The Great Expectations:
Impact of One-Child Policy on Education of Girls

Wei Huang
Xiaoyan Lei
Ang Sun

DISCUSSION PAPER SERIES

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

The Great Expectations:
Impact of One-Child Policy on
Education of Girls

Wei Huang
Harvard University and IZA

Xiaoyan Lei
CCER, Peking University and IZA

Ang Sun
Renmin University of China

ABSTRACT

The Great Expectations:
Impact of One-Child Policy on Education of Girls[*]

The rise in education of women relative to men is an emerging worldwide phenomenon in recent decades. This paper investigates the impact of the birth control policies on teenage girls' education attainment. The estimates suggest that the policies explain 30 percent of the education increase for women born in 1945-1980 and 50 percent of the gender gap narrowing in China. Further analysis provides some suggestive evidence for potential mechanisms, including the policy-induced expectations for labor and marriage market and subjective attitudes on children and gender-equality. These findings highlight the role of fertility policies in women's empowerment of last century.

Corresponding author:

Wei Huang
Department of Economics
Harvard University
1805 Cambridge Street
Cambridge, MA 02138
USA
E-mail: weihuang@fas.harvard.edu

I. Introduction

The rise in the schooling attainment of women was the most significant change during the past century, resulting in the level of schooling being higher for women than men in many countries of the world (Goldin et al. 2006, Goldin and Katz 2009, Dulfo 2012).[1] It was also accompanied with women's increased involvement in the economy and enhancement in socioeconomic status in both the society and family. For example, women in the US were 10 percent of first-year law students in 1970 but were 36 percent in 1980 (Goldin and Katz, 2002). These changes, named "Quiet Revolution" by Goldin (2006), have brought hot discussion over the potential lasting impacts on the social evolution and economic development.

Although the phenomenon has been well documented, the forces responsible for the "Revolution" are not as clear. The various explanations provided in the literature indicate no existence of a "silver bullet" answer to the question across the nations.[2] For example, the pills' power may not be applied in the countries in East Asia like China due to much smaller proportion of women taking the pills.[3] For less developed countries, some important factors emphasized by the literature include reduced fertility and maternal mortality and relevant policy actions (Dulfo, 2012).[4]

This paper investigates whether and how the birth control policies, especially the implementation at teenage, altered the decision on girls' education achievement. We consider birth control policies because 1) the variations of policies are more plausible *exogenous* than fertility itself, and 2) the policies have a huge impact in history of humans since they have restricted the fertility of hundreds of millions of couples in the world for many decades (Miller

---

[1] Goldin and Katz (2009) shows in Figure 1.2 (pp. 17) that the ratio of male to female secondary school enrollment is smaller than 1 for most of the countries in the world. This is especially true for those countries with Real GDP per capita higher than $3000 (PPP 2000 $).

[2] Goldin and Katz (2002) and Bailey (2006) find "the pills" contribute much to women's increased education and rising role in labor market. Chiappori et al. (2011) emphasized the role of labor market and marriage market in investment in education for the women. Jensen (2012) used data from an experiment in India and pointed out the (future) labor market opportunities for the women influence their education investment. But there is no explanation that applies to all the countries.

[3] UN Population Division (2006) shows that only 1.7 percent of women at reproductive age (15-49) take pills in China, compared to 15.6 percent in the United States (United Nations Population Division, 2005).

[4] Jayachandran and Lleras-Muney (2009) found that the sudden reduction in maternal mortality by health policies in Sri Lanka lead to a convergence in the education level of boys and girls because parents expect investing in girls to be relatively more valuable.

and Babiarz, 2014).[5] But the potential impact of the policies, especially their implementation at teenage, on women's education receives relatively less attention from researchers.[6] This paper aims to fill in this gap.

Why do the birth control policies at teenage matter for education investment of women? Similar to the ideology of previous literature (e.g Jayachandran and Lleras-Muney, 2009; Jensen, 2010; Oster et al. 2013), the motivation in education investment would be potentially increased because the policies lowered the expected quantity of children and raised the perceived education return. The mechanisms may be multiple folded.[7] First, their potential labor market opportunities of women would be expanded with fewer children to take care and they may be more involved in labor market activities. Second, the women (or their parents) will re-optimize the timing of their marriage and fertility with consideration of the birth control policies. Most likely they will delay their marriage and fertility age and that will allow for longer time of education (Field and Ambrus, 2008). Third, the women may be motivated to get more education because of belief that they will more rely on themselves when they are old due to less support from the fewer expected babies. Finally, the birth control policies may increase women's bargaining power in marriage (Chiappori and Oreffice, 2008), which leads to an increase in girl's education investment.

Because it is women who carry children, give birth, and spend more time in taking care of the young children, little or much smaller impact of the fertility policies are expected for men. Thus men could be a natural control group for this analysis. The asymmetric responses to OCP, if any, could also presumably explain the gender-gap narrowing.

China provides a natural setting for the analysis. For one thing, it has become a prominent example for narrowed gender-gap in education attainment (Rosenzweig and Zhang, 2013). Figure 1a shows that the senior high school completion for the women almost doubled from 13 percent among those born in 1945-1960 to 24 percent for those born in the 1970s. Meanwhile,

---

[5] Some of the mid- and low- income countries include but not restrict to Bangladesh, China, Colombia, Ethiopia, Ghana, Indonesia, Iran, Kenya, Peru, Romania, and Tanzania.

[6] One exception is Miller (2010), whose results are most relevant to ours. Miller (2010) used the variation in timing of introduction of the family planning programs across different regions in Colombia and found the policy introduction at fertility ages (i.e. Aged 15 - 49) decreases fertility and increases the women's socio-economic status.

[7] Although the direct consequence is that the potential risk of giving birth is reduced due to smaller number of babies to deliver, the maternal mortality ratio (MMR) in China in 1990 is smaller than 0.097%, which is a much smaller than that in the paper by Jaychandran and Lleras-Muney (2009).

2

that for men just increased from 21 percent to 28 percent, and thus the gender gap narrowed by half from 8 to 4 percentage points. Figure 1b shows the similar pattern for college completion.

[Figure 1a and 1b about here]

For the other, China formally initiated the birth control policies in 1979, also known as "One-Child Policy" (OCP, thereafter), to alleviate the social, economic, and environmental problems (Greenhalgh, 1986). Different from birth control policies in many other countries, OCP is *compulsory*, which just gave "one-birth" quota to each couple in general, and has a sizable variation in implantation across regions and in different times. This policy led to hundreds of millions of couples involved in this strict family-planning program lasting for over 30 years. Accordingly, the fertility rate in China dropped from 2.81 in 1979 to 1.51 in 2000 (World Bank). The gender gap in education actually started narrowing since the 1960s birth cohorts who were just in their teenage when the policy was implemented.

Our analysis shows that the above coincidence is not accidental. We use the average monetary penalty rate for one unauthorized birth in the province-year panel from 1979 to 2000 as the arguably exogenous measure for implementation of OCP (Ebenstein, 2010; Wei and Zhang, 2010; Huang et al. 2015). Our estimates suggest that increase in OCP fines by one-year household income at teenage (i.e. ages 10-19) predicts two percentage points increase in senior high school completion among women of Han ethnicity. Except for the fixed effects for both the regions and calendar years, we additionally control for the province-specific linear trends in birth cohorts throughout the whole analysis, with consideration that the heterogeneous time trends in development and feminist attitude toward women's education and careers across the regions may drive the results. Note that the magnitude of the OLS estimates is large: since the mean fine rate at teenage increased from zero in the 1950s birth cohorts to 1.4 in those born in the 1970s, the OLS estimates indicate that 30 percent of the increase in women's education and 50 percent of the gender gap narrowing in the birth cohorts 1945-1980.

The assumption of exogenous fine rate should not be taken for granted. We apply a series of robustness checks to test the assumption. First, we further control for the local population growth as well as the education resources assigned to the regions and find robust and consistent impact of OCP. Secondly, we investigate the heterogeneous impact by regions with different strictness of policy implementation, and consistently find larger impacts for regions with stricter policy.

Finally, we investigate the impact of the fines on two plausible control groups. The first group is the women of minorities because the fertility policy mainly restricts the population of Han ethnicity and has fewer regulations for the minorities and the second group is men of Han ethnicity. Consistently, we also find smaller and insignificant impact of the fines in both groups. Although the two control groups are not perfect, these results help to argue the exogeneity of the policy fines since there is no evidence that other policies or confounding factors have no or smaller effects.

Further investigating the heterogeneity by family background with an alternative dataset, the China General Social Survey (CGSS), we find that the responses to the policy fines are larger in the families with parents having higher education, working in the public sectors or having higher administrative ranking. This finding is consistent with the policy implementation because the individuals working in public sectors or with higher education are potentially faced by stricter enforcement and strengthened regulations.

To shed light on the channels through which OCP takes effect, we explore the outcomes on marriage and labor supply. In particular, we test whether the impact of OCP on later (marriage and labor market) outcomes is also larger for places and birth cohorts the impact of OCP on education is larger. We find that the impact of the policy fines on education is positively correlated with that on late marriage measured by whether married at age 25, late fertility by whether the women ever had a child, labor force participation by working status and whether holding a professional (or white collar) job. The results are consistent with the findings in previous literature like Goldin and Katz (2002) and Bailey (2006, 2010). In addition, based on the subjective opinions collected by CGSS, we also find the evidence that the regions where the women's education increased more by policy fines are more likely to be the places with larger impacts on the attitudes for more gender-equality and less reliability on children. The above findings suggest that the expectations and subjective attitude changed by the fertility policies potentially plays an important role in the relationship between the fertility policies and education. But we emphasize that the evidence here is *suggestive* rather than *causal or determinant*.

