One-Child Policy, Marriage Distortion, and Welfare Loss

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Abstract

We investigate how exposure to the One-Child Policy (OCP) during early adulthood affects marriage and fertility in China. Exploring fertility penalties across provinces over time and the different implementations by ethnicity, we show that the OCP significantly increases the unmarried rate among the Han ethnicity but not among the minorities. The OCP increases Han-minority marriages in regions where Han-minority couples are allowed for an additional child, but the impact is smaller in other regions. Finally, the deadweight loss caused by lower fertility accounts for 10 percent of annual household incomes, and policy-induced fewer marriages contribute to 30 percent of the fertility decline. (JEL codes: I31, J12, J13, J18)

Keywords: One-Child Policy, Marriage Distortion, Fertility

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"No union is more profound than marriage, for it embodies the highest ideals of love, fidelity, devotion, sacrifice, and family. In forming a marital union, two people become something greater than once they were."

——*Justice Anthony Kennedy*

1 Introduction

Marriage, serving as an essential source of happiness, generates and redistributes welfare among individuals (Zimmermann and Easterlin, 2006; Dupuy and Galichon, 2014). Since the seminal work on the marriage market by Becker (1973, 1974), scholars apply the transferable-utility model in family economics extensively (Rao, 1993; Edlund, 2000; Chiappori et al., 2002; Botticini and Siow, 2003; Bitler et al., 2004; Choo and Siow, 2006; Chiappori et al., 2018). The economic rationale of this model is that expected marriage gains shape individual behaviors and market equilibrium.

As children are the natural fruits of marriages, this study examines marriage behavior distortion induced by China's One-Child Policy (OCP). The OCP, which formally started in 1979, is the most strict family-planning policies in the world. Its *compulsory* and *strict* fertility restrictions create a natural setting to investigate how public policies affect marriage outcomes.

First, the OCP differentially affected the expected marriage gains by assigning different birth quotas to Han-Han (H-H), minority-minority (M-M), and Han-minority (H-M) couples.[1] The local governments mostly permit both Han (H-H) couples to have only one or two children. In contrast, M-M couples can have more birth quotas or, in some cases, are exempt from the OCP restrictions. Policies for H-M couples, however, are more intricate. Roughly 50% of the provinces possess official documents that extend birth quotas for H-M couples, known as pref-

[1]For simplicity, we identify only two ethnicities here – Han (H) and minority (M). In this paper, we interchangeably use the terms "inter-ethnic marriage" and "H-M marriage."

erential policy regions, while the remaining provinces are designated as non-preferential-policy regions. Second, financial penalties were charged for unauthorized births across provinces from 1979 to 2005 (Ebenstein, 2010; Wei and Zhang, 2011). In China, the penalty is also known as "social maintenance fees" or "fertility fines" and could be several times higher than local household average annual income in some regions. Changes in the OCP fines coincide with the attitudes of the central government towards fertility restrictions and with the promotion aspirations of provincial officials. Therefore, the implementation of the OCP provides ethnic, spatial, and temporal variations for empirical estimations in this study.

Since expected marriage gains shape the marriage-market equilibrium, we can have a couple of testable predictions based on the variations in OCP implementation. The first prediction is that the OCP would increase the unmarried rate of Han people because of lowered expected marriage gains. Secondly, the OCP would relatively increase the H-M marriage rate, especially in the preferential policy regions.[2] Lastly, the minorities living in preferential policy regions have a higher value in the marriage market. To test these predictions, we conduct empirical analysis on different outcomes in a couple of comparison groups, such as unmarried status and fertility in Han and minority groups, and inter-ethnic marriages in preferential-policy regions and non-preferential-policy regions.[3]

Our nationally representative sample is from the 2000 Population Census, the 2005 One

[2]"*Relatively*" here means the H-M marriage rate among the married ones. The changes in *unconditional* H-M marriages are difficult to predict. On the one hand, it can be negatively affected by the decreased number of marriages in total; on the other, it could be positively affected by a relative increase in the proportion of H-M couples.

[3]Notably, this comparison probably gives more conservative estimates because the comparison groups could also be affected by the OCP.

Percent Population Survey, and the 2010 Population Census in China. We restrict the sample to those aged between 26 and 55, and start with some graphical evidence, in which we focus on the unmarried rate at the survey, intra-ethnic marriage rate, and the number of births over different cohorts. Observing that some provinces took stricter fertility restrictions in 1989–1995, we divide the provinces into two groups and plot the outcomes over birth cohorts in each group. The graphs show that: 1) among the Han people, the cohorts born after 1970 have a significantly decreased probability of marriage in provinces with stricter restrictions relative to other ones, while the effects are negligible among the minorities. 2) In preferential policy regions, the intra-ethnic marriage rate significantly declines for married individuals born after 1970 in provinces with stricter restrictions. 3) among the Han people, the fertility difference between regions with and without such stricter restrictions is persistent and stable for the cohorts born before 1965, narrows from the late 1960 birth cohorts, and then becomes negligible afterward. These findings collectively provide preliminary supportive evidence for our predictions.

We then employ a difference-in-differences (DID) setting for further investigation by using variations in fertility penalties across provinces over time. The key independent variable is the mean value of the fertility fines in the *hukou* province of the birth cohorts when aged 16-25. Based on the data from Scharping (2003), the OCP fines are calculated as a multiplier of annual household disposable income at the province level. The covariates include birth cohort, *hukou* provinces, gender, age, interactions between gender and age, type of *hukou* (urban/rural), and provincial-specific linear birth cohort trends. The linear birth cohort trends are included to capture the heterogeneous trends across regions in China.

The results show that a one-unit increase in the fine rate leads to a significant rise of 2 percentage points in the unmarried rate for Han individuals (45 percent of the mean). In comparison, the estimate for minorities is only 0.6 percentage points (10 percent of the mean).

We also find that OCP affects the marriage status among the Han people when they are young rather than throughout the entire life cycle. Besides, among the married Hans, a one-unit increase in the OCP fine rate leads to a rise of 0.60 percentage points in H-M marriages in the preferential policy regions but only 0.18 percentage points in non-preferential policy regions. Meanwhile, in the same econometric framework, we find that a one-unit increase in the fertility penalty rate leads to 0.06 fewer births (3 percent of the mean) for Han women.[4] Based on the sufficient statistic approach (Chetty, 2009), we estimate that social welfare loss caused by the policy-induced lower fertility accounts for up to 10 percent of the annual household income. We further decompose the fertility effects into different marital statuses (Heckman et al., 2013) and find that the policy-induced fewer marriages could explain almost 30 percent of the policy-induced fertility decline and welfare loss. In contrast, we do not observe any significant impact on fertility among minorities.

Finally, we provide consistent evidence of a higher market value for minorities in the preferential policy regions. Among H-M couples in the preferential-policy regions, the minorities are more likely to marry educated Han people in the presence of higher OCP fines. In contrast, among the Hans or the minorities in the non-preferential policy regions, we do not find any significant association of the OCP fine rate with spousal education.

Our findings contribute to several ongoing themes in the literature. First, by showing how exposure to the OCP during early adulthood affects marriage outcomes, we build up the extensive literature about the effects of public policies on marriage behaviors (Blank et al., 2009;

[4]It is important to quantify how the OCP affects fertility in China because such estimates provide essential references to the dead-weight loss of social welfare (Chetty, 2009; Hendren, 2016; Kleven, 2021). Such investigation also enables us to estimate how much the fewer marriages induced by the OCP contribute to fertility reduction.

Buckles et al., 2011; Stevenson, 2007; Gayle and Shephard, 2019; Persson, 2020). For instance, Blank et al. (2009) show that the minimum age of marriage laws in the US lowered the incidence of young marriage. Buckles et al. (2011) find that a higher cost of marriage because of blood test requirements leads to a significantly smaller number of marriages. Consistently, previous researchers have found that marriage outcomes can also be affected by other public policies, including divorce laws (Stevenson, 2007), income taxes (Gayle and Shephard, 2019), and social insurance (Persson, 2020).

Our findings contribute to the literature that estimates the consequences of the OCP.[5] Previous researchers have investigated a series of outcomes, such as fertility (e.g., Schultz and Zeng, 1995; McElroy and Yang, 2000), the male-to-female sex ratio at birth (Ebenstein, 2010; Li et al., 2011), reported twinning rate (Huang et al., 2016), crime rate (Edlund et al., 2013), saving rate (Wei and Zhang, 2011), and human capital accumulation (Huang et al., 2021), etc. However, the marriage outcomes have so far been under-explored. We add to the ongoing literature by showing the impacts on marriage market outcomes for the first time.

Our findings also highlight the importance of marriage distortion when estimating the impact of the OCP on fertility. Although there is an established strand of literature about the fertility consequences of the OCP (e.g., Schultz and Zeng, 1995; McElroy and Yang, 2000; Zhang, 2017), these investigations mainly focus on contemporaneous fertility reduction and obtain mixed findings.[6] In contrast, the lagged effects on fertility and the role of marriage

[5]Zhang (2017) provides a comprehensive review of the literature about China's One Child Policy.

[6]For example, Schultz and Zeng (1995) find that the role of the OCP in fertility reduction is small, while McElroy and Yang (2000) find a significant reduction in fertility among rural households.

receive much less attention. Our estimates fill in this gap by showing that exposure to the OCP during early adulthood is associated with delayed marriage and lowered fertility in later life. We find that the decreased number of marriages plays a significant part in policy-induced fertility reduction.

We organize this paper as follows: Section 2 introduces the context of this study, especially the background of the OCP and several testable predictions based on the expected utility of various marriages. We introduce the data in Section 3 and provide descriptive evidence for the consequences of the OCP in Section 4. Section 5 presents the empirical strategy and the results. We conclude and discuss the results in Section 6.

2 Context: Ethnicity and One-Child Policy in China

This section introduces the context of this study. We start with an introduction to ethnicities in China. Then, we introduce the relevant details about OCP and briefly discuss which theory would predict what should happen as the OCP environment changes.

2.1 Ethnicities in China

China officially has 56 ethnicities. Soon after the founding of the People's Republic of China in 1949, the central government initiated a monumental project of ethnic identification.[7] The main part of this project was finished in 1957, but follow-up revisions continued until the 1970s. Based on cultural characteristics and the groups' willingness, minorities were officially into 55 ethnic groups.

According to the regulations on Household Registration of the People's Republic of China,

[7]In the 1953 population census, more than 400 groups applied for national minority status (Fei, 1979). With guidance from a few Western-educated anthropologists, hundreds of research teams were sent to conduct fieldwork and collect information about the history, language, and customs of each group.

every newborn's ethnicity should be registered in the *hukou* system in the first month after birth. For the intra-ethnic couples, the ethnicity of the children should follow that of their parents. The children of the inter-ethnic couples can identify with either the father's or the mother's ethnicity (Jia and Persson, 2019). Ethnic misrepresentation is illegal and is strictly controlled and monitored by the government, making it difficult to make a fake claim.

According to the 2010 census, the Han ethnicity makes up 92 percent of the population, while all other 55 ethnic groups account for the remainder. The largest minority group currently in China is *Zhuang*, with a population of 16.9 million in 2010. The smallest minority group, the *Keba*, has only 3,682 members. Appendix Figure A1 shows the geographic distribution of all 56 ethnic groups. The current geographic pattern of ethnic distribution is mainly the result of Chinese migration history (Poston Jr and Shu, 1987). The map shows that most minority groups concentrate in specific regions or provinces. For example, over 90 percent of the *Zhuang* minority people live in the *Guangxi Autonomous Region*, and over 95 percent of *Tibetan* minority people live in the *Tibet Autonomous Region*. Notably, most ethnic minority groups live in regions on the western or northeastern border and are usually poorer.

2.2 One-Child Policy

The central government announced China's OCP first in 1978. It then appeared in the amended Constitution of 1982. In recognition of the diversity of demographic and socioeconomic conditions across China, the central government issued *"Document 11"* in February 1982 to authorize local governments to issue specific regulations. Two years later, the Central Party Committee further issued *"Document 7"*, which formally devolved the responsibility of policymaking from the central government to the provincial governments. *"Document 7"* stipulated that provincial governments should make regulations regarding birth control in accordance with local needs and conditions, and these regulations only needed to be approved by the provincial-

level Standing Committees of the People's Congress.

2.2.1 The OCP Implementation for Different Types of Couples

China is a populous country with complicated ethnic issues (Sautman, 1998; Kaup, 2000; Ma, 2007),[8] and thus governments have a strong commitment to "inter-ethnic harmony" and "national unity." Therefore, while most H-H couples were permitted to have only one or two children, M-M couples often enjoy more birth quotas or have even been considered exempt from the OCP restrictions.

Since H-M couples only capture 3 percent of the population and receive less attention, provincial governments can decide whether to implement preferential policies to H-M couples. We collected data regarding the exemption terms for H-M couples in every region from the National Health and Family Planning Commission of China website. Appendix Figure A2a shows that preferential policies apply in half of the provinces.

Such preferential terms for H-M couples generally started in the early 1980s and are usually time-invariant. The provinces with preferential policies tend to have more minorities, possibly because local governments did not want to come across mass resistance and complaints, especially from minority groups. For example, *Qinghai* province, one of the provinces with the highest proportion of minority individuals in China (39 percent), legally allows H-M couples an additional birth. The policy states that "*families are permitted to have one additional birth if one or both sides of the couple are from minority groups.*" However, in some cases, such relaxation is not as much as that for minority couples. For example, there are usually additional terms on H-M couples' extra birth quota, such as "*there should be 3-5 years birth space between the previous and the permitted additional births*."

[8]Ma (2007) listed ten of China's ethnic problems that are worthy of academic attention, and the first one among them is ethnic identification and nationalism.

However, in the regions without a preferential policy for H-M couples, policy implementation for H-M couples is a "gray area." Notably, the absence of such a preferential policy does not mean the H-M couples are strictly forbidden to have another birth. Based on our anecdotal evidence, this issue strongly depends on the attitudes of local officials about H-M couples.

2.2.2 Variation in the OCP Fines across Regions and over Time

Since the central government authorized local governments to specify fertility regulations at the beginning of the OCP, there has been considerable variation in policy implementation across provinces and over time. The measure we use for the strength of OCP implementation is the province-level average financial penalty for an unauthorized birth from 1979 to 2005 (Ebenstein, 2010; Wei and Zhang, 2011). The OCP penalties, also known as "social maintenance fees," were formulated in multiples of yearly household income. Appendix Figure A2b plots the pattern of fertility penalties from 1979 to 2000 in each province, and the changes of penalty rate in different provinces generally happen differently in timing and magnitude.

In this paper, we use variation in fertility fines (see Appendix Figure A2b) to identify the effects of the OCP on marriage outcomes. It is necessary to know why the government changed the tax rates on unauthorized children. Indeed, the changes in the OCP fines were mostly driven by the attitudes of the central government towards birth control and the promotional ambition of local officials.

At the beginning of the OCP, Vice Premier *Chen Muhua* emphasized the necessity to pass new legislation imposing a "tax" on unauthorized children to encourage compliance. Legal measures such as monetary fines and subsidies were employed in 1979. The central government provided guidance fertility fines, but local governments had the latitude to modify them.[9]

[9]Throughout the process, it has been subnational leaders, rather than the central government, who have faced the practical difficulties associated with collecting high fines, such as

To help manage the practical difficulties experienced in earlier years, the Communist Party Central Committee (CPCC) issued several documents in the early 1980s as guidelines for local implementations, allowing even greater flexibility in local family-planning practices (Greenhalgh, 1986; Greenhalgh and Winckler, 2005). Since local governments cared about social stability and faced much resistance from the masses, they had little incentive to set high fine rates. As shown in Figure A2b, the fine rates in many provinces went down in 1982-1984, when the central government formally authorized local governments to design region-specific regulations. Fewer changes in the fine rates had happened in the period 1984-1988.

In the late 1980s, the central government noticed the high birth rate and thus established a link between OCP performance and the promotion of local officials.[10] According to Appendix Figure A2b, the national average fine rate increased from 0.82 to 2.99 times of annual household incomes from 1989 to 1992, just after *Li Peng*'s speech. This increase is significantly larger than the increases observed in any other period. In March 1991, family planning was listed among the three basic state policies in the Eighth Five-Year Plan passed by the National People's

resistance and complaints. For example, Guangdong Province once received over 5,000 letters complaining about the implementation of the One-Child Policy in a single year. In the first few years, some provincial officials complained, "There is no more difficult task in the world than the OCP implementation."

[10]As Greenhalgh and Winckler (2005) wrote in the book *Governing China's Population*: "Addressing governors in spring 1989 *Li Peng* (current premier) said that population remained in a race with grain, the outcome of which would affect the survival of the Chinese nation. To achieve subnational compliance, the central government must supplement the policy with more careful management by objectives. At a meeting on birth policy in the premier's office, *Li Peng* explained that such targets should be 'evaluative.'"

Council. This document explicitly set an objective that the natural population growth rate should decrease to less than 1.25 percent on average in the following decade. To achieve such a challenging goal, the national leaders employed a "responsibility system", in which the performance in OCP implementation was linked to the promotion of local officials. The "responsibility system" induces provincial leaders to set high fine rates and compel local cadres to enforce them. For example, shortly after the establishment of this "responsibility system," most newly inaugurated provincial governors increased OCP fine rates.

We find that the promotion incentives of provincial officials could be the main force driving the changes in the penalty rates, and the strength of such an incentive depended on the governor's characteristics.[11] As reported in Appendix Table A1, among the 17 "obvious" increases of fine rate in 1989-1992, 12 occurred in the first two years of the tenures of new provincial governors.[12] Besides, the average age of these 17 provincial governors was less than 56 years old in the year of fine increases, while the average age of other provincial governors was 58 years in 1990.[13]

[11]We also investigate the placements of former governors whose successors raised the fine rate by more than one- year's household income. We find that these former governors were at least as successful as their peers in their political careers. In some sense, these former provincial governors were more successful than their peers. Several of them, such as *Rongji Zhu*, *Changchun Li*, and *Guanzheng Wu*, even became political leaders of the central government. We do not find any information showing that any provincial governors were displaced due to bad performance in OCP implementation.

[12]A "obvious" increase means that the OCP fine rates increased during 1989-1992 and reached a level higher than an average household's annual income.

[13]When comparing the birth years of the 17 governors with others, they are slightly younger,

The central government created some institutions and laws for the effective enforcement of the OCP. Population and Family Planning Commissions (PFPC) were set up at every level of government to carry out registration and inspection work. A large-scale public birth control campaign was launched during the 1980s, and an effective curb on population growth was among the highest priorities for local officials. Local PFPCs can collect fines from households who had unauthorized births directly and sue those who did not pay fines as required. The provincial governments also used other measures to penalize fertility violations. For example, unauthorized children were not eligible for registration in the *hukou* system if their parents had not paid the fines.

2.2.3 Potential Marriage Distortion under the One-Child Policy

Economists consider children as homemade consumer durables in marriages (Becker, 1973, 1974). Therefore, fertility restrictions could undermine expected marriage gains. Meanwhile, according to the classical model developed by Becker (1973), Becker (1974) and Choo and Siow (2006), the equilibrium marriage outcomes are shaped by the expected utility gains of different marriage choices. Yet, most previous models fail to directly connect the expected utility from the number of children with marriage choices. On the one hand, marriage models like Choo and Siow (2006) do not explicitly include children. In their models, parents' transferable utility could come from both children and other sources (Chiappori, 2020). On the other hand, traditional economic models of fertility do not rely on marriage choices, simply assuming that children transfer utility to the parent(s) (Doepke et al., 2022). To formalize the equilibrium marriage outcomes, we combine these models and incorporate fertility restrictions into the theoretical framework from Choo and Siow (2006).

Online Appendix A1 describes the details of the theoretical framework. Because the ex-

with a p-value of 0.07.

pected utility determines the likelihood of marriage, we can intuitively expect several marriage consequences based on Appendix Figure A3.

Prediction 1: The OCP fines increase the unmarried rate among Han people, and the effect is smaller among the minorities. Han people are more likely to delay their marriages or stay single because their expected gains from marriage become less. In contrast, the effects of stricter fertility restrictions among the minorities should be smaller because their expected gains are less affected.

Prediction 2: Compared to the non-preferential policy regions, the OCP fines will relatively increase the number of inter-ethnic marriages in the preferential policy regions. In the presence of such preferential policies, inter-ethnic marriage could be a way to have more children without paying fines. Therefore, a higher level of OCP fine rate would induce *relatively* higher incentives for the H-M marriages among those who choose to marry. In contrast, the incentive is weaker for the people in the non-preferential policy regions. However, it is difficult to predict the policy-induced changes of unconditional H-M marriages. On the one hand, it could be decreased number of marriages; on the other, it could be positively affected by a relatively increased proportion of H-M couples.

