-0.371
	(0.0501)	(0.0740)	(0.0243)	(0.299)	(0.0175)	(0.0580)	(0.0868)	(0.0446)	(0.413)
	1,829	1,952	1,706	1,414	1,096	1,986	1,986	1,452	1,986
Observations	2.759	3.408	0.566	23.92	0.0538	0.164	0.329	0.311	5.544
Panel C: Mother, Rural									
M's Exposure to LLF	0.0102	0.0594	0.0274	-0.286	-0.00816	-0.0360	-0.190**	-0.0581*	1.112**
	(0.0544)	(0.0689)	(0.0175)	(0.273)	(0.0175)	(0.0562)	(0.0948)	(0.0321)	(0.436)
	5,625	6,334	4,775	5,133	5,064	6,493	6,493	5,339	6,493
Observations	2.802	3.702	0.445	23.31	0.0808	0.211	0.546	0.346	9.286
Panel D: Mother, Urban									
M's Exposure to LLF	-0.102	-0.165*	0.0820***	0.422	-0.0326	0.0347	0.118	-0.0615	0.987
	(0.0806)	(0.0932)	(0.0246)	(0.471)	(0.0498)	(0.0987)	(0.104)	(0.0540)	(0.703)
	1,584	1,720	1,422	1,237	797	1,773	1,773	1,246	1,773
Observations	2.751	3.516	0.537	24.37	0.0740	0.175	0.356	0.343	7.192
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Regression model: variables underweight and hypertension use Probit regression (average marginal effect reported); other variables use OLS. Standard errors are clustered at cohort-province level. Other control variables include age, gender, widow, hukou, and education.

Table 12: Heterogeneous Effect of Family Planning on Living Arrangements, Net Transfers from Children, and Household Consumption

Category	Dependent Variable	Coef of Policy Exposure ×Predicted Fertility	
		(1)	(2)
Living Arrangement	Children in Home	-0.007	0.014*
		(0.006)	(0.008)
	Children in Village/Community	-0.013***	0.006
		(0.005)	(0.007)
	Children in County/District	-0.007**	0.001
		(0.003)	(0.004)
Net Transfers from Children	Net Transfers from Children	-4.239	69.445
		(54.223)	(75.093)
Household Consumption	log(Annual Total Expenditure)	0.019*	0.006
		(0.010)	(0.017)
	log(Food Expenditure)	0.029	0.015
		(0.019)	(0.029)
	log(Living Expenditure)	0.034**	0.027
		(0.013)	(0.021)
	log(Health Expenditure)	-0.034	-0.055
		(0.030)	(0.052)
	Policy Exposure×Hukou	N	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Only the coefficients (or the marginal effects) β_3 from equation (5) are reported. We use OLS for all continuous dependent variables and Probit for all binary variables. Standard errors are clustered at cohort-province level.

Table 13: Heterogeneous Effect of Family Planning on Physical and Mental Health

Category	Dependent Variable	Coef of Policy Exposure ×Predicted Fertility			
		Male		Female	
		(1)	(2)	(3)	(4)
Physical Health	Self-Rated Satisfaction	-0.003	0.002	0.005	0.017
		(0.009)	(0.015)	(0.012)	(0.014)
	Self-Rated Health	0.001	-0.018	0.021	0.038*
		(0.013)	(0.022)	(0.015)	(0.020)
	Chances of Living	0.005	0.004	0.001	-0.000
	11–15 More Years	(0.004)	(0.006)	(0.004)	(0.005)
	BMI	0.001	-0.012	-0.063	-0.042
		(0.059)	(0.070)	(0.063)	(0.078)
	Underweight	0.026	0.022	0.008	-0.017
		(0.031)	(0.040)	(0.033)	(0.042)
	ADL	0.003	-0.016	0.023	0.020
		(0.013)	(0.021)	(0.015)	(0.017)
	IADL	0.008	-0.018	-0.005	-0.007
		(0.018)	(0.029)	(0.019)	(0.027)
	Hypetension	0.000	0.016	-0.013	-0.013
		(0.021)	(0.034)	(0.023)	(0.027)
Mental Health	CES-D Scale	0.055	0.233**	0.266***	0.295**
		(0.071)	(0.116)	(0.095)	(0.116)
Depression Symptoms	Bothered by Trifles	0.005	0.010	0.005	0.003
		(0.006)	(0.008)	(0.008)	(0.009)
	Difficulty in Concentration	0.002	0.013	0.006	0.005
		(0.006)	(0.009)	(0.007)	(0.008)
	Felt Depressed	0.001	0.013	-0.000	0.003
		(0.006)	(0.008)	(0.007)	(0.008)
	Difficulty in Doing	0.007	0.008	0.012*	0.021**
	Everything	(0.006)	(0.009)	(0.007)	(0.009)
	Felt Fearful	0.006*	0.005	0.010**	0.011*
		(0.003)	(0.004)	(0.005)	(0.006)
	Insomnia	-0.011*	0.002	0.007	0.001
		(0.006)	(0.009)	(0.007)	(0.008)
	Felt Lonely	0.003	0.014**	-0.000	-0.002
		(0.005)	(0.006)	(0.006)	(0.008)
	Could not Continue Life	-0.003	-0.001	0.011**	0.010*
		(0.004)	(0.006)	(0.005)	(0.006)
	Felt Unhappy	-0.005	0.001	0.007	0.020**
		(0.006)	(0.009)	(0.007)	(0.009)
	Felt Hopeless	-0.004	-0.012	0.012	0.009
		(0.007)	(0.011)	(0.007)	(0.009)
	Policy Exposure×Hukou	N	Y	N	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. Only the coefficients (or the marginal effects) β_3 from equation (5) are reported. We use OLS for all continuous dependent variables and Probit for all binary variables. Standard errors are clustered at cohort-province level.