Our findings build up several literatures. First, this paper builds up the women's empowerment literature (e.g. Goldin et al. 2006, Goldin and Katz 2009, Duflo 2012) by providing a potential new explanation from policy side that OCP implement at teenage increases women's education attainment. It emphasizes the impact of the policy implementation at teenage

on human capital accumulation by forming expectation and increased motivation in education, which is different from previous studies examining the effects of fertility policies on human capital accumulation through Quantity-Quality trade-off theory (e.g. Qian, 2009; Rosenzweig and Zhang, 2009). Second, there is also a large literature on education investment (e.g. Chiappori et al. 2009, Jensen 2001, 2010 and 2012; Bursztyn and Jensen 2015) and our findings contribute to this literature by showing the impact of fertility policies. Finally, the findings are also relevant to the impact of expectation for the future on current behaviors (e.g. Manski 2004, Jayachandran and Lleras-Muney 2009 and Oster et al. 2013). We provide suggestive evidence that the impact of OCP on women's education probably originates from the expectation for the future and that policy-induced education increase is correlated with future outcomes like marriage and fertility, which to some extent highlights the importance of expectations.

The paper is organized as follows. The next section introduces the background and our measurement for the OCP. Section III introduces the micro-level data used in the analysis including the Population Census 2000, the 2005 One-Percent Population Survey, and CGSS. Section IV shows the empirical results for the impact of OCP on the education attainment and Section V further provides additional results for possible mechanisms. Section VI concludes.

II. Background and One-Child Policy

In the 1970s, after two decades of explicitly encouraging population growth, policy makers in China enacted a series of measures to curb population growth, especially to the Han ethnicity. The one child policy was formally conceived in 1979, and enforcement gradually tightened until it was firmly established across the country in 1980 (Banister, 1987). It is the first time that family planning policy has formally become one article in the laws of China. The one-child policy, as the name suggests, restricted a couple to having only one child. The strictness of the one-child policy was partly reflected in its enforcement. Legal measures, such as monetary penalties and subsidies, also ensured the effective enforcement of the one-child policy since 1979. In 1984, the Central Party Committee "Document 7" recognized the diversity of demographic and socioeconomic conditions across China and stipulated that regulations regarding birth control were to be made in accordance with local conditions and to be approved by the provincial Standing Committee of the People's Congress and provincial-level

governments, which devolved responsibility from central government to the local and provincial governments (Gu et al. 2007). It actually allowed for regional variation in family planning policies, like the amounts for monetary penalties or subsidies (Greenlaugh, 1986). As the population was still growing rapidly in the 1980s, Chinese policymakers felt more compelled to limit fertility, and emphasized the importance of this policy in several different documents. Afterwards, local governments tightened enforcement by reducing land allotments, denying public services, increasing unauthorized births, and so on.

The measure of the one child policy in this study is the average monetary penalty rate for one unauthorized birth in the province-year panel from 1979 to 2000, which are from Ebenstein (2010).[8] The one child policy regulatory fine (which is named as "social child-raising fee" in China, and this paper uses "policy fine" for short) is formulated in multiples of annual income (Ebenstein, 2010; Wei and Zhang, 2010; Huang et al. 2015). Appendix Figure 1 shows the pattern of policy fines from 1980-2000 in each province.

[Appendix Figure 1 about here]

It is noteworthy that OCP implementation differs for different ethnicities. It was mainly focused on the Han ethnicity, because it is the largest ethnic group in China with more than 90 percent of the population. But most of the minorities are allowed to give birth to another child in most of the provinces. The enforcement of OCP also differs in urban and rural areas. The policy is strictly enforced in urban areas and some of the rural areas that one couple is only allowed to have one child, but many other rural areas allow a couple to have a second child if the first is a girl. Our analysis also uses the different policy implementation to testify the consistency.

The public expectation for births in the future can be formed only under clear awareness and harsh enforcement. The fertility policies in China should meet this requirement. To make sure the policy enforcement, "Population and Family Planning Commissions" (CFPC) were set up at every level of government to raise awareness and carry out registration and inspection work. A large-scale publicity campaign about the law was launched during the 1980s and effective curb on population growth was of the highest priority for local officials (Liang, 2014). To motivate the incentive of local officials in the birth control policies, the local performance in implementing the OCP is closely correlated with the officials' promotion (Serrato et al. 2015,

---

[8] The details about the construction of the variable can be found in Ebenstein (2010).

working paper). To make sure the policy fine's enforcement, those who had an illegal birth but did not pay the fine could be sued by the local CFPC, and the fine could be collected compulsorily. Therefore, provincial governments set up detailed regulations to ensure the policy fine effective collection. In many regions, the illegal birth child cannot be registered to the *hukou* system if the fines were not paid and thus the child cannot go to school etc. It is also possible that property was confiscated for nonpayment of policy fines.[9] There is also an extreme case happened in Shaoyang City, Hunan Province, that the illegal birth children themselves were confiscated and settled in social welfare institute if the policy fine was not paid.[10]

However, the amount of the policy fine collected was never open to the public and it is even more unclear how the money was spent. Only until recent years, some provinces disclosed the amount of the policy fines collected: the total number is about 20 billion RMB yuan (3.3 billion US$) among 24 provinces that reported in 2012. For example, Guangdong, one of the richest provinces in China, collected 1.5 billion. Compared to that, the total local government expenditure on compulsory schooling is 10.5 billion, suggesting that the policy fines composed non-trivial part to local governments fiscal revenue.[11]

III. Data

3.1 China Population Census 2000 and 2005 One-Percent Population Survey

The main data used in this study are from the 2000 Population Censuses and the 2005 One-Percent Population Survey (Census 2000 and 2005, thereafter). Both the datasets contain gender, education level, year and month of birth, region of residence (prefecture level), type of *hukou* (urban/rural), *hukou* province, ethnicity (Han/Minorities), marital status, number of siblings and relation to the household head.[12] For the married, the data provide the year and month of the first marriage. For the respondents older than 16, the data also provide information about the labor market participation including the working status, occupation and days of work in last week.

---

[9] http://view.news.qq.com/a/20101104/000039.htm (Chinese version)

[10] http://baike.baidu.com/subview/5708887/5757115.htm (Chinese version)

[11] Website in Chinese:

http://news.ifeng.com/mainland/special/2013gdlianghui/content-3/detail_2013_01/28/21654564_0.shtml

[12] Prefecture is the lower level of province. The number of siblings is provided for those aged below 30 in 2005, i.e. those born later than 1975 in 2005 data.

Because the sampling rate is different in the two datasets, sampling weights are applied throughout the analysis in this paper.

For the analysis of education, we keep those aged between 25 and 55 in both datasets, and thus the earliest birth cohort in our analysis is 1945 and the latest one is 1980. The reason we keep those aged above 25 and born no later than 1980 is that 1) most of the respondents have completed their formal education, and 2) we do not want the identified impact of OCP is originated from restricted number of siblings.[13]

Education is divided into six levels: illiterate, primary school, junior high school, senior high, college and graduate or above. We define "senior high or above" as those who have completed senior high school (i.e. it is at least twelve years of education). Considering the respondents generally have lower education than those in developed countries, we choose it as our main outcome of interest for at least three reasons. First, the number of dropouts after finishing junior high (i.e. just before senior high) is largest for all the stages, implying this stage is the most important for education investment. For example, the dropout rate is 68% while that just after primary school (i.e. just before junior high) is 36%; second, the compulsory schooling laws (CSLs) initiated in 1986 required nine years of schooling (i.e. junior high school) in China, and we do not want our results mixed with the impact of CSLs; third, we just use completion rate of college to check robustness in this study because it is much smaller (i.e. less than 6 percent). As Figure 1 shows, the proportion of senior high school completion increases from 13 to 25 percent in the period, with a mean of 18 percent.

3.2 CGSS (China General Social Survey)

The Chinese General Social Survey (CGSS) launched in 2003, is the earliest continuous survey project run by academic institution in China mainland. CGSS is aimed to (1) to gather longitudinal national representative data on social trends in China mainland,(2) to monitor Chinese behavior and attitude in radical social change, (3) to address issues of theoretical and practical significance, and (4) to serve as a global resource for the cross-national comparative

---

[13] We further include number of siblings where available to control for the impact of OCP on education through the Quantity-Quality trade-off channel. We also compare the results using 2000 census where no sibling information is provided and those from 2005 population study survey with number of siblings controlled, finding the two sets of results are almost the same. The other findings also suggest our results should not be driven by the channel of number of siblings and Section 4 shows more details.

study. Since 2003, the CGSS has three different sampling designs and has used three set of sampling frames. They are 2003-2006, 2008, and 2010-present. The targeted population of the CGSS are civilian adults aged 18 and above.

CGSS provides information in many aspects of individuals, households and communities, including demographics, gender, ethnicity, education, year of birth, and time use etc. One important reason that we use CGSS is that it provides subjective evaluation on aspects in life. We pick up four relevant questions for our analysis, which are consistently measured in 2010 and 2012 waves. The first two questions are about the attitudes towards children: "Do you agree that the happiest thing is looking at children growing up?" and "Do you agree Adult children are important support for old people?" The answers are ranged from 1 to 5: 1 "Strongly Disagree", 2 "Disagree", 3 "Neither Agree nor Disagree", 4 "Agree" and 5 "Strongly Agree". Similarly, the respondents are also asked "Do you agree men and women have equal housework duty?" We use the answers coded from 1 to 5 directly. In addition, there is another question: "What is your potential arrangement when there is a pre-school child at home?". We code the answer as one if the respondents chose "Women at home and men work outside" and zero for other answers.