Prediction 3: In the preferential-policy regions, the OCP fines will increase the value of minorities in the marriage market. Since a minority spouse in preferential policy regions can share additional birth quotas with Han people through marriage, the demand for minority spouses should increase with fertility fines. In other words, the identity of a minority will have a higher market value and subsequently increase spousal quality in matching decisions of marriage. In the later analysis, we measure the marriage value (or spousal quality*)* by spousal education as frequently applied in the previous literature (Charles and Luoh, 2010; Shenhav, 2021).

3 Data

The primary data sets used in this study are the 2000 Population Census, the 2005 One Percent Population Survey, and the 2010 Population Census (referred to as Census 2000, Mini Census 2005, and Census 2010 hereafter). All the data sets include gender, education level, year and month of birth, region of residence, type of *hukou* (urban/rural), *hukou* province, ethnicity, marital status, and number of children. The data also contains birth history information for women. The relationship between each member and the household head is also available (e.g., spouse, offspring, siblings, parents), and we use it to identify couples within households.Based on the responses to questions regarding marital status and spouse ethnicity, we have three outcomes in the marriage market: being unmarried, being in an intra-ethnic marriage (i.e., H-H or M-M marriage), and being in an inter-ethnic marriage (i.e., H-M marriage).

We restrict our sample to those between the ages of 26 and 55 at the survey time. The questionnaire classifies marital status into five groups: unmarried, in the first marriage, remarried, divorced, and widowed. We retain only those who were single, in first marriages, and remarried.[14] Appendix A2 presents a comprehensive overview of the summary statistics for our final sample.

4 Graphical and Preliminary Analysis

Before regression analysis, we provide some descriptive evidence for the impact of the OCP on marriage and fertility outcomes. We divide the provinces into two groups and define the

[14]We drop the divorced and the widowed for two reasons. First, we do not have spousal information for those divorced and widowed. Second, the divorced and widowed people only capture 3 percent in the whole sample, and thus dropping them should not drive our results much. As part of robustness checks, we examine the associations between the OCP fines and divorced or widowed status, and the results show no significant correlations.

provinces with increased fertility fines in 1989–1995 as the "treated" group and the others as the "control" group. Figures 1-3, we plot the means of the outcome variable against the birth cohort for each group, together with the mean difference between the two groups. To present the basic patterns more formally, we plot the 95 percent confidence interval for the mean difference denoted by dots and highlight the F-statistics for the pre-trends in the cohorts born before 1965 on the left-hand side. Moreover, we pool all of the cohort years in a simple regression and test the outcome differences between the cohorts born before 1965 (i.e., unexposed cohorts) and after 1970 (i.e., fully exposed cohorts) on the right-hand side.

Unmarried status at the survey. Panel A of Figure 1 shows how the proportion of the unmarried changes over birth cohorts for Han people. The diamond line represents the birth cohort trend for the provinces with fine increases during 1989-1995 (the treated group), and the dotted line represents the other provinces. The unmarried rate *at the survey* is much higher among later cohorts, such as those born after 1970, because they are younger and could still be in the marriage market. The dashed line plots the differences between the two. The post-1970 cohorts in the treated group are exposed to higher OCP fines in their young adulthood than those in the control group. Consistently, the unmarried rate *at the survey* among post-1970 birth cohorts also increases more rapidly in the treated group.

[Figure 1 about here]

The gap increases from about zero in the cohorts born before 1970 to almost 2 percent for those born after 1970. By comparing the cohorts born before 1965 with those born after 1970, we get an F-statistic of 18.4, implying that the gap increases are statistically significant. Therefore, the preliminary evidence shows that, for the Han people, exposure to higher fertility fines in young adulthood induces a lower chance of marriage.

As a comparison, Panel B of Figure 1 shows the patterns for minorities. We use the same scales for the y-axis so that the magnitudes in both panels are comparable. Consistent with

Panel A, the unmarried rates *at the survey* also increase dramatically among the post-1970 birth cohorts. However, the treat-control difference in unmarried rate *at the survey* (as shown by the dashed line) does not present any increase pattern, with a statistically insignificant difference between the cohorts born before 1965 and those born after 1970 (p-value = 0.88). In sum, we do not find any significant evidence that higher fertility fines reduce the number of marriages among minorities.

Intra- and inter- ethnic marriage. We employ the same methodology to investigate intra- and inter-ethnic marriages. Different from the above, we cannot compare between ethnicities because both ethnicities are involved in these marriages. Exploring the different policies for H-M marriages in different regions, we conduct a parallel analysis by the regions where H-M marriages can have another birth or not.[15]

We confine the sample to the married ones here, considering that unconditional intra-ethnic marriage rates are also affected by the unmarried rate *at the survey* (Appendix Figure A4). Using the same methodology in the above analysis, we plot the intra- ethnic marriage rate over the birth cohort in Figure 2. As Panel A shows, the intra-ethnic marriage rate in preferential policy regions declines. More importantly, the decline is statistically and economically more significant in provinces that experienced the fine increases during 1989-1995. Panel B presents the results for regions with no preferential policy for H-M marriages. The intra-ethnic marriage rate remains stable over the birth cohorts, and there is no significant trend between the two groups (p-value = 0.5). Therefore, this descriptive analysis provides consistent evidence for the predictions about inter-ethnic marriages.

[15] Appendix Figure A4 shows the intra-ethnic marriage rate over birth cohort and shows that the intra-ethnic marriage rate declines more significantly in the regions where H-M marriages can have another birth.

[Figure 2 about here]

Fertility. The census data collects the information of the fertility history for adult women. We then use the same method to analyze the impact on the number of births.[16] Panel A of Figure 3 shows the fertility trends over the birth cohort for the Han ethnicity. Fertility declines in regions both with and without fine increases. In the regions with fine increases in 1989-1995, fertility is significantly and persistently higher in birth cohorts before 1970. The dashed line shows that the fertility difference between regions with and without fines increases is persistent and stable for the cohorts born before 1965. Starting from the late 1960s birth cohort who were aged 20-25 when the fines increased during 1989-1995, fertility declines more dramatically in regions with such fine increases. As a result, the fertility gap narrows from the late 1960 birth cohorts and then becomes negligible afterward. Panel B of Figure 3 presents the results for minorities. Although the number of birth declines throughout all birth cohorts, there is no apparent trend between the two groups (p-value = 0.45). Collectively, the descriptive analysis suggests that those exposed to stricter OCP implementation during early adulthood would have lower fertility later in life.

[Figure 3 about here]

Although we assist the graphical presentations with formal statistical tests, we should note that the descriptive analysis above provides only preliminary evidence, which is not solid enough. For example, the patterns shown above could only reflect the different age profiles for Hans and minorities. The different birth cohort trends across provinces could be another critical confounding factor. Therefore, to address these concerns, we estimate the impact of the fertility fines during early adulthood on marriage and fertility outcomes with regression analysis in the next section.

[16]To ensure we have some cohorts born before 1965, we drop the 2010 census data in this investigation.

5 Empirical Design and Results

In this section, we conduct regression analysis to estimate the impact of the fertility fines during early adulthood on marriage and fertility outcomes.

5.1 Econometric Framework

To study the impacts of the OCP on marriage and fertility outcomes, we use variations in the fertility penalties across provinces over time to identify the impact of the OCP fines. Considering heterogeneity in marriage markets between Hans and minorities, we divide the sample by Hans and minorities and conduct the following regression for the two groups separately:[17]

$$Y_{ipbt} = \beta_0 + \beta_1 Fine_{pb}^{16-25} + D_{ipbt} + \delta_b + \delta_p + T_p + \varepsilon_i \tag{1}$$

where the dependent variable, Y_{ipbt}, is the outcome variable of an individual i of birth cohort b in province p and year t, which can be whether individual i is married or not, or to what marriage category he or she belongs. The key independent variable, $Fine_{pb}^{16-25}$, is the mean value of the fertility fines in *hukou* province for birth cohort when aged 16-25. The coefficient, $\beta_1(s)$, is of central interest, as it captures the effects of the OCP fines during early adulthood on marriage and fertility outcomes.

D_{ipbt} denotes a group of control variables, including the indicators of gender, age, interactions between gender and age, and type of *hukou* (urban/rural). The dummies of gender, age,

[17] There are good reasons to conduct the regressions by Hans and minorities. First, the OCP aims to restrict the population of Han people rather than minorities, and thus we expect differential effects of fertility penalties on the unmarried status for the two groups. Second, since the numbers of Han and minority people involved in H-M marriages are the same but the H-M marriage proportions in each group are significantly different because of different population sizes, it may be more straightforward to interpret the estimates if we conduct regressions separately for the two groups.

and the interactions between the two are included to capture the gender differences in level and age profiles. Dummy of type of *hukou* (urban/rural) is controlled to capture time-invariant differences between urban and rural regions.

Since the key independent variable, $Fine_{pb}^{16-25}$, is measured at the province-birth cohort level, we include the indicators of birth cohorts (δ_b) and *hukou* provinces (δ_p) to capture the time-invariant differences between the birth cohorts and across different provinces.

Besides the control variables mentioned above, we further control for the provincial-specific linear birth cohort trends, T_p, to capture heterogeneous trends across regions in China. For example, the culture and the preference for marriage and fertility may change over time. It is likely that these trends are different across provinces and can thus correlate with the fertility fines. Including these specific linear trends in birth cohorts can partly address this concern.

Since the key independent variable, $Fine_{pb}^{16-25}$, is at the province-and-birth-year level, we cluster the standard errors at the province level to allow auto-correlation within the same province for all the regression results. We may underestimate the accuracy here because the standard errors could be overestimated when clustered at the provincial level.

By controlling for the above covariates, we use the variation across provinces over the birth cohort to identify the effects of the OCP. The exogeneity of this variation should not be taken for granted. Thus we mitigate the endogeneity concern in several ways. First, as shown in Appendix Table A1, we document that most of the massive changes in fertility fines happened immediately after the central government emphasized the role of birth control in promoting local officials. Most changes occurred shortly after the inauguration of the new provincial governors. Second, in Appendix A5.1, we also present further evidence by showing no significant correlations between the fine rate and the contemporaneous macro-economic indices on the province level. Therefore, it is reasonable to believe that the change of fine rate

is independent of people's marriage behaviors.

To further examine the validity of the estimates, we conduct the regressions in a couple of comparison groups. Specifically, we analyze the unmarried status and fertility outcomes *at the survey* by Hans and minorities. Since the Hans have greater restrictions, we expect the impacts on unmarried status and fertility should be more salient among Han people than among minority people. In comparison, if the impact of the OCP fines on unmarried status and fertility were driven by some confounders that correlate with both local OCP fine rates and the outcomes, the regression results should be similar for both ethnicity groups.

When the outcomes are intra- or inter-ethnic marriages, the minorities may not be an ideal comparison group because they are involved in the marriages. In this case, we divide the sample according to whether there is a preferential policy for H-M couples and then conduct regressions with subsamples separately. Specifically, we expect that the impact of the OCP fines on the likelihood of inter-ethnic marriage should be larger and more significant in the regions with a preferential policy than in the regions without such a policy. Correspondingly, we divide the sample based on ethnicity and preferential policy throughout the paper for consistency. Therefore, we compare the difference between the outcomes from Han and minorities (or regions with and without a preferential policy for H-M couples) in a similar spirit of a triple-difference setting. [18]

[18]It is noteworthy that this comparison probably gives more conservative estimates because the comparison groups are also affected by the OCP. For example, in most cases, minority couples can usually have one more authorized birth than Han couples, but they are still not completely exempted from OCP regulations. Besides, in the regions without a preferential policy for H-M couples, the policy implementation for H-M couples is a "gray area." No specific document saying that H-M can have additional births does not mean that the restrictions on the

5.2 Impact of the OCP on Marriage Outcomes

Table 1 reports the OLS estimates for the impacts of the OCP on marital status. In this table, we mainly consider the two marriage outcomes: unmarried status *at the survey* in the full sample and inter-ethnic marriage (i.e., H-M marriages) in the married sample. Note that all the dependent variables are multiplied by 100, so the coefficients should be interpreted as changes in percentage points. For each outcome, two columns report the results for the Han people and the minorities, respectively. Panel A shows the results for all the regions. Panel B and Panel C show the results when dividing the sample into two groups, those in the preferential policy regions and those in the non-preferential policy regions.

[Table 1 about here]

Unmarried status at the survey. The first two columns in Table 1 show the results for unmarried status. The estimates in the first two columns suggest that an increase in the OCP fines by one year of local household income predicts a rise of 2 percentage points in the unmarried rate for Han individuals (45 percent of the mean). In contrast, the comparable estimate for minorities is only 0.6 percentage points (10 percent of the mean). The difference between the two is 1.4, which is also significant (p-value = 0.07). Therefore, the effects of the OCP fines on unmarried status for Han are stronger than those for minorities on both absolute and relative scales.

The effects of the OCP fines on unmarried status are larger and more significant in non-preferential-policy regions. For example, a one-unit increase in OCP fines leads to a substantial increase of 0.9 and 2.2 percentage points (i.e., 19 percent and 50 percent of the means) among the Han people in preferential-policy regions and non-preferential policy regions, respectively.

In contrast, the effects of the fertility fines are much smaller and less significant for minorities. In the preferential policy regions, the sign of the coefficients for the minorities is even

H-M couples are as strict as those on H-H couples.

negative, which is consistent with our prediction. As the fine rate increases, minority people would become relatively more valuable on the marriage market if the fine rate increases because they can exchange their additional birth quotas at higher prices.

Inter-ethnic marriage. To further investigate how the OCP affects inter-ethnic marriages, we confine the sample to married couples and present the results in columns 3 and 4 of Table 1. The two columns report the results for Hans and minorities, respectively. Among married couples, the OCP fines significantly increase inter-ethnic marriage for Han people. A one-unit increase in OCP fines leads to H-M marriage rates 0.28 percentage points higher among the Han people (17 percent of the mean). The magnitude of the coefficient for the minorities is larger but insignificant.[19]

We then divide the sample according to whether there is a preferential policy for H-M couples in that province and show the results in Panel B and Panel C. The results show that the observed effects are mainly contributed by the preferential policy regions. The impact of the fines on H-M marriages is positive and significant for both Hans and minorities in the preferential policy regions. Compared to those in non-preferential policy regions, the magnitude of the coefficient for Hans is three times larger in the preferential policy regions. Due to the large standard errors, the difference is only significant at the 15 percent level (p-value = 0.14). For

[19] As shown in column 3 of Table 1, the percentage among the Han people is 19.7 percent in preferential policy regions, similar to 17 percent in non-preferential policy regions. However, it is notable that most of the effects on H-M marriages are driven by minorities in preferential policy regions. Specifically, compared to non-preferential policy regions, the OCP impacts among the minorities in preferential regions are significantly larger in both level and percentage terms. In non-preferential policy regions, the effects on H-M marriages for the minorities are even negative.

minorities, the difference is significant at the 5 percent level (p-value = 0.03). In the regions without such a preferential policy, the estimate for the minorities is even negative. One possible explanation is that in the non-preferential-policy regions, the flexible birth quota is valid only if the minority individuals were to marry other minority individuals. Therefore, they had weaker incentives to marry Han people.[20]

Marriage timing and implications. Examining the effects on the unmarried status by age could inform us about whether people are forgoing marriage altogether, or merely delaying it. If the OCP delays marriage for someone who will eventually marry, the effect of OCP on marriage would disappear for individuals above a certain age. In other words, the results of the first two columns in Table 1 might imply that people living in regions with higher fine rates tend to marry later.

To explore this possibility, we start with restricting the sample to the fully-exposed cohorts (born 1970-79) and investigate how changes in exposure to the policy (i.e., differences in OCP fine increases) affect the unmarried rate between the ages of 26 and 40. In the same spirit as Figures 1-3, we divide the provinces into two groups and define the provinces with increased fertility fines in 1989–1995 as the "treated" group and the others as the "control" group. In Figure 4, we plot the means of the unmarried rate for both groups over age group in Panels A and C, together with the mean difference and the corresponding confidence interval between the two groups for each age in Panels B and D.

[Figure 4 about here]

We could observe that (1) in Panels A-B, differences in the unmarried rate *at the survey* are significantly distinguishable from zero when Han people younger than 36 but insignificant when older than 36; (2) among minorities (Panel C-D), differences in the unmarried rate *at*

[20]Appendix Table A3 also shows the effects of the OCP fines on intra- and inter-ethnic marriages in the full sample.

the survey are insignificant over different ages. As an alternative, we also directly compare the unmarried rate of fully-exposed cohorts (1970-74) and partially-exposed cohorts (1965-69) between 31 and 40 among Han people in Appendix Figure A5. Again, for Han people with different exposure to the OCP, we find the difference declines as age grows, which becomes statistically insignificant at ages over 35. These findings collectively suggest that the OCP effects on marriage attenuate when individuals become older. Yet, we should be cautious in interpretation because such comparisons are confounded by year effects (or census wave effects).

Given that we could observe the age at marriage for each person in the census data, we also examine the impact of OCP fines on unmarried status at different ages using formal regressions. In practice, we drop those who do not reach the corresponding age from the sample because of missing information on marital status. The specification is similar to equation (1), except that the outcome variables are whether married at the corresponding age, based on each individual's marriage history.[21] Coefficients of OCP fines on unmarried rate *at the corresponding age* for each regression are reported in Appendix Table A4 and plotted in Appendix Figure A6. Consistent with the results about unmarried status above, the estimates are significant for Han people but smaller and insignificant for the minorities. More importantly, we could observe that the estimates are only significant when the lower bound age cutoff is below 35 years old but not for the age cutoff above 35, suggesting that OCP affects the marriage status when they are young rather than throughout the entire life cycle. Overall, this formal analysis provides further support for the argument that the decrease in marriages could be mainly attributed to late marriage instead of remaining single throughout life.

[21]Notably, our sample restriction could induce sample selection issues. When the age floor rises, the sample increasingly consists of those too old, even if we have controlled for fixed effects of age and birth cohorts.

5.3 Impact of the OCP on Fertility

Because the reduced-form elasticities are sufficient statistics for the deadweight loss of social welfare (Chetty, 2009; Hendren, 2016; Kleven, 2021), whether and to what extent the OCP affects fertility in China is an important question.[22]

Since the OCP decreases the likelihood of getting married, as shown in the previous section, it is natural to investigate how much fewer marriages contribute to policy-induced lower fertility. We can answer this question with the census data. First, following the same framework as equation (1) , we estimate the impact of the OCP fines during early adulthood on fertility in the fertility sample (i.e., females born before 1980 who are between 26 and 45 years old). Then, we investigate how much the marriage outcomes (i.e., unmarried, inter-ethnic marriage) can explain the fertility reduction.

Fertility. Table 2 shows the OLS estimates results. The first two columns show the results without controlling marital status. The estimates in column 1 of Panel A suggest that a one-unit increase in the fertility penalty rate leads to 0.06 fewer births (3 percent of the mean) for Han women. In contrast, we do not find any significant impact among the minorities in column 2. The difference between the estimates is significant at the 10 percent level as well (p-value= 0.06). We also do not find systematic differences when dividing the sample according to whether or not there is a preferential policy on the province level (see Panels B and C). [23]

[22]There is a long debate in the literature about the impacts of the OCP on fertility (Zhang, 2017). For example, Goodkind (2017) shows that the OCP leads to a population decline of 400 million by 2015. However, others argue that socioeconomic factors, instead of the policy, could be key drivers (Greenhalgh, 2018; Wang et al., 2018; Zhao and Zhang, 2018).

[23]Appendix Table A5 also provides the impact of the OCP on fertility across different types of couples.

Welfare implications. As mentioned before, the OCP can induce welfare consequences through changing fertility. Our estimate adds to the debate on how the OCP contributes to fertility declines in the past few decades in China. Specifically, as shown in Figure 3, the total fertility rate declines from 1.9 among the 1960s birth cohorts to 0.9 among the post-1975 ones. Our estimates suggest that, as the average fine rate at ages 16-25 increases from 0.75 to 2.45, exposure to the OCP in early adulthood explains up to 9 percent of the fertility decline.[24]

This estimate also has a welfare implication about the deadweight loss caused by policy-induced lower fertility. Based on the previous literature, such as Chetty (2009), the demand elasticity with respect to the tax is a sufficient statistic to estimate the social burden. As the average number of unauthorized births in the sample is 0.4, the estimate in column 1 of Panel A gives an elasticity of unauthorized birth of about -0.14. Then, assuming the elasticity can be generalized to the full population in the period we study as a constant, we find that the welfare loss caused by the policy-induced fertility decline is 10 percent of annual household income. This back-of-the-envelope calculation provides a novel insight into the social burden caused by the OCP.