Appendix A: Robustness against other Contemporaneous Events

This appendix discusses the robustness of our estimated effects of family planning policies against other contemporary events. The key variation we use in our empirical analysis is the establishment years of provincial Family Planning Leading Group, who was responsible for enforcing the "Later, Longer, Fewer" policies. Because the establishment of the provincial leading groups spanned from 1970 to 1975, the two most important contemporaneous events are the Cultural Revolution and the Sent-Down Movement. More importantly, both historical events can affect the fertility decision directly. The Cultural Revolution from 1966 to 1976 was a catastrophic political event for large sections of the population, with the number of victims (fatalities plus those imprisoned or persecuted) estimated to be close to 30 million (Walder and Su 2003). The Cultural Revolution brought violence and uncertainties. If we believe fertility is a procyclical decision, the Cultural Revolution would suppress the desire to have children. The impact of the Sent-Down Movement is even more obvious. From 1967 until 1978, an estimated 17.7 million urban youths were sent down to rural areas (Gu 2009). Those young people were at the peak of their fertility but were sent to an unfamiliar place away from their hometown.

Table A1 discusses the robustness to other important events during the early 1970s in two steps. First, we construct the exposure to the Cultural Revolution (1966–1976) and the Sent-Down Movement (1968–1978) in a similar way as we construct the exposure to the "Later, Longer, Fewer" policies. More specifically,

$$\text{EXPO CulturalRevolution}_{pc} = \sum_{a=15}^{49} \text{AFR}_p\left(a\right) I\left[1966 \leq c + a \leq 1976\right]$$

$$\text{EXPO SentDown}_{pc} = \sum_{a=15}^{49} \text{AFR}_p\left(a\right) I\left[1968 \leq c + a \leq 1978\right].$$

In the second step, we take into account the fact that provinces can be shocked differently by the two events. We proxy the provincial intensity of the Cultural Revolution with the provincial aggregate fatalities during the revolution, which are taken from Walder (2017). We proxy the provincial intensity of the Sent-Down Movement by the total number of people who were sent down to the countryside during the movement, which is taken from Gu (2009). Table A1 suggests that exposure to the Cultural Revolution does not affect households' fertility decision. The Sent-Down Movement had some negative effects, which is not surprising given the nature of the movement. The important takeaway here is that the estimated coefficients in Table A1 are very close to those in Table 4. This suggests that even if those two events may independent effects on fertility, they will not bias our estimated effects of the family planning policies.

Table A1: Robustness to the Cultural Revolution and the Sent-Down Movement

Dependent Variables	Number of Living Children (mean = 3.290)				Number of Children Ever Born (mean = 3.427)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
M's Exposure to LLF	-0.249***	-0.249***	-0.247***	-0.258***	-0.323***	-0.324***	-0.321***	-0.333***
	(0.0420)	(0.0420)	(0.0431)	(0.0442)	(0.0457)	(0.0457)	(0.0466)	(0.0479)
M's Exposure to the CR	0.0316	0.102			-0.0175	0.0458		
	(0.0959)	(0.0871)			(0.0894)	(0.0894)		
M's Exposure to the CR		-0.0219				-0.0197		
*Provincial CR Intensity		(0.0188)				(0.0190)		
M's Exposure to the SDY			0.00883	0.0229			-0.0233	-0.00821
			(0.0752)	(0.0765)			(0.0701)	(0.0711)
M's Exposure to the SDY				-0.0458**				-0.0492*
*Provincial SDY				(0.0219)				(0.0266)
Observations	5,115	5,115	5,115	5,115	5,115	5,115	5,115	5,115
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are OLS. Standard errors are clustered at province-cohort level. Other control variables include widow, hukou, and education. "Provincial Cultural Revolution Intensity" is approximated by the provincial aggregate fatalities during the Cultural Revolution, which are taken from Walder and Su (2003). "Provincial Sent-Down Movement Intensity" is approximated by the total number of people who were sent outside the province during the movement, which is taken from Gu (2009).