To make the analysis consistent, we keep those born between 1945 and 1980. The proportion of senior high school completion is 0.24 for women and 0.31 for men. The difference between the CGSS sample and the Census may originate from the different sampling frame. Thus we should be cautious when comparing the results of CGSS to those of Census.

IV. Impact of OCP at Teenage on Education Attainment

4.1. Education Responds to Fertility Policy Fines at Teenage

We start the analysis applying an "Event Study" to investigate how the education attainment responds to the variations in the fertility fine. The methodology is straightforward: we first calculate the changes in fine rate at age 10-19 as well as the changes in senior high school completion rate in two consecutive birth cohorts with the same hukou province and the same type of hukou (Urban/Rural), and then plot or regress the changes in the senior high school completion against those in fine rate changes, weighted by the population in each birth cohort-province-hukou. We conduct this analysis in three separate samples - women of *Han*, men of *Han* and women of minorities, with consideration that OCP should mainly influence the

education attainment of women of Han as discussed above. In this part we only keep those born no earlier than 1965 because the fine rate changes mainly for these cohorts since there is few changes in fine rate at teenage for those born before this year. The number of observations should be ideally 900 since there are 30 provinces, 2 types of hukou and 15 birth cohorts. But some missing observations exist in the women of minorities sample.

Figures 3a-3c report the non-parametric estimation for the correlation in separate samples and Table 1 reports the corresponding OLS results and the standard errors are clustered at province level to allow for any auto-correlation within province. Both Figure 3a and the first column in Table 1 show a very significant positive correlation between increase in fine rate at teenage and those in senior high school completion. The OLS estimation suggests that one-year household income increase in fine rate at teenage predicts the two-percentage-point increase senior high school completion. In contrast, Figure 3b and 3c and rest columns in Table 1 suggest that there is no evidence for this correlation among neither men of Han nor women of minorities.

[Table 1 about here]

[Figure 3a-3c about here]

4.2 Impact of OCP at Teenage on Education Attainment

To control for potential individual heterogeneity and get more precise estimation, we conduct the following regression:

$$(1)\ Senior_{ijbt} = \beta_0 + \beta_1 Fine_{jb}^{10-19} + \beta_2 X_i + \delta_b + \delta_t + \delta_{bt} + \delta_j + \theta_j Prov_j \times T + \varepsilon_i$$

where subscription i denotes for individuals, j for *hukou* provinces, b for year of birth and t for the year of survey. The dependent variable $Senior_{ijbt}$ is an indicator for individual i born in year b with j's province *hukou* in survey year t having completed senior high school. $Fine_{jb}^{10-19}$ is the mean value of the fine rate in province j in the years when birth cohort b are aged between 10 – 19. We use hukou province to match the fine rate because it is a more accurate measure for the province where the respondent obtained education. Inter-province migration is a potential problem. It is also possible that the hukou will be moved to the other province. The census 2005 data provide the information on birth province, which finds that over 93 percent of the individuals are living in the same province as where they were born. The results are also consistent if using birth province directly.

The set of control variables, X_i, include the logarithm of birth cohort size, sex ratio in the corresponding birth cohort of local hukou province, and indicators for type of hukou (urban/rural) and number of siblings. δ_b, δ_t and δ_{bt} denote the indicators for the birth cohorts, year of survey and the interactions between the two. We control for the interactions to avoid any systematic sampling bias in specific birth cohort in any of the survey. The results are consistent if we drop the interaction dummies. δ_j denotes the dummies for hukou province which capture the time-invariant heterogeneity across provinces, and $Prov_j \times T$ are the provincial-specific birth linear time trends to control for potential trend in feminist views and attitude toward women's education and careers in each province.

The coefficient, β_1, is of our main interest because it presents the impact of OCP fine rate at teenage on the senior high school completion. Panel A and B of Table 2 present the OLS point estimation for β_1 among women and men of *Han* ethnicity, respectively. The standard errors in parentheses are clustered at province-year of birth level and those in brackets are clustered province level. The estimate in column 1 of Panel A indicate that the one unit increase in OCP fine for an additional illegal birth at teenage is positively associated with an statistically significant (i.e. significant for two different standard errors) increase in the likelihood of completing senior high school for women but not for men. Note the coefficient is very close to the first-difference estimation above. In addition, the magnitude is also economically significant: it implies that the increase of OCP fines (i.e. 1.4 years of local household income) contributes 2.8 percentage points increase in the women's senior high school completion rate for the birth cohorts from the late 1940s to the 1970s, suggesting that the OCP explains about 30 percent of the education increase for the women born in the period.

[Table 2 about here]

Because it is women who carry children and give birth, and in most of the developing countries, women spend more time in taking care of the young children. So we expect that the impact of OCP should be larger for women. The estimate in Panel B shows the results for men of Han. Comparing the impacts for women and men, we also conclude that the OCP explains about 50 percent of the gender gap narrowing among the sample group of people. However, the motivation for us to independently investigate the impact for men is not only to show the forces from OCP contributing to the narrowed gender-gap. If the impact of the fertility policy fine rate

were from other confounding factors like education policies or economic development, we should also find the impact for men. The above estimates provide some evidence for the exogeneity of the policy fines.

According to the documentation of the OCP, the fertility policy fine may change according to the population size and the potential increase, which may be correlated with the women's education level due to competition and other resources allocated by the central government to the province. Therefore, we additionally control for logarithm of population size in the local *hukou* province when the respondent was age 10 and that when age 19 in column 2. The estimates are very close to the first column for both men and women, indicating that the incentive to raise the policy fine caused by potential population increase is not an important confounding factor.

It is also concerned that the OCP fines may be correlated with the government support in education. Some confounding factors may originate from such education-supporting policies like Compulsory Schooling Laws in 1986, and it is possible that the policy fines are correlated with education resources supply. We add the measures for education supply in Column 3, including (logarithm of) the number of primary schools and mid-high schools. The results show the impact of the policy fine is still robust, suggesting the fertility policy-induced education should mainly originate from the forces from the education demand side like the higher policy-induced incentive in education among girls themselves or their parents.[14]

Appendix Table A1 shows the impact of OCP fine rate on college attainment. This is a parallel analysis to Table 2. The results are consistent. Increase the policy fine by one-year household local income predicts increase in college completion by 0.65 percentage points among women of Han. And the coefficient for men is about half of this magnitude and insignificant. The coefficients are also consistent when controlling for population size and growth or the number of local primary schools and that of middle-high schools.

---

[14] All these results are robust when using logit estimation. We also interact the survey year dummy (equals to one if the respondent is surveyed in 2005) with the policy fine at age 10 -19 to test whether there is difference between the sample from 2000 census data and that from the 2005 population survey. The coefficient on the interaction term is small and insignificant, indicating roughly similar effects of OCP fines on the women's education attainment in the two survey years. For the other, we interact the policy fine at age 10-19 with birth cohorts no earlier than 1969 so to test whether the impact of OCP is heterogeneous across different birth cohorts, with the concern that the changes of social norms across the birth cohorts may be correlated with both increase of the fine rate and the education of the women. The results show no evidence for this concern. These results are not provided here but available upon request.

[Table A1 about here]

The above established the relationship between the policy restriction at teenage (i.e. 10-19) and girls' education and thus it is natural to ask whether the policy changes at other ages matter. Since the decision to go to senior high school is made when the children are at teenage and it should be reasonable that policy changes at older ages may not matter.[15] It should be also noted that the policy restrictions at age 10-15 is earlier than the normal age of senior high school enrollment but the expectation formation may take some time. But it is an empirical question whether the policy changes at earlier age matters. It is a long span between childhood and the decision to take senior high school and the changes in policy may or may not have long-lasting effects. Investigation in the relationship between policy changes at even younger ages also shed light on the question whether the impact of OCP is time-accumulative or changes at certain ages matter most.

To answer the above question, we replace the policy fine at age 10-19 by that at age 6-9 and that at age 20-23 separately in the regression. Figure 4 reports the results for women and men separately. It is not surprising that all of the estimates are small in magnitude and insignificant. The estimates in female sample suggest that the changes at age 10-19 matter most with the coefficient (0.021 and significant). The coefficient for the fine rate at age 6-9 (0.010) is much smaller and has a wider confidential interval. Consistent with our expectation the estimate for the impact of policy fines at age 20-23 (0.006) is also much smaller, though significant. The possible reason for the significance may be that there are some students going to school at later age but we cannot have exact answer to this without further data and information. These results suggest that the policy fine rate changes matters mostly when they happen during teenage, which is not surprising because it is the most critical time when the households (or the girls) making decisions for their children's (or their) education.

[Figure 4 about here]

4.3 Further Evidence: Impact by Patterns of Policy Implementation

The above analysis provides evidence for the impact of OCP at teenage on women's education attainment. Since OCP mainly restrict the fertility of Han-ethnicity, the impact on the

---

[15] Generally, children in China go to senior high school at age 15 and graduate at age 18. But the age has some variation due to regional policies and social norms. In 1960s, many children went school at later age.

minorities should be also smaller. Women of minorities are another natural control group for our analysis, though not perfect. There are officially 56 ethnicities in China and Han is the majority, which has 93 percent of the population in 2005 census. More minorities live in remote areas and have lower social economic status in general. Due to smaller population and political reasons, most of the minorities are exempted from the restrictions of the policy (Gu et al. 2007). Previous literature like Li et al. (2010) used the minorities as control group to investigate the impact of OCP. This paper we follow the similar ideology and investigate whether there is any effect of the policy fines among the minorities. Before the formal analysis, Figure 2 shows the senior high school completion rate of women over 1945-1980 birth cohorts among women of han and minorities, respectively. Senior high school completion rate among women of minorities is lower in general. More importantly, the gap between these two groups is even larger since the 1960s, who are the first cohorts experiencing the OCP at teenage, suggesting that OCP may be an important factor contributing to the larger gender gap.