[Table 2 about here]

Decomposition. Under the OCP, people in young adulthood can expect restrictions on fertility and change their marriage behaviors accordingly. The new marriage outcomes such as a higher unmarried rate will, in turn, lower the fertility rate several years later. Therefore, we can further decompose the effects of OCP on fertility into two components: policy-induced fewer marriages and fewer births per marriage. Following Heckman et al. (2013) in decomposing policy impacts into different channels, we quantitatively estimate the contributions of

[24]Fertility declines 1.1 and the estimate suggests that the OCP contributes by 0.056*(2.45-0.75) = 0.095.

the marriage market to the OCP effects.[25] Overall, we find that around 27 percent of overall reduced fertility could be explained by unmarried status *at the survey* among the Han people. Consistently, unmarried status *at the survey* could account for about 16 percent and 28 percent, respectively, for fertitlity declines among Han ethnicity in preferential-policy regions and non-preferential-policy regions. Moreover, the explaining power of inter-ethnic marriage is small.

Discussion. In case of heavier taxation on the good "*children*", the potential marriage gains decline. Among the younger people, fertility fines would postpone marriages because of lower utility in marriage gains, which leads to welfare loss as a result. However, people may not stay out of the marriage market forever. A significant part may choose to marry at a later age rather than to keep single all the time. Consistent with this, we find that the effects of the OCP on being unmarried stronger at younger ages but less significant at older ages. As marriage is a prerequisite for fertility, postponing marriage leads to lower fertility *at the survey*. If people clearly recognize the potential utility loss of being single for each age and choose to stay in unmarried status temporarily, the induced welfare loss can reflect in the policy-induced fertility decline.

In contrast, if individuals get married just for love and have little preference about the quantity of children, the OCP will not change the expected marriage gains for these people. Then the OCP can still affect fertility but not the marriage outcomes. In this case, fertility constraints also result in welfare loss, but the welfare loss is not related to marriage outcomes.

The above discussion illustrates why the marriage outcomes matter for the welfare implication here. But it is an empirical question of how much marriage outcomes affect the welfare implication in terms of policy-induced fertility decline. There is an established strand of litera-

[25] See Appendix A3 for technical details of decomposition.

ture about the effect of the OCP on fertility (e.g., Schultz and Zeng, 1995; McElroy and Yang, 2000; Zhang, 2017). Our estimates suggest that the total deadweight loss is equivalent to 10 percent of household annual income using the sample of females at fertile ages. When the marital status is controlled for, the magnitude of impact declines by about 30 percent, suggesting the marriage behaviors matter in the "sufficient statistics" analysis. However, the distortion in the marriage market and its the consequences regarding fertility received much less attention. Our estimates fill in this gap by showing that the increased unmarried rate caused by the OCP contributes significantly to the decline in fertility.

5.4 Impact of the OCP on the Value of H-M Marriages

Higher market value of minority identity. If the OCP regulations become stricter and a preferential policy applies, the identity of a minority will have a higher market value because the value of birth quotas would be added to a minority spouse's price on the marriage market. To test this, we examine whether the minority spouses of H-M marriages in preferential-policy regions marry more-educated people when the fines increases.In contrast, this should not happen for either the spousal education of the Han people in H-M couples in the same regions, or the spousal education of the minority people involved in H-M couples in the non-preferential policy regions. To do this, we restrict the sample to those H-M couples, and use the spousal education being senior high or above as the dependent variable. Then we conduct the same regressions as equation (1). Finally, spousal education in H-H couples in the preferential policy regions should not be affected. Therefore, we then restrict the sample to those H-H couples and report the results in column 3.

Panel A of Table 3 reports the OLS estimates for all regions, and Panel B and Panel C report the results for the regions with a preferential policy and the regions without, respectively. The results suggest that a minority spouse becomes more valuable under higher fertility fines only

when the preferential policy to H-M couples is enforced. In column 3, we do not find significant associations between the education of the spouse and the fine rate among those in H-H couples.

By doing so, we create three comparison groups. First, among H-M couples in preferential policy regions, we compare the impact on spousal education of minorities to that on spousal education of Hans (F-statistic = 4.2, p-value = 0.06). Second, among the minorities involved in H-M couples, we compare the effect in preferential policy regions to that in non-preferential policy regions (F-statistic = 10.4 with p-value = 0.003). Finally, among the Hans in preferential policy regions, we compare the effect to that on spousal education of Hans (F-statistic = 6.2 with p-value = 0.025). These comparisons suggest that the identified effect should not be driven by the potential spousal education increase among the Hans in preferential policy regions, or that among H-M couples in preferential policy regions, or that among the minorities involved in H-M couples.

[Table 3 about here]

Incentives of H-M marriages. A primary incentive of H-M marriages in the preferential-policy regions is to have more children legally. We further provides evidence to support this argument in a similar spirit of Goldin et al. (2021). Based on the *ex-post* data, we examine this by checking whether the regions with a stronger positive impact on H-M marriages are also the regions with less negative impacts on the number of children of H-M couples. The rationale is straightforward. If policy-induced H-M couples are formed to seek additional childbirth quotas, they would be more likely to have more births *ex-post*, and thus the negative effect of the fines on the number of children should be smaller. The presence of non-preferential-policy regions provides a natural control group. In these regions, we expect that the impact on H-M marriages should not be correlated with the effects on the number of children because individuals do not have any policy-induced incentives to form H-M couples.

We divide the sample by *hukou* province and type of *hukou*. In each subsample, we fur-

ther estimate the impact on the H-M marriages and the number of births.[26] Figure 5a shows the correlation pattern for non-preferential-policy regions and Figure 5b for the presence of preferential policies. We find a very weak correlation between the impact on fertility and the impact on H-M marriages in Figure 5a, but a significant positive correlation in Figure 5b. The results imply that policy-induced H-M marriages would partially offset the restrictive effects of the OCP on fertility. Therefore, the results provide some suggestive evidence that the expected number of children is an essential factor that individuals consider in their marriage decision.

[Figure 5 about here]

5.5 Additional Results and Robustness Checks

This subsection thoroughly addresses concerns about endogeneity and potential heterogeneous treatment effects, and also briefly presents a range of robustness checks to support the validity of the study's findings.[27]

One main concern about the identification is the possible endogeneity of the OCP fines across the provinces over time. To alleviate the concern, we examine the correlation of the OCP fines with a series of initial and contemporaneous province-year level macroeconomic indices, including GDP, government expenditure, etc. We do not find significant level-change, level-level, or change-change correlations between economic conditions and OCP fines. For another, the distinct results from various comparison groups also shed some light on this issue.

Another technical issue for our results relates to potential heterogeneous treatment effects because the changes in OCP fines are continuous and staggered (de Chaisemartin and D'Haultfoeuille, 2022). For this possibility, we employ the technique proposed by de Chaisemartin et al. (2022) and estimate the weighted average of movers' potential outcome slope, which yields consistent results with those from the baseline estimation.

[26] See Appendix A4 for technical details.

[27] Additional details can be found in Appendix A5.

The results are also consistent in a battery of robustness checks. Firstly, we restrict the sample by different age ranges and use various methods for fine rate construction (i.e., alternative age ranges, and birth province or current residential province instead of *hukou* province). Secondly, our results are robust to including education control, excluding famine cohorts, controlling economic conditions during early adulthood, and using alternative data from the Urban Household Survey (2002-2009). Finally, the gender-specific estimates and results from residual analysis also accord with the baseline findings.

6 Conclusion

This study examines the impacts of China's One-Child Policy on marriage outcomes and fertility. By analyzing the variation in the assigned birth quotas and fertility fines across provinces over time, we find that higher penalties during early adulthood lead to higher unmarried rates, especially among the Han population, and more H-M marriages, particularly in regions with preferential policies for H-M couples. Additionally, women who are exposed to higher penalties have lower fertility rates later in life. We also demonstrate that minorities have a higher value in the marriage market in the presence of preferential policies for H-M couples.

We decompose the fertility reduction into two parts: the decrease in the number of marriages and the decrease in the number of births per marriage. Our results reveal that the deadweight loss caused by the lower fertility rates due to the OCP can account for up to 10 percent of annual household income, with the decline in the number of marriages explaining up to 30 percent of this loss. Our findings suggest that the distortion in the marriage market is a crucial factor contributing to the welfare loss caused by the OCP.

While this study provides valuable insights into the impact of OCP on marriage and fertility, there are some limitations that should be acknowledged. Firstly, other strict OCP regulations implemented during the period, such as the risk of job loss for non-compliance in the public

sector, were not considered in our analysis. Additionally, using average fines as a measure of OCP toughness may not fully capture the overall effects of the policy, and may not apply to specific individuals. Furthermore, our analysis does not account for social conflicts during the collection of fines, delayed education of unauthorized births, and externalities of the number of children. Finally, we did not investigate the impact of the OCP on other dimensions, such as the status of women and the quality of children, as well as potential spillover effects on human capital and social burden. Future studies could shed light on these important questions.

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Table 1: Impact of the OCP Fines at Ages 16-25 on Marriage Outcomes

	(1)	(2)	(3)	(4)
Sample	Full sample		Married sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)	
Ethnicity	Han	Minority	Han	Minority
Panel A: All regions				
Fines at ages 16-25	2.013***	0.646	0.282**	0.937
	[0.581]	[0.721]	[0.111]	[0.615]
Observations	5,965,631	518,327	5,715,489	488,619
R-squared	0.100	0.128	0.034	0.139
Mean of Dep. Var.	4.503	6.246	1.592	17.50
F-stat	3.66	-	-	-
P-value	0.07	-	-	-
Panel B: Preferential-policy regions				
Fines at ages 16-25	0.943	-0.252	0.600**	2.248**
	[0.593]	[0.772]	[0.274]	[1.044]
Observations	1,681,813	304,554	1,601,255	288,296
R-squared	0.111	0.123	0.032	0.126
Mean of Dep. Var.	5.074	5.958	3.044	15.15
F-stat	1.27	-	-	-
P-value	0.28	-	-	-
Panel C: Non-preferential-policy regions				
Fines at ages 16-25	2.151***	0.853	0.179**	-0.280
	[0.681]	[0.648]	[0.082]	[0.341]
Observations	4,283,818	213,773	4,114,234	200,323
R-squared	0.097	0.139	0.027	0.150
Mean of Dep. Var.	4.289	6.672	1.051	21.01
F-stat	4.32	-	2.25	5.76
P-value	0.05	-	0.14	0.02

Notes: This table shows the impacts of fines at ages 16-25 on marriage outcomes. The sample is from Census 2000, Mini Census 2005 and Census 2010, involving individuals born before 1980 who are between 26 and 55 years old. Panels A-C report the results in the samples of all regions, preferential-policy regions, and non-preferential regions, respectively. The dependent variables are unmarried status in columns 1-2 using the full sample, and inter-ethnic

marriage (i.e., H-M) in columns 3-4 using the sample of married individuals. We report the estimates for Hans and minorities separately. Regressions use the census sampling weights. The models control for dummies of gender, age, and interactions of the two, *hukou* type, year of birth, and provincial specific linear trends in birth cohort. Standard errors clustered at the province level are reported in brackets. The F-tests in column 1 test the significance for coefficient differences between Han and minorities. In columns 3-4, the F-tests in the bottom of Panel C test the significance for coefficient differences between preferential policy regions and non-preferential policy regions. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 2: Impact of the OCP Fines at Ages 16-25 on the Number of Children Ever Born

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Number of births					
Region	All regions		Pref-policy		Non-pref-policy	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Fines at ages 16-25	-0.056**	0.001	-0.076	0.003	-0.058*	0.001
	[0.027]	[0.018]	[0.050]	[0.030]	[0.030]	[0.031]
Observations	2,118,412	192,598	598,685	114,575	1,519,727	78,023
R-squared	0.348	0.337	0.373	0.328	0.340	0.334
Mean of Dep. Var.	1.619	1.985	1.730	2.110	1.577	1.793
F-stat	3.15	-	1.61	-	2.64	-
P-value	0.09	-	0.22	-	0.12	-

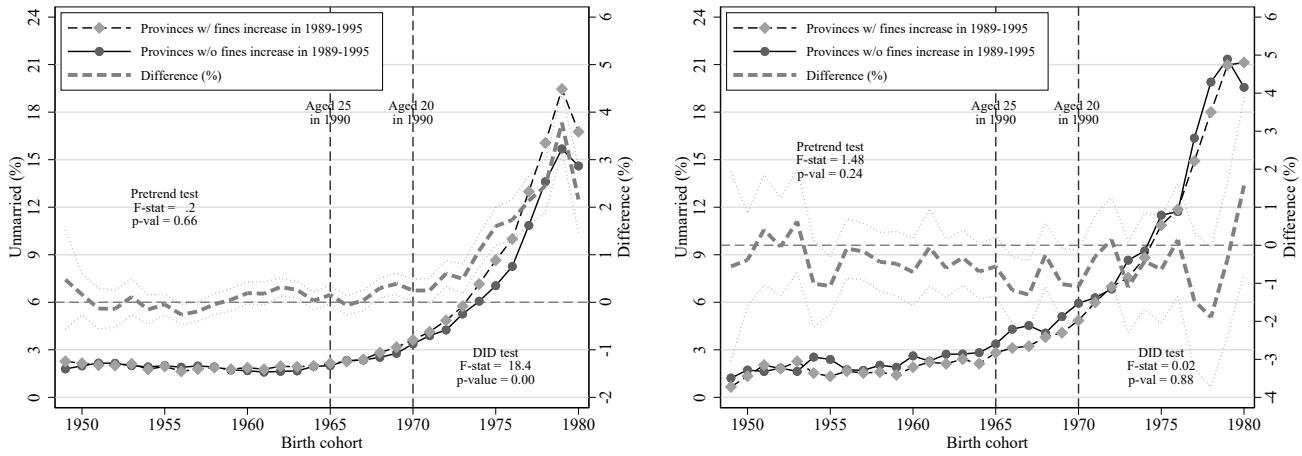
Notes: This table shows the estimates for the impacts of fines at age 16-25 on the number of births. The sample involves females at fertile ages in the main sample. Regressions use the census sampling weights. The basic control variables are the same as in Table 2. Each column reports the results in the samples of all regions (columns 1-2), preferential-policy regions (columns 3-4), and non-preferential regions (columns 5-6), respectively. Standard errors clustered at the province level are reported in brackets. The F-tests in columns 1, 3 and 5 test the significance for coefficient differences between Hans and minorities. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 3: Impact of the OCP Fines at Ages 16-25 on Spousal Education

Dep. Var.	(1)	(2)	(3)
	Spousal education is senior high or above (%)		
Type of marriage	H-M		H-H
Ethnicity	Minority	Han	Han
Panel A: All regions			
Fines at ages 16-25	0.299	0.223	0.094
	[0.731]	[0.508]	[0.572]
Observations	85,422	86,156	5,426,883
R-squared	0.463	0.469	0.398
Mean of Dep. Var.	26.27	26.30	20.87
Panel B: Preferential-policy regions			
Fines at ages 16-25	2.236**	0.293	0.397
	[0.790]	[0.464]	[0.713]
Observations	44,446	44,726	1,492,041
R-squared	0.457	0.458	0.351
Mean of Dep. Var.	21.37	21.56	13.81
F-stat	–	4.20	6.20
P-value	–	0.06	0.03
Panel C: Non-preferential-policy regions			
Fines at ages 16-25	-0.876	-0.044	-0.343
	[0.628]	[0.723]	[0.642]
Observations	40,976	41,430	3,934,842
R-squared	0.459	0.469	0.402
Mean of Dep. Var.	31.58	31.42	23.43
F-stat	10.4	–	–
P-value	0.00	–	–

Notes: This table shows the impacts of fines at ages 16-25 on spousal education. The dependent variable is whether the spousal education is senior high school or above. The dependent variable is multiplied by 100, so all the coefficients here should be interpreted as the percentage change. In addition to the basic controls in Table 2, regressions control for individual education levels. Regressions use the census sampling weights. In Panel B, the F-tests in columns 2-3 test the significance for coefficient differences with column 1. In Panel C, the F-test in column

1 tests the significance for coefficient differences with Panel B. Standard errors clustered at the province level are reported in brackets.*** Significant at the 1 percent level.** Significant at the 5 percent level. * Significant at the 10 percent level.

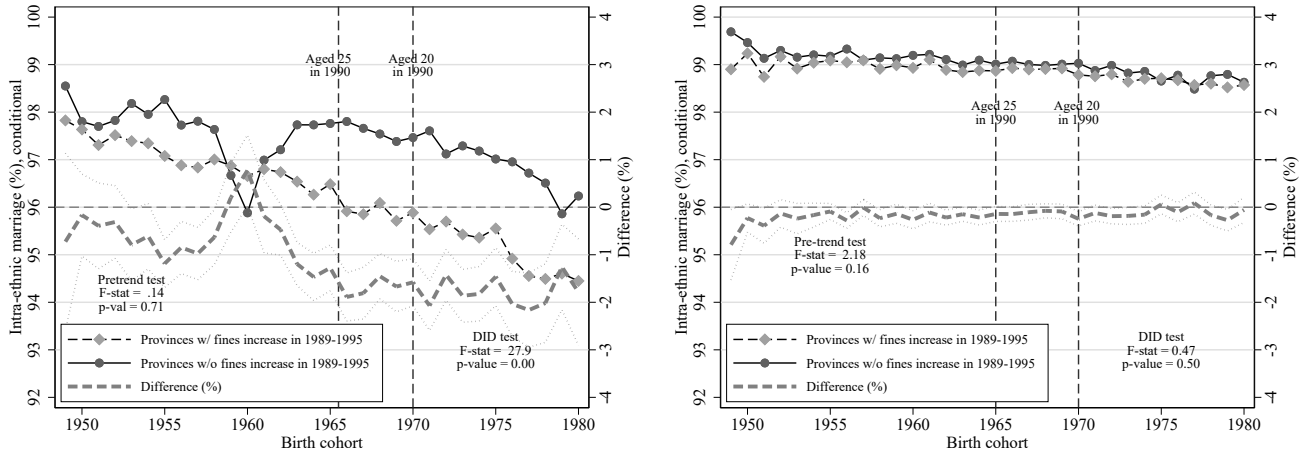


(a) Unmarried Rate among the Hans

(b) Unmarried Rate among the Minorities

Figure 1: Unmarried Rate over Birth Cohort, by Ethnicity

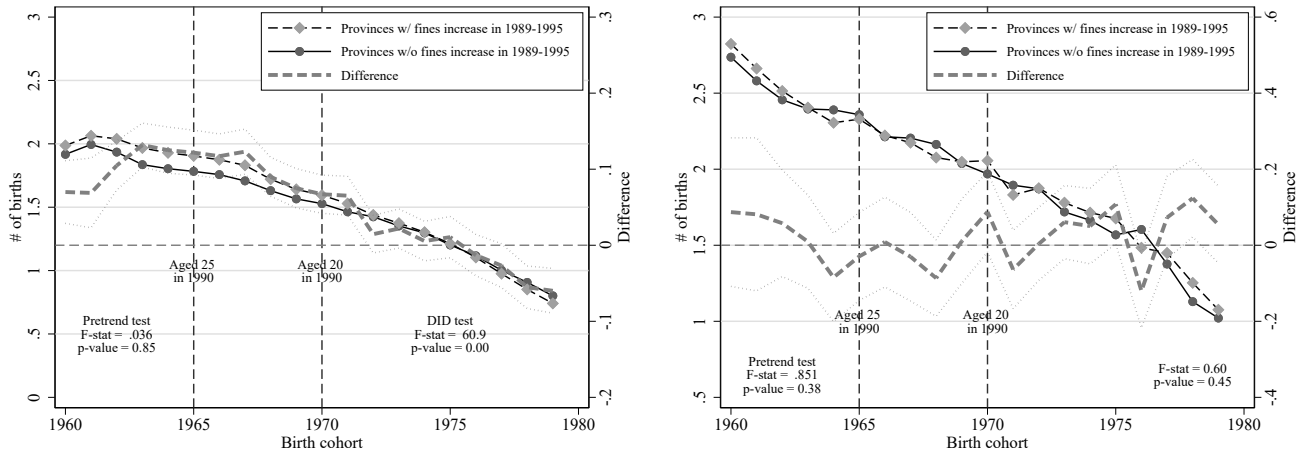
Notes: Panels A and B in the figure show how unmarried (*at the survey*) proportion changes over birth cohorts for Han and minorities, respectively. The scales in both panels are consistent. The sample is from Mini Census 2005 and Census 2010. The diamond line represents the birth cohort trend for the provinces with fine increases during 1989-1995, and the dotted line represents that for the provinces without fine increases during 1989-1995. The dashed line represents the differences and uses a different scale on the right, with a 95% confidence interval denoted by dots. F-statistic on the left-hand side is calculated based on the joint test for significance of the difference in the unmarried rate of those born before 1965. F-statistic on the right-hand side is from a simple regression pooling all cohort years and calculated based on an F-test that compares the difference in the unmarried rate of those born before 1965 (unexposed cohorts) and after 1970 (fully-exposed cohorts).



(a) Preferential-policy Regions (b) Non-preferential-policy Regions

Figure 2: Intra-ethnic Marriage Rate over Birth Cohort, by the Presence of Preferential Policy

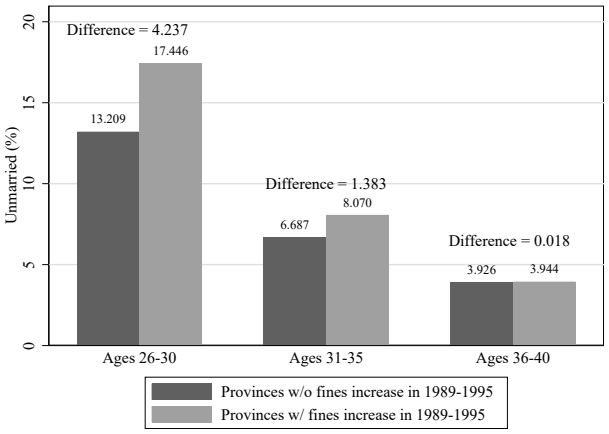
Notes: Panels A and B in the figure show how intra-ethnic marriage changes over birth cohorts for preferential-policy regions and non-preferential-policy regions, respectively. The scales in both panels are consistent. The sample is from Mini Census 2005 and Census 2010. The diamond line represents the birth cohort trend for the provinces with fine increases during 1989-1995, and the dotted line represents that for the provinces without fine increases during 1989-1995. The dashed line represents the differences and uses a different scale on the right, with a 95% confidence interval denoted by dots. F-statistic on the left-hand side is calculated based on the joint test for significance of the difference in the intra-ethnic marriage rate of those born before 1965. F-statistic on the right-hand side is from a simple regression pooling all cohort years and calculated based on an F-test that compares the difference in the intra-ethnic marriage rate of those born before 1965 (unexposed cohorts) and after 1970 (fully-exposed cohorts).



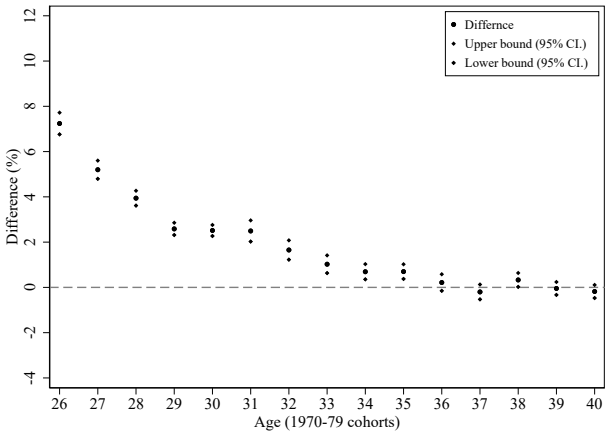
(a) Fertility among the Hans (b) Fertility among the Minorities

Figure 3: Fertility over Birth Cohort, by Ethnicity

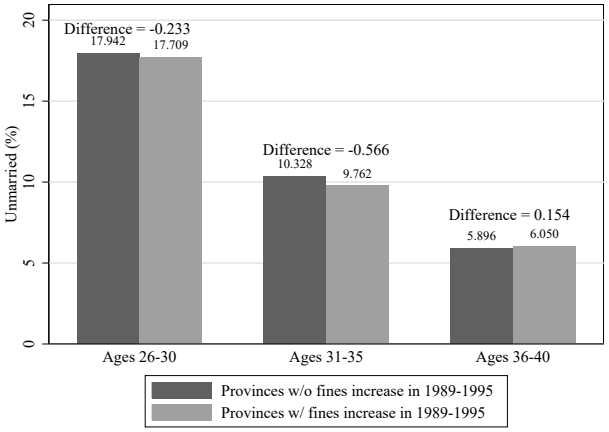
Notes: Panels A and B in the figure show how the number of births changes over birth cohorts for Han and minorities, respectively. The scales in both panels are consistent. The sample is from Mini Census 2005. The diamond line represents the birth cohort trend for the provinces with fine increases during 1989-1995, and the dotted line represents that for the provinces without fine increases during 1989-1995. The dashed line represents the differences and uses a different scale on the right, with a 95% confidence interval denoted by dots. F-statistic on the left-hand side is calculated based on the joint test for significance of the difference in the fertility of those born before 1965. F-statistic on the right-hand side is from a simple regression pooling all cohort years and calculated based on an F-test that compares the difference in the fertility of those born before 1965 (unexposed cohorts) and after 1970 (fully-exposed cohorts).



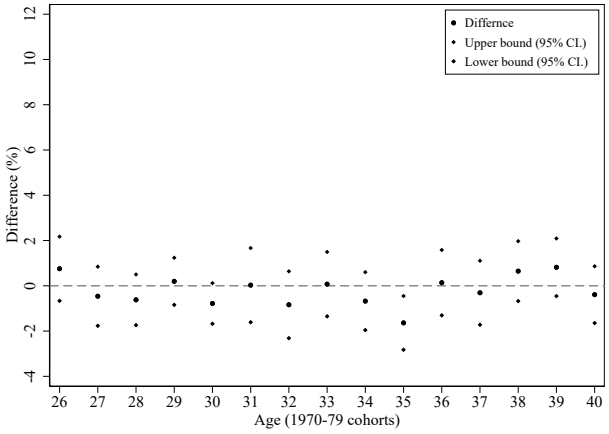
(a) Unmarried Rate over Age Group (Hans)



(b) Differences over Age (Hans)



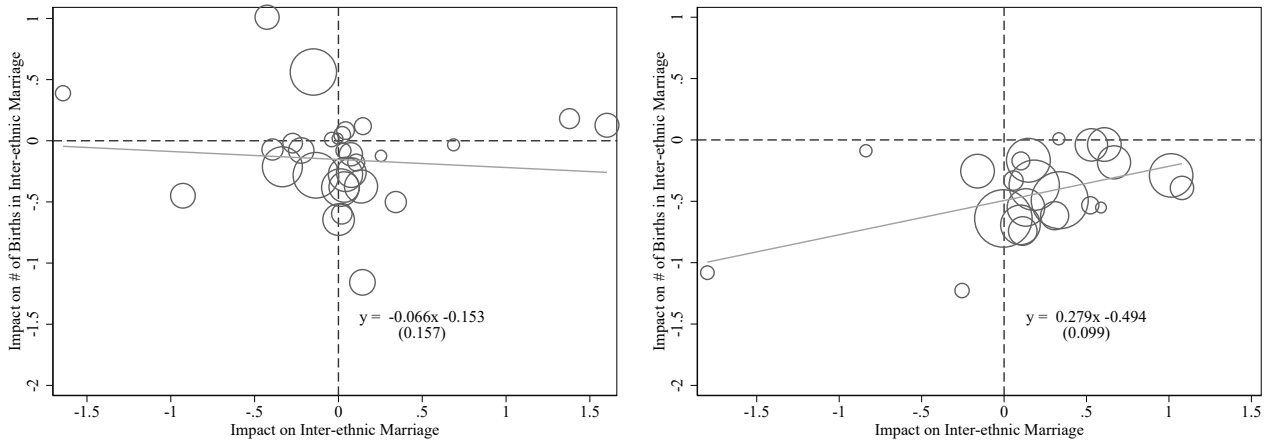
(c) Unmarried Rate over Age Group (Minorities)



(d) Differences over Age (Minorities)

Figure 4: Unmarried Rate over Age among Fully-Exposed Cohorts, by Ethnicity

Notes: The sample is restricted to those born in 1970-1979, who are fully exposed to the OCP. Panels A and C show how unmarried (*at the survey*) proportion changes over age groups for Han and minorities, respectively. In Panels B and D, the dots represent the differences at each age, with a 95% confidence interval denoted by diamonds.



(a) Non-preferential-policy Regions (b) Preferential-policy Regions

Figure 5: Correlations of Impacts of the OCP on H-M marriages with Impacts on Fertility of H-M Couples

Notes: Panels A and B in the figure show impacts of the OCP on inter-ethnic marriages and impacts on the fertility of H-M couples, respectively. The data is from Census 2000, Mini Census 2005 and Census 2010. We divide Han people into subsamples by province and *hukou* type. Then, for each subsample, we estimate the impacts of the OCP fines at ages 16-25 on fertility in H-M couples and the incidence of H-M marriage. Then we divide the estimates by the presence of the preferential policy and then plot the impacts on fertility against those on H-M marriage separately. The F-statistic for the slope difference between the fitted lines in the two panels is 3.43 (p-value = 0.07).

ONLINE APPENDIX

A1. Theoretical Framework and Implications

We extend the implications of the model in Choo and Siow (2006) to obtain our predictions. Based on the settings by Choo and Siow (2006), we have the following:

$$\prod_{ij} = \frac{\mu_{ij}}{\sqrt{\mu_{i0}\mu_{0j}}} \text{ (A1. Marriage market equilibrium)}$$

where μ_{ij} is the number of i,j marriages composed of type i men and type j women, μ_{i0} is the number of type i men who are unmarried, and μ_{0j} is the number of the type j women who are unmarried.[1] The log of the left-hand side, $ln\prod_{ij} = \pi_{ij}$ is interpreted as the total systematic gain from marriage per partner for any i,j pair relative to the total systematic gain per partner from remaining unmarried. *Therefore, one can expect more i,j marriages if the higher systematic gains to marriage of i,j pairs.*

Under our settings, individuals are divided into two types: Han (H) or minority (M). For simplicity, we consider the symmetric equilibrium between men and women (i.e., $\mu_{ij} \equiv \mu_{ji}$, $\mu_{i0} \equiv \mu_{0i}$, and $\mu_{0j} \equiv \mu_{j0}$). Assuming $\overline{H}$ as the total population of Han and $\overline{M}$ as that of minorities, we have:

$$\mu_{H0} + \mu_{HM} + \mu_{HH} \equiv \overline{H},\ \mu_{M0} + \mu_{HM} + \mu_{MM} \equiv \overline{M}, \text{ with } \overline{H} \gg \overline{M}. \text{ (A2. Population conditions)}$$

Because of the OCP, expected marriage gains, π_{ij} , is a function of the fertility penalties f: $\pi_{ij} = \pi_{ij}(f)$. When the penalty f increases, the marriage gains decrease: $\pi_{ij}^{'} < 0$. As summarized in the main text, the decrease in marriage gains depends on the number of birth quotas assigned to the corresponding type of marriages and whether there is a preferential policy for H-M couples. That is, we have the following one-child policy conditions:

[1]The details of this model can be found on pages 179-181 in Choo and Siow (2006).

$$\pi'_{HH} \leqslant \pi'_{HM}|_{non-pref} < \pi'_{HM}|_{pref} \leqslant \pi'_{MM}. \text{ (A3. One-Child Policy conditions)}$$

Taking derivatives with respect to f in equations in (A1) marriage market equilibrium and (A2) population conditions and assuming $\pi'_{MM} = 0$ (i.e., the marriage gains of the M-M couples would not be affected) for simplicity, we have the following results:

$$\frac{\partial ln\mu_{H0}}{\partial f} = -\frac{\mu_{HH}}{\mu_{H0}+\mu_{HH}}\pi'_{HH} - \frac{\mu_{HM}}{\mu_{H0}+\mu_{HH}}\frac{\partial ln\mu_{HM}}{\partial f},$$

$$\frac{\partial ln\mu_{HM}}{\partial f} = \frac{2}{A}\pi'_{HM} - \frac{1}{A}\frac{\mu_{HH}}{\mu_{H0}+\mu_{HH}}\pi'_{HH},$$

$$\text{and } \frac{\partial ln\mu_{HH}}{\partial f} = \frac{\mu_{H0}}{\mu_{H0}+\mu_{HH}}\pi'_{HH} - \frac{\mu_{HM}}{\mu_{H0}+\mu_{HH}}\frac{\partial ln\mu_{HM}}{\partial f},$$

where A is a positive constant, depending on the number of different types of marriages.[2] The equations are very intuitive as the policy-induced changes in the number of marriages depends on the values of μ_{ij} (i.e., the number of different types of marriages) and the π'_{ij} (i.e., the policy induced utility loss in different types of marriages). From the derivatives, we have the following implications.

(1) **Unmarried status.** Because the numbers of inter-ethnic marriages or unmarried people are much smaller than that involved in intra-ethnic marriages among the Hans, ($\mu_{HM} \approx \mu_{H0} \ll \mu_{HH}$), the sign of $\frac{\partial ln\mu_{H0}}{\partial f}$ is mostly driven by the first term, which is positive. Therefore, we have $\frac{\partial ln\mu_{H0}}{\partial f} > 0$, suggesting that the OCP decreases the number of marriages among the Han people. The intuition is that, given most Han people will be involved in intra-ethnic marriages as the population size of the minorities is much smaller, their fertility is expected to be greatly restricted. Consequently, their expected marriage gains will decline significantly, so they are more likely to choose to delay their marriages or stay single.

(2) **Inter- and intra- ethnic marriages.** The sign of $\frac{\partial \mu_{HM}}{\partial f}$ depends on the relative sizes of $\pi'_{HH}(f)$ and $\pi'_{HM}(f)$. As the fines increase, the absolute number of H-M marriages may

[2]Note that $A = 2 + \frac{\mu_{HM}}{\mu_{H0}+\mu_{HH}} + \frac{\mu_{HM}}{\mu_{M0}+\mu_{MM}}$, which is a positive constant larger than 2.

increase or decrease, depending on the magnitudes of the changes in marriage gains of H-M couples and H-H couples. In the preferential policy regions where π'_{HM} is small, the sign of $\frac{\partial ln\mu_{HM}}{\partial f}$ should be driven by the second term, which is positive. However, it is noteworthy that the sign is sensitive to the magnitude of π'_{HM} , and the magnitude may be small as it is divided by the positive constant A.

Because $\pi'_{HH} < 0$ and $\frac{\partial ln\mu_{HM}}{\partial f} > 0$ in the preferential policy regions, we have $\frac{\partial ln\mu_{HH}}{\partial f} < 0$ based on the third equation. Therefore, $\frac{\partial ln(\mu_{HM}/\mu_{HH})}{\partial f} > \frac{\partial ln\mu_{HM}}{\partial f} > 0$, which means that relative proportion of H-M marriages in preferential policy regions will increase as the fine increases. However, in the non-preferential-policy regions, it is difficult to say whether the sign is not positive or negative.

This is very intuitive. In the presence of the preferential policies, inter-ethnic marriage could be a way to have more children legally. Therefore, a higher level of the OCP fines would induce *relatively* higher incentives for the H-M marriages. In contrast, the incentive is weaker for the people in the non-preferential policy regions.

(3) **Market Price of the Minorities.** The transfer utility model by Choo and Siow (2006) use the transfers he/she receives in the marriage market to measure the market price. Using the equation in their paper, we can directly have $\tau_{HM} = \frac{1}{2}(ln\mu_{H0} - ln\mu_{M0})$ under our setting. Taking derivative with respect to f and applying the same conditions as above, we have

$$\frac{\partial \tau_{HM}}{\partial f} = \frac{1}{2}(\frac{\partial ln\mu_{H0}}{\partial f} - \frac{\partial ln\mu_{M0}}{\partial f}) = \frac{1}{2}[(\frac{\mu_{HM}}{\mu_{MM}+\mu_{M0}} - \frac{\mu_{HM}}{\mu_{HH}+\mu_{H0}})\frac{\partial ln\mu_{HM}}{\partial f} - \frac{\mu_{HH}}{\mu_{H0}+\mu_{HH}}\pi'_{HH}]$$

Because $\frac{\mu_{HM}}{\mu_{MM}+\mu_{M0}} - \frac{\mu_{HM}}{\mu_{HH}+\mu_{H0}} > 0$ and $\pi'_{HH} < 0$, we have $\frac{\partial \tau_{HM}}{\partial f} > 0$ in preferential policy regions because $\frac{\partial ln\mu_{HM}}{\partial f}$ is positive here. In contrast, in the non-preferential policy regions, the sign depends on the magnitudes of π'_{HM} and π'_{HH}, which is difficult to predict.

Above all, we summarize the effects of the OCP fines on expected marriage gains in Figure A3 based on the OCP regulations. Each individual has three options: unmarried, intra-ethnic

marriage (i.e., H-H or M-M), or inter-ethnic marriage (i.e., H-M). The expected utility of being single is affected by the OCP. Because of the ethnic-specific birth quotas assigned by the OCP, fertility restrictions affect the expected gains of each marriage type for the Hans and minorities differently. The more birth quotas indicate the smaller loss induced by one unit increase in fines.

The OCP will significantly lower the expected gains for H-H couples because they have only one or two birth quotas. The expected marriage gains will be substantially reduced for all H-H couples ($\downarrow\downarrow$). In contrast, the impact for M-M couples would be much smaller because the M-M couples have one additional birth quota (Marginal).

For the H-M couples, the expected marriage gains depend on whether these couples have another birth quota or not. In the regions with a preferential policy, the effects on the expected gains of H-M marriages should be *similar* to those of M-M (Marginal).[3] In regions without a preferential policy for H-M couples, the policy implementation for H-M couples remains a "gray area." The lack of a specific document stating that H-M can have additional births does not mean that the restrictions on H-M couples are as strict as those on H-H couples. Therefore, the expected marriage gains would decline ($\downarrow$), but maybe not be as much as for H-H couples.

[3]According to the detailed regulations, the restrictions for H-M couples in such preferential policies regions is relaxed. But the relaxation is not much as that for minorities. For example, there are usually additional terms, such as the stipulation that there should be 3-5 years of birth space between the previous and the additionally permitted births.

A2. Summary Statistics

Appendix Table A2 shows the mean values and standard deviations of the main variables by Hans and minorities. Panel A shows that 4.7 percent (4.5 percent of Han and 6.3 percent of minorities) were unmarried at the time of the survey, and 2.8 percent were in inter-ethnic marriages. Because the population size of the minorities is much smaller (8.4 percent of the population), the H-M marriage share is 1.5 percent for Han people and 16.4 percent for minorities. The H-M marriage rate will be 6.5 percent if marriage matching is completely ethnic-neutral. Therefore, inter-ethnic marriages are still relatively rare. The reasons for this ethnic segregation may be cultural and geographical. For example, people prefer spouses of the same ethnicity because of the shared culture and language. Additionally, opportunities for interaction between individuals from different ethnicities are lower than within the same ethnicity because of geographical distributions.

Panel A also provides descriptive statistics for the demographic and socioeconomic variables. On average, minority people are of lower socioeconomic status than Han people. The proportion of Han with urban *hukou* (28 percent) is much higher than that of minorities (18 percent). The gender composition is almost balanced, and the average age is approximately 40 across all samples. The minorities have less education on average. For example, the proportion of illiterate among the minorities is 14 percent, while that is only 4.4 percent among the Hans. Panel B shows the number of births for the women of fertile ages in the sample. The Han women have 1.6 births on average, while minority women have 2.0 births.

A3. Details of Decomposition

To quantitatively estimate the contributions of the marriage market to the OCP effects, we conduct the analysis in the fertility sample (i.e., females born before 1980 who are between 26 and 45 years old) and specifically denote Y_{ipbt} as the number of births. First, we include the marital status indicators m^j_{ipbt} in equation (1):

$$Y_{ipbt} = \gamma_0 + \gamma_1 Fine^{16-25}_{pb} + \sum_j \varphi^j m^j_{ipbt} + D_{ipbt} + \delta_b + \delta_p + \varepsilon_i,$$

where j denotes marital status, including unmarried status and inter-ethnic marriage.

Second, we replicate equation (1) by replacing Y_{ipbt} with the marital status indicator, m^j: $m^j_{ipbt} = \alpha^j_0 + \alpha^j_1 Fine^{16-25}_{pb} + D_{ipbt} + \delta^j_b + \delta^j_p + \varepsilon^j_i$.