We conduct the parallel analysis for Han and minorities separately and report the coefficients one policy fine and corresponding 95 percent confidential intervals in Figure 5a. Panel A shows that the coefficient for women of Han (0.021) is positive and significant but that for the minorities (-0.007) is negative, smaller in magnitude and insignificant. Panel B reports the estimates for men, also by Han and the minorities. Both the coefficient for Han (0.004) and that for minorities (-0.006) are much smaller in magnitude statistically insignificant, and much smaller than that estimated from women of Han ethnicity. Thus we provide evidence that the impact of OCP on education holds for women of han rather than men of han nor women of minorities.

[Figure 5a about here]

As discussed above in Section II, the enforcement of OCP also differs by type of *hukou* (Urban/Rural). For people with urban *hukou*, the policy is strictly enforced that one couple is only allowed to have one child. But many couples with rural *hukou* are allowed to have a second child if the first is a girl, which is also named "One-and-Half Children Policy". In general, the enforcement of OCP in rural areas is also looser than that in urban regions. Therefore, we keep those women with Han ethnicity only, divide the sample by types of the *hukou* and estimate the equation (1) in each separate sample in Panel A of Figure 5b. Then we further divide the rural

sample by whether the local province has the "One-and-Half Children Policy" and conduct the same analysis in the two subsamples in Panel B of Figure 5b.

[Figure 5b about here]

Panel A of Figure 5b shows that the estimate for urban hukou (0.031) is about two times larger than that for rural ones (0.016). This is consistent with the looser enforcement and more children allowed to bear in rural areas. Panel B keeps the rural hukou sample and shows that the impact in the areas where there is One-and-Half Children policy (0.011) is also smaller than that in the regions without it (0.020). Consistent with the expectation, all the results show that the impact of OCP at teenage is larger for the regions with stricter policy implementation.

4.4 Placebo Test: Can Education In Earlier Cohorts Predict the Fertility Fine Later?

Although the result that OCP at teenage increases girls' education is robust to different model specifications and consistent with the patterns of policy implementation, another possible endogeneity issue may originate from that the local officials may raise the fertility fine rate based on the local conditions including women's education. Though small, the possibility still exists that local officials change the fine rate due to women's education, since we do not have formal documentation for the exact procedures how the fine rate is designed. In particular, if spatial and temporal variation in OCP fine is affected by the local fertility rate, it may correlate with the preexisting pattern of education of women or the gender difference in education. If this is true, above results may be driven by this correlation.

To shed light on this issue, we conduct the following analysis. We estimate how much the fine rate would change according to the pre-existing education pattern fir women and men, respectively. In practice, we estimate the correlation between the local education level of the birth cohorts in our sample and the fine rate when these cohorts are aged 24-26, by gender. Since almost all individuals have completed their education at this age, we regress the fine rate at age 24-26 on the senior high school completion (Yes = 1) in our sample, with all the covariates same as in Equation (1). By doing so, we actually examine whether the officials will consider the education level of those aged 24-26 as a factor to design the current policy fines. Table 3 reports the results.

[Table 3 about here]

First two columns show no evidence for the correlation for the preexisting pattern of women with policy fines, for both all people and those of han ethnicity, respectively. Next two columns provide similar results for men. Note that all the coefficients are fairly small: even if the senior high school completion rate increase from 0 to 1, the predicted fine rate increase would be smaller than 0.004, for both men and women. The similar coefficients for men and women also suggest that the fine rate changes may not correlated with the earlier gender difference in education.

4.5 Additional Evidence from CGSS and Heterogeneous Effects by Family Background

Section 3 introduces that CGSS provides detailed parents socio-economic status (SES) when respondents were at age 14. First, we keep people with Han ethnicity in CGSS to double-check the above results by re-estimating equation (1). The size of minorities is too small to get convincing results. All the covariates are kept the same expect that the CGSS do not have information for the number of siblings, which, we will show later, may be not a critical issue. The first two columns of Table 4 show the results for men and women, respectively. Consistent with above, we find that in CGSS data the OCP at teenage also impacts the education for women, rather than men. In column 3, we further control for the parents' conditions when respondents aged 14, including education (measured by some formal education or not), political status (measured by whether belong to party member), administrative rank (measured by whether having a rank equal or higher than subsection chief), working status (measured by whether working for a state-owned or collective enterprise). These measures for parents' socio-economic status should be strongly correlated with the number of siblings of the respondents. The coefficient, however, just change a little bit from 0.042 to 0.040, suggesting that family background or the number of siblings should not bring much bias when ignored.

[Table 4 about here]

The other important reason for us to investigate the heterogeneous effect by family background is that the strictness of enforcement of the policy. For example, those hired by state owned or collected enterprises may lose their jobs when they were found to have any illegal birth; party members who went against the policy will also face more severe punishment like losing their membership. Thus these households are more likely to form the expectation for their

daughters that they would have limited number of children allowed to give birth. We interact these family background measures with the policy fines with the expectation that the effects of the OCP would be larger for those with higher status, party membership or working for state owned or collective enterprises. The rest few columns provide consistent evidence for the expectation: all the coefficients on the interactions are positive and significant. However, the heterogeneous effects have at least another interpretation: since these measures reflect higher SES in general, it is also possible that these parents are more patient and farther sighted, and thus they would be more likely to respond to the OCP even they faced the same policy enforcement as other people. It is also possible that the above results are caused by the fact that those higher SES parents are able to pay the tuition of the senior high school education for their children. Without further information, we just conclude here that the data from CGSS provide consistent evidence and that the households with higher SES are more likely to respond to the OCP by increasing their girls' education.

V. Possible Mechanisms: Link to *Ex Post* Outcomes

5.1 Methodology and Econometric Framework

The above analysis shows a positive effect of OCP fine at teenage on the education for women with Han ethnicity, which explains a large part of education increase for women born between 1945 and 1980 in China and remarkable part of gender-gap narrowing in the birth cohorts. This section provides the answers to mechanisms: why do these women or their parents decide to investment more in education when they face a higher fertility policy fine rate at age 10-19?

First, their potential labor market opportunities would be expanded and they have potential more time on labor market, which probably increase the perceived returns of education. Second, the women (or their parents) may expect delayed potential marriage and fertility age by optimizing the timing in the future with the consideration of birth control policies. Third, women are more likely to rely on themselves due to fewer expected babies. Finally, the birth control policies may also increase the women's social status by increased bargaining power in marriage and more freedom in when to give birth.

Ideally speaking, we can examine the effects of the policy on expectations and subjective attitude and the role of them in the fertility policy-education nexus if we had the data of the expectations for the future and the subjective opinions during the period when the policy fines just changed. Unfortunately, the data used in this study are *ex post:* the earliest survey year is 2000 and those facing stricter OCP at teenage are aged at least 20 in the sample. Furthermore, as far as we are concerned, there is no public available data measuring individual expectation during the period of the 1980s and 1990s in China.

Based on the limitation above, we try to provide some suggestive evidence by examining the correlation between the impacts of policy fines on *ex post* outcomes and the impact on education.[16] The rationale is that if the policy-induced education is mainly driven by policy-induced expectation, we would expect that the impact of fertility policy on the *ex post* outcomes should be larger whereas the impact on education is larger, with the assumption that the expectation is fulfilled. In practice, we keep those women with Han ethnicity, divide the sample by *hukou* province, type of *hukou* and survey year and conduct the following regressions in each sample *s*:

$$(2)\ Senior_i^s = \alpha_0^s + \alpha_1^s Fine_{jb}^{10-19} + \alpha_2^s X_i^s + \delta_b^s + \varepsilon_i$$

$$(2')\ Y_i^s = \gamma_0^s + \gamma_1^s Fine_{jb}^{10-19} + \gamma_2^s X_i^s + \delta_b^s + \varepsilon_i$$

where the superscript *s* denotes the sample *s*. The term, X_i^s, includes male proportion in the birth cohort of the *hukou* province and number of siblings of individual *i* in sample *s,* and δ_b^s is a set of birth cohort group dummies (i.e. 1945-1960, 1961-1980). Note we cannot control for the dummies for each birth cohort because the identification is based on the time-series variation in fine rate change within each sample *s*. Then we test whether impact of fine on outcome tend to be larger if the impact is also larger on education by plotting γ_1^s against α_1^s, weighted by the representative population in each sample *s*. If we found the impacts of fine on outcome Y tend to be larger if the impact is also larger on education, we then conclude that some *suggestive* evidence is found that the policy-induced expectation on Y is a potential reason for women's education increase.

---

[16] We thank Professor Lawrence Katz for providing great help and guidance on this methodology.

However, we emphasize here that this evidence is *suggestive* rather than *determinant or causal* because the interpretation can be also that the impact of fertility policy on these outcomes may be just through the increased education by the policy.

5.2 Ex Post Outcomes in Labor and Marriage Markets

Following the above methodology, we test whether the expectations in labor market and marriage market may be possible mechanisms by examine the following four outcomes: marriage age (measured by whether married at age 25), fertility (measured by whether ever having a child), labor market participation (measured by whether working currently) and occupation (measured by whether holding a professional job).[17] Panel A of Table A2 presents the means and standard deviations for the variables. In particular, 77 percent of women are married before 25 and 94 percent had a child, and 75 percent of them are working, 13 percent of them hold professional jobs. Figure 6a-6d shows the correlation of the impacts on education with those on the four outcomes separately.