Gelbach (2016) proves that $\hat{\beta}_1 = \hat{\gamma}_1 + \sum_j \hat{\varphi}^j \hat{\alpha}^j$. The term, $\hat{\varphi}^j \hat{\alpha}^j$, implies the effects of OCP fines on the number of births through marital status j. Therefore, $\frac{\hat{\varphi}^j \hat{\alpha}^j}{\hat{\beta}_1}$ can be viewed as the proportion of effects of OCP fines attributable to different marital statuses. By doing so, we estimate to what extent fewer marriages caused by the OCP could explain the policy-induced fertility reduction. Results are reported in Appendix Table A6.

A4. Details of Incentives of H-M Marriages

We divide the sample by *hukou* province and type of *hukou*. In each subsample, we further estimate the impact on the H-M marriages and the number of births. Specifically, we divide Han people into subsamples (s) by *hukou* province (p) and *hukou* type (h). Then, for each subsample (s), we conduct the following regressions:

$$HM_{ibt}^{s} = \theta_1^{s} Fine_{b}^{16-25,s} + X_{ibt}^{s} + \varepsilon_{i1}^{s}$$

where the dependent variable, HM_{ibt}^{s}, denotes whether an individual i of birth cohort b in year t in subsample s is involved in an H-M marriage; $Fine_{b}^{16-25,s}$ denotes the average penalty rate at ages 16-25 for the birth cohort b in the local province p in subsample s.

Using the same setting like that in the main regressions, we include the covariates, denoted by X_{ibt}^{s}, such as dummies for gender, age, and interactions of the two, and groups of birth cohorts. However, we cannot control for the specific dummies for the specific year of birth or age, because the fine used here is specified in the level of the year of birth.

Then we keep the Han people involved in H-M marriages and conduct the same regressions: $Children_{ibt}^{s} = \theta_2^{s} Fine_{b}^{16-25,s} + X_{ibt}^{s} + \varepsilon_{i2}$ where dependent variable is number of births. For each subsample (s), we get estimates for θ_1^{s} and θ_2^{s} and then plot θ_2^{s} against θ_1^{s} to investigate how they are correlated.

A5. Details of Additional Results and Robustness Checks

This section provides additional results and robustness checks for the analysis in the paper.

A5.1 Statistical Tests for the OCP Fines

The changes in the fine rate may not be fully exogenous and could relate to other policies or economic conditions in a particular locality (Zhang, 2017). These conditions include public investments to human capital accumulation, parental preferences, and shocks in the marriage market. Because local officials could easily adjust policy implementation in an area with a low population, it is even more problematic when using the variation at the community/village level.

Because our analysis strongly relies on the exogeneity of the fine rate, we need to understand whether and to what extent the province-year level fines correlate with the provincial localities. To examine the validity of exogeneity, we use the province-year-level macroeconomic indices from four broad categories and investigate their correlation with the OCP fines.

Since the changes in fines may reflect the differences in initial development levels, we investigate the correlations between initial levels of the macroeconomic index in 1978 and changes in fines from 1990 to 2005. Then, we test whether the changes in fines are associated with the changes in these indices. Next, we also examine whether the average levels of these indices in the previous year are correlated with fine rates. Finally, we classify them into different subgroups, put them together in regressions with the same controls, and test the joint significance.

Results in Appendix Table A7 are specifically p-values based on different specifications for each index (columns 1-3) or each subgroup of indices (column 4). Column 1 reports p-values for β_1 in: $\triangle Fine_p^{1990-2005} = \beta_0 + \beta_1 Index_p^{1978} + \varepsilon_p$, where $\triangle fine_p^{1990-2005}$ is the unit change of OCP fines between the years of 2005 and 1990 in province p; $Index_p^{1978}$ is the initial level of

indices in 1978. Column 2 reports p-values for β_1 in: $\triangle Fine_{pt} = \beta_0 + \beta_1 \triangle Index_{pt} + \delta_t + \delta_p + T_p + \varepsilon_{pt}$, where $\triangle Fine_{pt}$ is the change of OCP fines between the years t and $t-1$ and $\triangle Index_{pt}$ is the change of indices. Column 3 reports p-values for β_1 in: $Fine_{pt} = \beta_0 + \beta_1 Index_{p,t-1} + \delta_t + \delta_p + T_p + \varepsilon_{pt}$, where $Fine_{pt}$ is the OCP fines in year t and $Index_{p,t-1}$ is the index level in year $t-1$. Column 4 reports p-values for β_1 in: $Fine_{pt} = \beta_0 + \beta_1 Index^g_{p,t-1} + \delta_b + \delta_p + T_p + \varepsilon_{pt}$, where $Index^g_{p,t-1}$ is a vector of indices in each subgroup (g). Regressions in columns 2-4 also include dummies for year (δ_t), province (δ_p), and provincial specific linear trends in the calendar year (T_p). The first three columns in Appendix Table A7 report the p-values for the coefficients of the OCP fines, and the last column shows the p-values for the joint tests.

In general, the results suggest that the correlations between the changes in fine rates and the macro indices at the province-year level are insignificant. These findings do not mean that OCP enforcement is not related to factors on the sub-regional levels (such as village/community level) or sub-population groups within provinces (such as party members versus non-party members). Besides, we cannot rule out all confounding factors, such as regional culture, son preference, and other regional factors. Therefore, all these tests only provide suggestive evidence for the exogeneity of the variation in fertility fines across the provinces over time (conditional on covariates) in our analysis.

A5.2 Robustness Checks

In the following analysis, we will address several empirical concerns with different model specifications.

Alternative heterogeneity-robust DID estimator. Our baseline specification is in the same spirit as two-way fixed effects (TWFE) regression and could be sensitive to heterogeneous treatment effects (de Chaisemartin and D'Haultfoeuille, 2022). Notably, there are two impor-

tant features of our setting: (1) our "treatment" (i.e., amount of fine) is continuous, which makes it different from the standard DID cases with binary treatment; and (2) it is staggered in the sense that the value of the treatment changes at different times for different units. To assess the seriousness of this issue in our setting, we follow de Chaisemartin et al. (2022) by using the estimator of weighted average of movers' potential outcome slope (WAMPOS). As suggested by de Chaisemartin et al. (2022) and de Chaisemartin and D'Haultfoeuille (2022), the estimands from WAMPOS could be interpreted as some average of the effect of increasing the OCP fines by one unit on marriage outcomes. Columns 2 and 4 of Appendix Table A8 report the corresponding estimands, which are qualitatively and quantitively consistent with the ones from the TWFE estimation. This additional analysis implies that heterogeneous treatment effects are less likely to bias our baseline results.

Sample restrictions at different ages for inter-ethnic marriage. The results on inter-ethnic marriage might be different due to sample selection. We use alternative lower age cutoffs to mitigate such a concern, and the results are similar in Appendix Table A9 (or Appendix Figure A7).

OCP fines at different ages. Our main analysis uses the penalty at ages 16-25. It could be an issue if the results are sensitive to age selection. Therefore, we use the mean values of the fines at ages 18-25, 18-23, and 16-20 to test the robustness for marriage and fertility outcomes, and the results are consistent in Appendix Table A10.

When examining fertility behavior, a related concern might be that the treatment intensity is measured as OCP fines in ages 16-25. We verify the validity of this measurement in three ways. First of all, we show that a large portion of mothers do give births in this age range. Specifically, we plot the frequency of females without children across different ages in Appendix Figure A8. As shown, the normal age for fertility ranges from 21 to 25 years. The frequency of females

without children declines sharply after 26 years old. Therefore, it is expected that the fertility penalties at ages above 26 are less likely to matter for lifecycle fertility behaviors. Secondly, we try different definitions of OCP fines with upper bound ages ranging from 21 to 30. In Appendix Table A11, each cell represents the coefficient of OCP fines at the corresponding age range in a single regression. Consistently, the first column shows a hump-shape pattern of OCP fines at different upper bound ages, and the effects peak at the age of 24. As most women in the sample gave birth between ages 21 and 25, the results in the table show that exposure to fertility restrictions before age 25 actually matters more in the fertility decisions of Han females. It is also noteworthy that no such pattern exists among the minorities. Lastly, as mentioned above, we also consider other age ranges (i.e., 18-25, 18-23, and 16-20) in Appendix Table A10.

Inter-province migration. In the basic specifications, we use the OCP fines in the *hukou* province. It is because individuals pay the OCP fines to local governments where their children have *hukou* registration, and children typically follow mother's or father's *hukou-registered* place. Even though individuals with stronger children preferences have a higher incentive to migrate to the provinces with lower OCP fines, it is much more difficult to change their hukou province. However, we cannot completely rule out this possibility. To alleviate this potential issue, we examine the impact of the OCP fines on the potential cross-province migration behaviors in Appendix Table A12. The outcomes include: whether the current residency province is the same as the one at birth, whether hukou province is the same as the one at birth, and whether the hukou province is the same as the one where they currently live. All the coefficients are small and insignificant. Additionally, Appendix Table A13 reports the results when calculating fine rates based on birth province and current residential province. In general, the results are consistent.

Economic conditions during early adulthood. Although the statistical test in section 6

shows no significant correlation between the fines and local economic conditions, economic conditions in early times might orrelate with both the outcomes and other dimensions of local OCP implementation. To mitigate this concern, we further include the GDP per capita and the share of the agricultural sector GDP at age 15 in our analysis, report the results in Appendix Table A14, and find that the results are stable.

Re-marriages. Our main analysis includes both first marriages and remarriages. It is interesting to ask whether the OCP affects remarriages and how much remarriages affect intra- and inter-ethnic marriages. To answer this question, Appendix Table A15 presents the regression results when using the same econometric model to investigate the impact of the OCP fines on the incidence of remarriage. All the coefficients are small and insignificant, suggesting that remarriage is not a first-order factor affecting the results in the primary analysis. Furthermore, Appendix Table A16 reports the results when we drop all remarriages from the main sample, and we do not find any material changes.

Divorce and widowhood. Our main analysis excludes those who are divorced and widowed because of the lack of information about spouses. It could be an issue if divorces and widows are correlated with fertility penalties. However, excluding them should not significantly affect our results and interpretations as they only capture 3 percent of the sample. We further examine whether divorces and widows are correlated with the fertility penalties in Appendix Table A17 and show that exposure to the OCP during early adulthood has no significant impact on the outcomes in general.

Excluding the famine cohorts. The descriptive analysis in the previous section shows that the famine birth cohorts could be outliers in our sample. Therefore, we drop the famine birth cohorts and reconduct the analysis in Appendix Table A18. The consistent results suggest that the famine cohorts do not affect our results.

Including the education level. Although education is usually considered as a predetermined variable when considering marriage outcomes, it might be endogenous because education also reversely responds to the change in marriage expectations (Chiappori et al., 2009; Lafortune, 2013). Therefore, we also conduct a set of regressions without controlling for education, and we do not find any material changes (See Appendix Table A19). Moreover, this suggests that education is not a channel for the observed relationship between the OCP fines and marriage outcomes.

Using other data. The census data are the most extensive and reliable data we can find to investigate the impacts of the OCP. To show that unobservable characteristics of census data do not drive our results, we also use the Urban Household Survey (UHS) data collected from 16 provinces in urban China during 2002-2009, conduct a similar analysis, and report the results in Appendix Table A20. We find the results are consistent with what we have now.

Gender-specific estimates. Appendix Figure A9 show the gender-specific point estimates for $\beta_1(s)$, as well as the corresponding 95-percent confidence intervals. In general, we find the results are consistent with those in the main analysis, and there is no significant difference between men and women.

Residual analysis. We provide the non-parametric estimation for the above analysis with the residual analysis. For each outcome variable, we exclude the key independent variable $Fine_{pb}^{16-25}$ in Equation (1), conduct the main regression, and keep the residuals. Then we use the $Fine_{pb}^{16-25}$ as the dependent variable to redo the process. For each outcome, we then plot its residuals against those from the fines in Appendix Figures A10a through A10f. To make the figures more straightforward, we group the residuals from fines into 30 equal-sized bins, computes the mean of the residuals from the fines and the those from the outcome variable within each bin, then creates a scatter plot of these data points. Panel A and Panel B show the

results for unmarried status for the Hans and the minorities, respectively. Panel C and Panel D show the results for conditional H-M marriage for the preferential policy regions and the non-preferential policy regions, respectively. Panel E and F show the results for fertility for the Hans and the minorities, respectively. All the patterns are fairly consistent with our previous findings.

A6. Additional Tables and Figures

Table A1: Provincial Governors and OCP Fine Increases in 1989-1992

Province	Governor	Birth Year	Inaugural Year	Year of Fine Increases (1989-1992)
Beijing	Xitong Chen	1930	1983	1989
Tianjin	Bichu Nie	1928	1989	–
Hebei	Qifeng Yue	1931	1988	1988
Shanxi	Senhao Wang	1933	1983	–
Inner Mongolia	Buhe	1926	1978	–
Liaoning	Qifeng Yue	1931	1991	1991
Jilin	Zhongyu Wang	1933	1989	–
Heilongjiang	Qihui Shao	1934	1989	–
Shanghai	Ju Huang	1938	1991	1991
Jiangsu	Huanyou Chen	1934	1989	1989
Zhejiang	Zulun Shen	1931	1988	1988
Anhui	Xishou Fu	1931	1989	–
Fujian	Qinglin Jia	1940	1990	1990
Jiangxi	Guanzheng Wu	1938	1986	–
Shandong	Zhihao Zhao	1931	1989	–
Henan	Weigao Cheng	1933	1988	1989
Hubei	Shuyan Guo	1935	1990	1990
Hunan	Qingquan Xiong	1927	1985	1988
Guangdong	Senlin Zhu	1930	1991	1991
Guangxi	Chunshu Wei	1922	1983	–
Sichuan	Haoruo Zhang	1932	1988	–
Guizhou	Chaowen Wang	1930	1983	–
Yunnan	Zhiqiang He	1934	1985	1989
Tibet	Jiangcunluobu	1932	1990	–
Shaanxi	Qingcai Bai	1932	1990	1990
Gansu	Zhijie Jia	1935	1986	1988
Qinghai	Jipeng Jin	1934	1990	1991
Ningxia	Lichen Bai	1941	1986	1989
Xinjiang	Dawamaiti	1927	1985	1990

Notes: This table lists the "obvious" OCP fine increases that occurred in 1989-1992 and information of the provincial governors in 29 provinces during the corresponding period. The data for provincial governors during the period of 1989-1992 is collected by the authors. The 17 provincial governors in the provinces with obvious increases were younger than other provincial governors (with a p-value of 0.07).

Table A2: Summary Statistics

Sample	(1) Full Sample	(2) Han	(3) Minority
Panel A: Main sample			
Unmarried (%)	4.65	4.50	6.25
	(21.06)	(20.74)	(24.20)
Intra-ethnic marriage (%)	92.58	93.98	77.35
	(26.22)	(23.79)	(41.86)
Inter-ethnic marriage (%)	2.77	1.52	16.41
	(16.42)	(12.24)	(37.03)
Age	40.14	40.23	39.16
	(7.92)	(7.91)	(7.93)
Male (%)	50.98	50.94	51.39
	(49.99)	(49.99)	(49.98)
Urban (%)	27.50	28.34	18.38
	(44.65)	(45.06)	(38.73)
Han (%)	92.01	–	–
	(27.12)	–	–
Education level			
Illiteracy (%)	5.23	4.44	13.83
	(22.27)	(20.61)	(34.52)
Primary school (%)	29.55	28.638	39.44
	(45.626)	(45.207)	(48.87)
Junior high school (%)	44.83	45.98	32.33
	(49.73)	(49.838)	(46.77)
Senior high school (%)	13.96	14.387	9.323
	(34.66)	(35.096)	(29.08)
College or above (%)	6.43	6.55	5.08
	(24.52)	(24.74)	(21.97)
Observation	6,483,958	5,965,631	518,327
Panel B: Fertility sample			
Number of births	1.65	1.62	1.99
	(0.91)	(0.88)	(1.13)
Observation	2,311,010	2,118,412	192,598

Notes: The samples are from Census 2000, Mini Census 2005 and Census 2010. In Panel A, the sample consists of individuals born before 1980 who are between 26 and 55 years old. In Panel B, the sample consists of females born before 1980 who are between 26 and 45 years old. Columns 1-3 report summary statistics for the full sample, the sample of Hans, and the sample of minorities, respectively. Outcomes are weighted using the census sampling weights. Standard deviations are in parentheses.

Table A3: Impact of the OCP Fines at Ages 16-25 on Marriage Outcomes in Full Sample

Dep. Var.	(1)	(2)	(3)	(4)
	Intra-ethnic marriage (%)		Inter-ethnic marriage (%)	
Ethnicity	Han	Minority	Han	Minority
Panel A: All regions				
Fines at ages 16-25	-2.104***	-1.526**	0.091	0.880*
	[0.556]	[0.681]	[0.081]	[0.509]
Observations	5,965,631	518,327	5,965,631	518,327
R-squared	0.089	0.127	0.032	0.131
Mean of Dep. Var.	93.98	77.35	1.520	16.40
Panel B: Preferential-policy regions				
Fines at ages 16-25	-1.318*	-1.190	0.375	1.442*
	[0.625]	[1.311]	[0.228]	[0.761]
Observations	1,681,813	304,554	1,681,813	304,554
R-squared	0.085	0.113	0.030	0.121
Mean of Dep. Var.	92.04	79.80	2.890	14.24
Panel C: Non-preferential-policy regions				
Fines at ages 16-25	-2.175***	-1.329*	0.024	0.476
	[0.669]	[0.667]	[0.067]	[0.563]
Observations	4,283,818	213,773	4,283,818	213,773
R-squared	0.089	0.139	0.025	0.138
Mean of Dep. Var.	94.71	73.72	1.006	19.61

Notes: This table shows the impacts of fines at ages 16-25 on marriage types in the full sample. Panels A-C report the results in the samples of all regions, preferential-policy regions, and non-preferential regions, respectively. The dependent variables are intra-ethnic marriage (i.e., H-H or M-M) in columns 1-2, and inter-ethnic marriage (i.e., H-M) in columns 3-4. We report the estimates for Hans and minorities separately. Regressions use the census sampling weights. The models control for dummies of gender, age, and interactions of the two, education level, *hukou* type, year of birth, and provincial specific linear trends in birth cohort. Standard errors clustered at the province level are reported in brackets. The F-tests in column 1 test the significance for coefficient differences between Han and minorities. In columns 3-6, the F-tests in the bottom of Panel C test the significance for coefficient differences between preferential policy regions and non-preferential policy regions. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Columns 1 and 2 in Panel A show significant negative impacts of the OCP on intra-ethnic marriages for both Han and minorities. Specifically, a one-unit increase in the fertility penalty rate is associated with a decrease of 2.1 percentage points in H-H marriages for Han people and with a decline of 1.5 percentage points in M-M marriages for the minorities. Columns 3 and 4 in Panel A show a positive impact on inter-ethnic marriages in general. But the coefficients for Han ethnicity are insignificant. Panel B and Panel C show consistent results for the preferential policy regions and non-preferential policy regions. In general, these results suggest that fewer intra-ethnic marriages mostly cause the policy-induced higher unmarried rates in Han ethnicity.

Table A4: Impact of OCP Fines on Unmarried at Different Ages

	(1)	(2)
Dep. Var.	Unmarried at the Corresponding Age (%)	
Ethnicity	Han	Minority
Age		
26	2.574***	0.949
	[0.791]	[0.804]
27	2.500***	0.891
	[0.628]	[0.744]
28	2.060***	0.558
	[0.519]	[0.677]
29	1.677***	0.431
	[0.439]	[0.577]
30	1.373***	0.242
	[0.400]	[0.489]
31	1.014***	0.102
	[0.351]	[0.470]
32	0.762**	0.019
	[0.301]	[0.467]
33	0.578**	-0.100
	[0.271]	[0.509]
34	0.436*	-0.223
	[0.255]	[0.497]
35	0.292	-0.066
	[0.236]	[0.430]
36	0.173	-0.236
	[0.210]	[0.413]
37	0.139	-0.009
	[0.201]	[0.478]
38	0.069	-0.313
	[0.185]	[0.582]
39	0.038	-0.886*
	[0.181]	[0.491]
40	0.233	-1.107**
	[0.217]	[0.537]

Notes: This table shows the impacts of fines at ages 16-25 on the unmarried *at the correponding age*. Unmarried *at the correponding age* is calculated based on individual marriage history. Each cell reports the coefficients of OCP fines at ages 16-25 for individuals ages between the corresponding age and 55 years old. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A5: Impact of the OCP Fines at Age 16-25 on the Number of Births, by Type of Marriage

	(1)	(2)	(3)	(4)	(5)
Dep. Var.	Number of Births				
Type of marriage	HH	HM			MM
Region	All regions	All regions	Non-pref-policy	Pref-policy	All regions
Fine at 16-25	-0.043	-0.027	-0.043	-0.022	0.016
	[0.026]	[0.019]	[0.033]	[0.018]	[0.023]
Observations	2,047,479	67,912	32,350	35,562	149,835
R-squared	0.339	0.374	0.358	0.401	0.320
Mean of Dep. Var.	1.659	1.594	1.536	1.646	2.149

Notes: This table shows the impacts of fines at ages 16-25 on the number of births, conditional on the type of marriage. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A6: Impact of the OCP Fines at Ages 16-25 on Marriage and Fertility Outcomes of Han Females

Dep. Var.	(1) Number of births	(2) Unmarried (=1)	(3) Inter-ethnic marriage(=1)
Panel A: All regions			
Fines at ages 16-25	-0.041	0.013**	0.001
	[0.025]	[0.005]	[0.001]
Unmarried	-1.185***		
(=1)	[0.064]		
Inter-ethnic marriage	-0.044		
(=1)	[0.028]		
Observations	2,118,412	2,118,412	2,118,412
R-squared	0.387	0.080	0.031
Panel B: Preferential-policy regions			
Fines at ages 16-25	-0.064	0.010*	0.000
	[0.050]	[0.005]	[0.002]
Unmarried	-1.297***		
(=1)	[0.134]		
Inter-ethnic marriage	-0.009		
(=1)	[0.040]		
Observations	598,685	598,685	598,685
R-squared	0.409	0.071	0.030
Panel C: Non-preferential-policy regions			
Fines at ages 16-25	-0.042	0.014**	0.001
	[0.030]	[0.006]	[0.001]
Unmarried	-1.152***		
(=1)	[0.055]		
Inter-ethnic marriage	-0.081**		
(=1)	[0.038]		
Observations	1,519,727	1,519,727	1,519,727
R-squared	0.380	0.083	0.024

Notes: This table shows the impacts of fines at ages 16-25 on the number of births and marriage outcomes. The sample involves Han females born before 1980 who are between 26 and 45 years old. Panels A-C report the results in the samples of all regions, preferential-policy regions, and non-preferential regions, respectively. The dependent variables are the number of births in column 1, unmarried status in column 2, and inter-ethnic marriage (i.e., H-M) in column 3. Estimates are weighted using the census sampling weights. The basic control variables are the same as in Table 2. Column 1 further controls for marital status. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Adding the controls for marriage market outcomes, we find that the coefficients for the Han women decline from -0.056 to -0.041. It also suggests that the policy-induced marriage outcome changes could explain around 27 percent of the policy-induced fertility decline, consistent with the formal analysis above. Because of the large standard errors, however, the two coefficients are not statistically different. Likewise, for Han ethnicity, the coefficients in Panels B and C also decline when marriage outcomes are controlled.

Table A7: P-values for Correlations of OCP Fines with Macroeconomic Conditions

	(1)	(2)	(3)	(4)
	P-values			
Specification	Initial level	First difference	Lagged 1 year	Joint test
Panel A: Demographic variables				
Population	0.601	0.912	0.153	
Urban population	0.416	0.259	0.274	0.182
Rural population	0.912	0.390	0.863	
Birth rate	0.791	0.455	0.993	0.807
Death rate	0.834	0.373	0.521	
Panel B: Macroeconomic indices				
Employment	0.692	0.478	0.887	
Urban employment	0.634	0.498	0.604	0.243
Rural employment	0.429	0.290	0.138	
Wage of workers	0.965	0.159	0.369	
– of urban workers	0.843	0.821	0.645	0.155
– of rural workers	0.576	0.253	0.714	
GDP per capita	0.276	0.158	0.118	
Unemployment rate	0.680	0.318	0.270	0.119
Urban unemployment rate	0.746	0.858	0.917	
Panel C: Government outcomes (# of participants)				
Pension	-	0.416	0.761	
Medical insurance	-	0.308	0.855	0.535
Unemployment insurance	-	0.528	0.842	
Minimum subsistence	-	0.101	0.255	
Gov. exp.	0.960	0.472	0.882	
Gov. exp. (Administrative)	0.381	0.909	0.275	
Gov. exp. (Agriculture)	0.496	0.431	0.418	0.608
Gov. exp. (Education)	0.965	0.769	0.246	
Gov. exp. (Social Security)	0.673	0.219	0.452	
Panel D: Sanitary and education conditions				
Beds in hospitals	0.157	0.328	0.408	0.665
Doctors in hospitals	0.146	0.553	0.564	
Teachers in prim. schools	0.295	0.299	0.741	
– in sec. schools	0.910	0.346	0.531	0.724
– in tertiary schools	0.067	0.961	0.319	

Notes: The data for provincial macroeconomic indices are from the China Compendium of Statistics (CCS) in 60 years. For each particular index in column 1, we regress penalty rate change between 1990 and 2005 on its initial value in 1978. For each particular index or each set of indices in columns 2-4, we regress penalty rates on it/them and control for fixed effects for year and province as well as province-specific linear time trends. Then we conduct the t-test or F-test for the significance of the coefficient(s) on the macroeconomic indices. Each p-value reported here is from a t-test or F-test indicating the significance of the association between OCP fines and the indices in the regressions. P-values in column 4 show the joint significance of the indices in the regressions. Data for government outcomes are missing in 1978, and therefore, results are missing in Panel C of column 1.

Table A8: Impact of the OCP Fines at Ages 16-25 on Marriage Outcomes by Heterogeneity-Robust WAMPOS Estimator

	(1)	(2)	(3)	(4)
Sample	Full sample		Married sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)	
Specification	TWFE	WAMPOS estimator	TWFE	WAMPOS estimator
Panel A: All regions				
Han	2.013***	2.600***	0.282**	0.198**
	[0.581]	[0.215]	[0.111]	[0.084]
Minority	0.646	0.532	0.937	-0.306
	[0.721]	[0.414]	[0.615]	[0.712]
Panel B: Preferential-policy regions				
Han	0.943	2.206***	0.600**	0.480**
	[0.593]	[0.544]	[0.274]	[0.188]
Minority	-0.252	0.022	2.248**	0.176
	[0.772]	[0.479]	[1.044]	[0.756]
Panel C: Non-preferential-policy regions				
Han	2.151***	2.453***	0.179**	0.018
	[0.681]	[0.243]	[0.0816]	[0.049]
Minority	0.853	0.919*	-0.280	-0.638
	[0.648]	[0.549]	[0.341]	[0.642]

Notes: This table shows the impacts of fines at ages 16-25 on marriage outcomes, by comparing the baseline results with the results using WAMPOS estimators proposed by de Chaisemartin et al. (2022). Panels A-C report the results in the samples of all regions, preferential-policy regions, and non-preferential regions, respectively. The dependent variables are unmarried status in columns 1-2 using full sample, and inter-ethnic marriage (i.e., H-M) in columns 3-4 using the sample of married individuals. We report the estimates for Han and minorities separately. Regressions use the census sampling weights. The models control for dummies of gender, age, and interactions of the two, *hukou* type, year of birth, and provincial specific linear trends in birth cohort. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A9: Impact of OCP Fines on Inter-ethnic Marriage Based on Different Lower Age Cutoffs

	(1)	(2)	(3)	(4)
Dep. Var.	Inter-ethnic marriage (%)			
Region	Pref-policy		Non-pref-policy	
Ethnicity	Han	Minority	Han	Minority
Lower age cuttoff at				
26	0.600**	2.452**	-0.192	0.179**
	[0.279]	[1.053]	[0.367]	[0.077]
27	0.623**	2.565**	-0.011	0.179**
	[0.259]	[1.066]	[0.399]	[0.075]
28	0.616**	2.386**	0.042	0.183**
	[0.256]	[1.056]	[0.417]	[0.075]
29	0.630**	2.394**	0.165	0.179**
	[0.247]	[1.042]	[0.423]	[0.078]
30	0.660**	2.604**	0.176	0.208**
	[0.264]	[1.105]	[0.457]	[0.089]
31	0.644**	2.610**	0.130	0.208**
	[0.283]	[0.962]	[0.475]	[0.097]
32	0.712**	2.653**	0.427	0.220**
	[0.332]	[1.012]	[0.553]	[0.097]
33	0.698*	2.641**	0.393	0.224*
	[0.334]	[1.151]	[0.526]	[0.109]
34	0.727*	2.722*	0.701	0.248**
	[0.397]	[1.414]	[0.553]	[0.117]
35	0.794*	3.153*	0.515	0.251*
	[0.406]	[1.684]	[0.582]	[0.122]
36	0.914*	3.173*	-0.117	0.209*
	[0.447]	[1.627]	[0.716]	[0.113]
37	0.980**	3.901*	-0.065	0.240*
	[0.452]	[1.966]	[0.829]	[0.130]
38	1.094**	3.878*	0.239	0.276*
	[0.451]	[2.096]	[0.904]	[0.151]
39	1.374**	4.163	-0.660	0.251
	[0.601]	[2.626]	[1.360]	[0.191]
40	1.412*	4.832	-0.101	0.143
	[0.672]	[2.896]	[1.495]	[0.205]

Notes: This table replicates the baseline results about H-M Marriage based on different lower age cutoffs. Each cell reports the coefficients of OCP fines at ages 16-25 for individuals ages between the corresponding lower bound age cutoff and 55 years old. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A10: Robustness Checks: OCP Fines at Different Age Ranges (Key Independent Variable)

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full sample		Married sample		Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: Baseline results						
All regions	*2.013***	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Pref-policy	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Non-pref-policy	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Panel B: OCP Fines at 18-25 as the key independent variable						
All regions	1.576***	0.468	0.243**	0.740	-0.031	0.003
	[0.461]	[0.526]	[0.093]	[0.505]	[0.020]	[0.014]
Pref-policy	0.645	-0.231	0.485**	1.922*	-0.040	0.008
	[0.457]	[0.581]	[0.228]	[0.937]	[0.033]	[0.018]
Non-pref-policy	1.699***	0.593	0.151**	-0.343	-0.036	-0.001
	[0.539]	[0.491]	[0.068]	[0.277]	[0.022]	[0.026]
Panel C: OCP Fines at 18-23 as the key independent variable						
All regions	1.394***	0.381	0.168**	0.595	-0.036**	0.002
	[0.426]	[0.401]	[0.068]	[0.422]	[0.017]	[0.012]
Pref-policy	0.673	-0.076	0.291	1.410*	-0.044	0.002
	[0.408]	[0.498]	[0.166]	[0.767]	[0.029]	[0.014]
Non-pref-policy	1.489***	0.511	0.113*	-0.257	-0.038*	-0.002
	[0.513]	[0.402]	[0.057]	[0.239]	[0.020]	[0.018]
Panel D: OCP Fines at 16-20 as the key independent variable						
All regions	1.292***	0.248	0.102*	0.341	-0.047***	-0.007
	[0.460]	[0.363]	[0.055]	[0.303]	[0.017]	[0.010]
Pref-policy	0.687	0.040	0.207	0.587	-0.055**	-0.021
	[0.445]	[0.510]	[0.138]	[0.547]	[0.021]	[0.016]
Non-pref-policy	1.402**	0.577	0.076*	0.225	-0.043**	0.001
	[0.574]	[0.450]	[0.044]	[0.213]	[0.020]	[0.014]

Notes: This table replicates the baseline results by using fines at different age ranges. Panel A shows the baseline results as a reference. Panels B-C respectively use fines at 18-25, 18-23, 16-20 as the key independent variable. Regressions use the census sampling weights. The control variables are the same as Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A11: Impact of the OCP Fines at Different Age Ranges on the Number of Children Ever Born

Dep. Var.	(1) Number of births	(2)
Ethnicity	Han	Minority
Fines at ages		
16- 21	-0.051**	-0.005
	[0.019]	[0.012]
16- 22	-0.055**	-0.002
	[0.021]	[0.014]
16- 23	-0.056**	-0.000
	[0.023]	[0.015]
16- 24	-0.058**	0.003
	[0.025]	[0.017]
16- 25	-0.056**	0.001
	[0.027]	[0.018]
16- 26	-0.051*	-0.000
	[0.027]	[0.020]
16- 27	-0.043	-0.004
	[0.027]	[0.022]
16- 28	-0.032	-0.006
	[0.027]	[0.026]
16- 29	-0.019	-0.004
	[0.027]	[0.032]
16- 30	-0.007	0.009
	[0.027]	[0.037]

Notes: The sample involves females at fertile ages in the main sample. Each cell represents the coefficient of OCP fines at the corresponding age range in a single regression. We report the estimates for Han and Minority separately. Regressions use the census sampling weights. The basic control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A12: Impact of the OCP Fines at ages 16-25 on Inter-province Differences

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Birth- Hukou migration (%)			Birth- Residential migration (%)			Hukou- Residential migration (%)		
Ethnicity	Full	Han	Minority	Full	Han	Minority	Full	Han	Minority
Panel A: All regions									
Fines at ages 16-25	0.068	0.187	-0.027	-0.120	0.031	-0.018	0.068	0.187	-0.027
	[0.443]	[0.497]	[0.142]	[0.471]	[0.523]	[0.225]	[0.443]	[0.497]	[0.142]
Observations	6,483,958	5,965,631	518,327	6,483,958	5,965,631	518,327	6,483,958	5,965,631	518,327
R-squared	0.035	0.046	0.043	0.028	0.034	0.033	0.035	0.046	0.043
Mean of Dep. Var.	2.121	2.204	1.227	4.141	4.303	2.381	2.121	2.204	1.227
Panel B: Preferential-policy regions									
Fines at ages 16-25	-0.022	0.066	0.001	-0.380	-0.379	-0.083	-0.022	0.066	0.001
	[0.631]	[0.720]	[0.221]	[0.564]	[0.608]	[0.275]	[0.631]	[0.720]	[0.221]
Observations	1,986,367	1,681,813	304,554	1,986,367	1,681,813	304,554	1,986,367	1,681,813	304,554
R-squared	0.037	0.061	0.025	0.031	0.044	0.019	0.037	0.061	0.025
Mean of Dep. Var.	1.710	1.887	0.832	3.163	3.548	1.254	1.710	1.887	0.832
Panel C: Non-preferential-policy regions									
Fines at ages 16-25	0.240	0.312	-0.025	0.141	0.281	-0.243	0.240	0.312	-0.025
	[0.569]	[0.618]	[0.245]	[0.594]	[0.629]	[0.309]	[0.569]	[0.618]	[0.245]
Observations	4,497,591	4,283,818	213,773	4,497,591	4,283,818	213,773	4,497,591	4,283,818	213,773
R-squared	0.036	0.043	0.056	0.028	0.032	0.035	0.036	0.043	0.056
Mean of Dep. Var.	2.298	2.322	1.812	4.561	4.587	4.053	2.298	2.322	1.812

Notes: This table shows the impacts of fines at ages 16-25 on migration. In columns 1-3, the outcome is birth- hukou difference (%), meaning whether an individual's birth province is different from hukou province; In columns 4-6, the outcome is birth- residential difference (%), meaning whether an individual's birth province is different from the residential province; In columns 7-9, the outcome is hukou- residential difference (%), meaning whether an individual's *hukou* province is different from the residential province. Outcomes are dummy variables multiplied by 100, so the results could be interpreted as the percentage change in probability. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A13: Robustness Checks: Using Different Provinces for Fines

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full sample		Married sample		Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: All regions						
Baseline results	*2.013****	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
(Hukou Province)	*[0.581]*	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Fines at ages 16-25	1.972***	0.662	0.238***	0.962*	-0.043**	-0.001
(Birth Province)	[0.553]	[0.710]	[0.086]	[0.545]	[0.019]	[0.015]
Fines at ages 16-25	1.383***	0.746	0.288***	0.996	-0.047***	-0.006
(Resid. Province)	[0.480]	[0.717]	[0.092]	[0.671]	[0.014]	[0.017]
Panel B: Preferential-policy regions						
Baseline results	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
(Hukou Province)	*[0.593]*	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Fines at ages 16-25	0.945	-0.162	0.440**	1.939**	-0.059	0.000
(Birth Province)	[0.576]	[0.734]	[0.196]	[0.841]	[0.039]	[0.026]
Fines at ages 16-25	0.407	-0.296	0.541**	2.736***	-0.047	0.006
(Resid. Province)	[0.564]	[0.736]	[0.236]	[0.860]	[0.028]	[0.028]
Panel C: Non-preferential-policy regions						
Baseline results	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
(Hukou Province)	*[0.681]*	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Fines at ages 16-25	2.126***	0.858	0.163**	-0.003	-0.044**	-0.001
(Birth Province)	[0.644]	[0.661]	[0.065]	[0.448]	[0.020]	[0.024]
Fines at ages 16-25	1.494**	1.111*	0.217***	-0.492	-0.051***	-0.013
(Resid. Province)	[0.577]	[0.610]	[0.077]	[0.398]	[0.015]	[0.028]

Notes: This table replicates the baseline results by using fines based on different provinces. For each panel, the upper estimates are based on fines at ages 16-25 in the birth province, while the lower estimates are based on fines at ages 16-25 in the current residential province. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A14: Robustness Checks: Controlling for Economic Conditions at age 15

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full sample		Married sample		Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: All regions						
Baseline results	*2.013****	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Fines at ages 16-25	2.011***	0.698	0.291**	0.899	-0.051*	0.000
	[0.579]	[0.729]	[0.107]	[0.674]	[0.027]	[0.022]
Observations	5,951,366	515,774	5,701,540	486,115	2,115,544	192,004
R-squared	0.101	0.128	0.035	0.140	0.348	0.336
Mean of Dep. Var.	4.503	6.246	1.592	17.50	1.619	1.985
Panel B: Preferential-policy regions						
Baseline results	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Fines at ages 16-25	0.971	-0.190	0.618**	2.204	-0.071	-0.004
	[0.598]	[0.675]	[0.228]	[1.289]	[0.048]	[0.032]
Observations	1,675,049	302,775	1,594,706	286,552	597,127	114,116
R-squared	0.111	0.123	0.033	0.127	0.371	0.327
Mean of Dep. Var.	5.074	5.958	3.044	15.15	1.730	2.110
Panel C: Non-preferential-policy regions						
Baseline results	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Fines at ages 16-25	2.107***	0.877	0.184**	-0.313	-0.056*	0.002
	[0.677]	[0.708]	[0.079]	[0.351]	[0.030]	[0.034]
Observations	4,276,317	212,999	4,106,834	199,563	1,518,417	77,888
R-squared	0.097	0.140	0.027	0.150	0.340	0.334
Mean of Dep. Var.	4.289	6.672	1.051	21.01	1.577	1.793

Notes: This table replicates the baseline results by controlling for provincial macro conditions. Regressions use the census sampling weights. Except for the same control variables as in Table 2, we additionally control for provincial GDP per capita and proportion of provincial GDP in agriculture when individuals were 15 years old. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A15: Impact of the OCP Fines at Ages 16-25 on the Incidence of Re-marriage

Dep. Var.	(1)	(2) Re-marriage (%)	(3)
Ethnicity	Full	Han	Minority
Panel A: All regions			
Fines at ages 16-25	0.045	-0.028	0.277
	[0.087]	[0.0608]	[0.194]
Observations	6,483,958	5,965,631	518,327
R-squared	0.017	0.008	0.083
Mean of Dep. Var.	1.549	1.389	3.285
Panel B: Preferential-policy regions			
Fines at ages 16-25	0.025	-0.012	-0.134
	[0.129]	[0.104]	[0.165]
Observations	1,986,367	1,681,813	304,554
R-squared	0.040	0.008	0.121
Mean of Dep. Var.	2.120	1.667	4.367
Panel C: Non-preferential-policy regions			
Fines at ages 16-25	0.033	-0.007	0.037
	[0.081]	[0.081]	[0.149]
Observations	4,497,591	4,283,818	213,773
R-squared	0.009	0.008	0.030
Mean of Dep. Var.	1.304	1.285	1.681

Notes: This table shows the impacts of fines at ages 16-25 on the incidence of remarriage. Remarriage is a dummy variable multiplied by 100, so the results could be interpreted as the percentage change in probability. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A16: Robustness Checks: Excluding Remarried Individuals