[Figure 6a-6d about here]

For example, Figure 6a shows a negative correlation between the impacts on education and those on married at 25, implying that the women with higher policy-induced education are also likely to be unmarried due to the policy. It is consistent with the hypothesis that women may increase their education due to expected later marriage. In addition, Figure 6b also shows a negative correlation between the impacts on education and those on ever having a child, which is also consistent that the policy-induced education may also originate from the expected later fertility. Figure 6c and Figure 6d also provide consistent evidence that expectations for labor market may play an important role in effects of fertility policy on women's education. The positive correlations of the impacts on education with those on working and professional job occupation are consistent with that the policy-induced expectation for higher labor market participation or higher professional job occupation likelihood may be potential channels to explain the identified effects of fertility policy on women's education attainment. Note that all the correlations in the four figures are significant at 1 percent level.

5.3 Subjective Attitude Towards Children and Gender-Equality

---

[17] The professional job is defined as: party leaders, firm managers, administrative staff and high-skilled workers including science researchers, engineers and professors etc.

We conduce the same analysis for the attitude towards children and gender-equality in CGSS.[18] As mentioned in Section 3, we use two measures for attitude towards children and the other two for that for gender-equality. Panel B of Table A2 presents the means and standard deviations for the variables. Specifically, the women have almost neutral attitudes towards importance of children; the mean values of the two measures for children are around 3 – "Neither agree nor disagree". They tend to agree that men should have the equal duty on household work with women with mean value is almost 4 – "Agree". But over half of the women think that women should stay at home and father should work outside when there is a pre-school child at home. Figure 7a-7d shows the correlations between the impact of OCP on each measure for the attitudes and those on the education, respectively.

Figure 7a and 7b show that the larger positive impact of fertility policy on education is correlated with larger negative (or smaller positive) impact on agreement with the statements that "the happiest thing is to look at children growing up" and that "adult children are important support for old people". This implies that, if the fertility policies have larger positive impact on the attitude that the women should reply more on themselves rather than children, the policies also lead to higher education level. Similarly, Figure 7c and 7d consistently show that those with more gender-equal views caused by the fertility policy are more likely to have higher policy-induced education. Note that this sample is much smaller; the correlations are significant at 10 percent level and the signs of them are consistent with our expectation.

However, the evidence in this section is based on the correlations between the impacts of policies on different outcomes. We emphasize here again that they are neither *determinant* nor *causal*. It is very possible that these outcomes may be consequences rather than mechanisms. For example, it is possible that the higher education caused by fertility policy is just because fertility policy changed their subjective attitudes and *then* those with higher policy-induced education delay their marriage and fertility age and participate more in the labor market, and *vice versa*. Based on the *ex post* data, it seems to be impossible to distinguish whether these outcomes are *mechanisms* or *consequences*. We hope the research in the future may shed some light on it.

VI. Conclusions and Discussion

---

[18] Because the sample is much smaller for CGSS, we just divide the sample by province and type of hukou.

The rise in schooling attainment of women relative to men is an emerging worldwide phenomenon. This paper argue that the fertility policy implementation at teenage plays an important role in explaining the women's increase in education and the narrowing of education gender gap. China initiated the government orientated, unprecedented and one of the most strict fertility policies in the late 1970s. Using the temporal and regional variation in the policy financial penalties, we show that higher policy fine at age 10-19 predicts higher likelihood of completing senior high school for women of Han ethnicity. We also provide some suggestive evidence that the impacts of the policy fines on women's education is correlated with those on their late marriage, fertility status, labor force participation and holding a professional job as well as impacts on subjective attitudes towards children and gender-equality.

For one thing, these findings provide a brand new explanation to women's increase in education and economy. Our results help to understand the wide and potentially long-reach but almost ignored impacts of these popular programs on human capital accumulation and narrowed gender-gap in education. The findings here put the research in agenda to investigate whether and how the fertility policies over the world increase the human capital accumulation in the different countries. For another, since girls at teenage are not restricted by the OCP *directly*, we argue and provide some evidence here that the impact of OCP on women's education probably originates from the expectations for the future like marriage and fertility. However, the limitation here is that the expectation cannot be observed in the ex post data we have and thus we cannot provide direct evidence for the impact of the OCP on subjective expectations. We hope the future studies may shed light on this issue.

There are some limitations in the study. First one is about the endogeneity of the fertility fine rate. Without formal official documentation on the design of the policy fines, we do not have much information how and why the fine rate changes. Although we conduct a series of empirical tests to show that the endogeneity may not be the first-order driven factor for our results, we cannot rule out the possible endogeneity *completely*. Thus our estimates should be used and interpreted with caution. The second one is about the mechanisms. It should be noted that the mechanisms studied here should not be the whole story. Without exactly quantifying the contribution of each mechanism to the impact of OCP on women's education, it is likely that some other important mechanisms may be missed. We hope researchers in the future may shed light on this issue.

References

Bailey, M. J. (2006). More power to the pill: the impact of contraceptive freedom on women's life cycle labor supply. *The Quarterly Journal of Economics*, 289-320.

Bailey, M. J. (2010). Momma's Got the Pill: How Anthony Comstock and Griswold v. Connecticut Shaped US Childbearing. *The American Economic Review, 100*(1), 98-129.

Banister, J. 1987. "China's Changing Population." Palo Alto, Calif.: Stanford University Press.

Bursztyn, L., and Jensen , R. (2015). "How Does Peer Pressure Affect Educational Investments?" *Quarterly Journal of Economics,* forthcoming.

Chiappori, P. A., & Oreffice, S. (2008). Birth control and female empowerment: An equilibrium analysis. *Journal of Political Economy*, *116*(1), 113-140.

Chiappori, P. A., Iyigun, M., & Weiss, Y. (2009). Investment in Schooling and the Marriage Market. *The American Economic Review*, *99*(5), 1689-1713.

Cleland, J., Bernstein, S., Ezeh, A., Faundes, A., Glasier, A. & Innis, J. 2006. Family planning: the unfinished agenda. *Lancet,* 368, 1810-1827.

Comstock, A. 1873. An Act for the Suppression of Trade in, and Circulation of, Obscene Literature and Articles of Immoral Use. *ch. 258, 2, 17 Stat. 599.* 42nd United States Congress, 3rd Session.

Duflo, E. (2012). Women Empowerment and Economic Development. *Journal of Economic Literature*, 50(4), 1051-79.

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

Field, E., & Ambrus, A. (2008). Early marriage, age of menarche, and female schooling attainment in Bangladesh. *Journal of Political Economy*, *116*(5), 881-930.

Goldin, C., & Katz, L. F. (2002). The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions. *Journal of Political Economy*, *110*(4).

Goldin, C., Katz, L. F., & Kuziemko, I. (2006). The Homecoming of American College Women: The Reversal of the College Gender Gap. *The Journal of Economic Perspectives*, *20*(4), 133-156.

Goldin, C. D., & Katz, L. F. (2009). *The race between education and technology*. Harvard University Press.

Greenhalgh, S. (1986). Shifts in China's population policy, 1984-86: Views from the central, provincial, and local levels. *Population and Development Review*, 491-515.

Gu, B., Feng, W., Zhigang, G., & Erli, Z. (2007). China's local and national fertility policies at the end of the twentieth century. *Population and Development Review*, 129-147.

Guinnane, T. W. (2011). The historical fertility transition: A guide for economists. *Journal of Economic Literature*, *49*(3), 589-614.

Huang, W., Lei, X., & Zhao, Y. Forthcoming. One-Child Policy and the Rise of Man-Made Twins. *Review of Economics and Statistics*

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

Jensen, R. (2000). Agricultural volatility and investments in children. *American Economic Review*, 399-404.

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

Jensen, R. (2012). Do labor market opportunities affect young women's work and family decisions? Experimental evidence from India. *The Quarterly Journal of Economics*, *127*(2), 753-792.

Manski, C. F. (2004). Measuring expectations. *Econometrica*, *72*(5), 1329-1376.

Miller, G. (2010). Contraception as development? New evidence from family planning in Colombia. *The Economic Journal*, *120*(545), 709-736.

Miller, G., & Babiarz, K. S. (2014). *Family Planning: Program Effects* (No. w20586). National Bureau of Economic Research.

Oster, E., Shoulson, I., & Dorsey, E. (2013). Limited life expectancy, human capital and health investments. *The American Economic Review*, *103*(5), 1977-2002.

Qian, N. (2009). *Quantity-quality and the one child policy: The only-child disadvantage in school enrollment in rural China* (No. w14973). National Bureau of Economic Research.

Rosenzweig, M. R., & Zhang, J. (2009). Do population control policies induce more human capital investment? twins, birth weight and china's "one-child" policy. *The Review of Economic Studies*, *76*(3), 1149-1174.

Rosenzweig, M. R., & Zhang, J. (2013). Economic growth, comparative advantage, and gender differences in schooling outcomes: Evidence from the birthweight differences of Chinese twins. *Journal of Development Economics*,*104*, 245-260.

UN Population Division (2006). World Contraceptive Use 2005. New York: United Nations. ISBN 92-1-151418-5.

Wei, S. J., & Zhang, X. (2011). The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China. *Journal of Political Economy*, *119*(3), 511-564.

Table 1.Education Responds to the Fine Rate Changes

Dep. Var.	(1)	(2)	(3)
	Change in Senior High School Completion		
Sample	Women of Han	Men of Han	Women of Minorities
Change in Fine rate 10-19	0.0211***	-0.00330	0.0112
	(0.00732)	(0.00687)	(0.0121)
Observations	900	900	832
R-squared	0.004	0.000	0.000

Notes: Sample is from Census 2000 and 2005. Birth cohorts 1965-1980 are kept. The independent variable is the change in the senior high school completion rate in two continuous birth cohorts in the same *hukou* province-type of *hukou* group. The dependent variable is the corresponding change for fertility policy fine rate at age 10-19 in the cell. The ideal observation is 30*2*15 = 900. There are some missing observations in the sample of women of minorities. Huber-White robust standard errors allowing for clustering by hukou province to account for possible serial dependence in errors across cohorts within hukou province are presented in brackets.

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

Table 2. Impact of One-Child Policy (OCP) Fines on Education (Senior High or above)

Dependent variable	(1)	(2)	(3)
		Senior high or above (Yes = 1)	
Panel A. Female sample: Mean of Dep. Var. = 0.181			
Fine rate at age 10-19	0.0206***	0.0207***	0.0222***
	(0.00394)	(0.00395)	(0.00395)
	[0.00997]	[0.00979]	[0.00960]
Observations	810,994	810,994	810,994
R-squared	0.336	0.336	0.336
Panel B. Male sample: Mean of Dep. Var. = 0.244			
Fine rate at age 10-19	0.00391	0.00426	0.00358
	(0.00406)	(0.00408)	(0.00403)
	[0.00439]	[0.00444]	[0.00470]
Observations	792,075	792,075	792,075
R-squared	0.289	0.289	0.289
Covariates controlled for in both panels			
Basic control	Yes	Yes	Yes
Population size and increase	No	Yes	No
Education supply condition	No	No	Yes

Notes: Sample is from Census 2000 and 2005. One-Child Policy fine rate is from Ebenstein (2010). Basic control includes indicators for type of living residence, number of siblings, hukou province, year of birth, survey year, interactions between year of birth and survey year and provincial year of birth (YoB) linear trends. Macro economic conditions include the logarithm of population size, male proportion and GDP per capita in the local province when the respondent is 15. Education supply condition includes the number of teachers in middle high school in the local province when the respondent is 15. Huber-White robust standard errors in parentheses allow for clustering of errors within hukou province-year of birth cells. More conservative Huber-White robust standard errors allowing for clustering by hukou province to account for possible serial dependence in errors across cohorts within hukou province are presented in brackets.

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

Table 3. Placebo Test - Predictive Power of Education on Fertility Policy Fines in the Future

	(1)	(2)	(3)	(4)
Dependent variable	Policy Fine rate at age 24-26 (Yes = 1)			
Sample	All Women	Women of Han	All Men	Men of Han
Senior High School	0.00294	0.000895	0.00398	0.00373
Completion	(0.00338)	(0.00333)	(0.00297)	(0.00293)
Observations	822,379	751,752	812,979	741,248
R-squared	0.865	0.871	0.862	0.867
Basic control	Yes	Yes	Yes	Yes

Note: Sample is from Census 2000 and 2005. Those who are aged between 25 and 55 are kept. Basic control includes indicators for type of living residence, number of siblings, prefectures, hukou province, year of birth, survey year, interactions between year of birth and survey year and provincial YoB linear trends. Robust standard errors in parentheses are clustered at province-YoB level.

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

Table 4. Impact of OCP on Education in CGSS, Birth Cohorts 1945 - 1980

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable			Senior high or above (Yes = 1)				
Sample	Men			Women			
Mean of dependent var.	0.293			0.222			
Fine rate at age 10-19	-0.0114	0.0423**	0.0396**	0.0172	0.0340	0.0360*	0.0267
	(0.0237)	(0.0199)	(0.0199)	(0.0251)	(0.0211)	(0.0197)	(0.0219)
	[0.0276]	[0.0169]					
Parents Condition or SES when respondents aged 14							
Either Parent Some Education			0.0595***	0.0841***			
			(0.00863)	(0.0119)			
Either Some Education * Fine				0.0290*			
				(0.0165)			
Either Party Member			0.0502***		0.102***		
			(0.0129)		(0.0171)		
Either Party member * Fine					0.0306*		
					(0.0176)		
Either Administrative Rank >=			0.0882***			0.169***	
Subsection Chief (Yes = 1)			(0.0264)			(0.0338)	
Either Higher Rank * Fine						0.0649**	
						(0.0282)	
Either in State owned or			0.154***				0.180***
Collective enterprise			(0.0151)				(0.0178)
Either in State owned or							0.0293*
Collective enterprise * Fine							(0.0172)
Observations	6,901	6,901	6,901	6,901	6,901	6,901	6,901
R-squared	0.314	0.314	0.354	0.325	0.326	0.327	0.345
Covariates controlled for							
Basic control	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Sample is from CGSS. One-Child Policy fine rate is from Ebenstein (2010). Basic control includes indicators for type of living residence, hukou province, year of birth, survey year, interactions between year of birth and survey year and provincial year of birth (YoB) linear trends. Huber-White robust standard errors in parentheses allow for clustering of errors within hukou province-year of birth cells. More conservative Huber-White robust standard errors allowing for clustering by hukou province to account for possible serial dependence in errors across cohorts within hukou province are presented in brackets.

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

Table A1. Impact of One-Child Policy (OCP) Fines on Education (College or above)

	(1)	(2)	(3)
Dependent variable	College or above (Yes = 1)		
Panel A. Female sample			
Fine rate at age 10-19	0.00651***	0.00545**	0.00496**
	(0.00234)	(0.00232)	(0.00234)
Observations	810,994	810,994	810,994
R-squared	0.161	0.161	0.161
Panel B. Male sample			
Fine rate at age 10-19	0.00372	0.00321	0.00278
	(0.00250)	(0.00251)	(0.00252)
Observations	792,075	792,075	792,075
R-squared	0.185	0.185	0.185
Covariates controlled for in both panels			
Basic control	Yes	Yes	Yes
Population size and increase	No	Yes	No
Education supply condition	No	No	Yes

Notes: Sample is from Census 2000 and 2005. One-Child Policy fine rate is from Ebenstein (2010). Covariates are the same with those in Table 2.

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

Table A2. Means and Standard Deviations of the Variables in Census and CGSS for Women of Han

Variable	(1)
Panel A: Census Data	
Married before 25 (Yes = 1)	0.77
	(0.42)
Ever had Child (Yes = 1)	0.94
	(0.23)
Work Now (Yes = 1)	0.75
	(0.44)
Having professional jobs (Yes = 1)	0.13
	(0.34)
Observations	810,994
Panel B: CGSS data	
Agreement with the statement (1-5, higher for agreement)	
"The happiest thing is to look at children growing up"	3.37
	(0.57)
"Adult children are imporant support for old people"	2.91
	(0.85)
"Men and women have the equal duty for housework"	3.94
	(1.00)
Agree with "Mother should stay at home and father work outside if having a pre-school child at home"(Yes =1)	0.55
	(0.50)
Observations	6901

Notes: Data sources are Census and CGSS. Standard deviations are in parentheses. The sample in Panel A are the same with that in Panel A of Table 2. The sample in Panel B is the same with that in column 2 of Table 4.