Sample	(1) (2) Full sample		(3) (4) Married sample		(5) (6) Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: All regions						
Baseline results	*2.013****	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Fines at ages 16-25	2.008***	0.698	0.279**	0.962	-0.055*	-0.001
	[0.582]	[0.708]	[0.115]	[0.650]	[0.027]	[0.018]
Observations	5,879,616	500,679	5,629,474	470,971	2,087,764	186,466
R-squared	0.100	0.128	0.034	0.137	0.351	0.340
Mean of Dep. Var.	4.566	6.458	1.577	17.68	1.616	1.969
Panel B: Preferential-policy regions						
Baseline results	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Fines at ages 16-25	0.935	-0.164	0.609**	2.365**	-0.077	0.001
	[0.601]	[0.746]	[0.284]	[1.105]	[0.051]	[0.029]
Observations	1,653,286	290,755	1,572,728	274,497	588,411	109,789
R-squared	0.111	0.123	0.032	0.123	0.376	0.333
Mean of Dep. Var.	5.160	6.230	3.018	15.46	1.727	2.088
Panel C: Non-preferential-policy regions						
Baseline results	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Fines at ages 16-25	2.143***	0.851	0.173**	-0.272	-0.058*	0.000
	[0.681]	[0.643]	[0.0814]	[0.341]	[0.030]	[0.030]
Observations	4,226,330	209,924	4,056,746	196,474	1,499,353	76,677
R-squared	0.097	0.139	0.027	0.149	0.342	0.337
Mean of Dep. Var.	4.345	6.786	1.043	20.90	1.575	1.791

Notes: This table replicates the baseline results by excluding individuals who are remarried. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A17: Impact of the OCP Fines at ages 16-25 on Divorce and Widow

	(1)	(2)	(3)	(4)	(5)
Region		All		Pref-policy	Non-pref-policy
Ethnicity	Full	Han	Minority	All	
Panel A: Dependent variable is divorce (%)					
Fines at ages 16-25	-0.132	-0.229	0.336	-0.423	-0.086
	[0.188]	[0.196]	[0.230]	[0.368]	[0.198]
Observations	6,670,001	6,132,302	537,699	2,051,395	4,618,606
R-squared	0.011	0.011	0.012	0.012	0.011
Mean of Dep. Var.	1.855	1.821	2.220	1.890	1.839
Panel B: Dependent variable is widow (%)					
Fines at ages 16-25	0.034	0.030	-0.199	-0.220	0.080*
	[0.0483]	[0.0354]	[0.187]	[0.141]	[0.0453]
Observations	6,670,001	6,132,302	537,699	2,051,395	4,618,606
R-squared	0.014	0.014	0.022	0.015	0.014
Mean of Dep. Var.	1.138	1.095	1.604	1.509	0.978

Notes: Panel A and Panel B in this table show the impacts of fines at ages 16-25 on the marital status of divorce and widow, respectively. The dependent variables are dummy variables multiplied by 100, so the results could be interpreted as the percentage change in probability. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A18: Robustness Checks: Excluding Famine Cohorts

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full sample		Married sample		Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: All regions						
Baseline results	*2.013****	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Fines at ages 16-25	2.044***	0.727	0.265**	0.868	-0.055**	0.002
	[0.585]	[0.701]	[0.104]	[0.540]	[0.026]	[0.019]
Observations	5,537,496	483,359	5,295,183	454,360	1,958,849	179,238
R-squared	0.102	0.128	0.035	0.139	0.342	0.328
Mean of Dep. Var.	4.708	6.545	1.600	17.51	1.593	1.948
Panel B: Preferential-policy regions						
Baseline results	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Fines at ages 16-25	0.947	-0.115	0.503*	2.093**	-0.078	0.001
	[0.596]	[0.687]	[0.261]	[0.927]	[0.050]	[0.030]
Observations	1,572,230	284,003	1,493,964	268,139	554,481	106,124
R-squared	0.113	0.124	0.033	0.126	0.365	0.318
Mean of Dep. Var.	5.282	6.240	3.040	15.18	1.701	2.063
Panel C: Non-preferential-policy regions						
Baseline results	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Fines at ages 16-25	2.191***	0.887	0.183**	-0.261	-0.056*	0.004
	[0.681]	[0.641]	[0.082]	[0.316]	[0.029]	[0.031]
Observations	3,965,266	199,356	3,801,219	186,221	1,404,368	73,114
R-squared	0.099	0.140	0.027	0.150	0.334	0.329
Mean of Dep. Var.	4.491	6.998	1.059	21	1.553	1.773

Notes: This table replicates the baseline results by excluding individuals who were born during the famine period (1959-1961). Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A19: Robustness Checks: Including Educational Control

Sample	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		Married sample		Fertility sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)		Number of births	
Ethnicity	Han	Minority	Han	Minority	Han	Minority
Panel A: All regions						
Baseline results	*2.013****	*0.646*	*0.282***	*0.937*	*-0.056***	*0.001*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*	*[0.027]*	*[0.018]*
Fines at ages 16-25	2.093***	0.654	0.277**	0.903	-0.051*	0.009
	[0.597]	[0.715]	[0.109]	[0.595]	[0.026]	[0.018]
Observations	5,965,631	518,327	5,715,489	488,619	2,118,412	192,598
R-squared	0.108	0.130	0.035	0.144	0.366	0.354
Mean of Dep. Var.	4.503	6.246	1.592	17.50	1.619	1.985
Panel B: Preferential-policy regions						
Baseline results	*0.943*	*-0.252*	*0.600***	*2.248***	*-0.076*	*0.003*
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*	*[0.050]*	*[0.030]*
Fines at ages 16-25	1.113*	-0.232	0.571**	2.139*	-0.065	0.013
	[0.613]	[0.787]	[0.254]	[1.055]	[0.049]	[0.030]
Observations	1,681,813	304,554	1,601,255	288,296	598,685	114,575
R-squared	0.119	0.125	0.033	0.134	0.390	0.344
Mean of Dep. Var.	5.074	5.958	3.044	15.15	1.730	2.110
Panel C: Non-preferential-policy regions						
Baseline results	*2.151****	*0.853*	*0.179***	*-0.280*	*-0.058**	*0.001*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*	*[0.030]*	*[0.031]*
Fines at ages 16-25	2.200***	0.844	0.178**	-0.271	-0.056*	0.004
	[0.711]	[0.662]	[0.0816]	[0.334]	[0.029]	[0.031]
Observations	4,283,818	213,773	4,114,234	200,323	1,519,727	78,023
R-squared	0.105	0.142	0.027	0.151	0.356	0.350
Mean of Dep. Var.	4.289	6.672	1.051	21.01	1.577	1.793

Notes: This table replicates the baseline results by including educational controls. Regressions use the census sampling weights. The control variables are the same as in Table 2, as well as including individual education level. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A20: Robustness Checks: Using Urban Household Survey

	(1)	(2)	(3)	(4)
Sample	Full sample		Married sample	
Dep. Var.	Unmarried (%)		Inter-ethnic marriage (%)	
Ethnicity	Han	Minority	Han	Minority
Panel A: All regions				
Baseline results	*2.013*** *	*0.646*	*0.282*** *	*0.937*
	[0.581]	*[0.721]*	*[0.111]*	*[0.615]*
Fines at ages 16-25	2.922***	0.728	-0.301*	4.845**
	[0.671]	[2.922]	[0.158]	[1.971]
Observations	385,064	11,735	360,664	10,769
R-squared	0.220	0.260	0.025	0.067
Mean of Dep. Var.	6.337	8.232	98.40	50.63
Panel B: Preferential-policy regions				
Baseline results	*0.943*	*-0.252*	*0.600*** *	*2.248*** *
	[0.593]	*[0.772]*	*[0.274]*	*[1.044]*
Fines at ages 16-25	2.289**	-0.639	1.038	6.752**
	[0.261]	(1.748)	[0.359]	[0.900]
Observations	79,357	6,805	73,236	6,310
R-squared	0.201	0.195	0.021	0.025
Mean of Dep. Var.	7.713	7.274	4.222	46.99
Panel C: Non-preferential-policy regions				
Baseline results	*2.151*** *	*0.853*	*0.179*** *	*-0.280*
	[0.681]	*[0.648]*	*[0.0816]*	*[0.341]*
Fines at ages 16-25	3.322***	4.336***	0.159*	3.787
	[0.893]	[1.042]	[0.077]	[2.171]
Observations	305,707	4,930	287,428	4,459
R-squared	0.226	0.353	0.009	0.136
Mean of Dep. Var.	5.979	9.554	0.937	55.77

Notes: This table replicates the baseline results on marriage outcomes, using alternative datasets. The sample is from Urban Household Survey (2002 -2009), involving individuals born before 1980 who are between 26 and 55 years old. Regressions use the census sampling weights. The control variables are the same as in Table 2. Standard errors clustered at the province level are reported in brackets. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

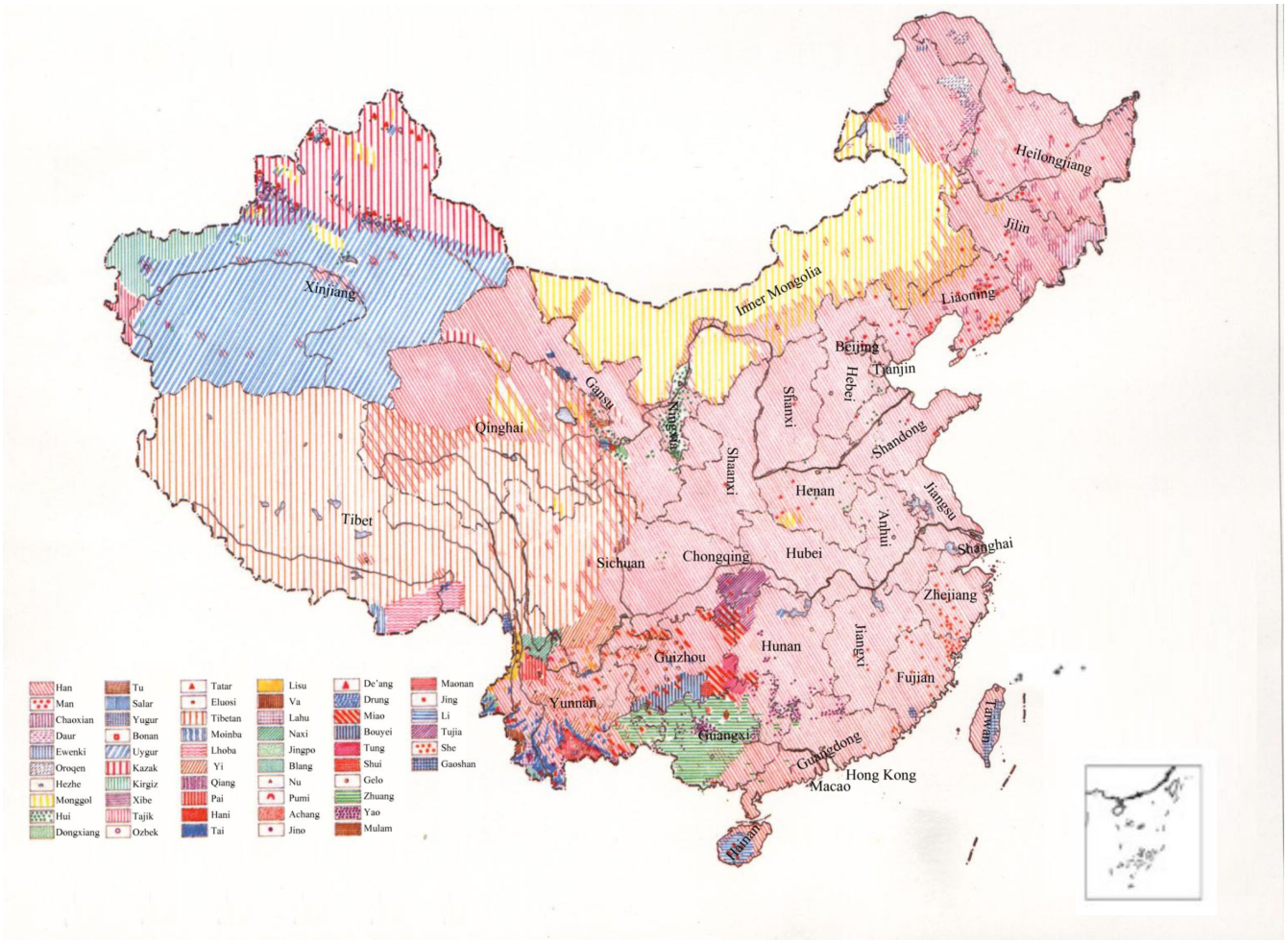
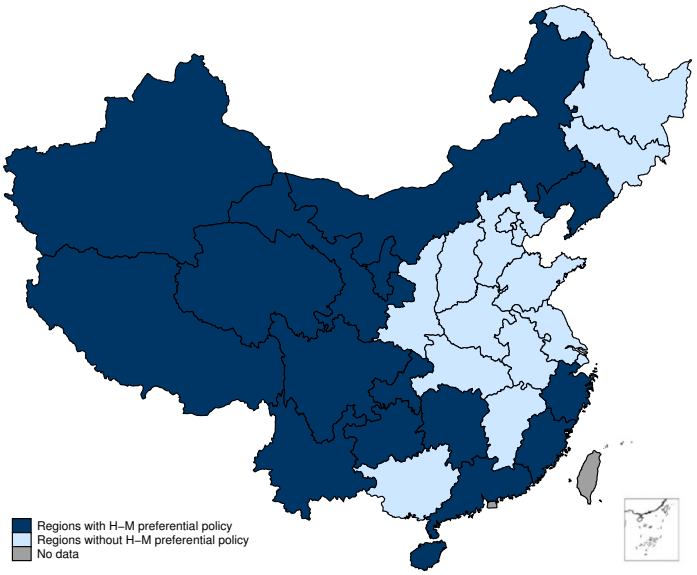
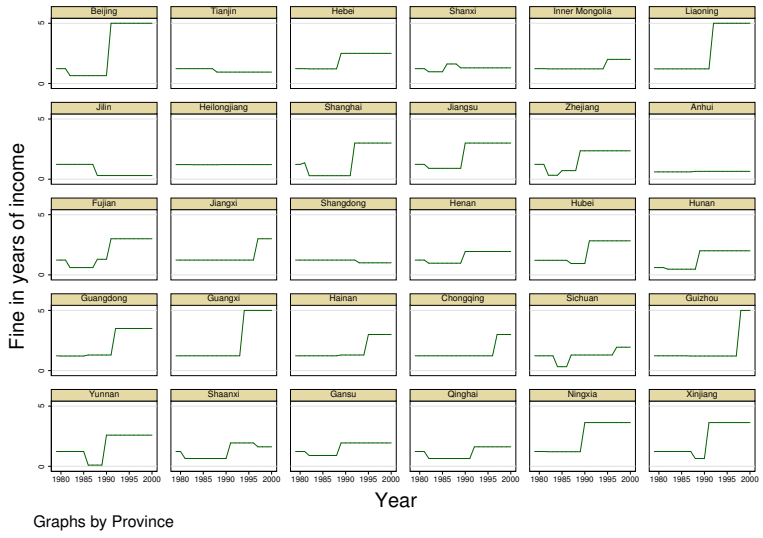


Figure A1: Geographic Distribution of Ethnicities in China

Notes: This map is from the book "A Mosaic of Peoples: Life Among China's Ethnic Minorities" (1992) by China Nationality Art Photograph Publishing House.



(a) Preferential-policy Regions



(b) The OCP Fines, by Province

Figure A2: Measures of the OCP: Preferential-policy Regions and OCP Fines

Notes: Panel A shows the geographic distribution of preferential-policy regions as well as non- preferential-policy regions. Darker blue indicates preferential-policy regions. The data is from the website of the National Health and Family Planning Commission of the People's Republic of China (Chinese Website accessed in November 2015: http://www.nhfpc.gov.cn/zhuzhan/dftl/lists.shtml). Panel B shows the OCP fines by province over year. Based on the data from Scharping (2003), the OCP fines are calculated as a multiplier of annual household disposable income at the province level.

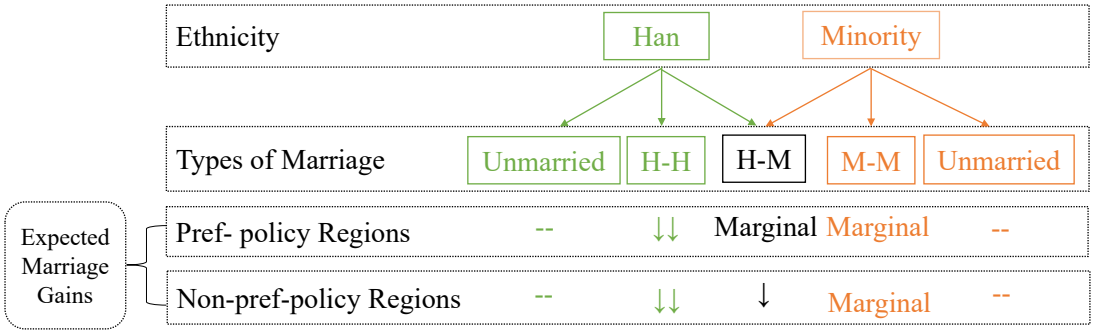
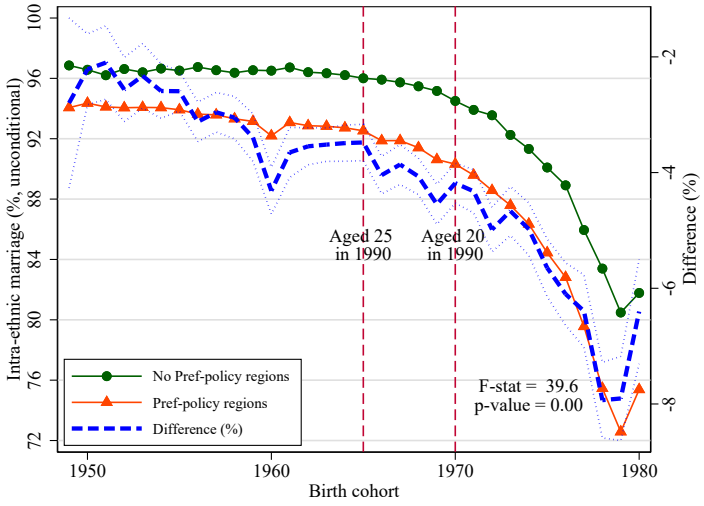
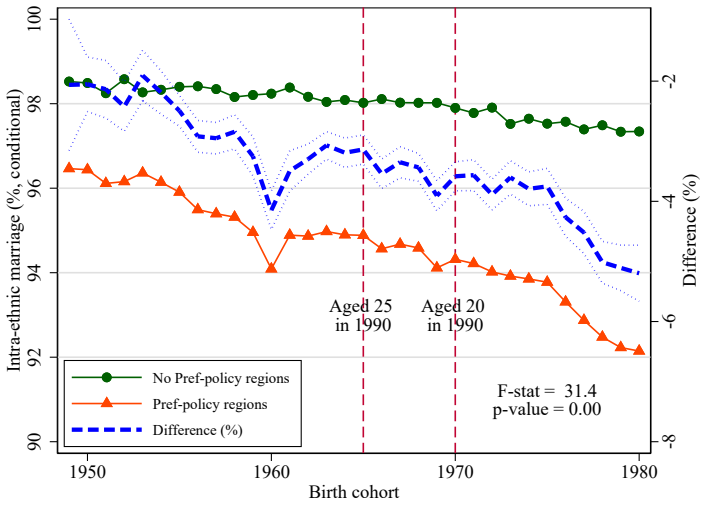


Figure A3: Conceptual Framework for Expected Marriage Gains

Notes: This figure shows the potential loss in marriage gains by types of marriage and the presence of the preferential policy for H-M couples. For individuals of each ethnicity, they face three choices, being unmarried, inter-ethnic marriage, and inter-ethnic marriage. Under the OCP, the reductions in expected marriage gains are denoted by "--" for unchanged gains, "↓↓" for a substantial decline and "Marginal" for a slight decline.



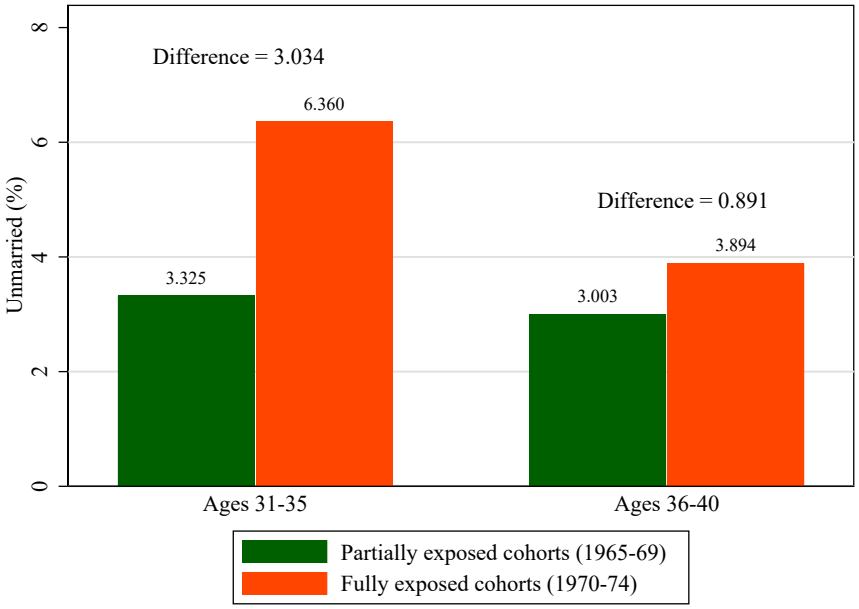
(a) Unconditional



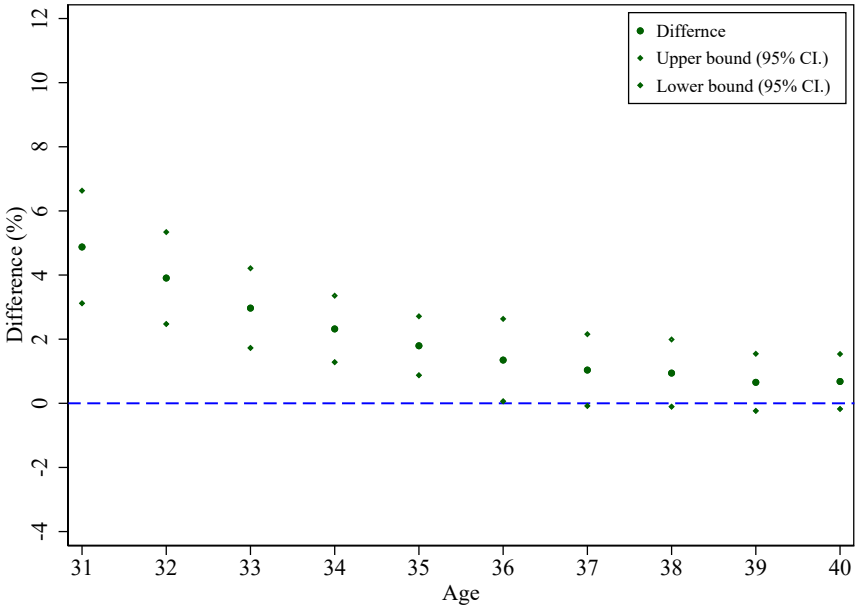
(b) Conditional on Marriage

Figure A4: Intra-ethnic Marriage over Birth Cohort (Unconditional V. S. Conditional Results)

Notes: Panels A and B in the figure show how intra-ethnic marriage changes over birth cohorts for the samples unconditional and conditional on marriage, respectively. The scales in both panels are consistent. The sample is from Mini Census 2005 and Census 2010. The diamond line represents the birth cohort trend for the preferential-policy regions during 1989-1995, and the dotted line represents that for the rest of the regions. The dashed line represents the differences and uses a different scale on the right, with a 95% confidence interval denoted by dots. F-statistic on the right-hand side is from a simple regression pooling all cohort years and calculated based on an F-test that compares the difference in the intra-ethnic marriage rate of those born before 1965 (unexposed cohorts) and after 1970 (fully-exposed cohorts).



(a) Unmarried Rate over Age Group



(b) Differences in Unmarried Rate over Age

Figure A5: Impact of Fines on Unmarried Status at the Survey over Age, by Cohort
Notes: Panel A plots the proportion that the 1965-74 cohorts are unmarried *at the survey* at each age group between 31 and 40 among Han people. In Panel B, the dots represent the differences in unmarried proportion between fully and partially exposed cohorts at each age, with a 95% confidence interval denoted by diamonds. Partially-exposed cohorts at ages 31-35 (36-40) are from Census 2000 (2005), and fully-exposed cohorts at ages 31-35 (36-40) are from Census 2005 (2010).

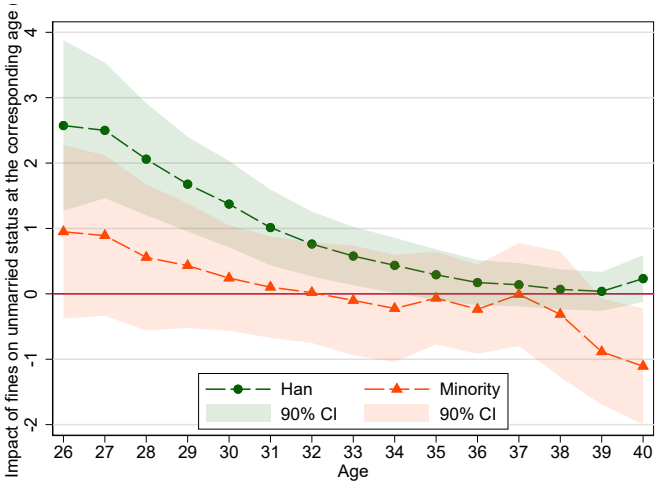
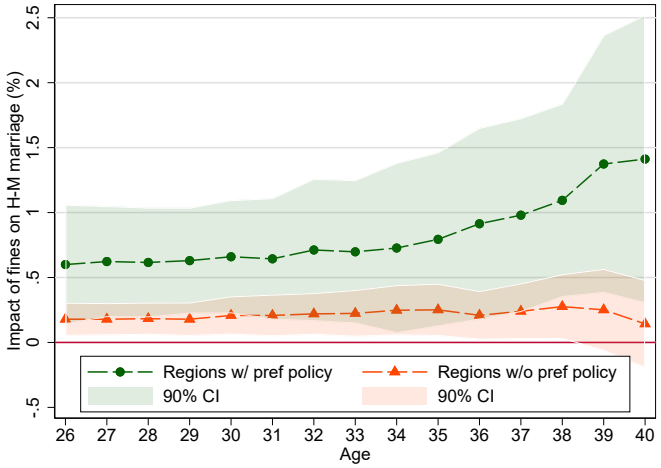
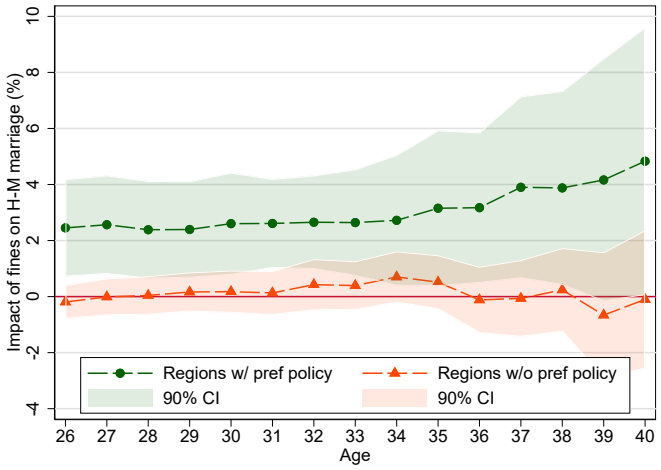


Figure A6: Impact of Fines on Unmarried Status at the Corresponding Age, by Ethnicity

Notes: This figure shows how OCP fines affect unmarried status *at the corresponding age*. We drop those who do not reach the corresponding age from the sample. Regressions use the census sampling weights. The control variables are the same as in Table 2. The 90% confidence intervals are calculated using the standard errors clustered at the province level.

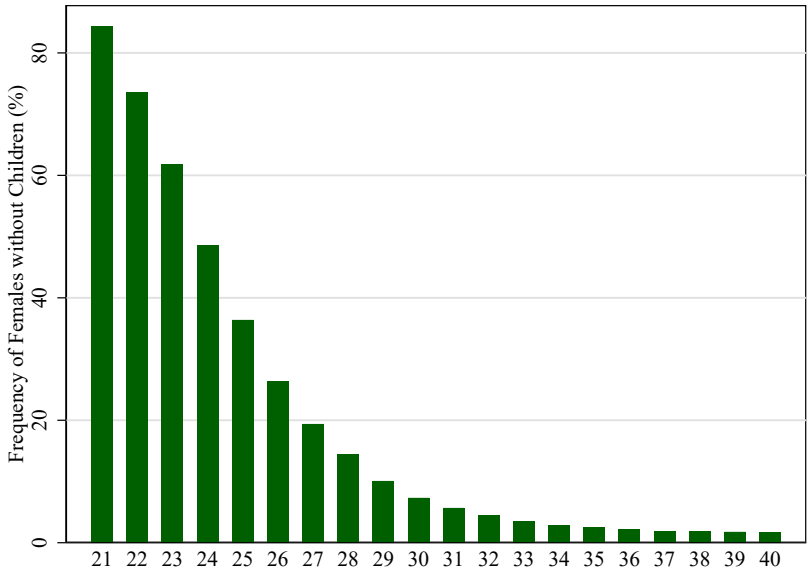


(a) Impact of Fines on H-M Marriage among the Hans, by the Presence of Preferential Policy

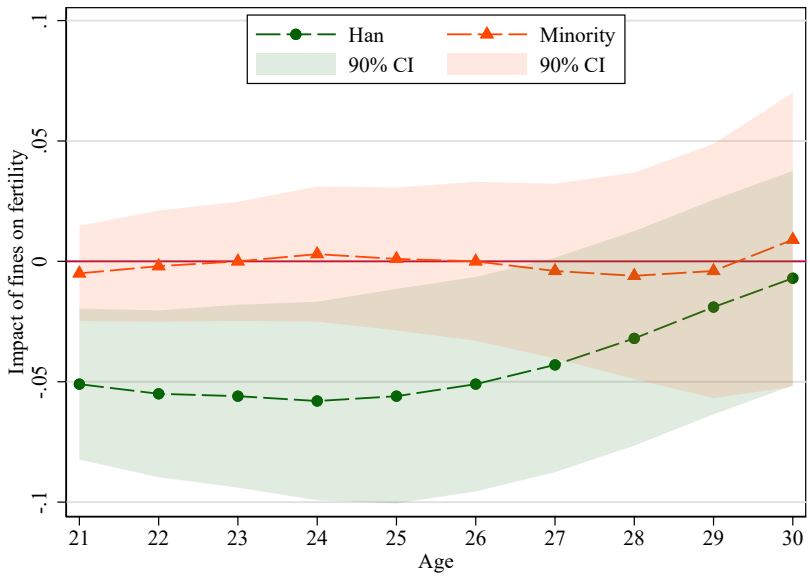


(b) Impact of Fines on H-M Marriage among the Minorities, by the Presence of Preferential Policy

Figure A7: Impact of OCP Fines on H-M Marriage Based on Different Lower Age Cutoffs
Notes: Panels A-B replicate the baseline results about H-M Marriage by using samples based on different lower age cutoffs. Regressions use the census sampling weights. The control variables are the same as in Table 2. The 90% confidence intervals are calculated using the standard errors clustered at the province level.



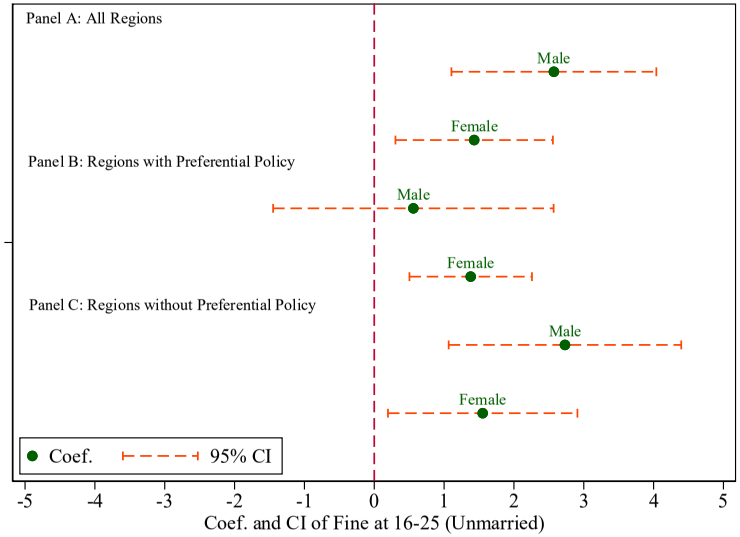
(a) Frequency of Females without Children over Age



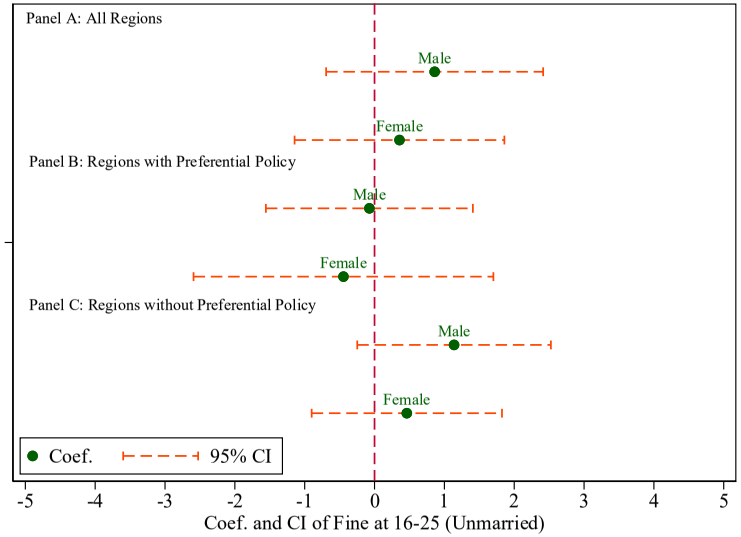
(b) Impact of the OCP Fines at Different Age Ranges on the Number of Children Ever Born

Figure A8: Fertility at Different Ages

Notes: The sample involves females at age 21-40 in the main sample. Panel A plots the frequency of females without children over different ages. Panel B reports the coefficients in Appendix Table A11. Regressions use the census sampling weights. The control variables are the same as Table 2. The 90% confidence intervals are calculated using the standard errors clustered at the province level.

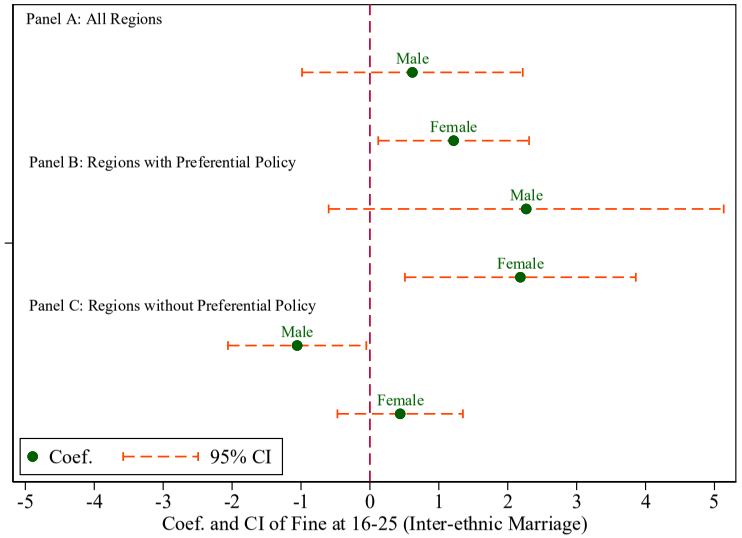


(a) Han Ethnicity



(b) Minorities

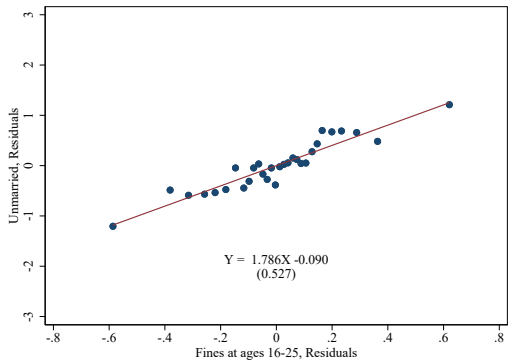
(c) Han Ethnicity (Conditional on Marriage)



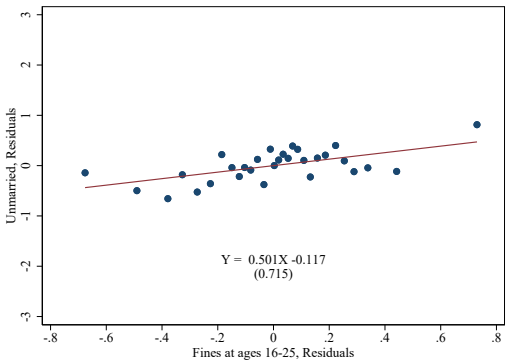
(d) Minorities (Conditional on Marriage)

Figure A9: Impact of the OCP Fines at ages 16-25 on Marriage Outcomes, by Gender

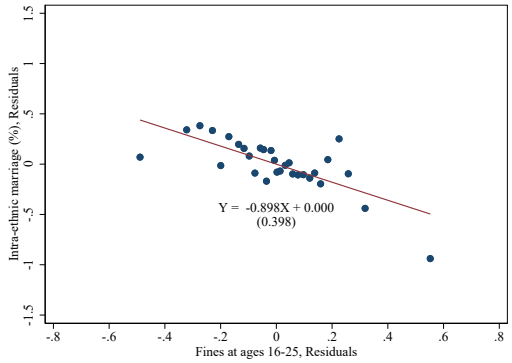
Notes: Panels A and B in the figure show the impacts of the OCP fines at ages 16-25 on unmarried status, by gender. The sample is from Census 2000, Mini Census 2005 and Census 2010, involving individuals born before 1980 who are between 26 and 55 years old. Regressions use the census sampling weights. The control variables are the same as in Table 2. The 95% confidence intervals are calculated using the standard errors clustered at the province level.



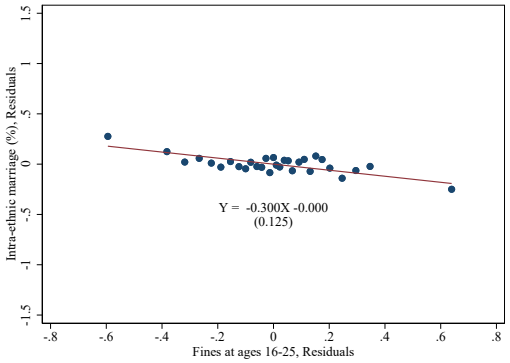
(a) Unmarried status, Han



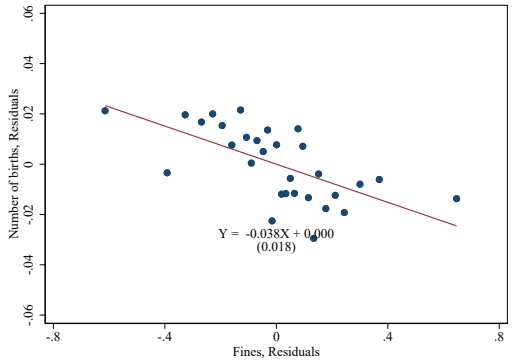
(b) Unmarried Status, Minority



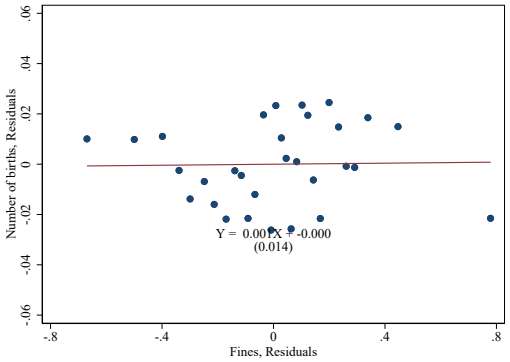
(c) Intra-ethnic Marriage, Preferential-policy Regions



(d) Intra-ethnic Marriage, Non-preferential-policy Regions



(e) Number of Births, Han



(f) Number of Births, Minority

Figure A10: Residual Analysis

Notes: The sample is from Census 2000, Mini Census 2005 and Census 2010. For each outcome variable, we exclude the key independent variable $Fine_{pb}^{16-25}$ in Equation (1), conduct the main regression, and keep the residuals. Then we use the $Fine_{pb}^{16-25}$ as the dependent variable to redo the process. For each outcome, we then plot its residuals against those from the fines. To make the figures more straightforward, we group the residuals from fines into 30 equal-sized bins, computes the mean of the residuals from the fines and the those from the outcome variable within each bin, then creates a scatter plot of these data points.