a. Senior High School Completion
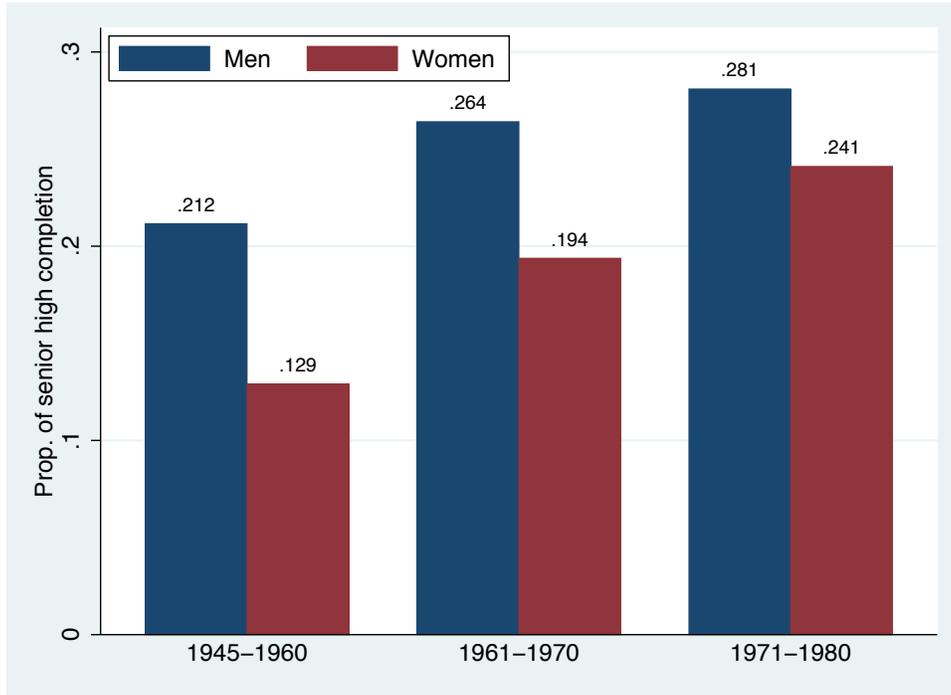
b. College Completion
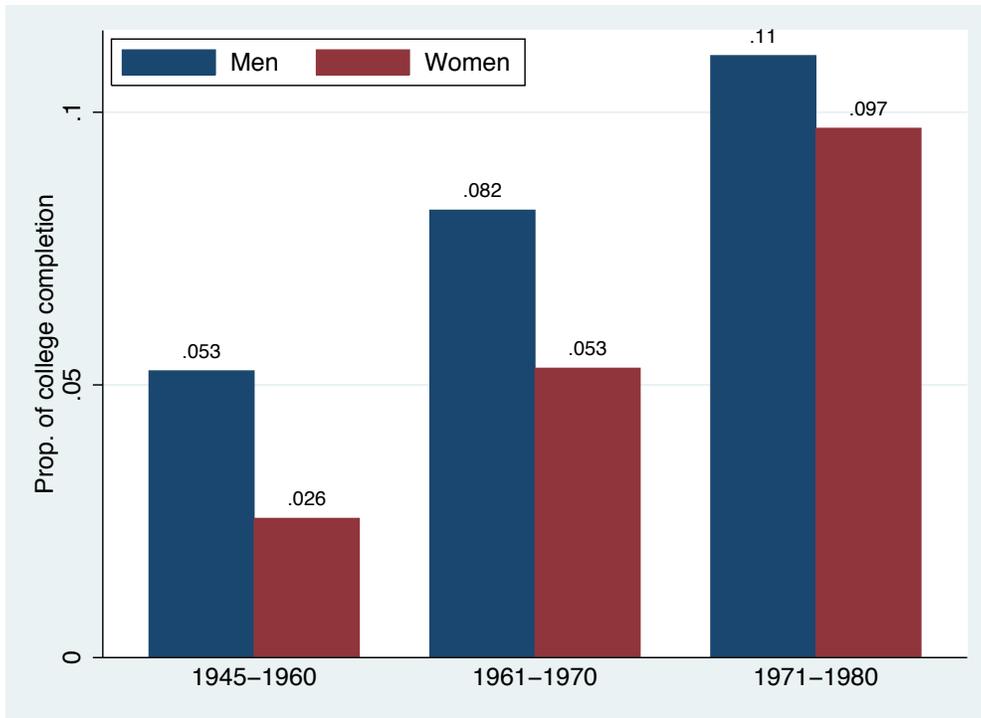
Figure 1a and 1b. Senior High School and College Completion over Birth Cohorts, by Gender, 1945-1980
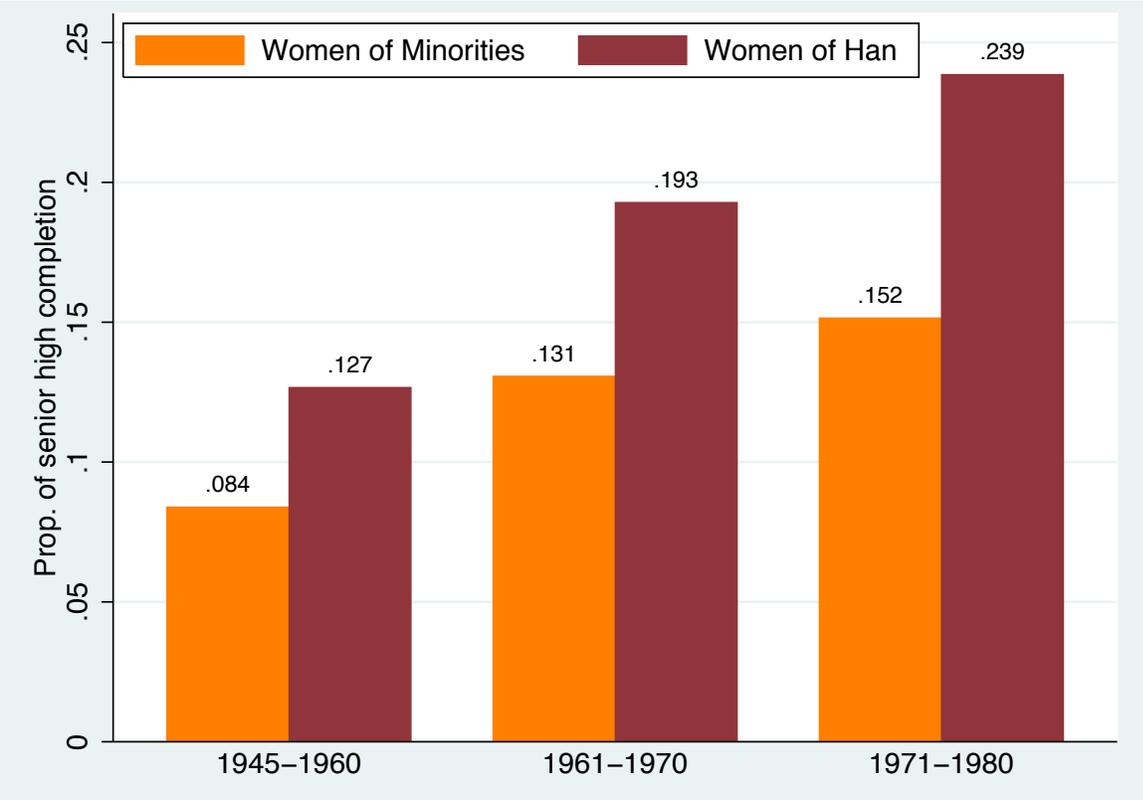
Figure 2. Women's Senior High School Completion over Birth Cohorts 1945-1980, by Ethnicity

Note: Sample is from Census 2000 and 2005.
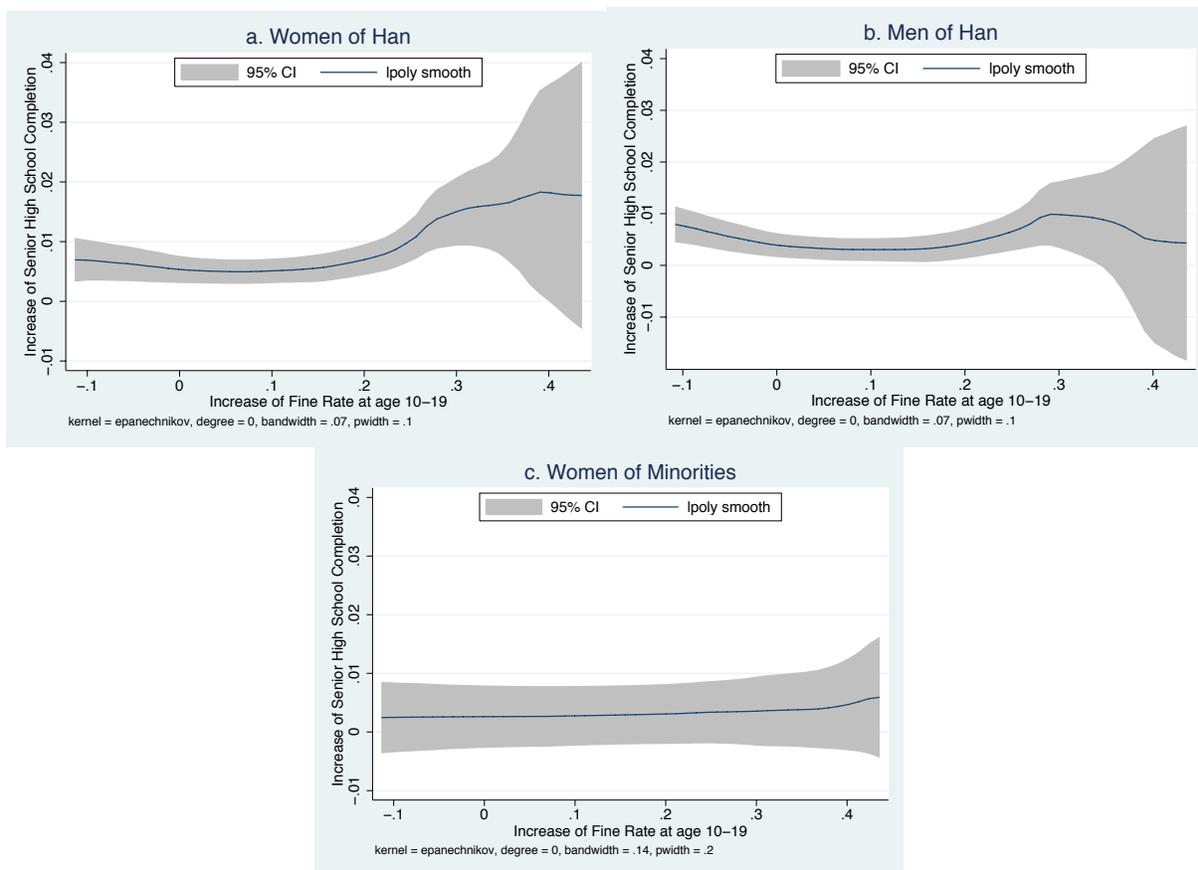
Figure 3a-3c. Non-Parametric Estimation for Correlation between Increase of Policy Fine rate and Increase of Senior High School Completion in Different Samples
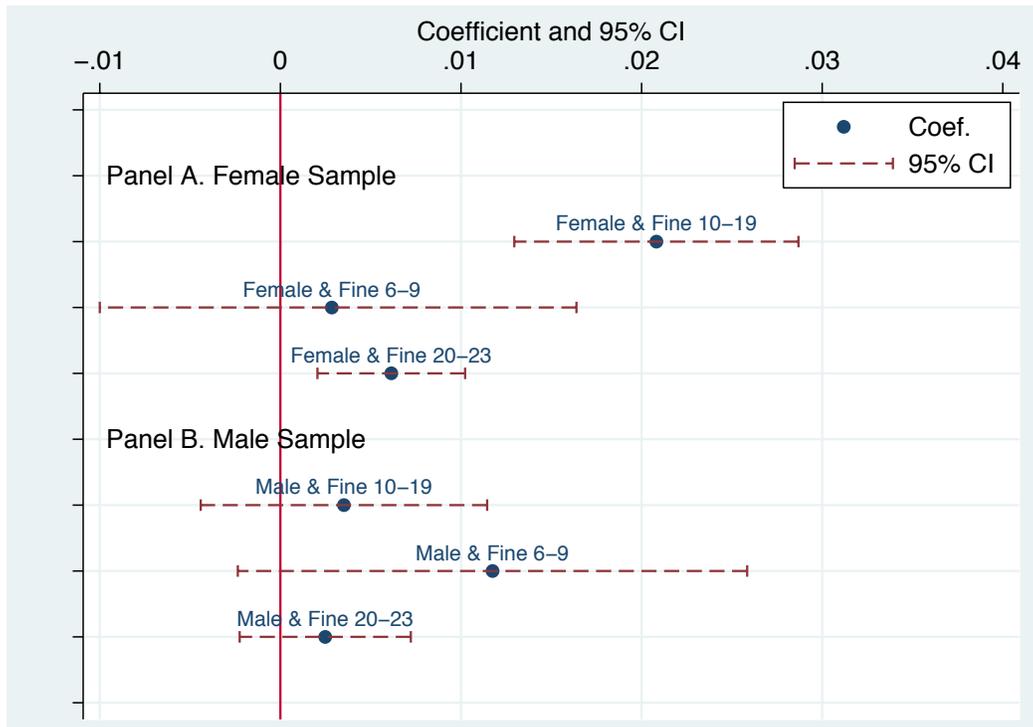
Figure 4. Impact of OCP Fine Rate at Different Ages on Senior High School Completion

a. By Gender and Ethnicity
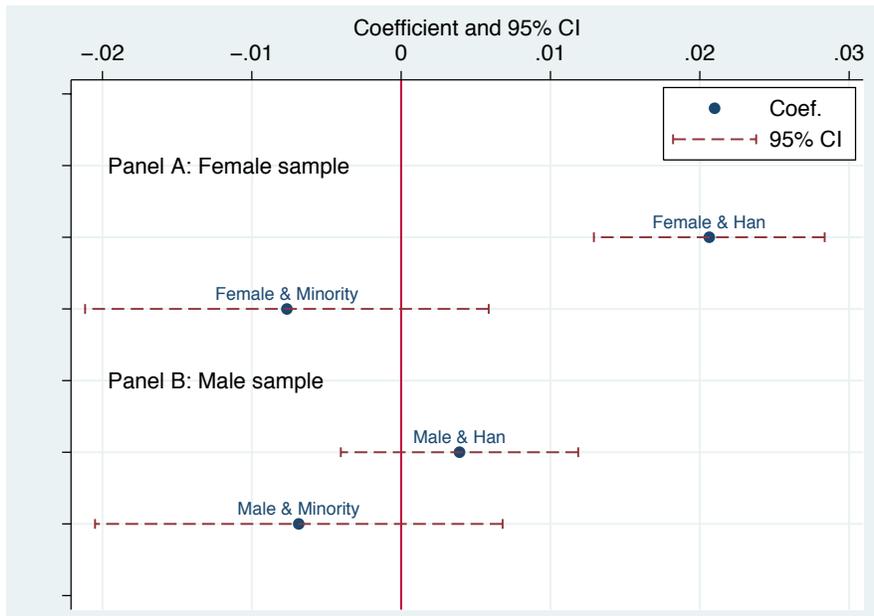

b. By Type of Hukou and Policy Implementation
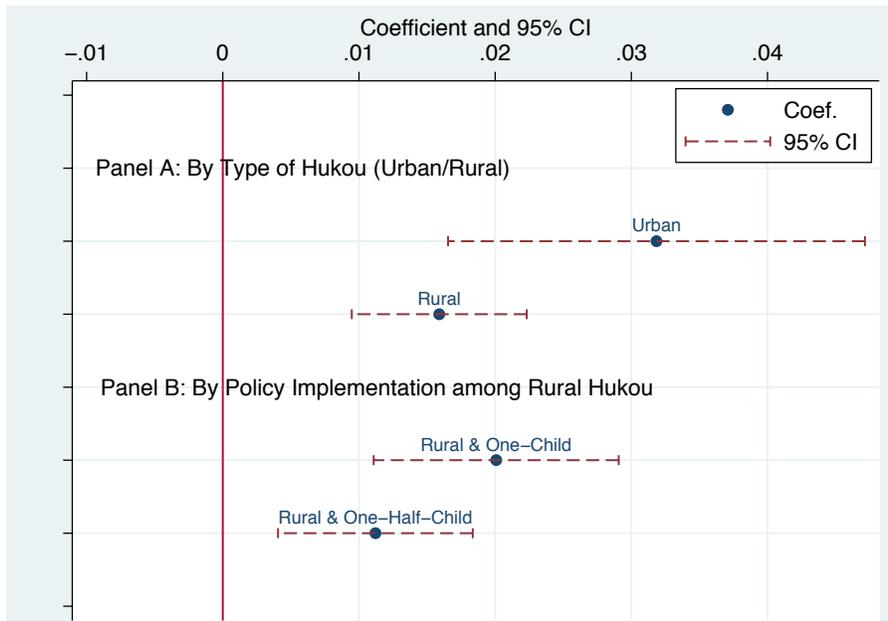
Figure 5a-5b. Impact of OCP Fine Rate at Age 10-19 on Senior High School Completion, by Patterns of Policy Implementation

a. Married before 25
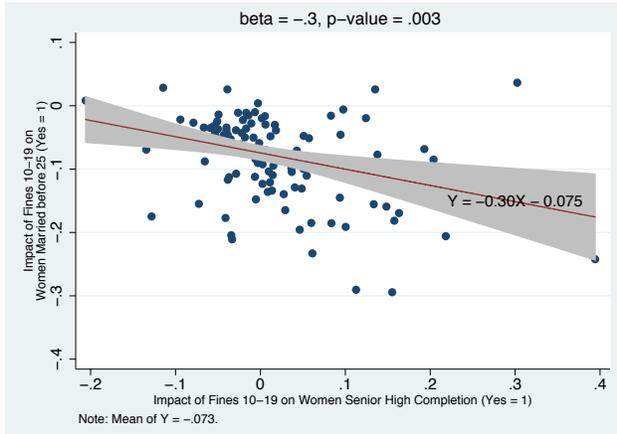
b. Ever had a child
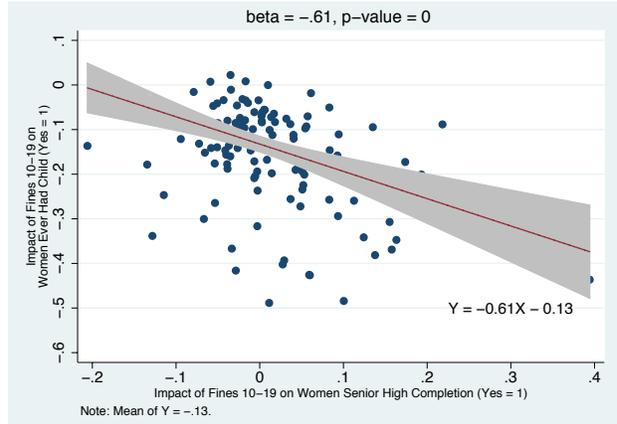
c. Working Status
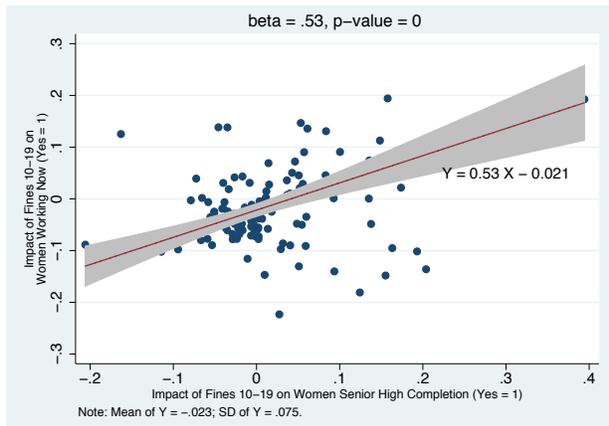
d. Higher level occupation
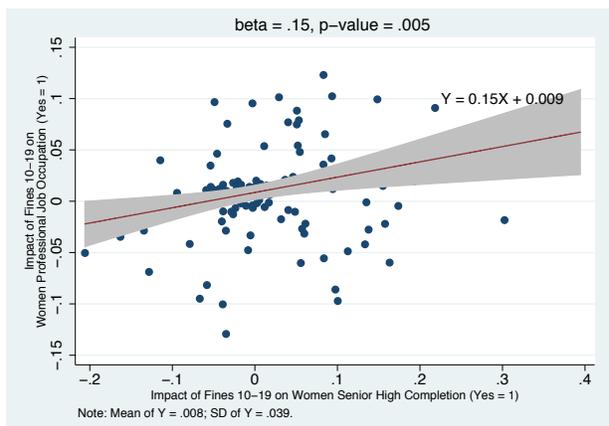
Figure 6a-6d: Correlation between Impact of Policy Fine on Education and that on Marriage and Labor Market Outcomes, Birth Cohorts 1945-1980 in Census
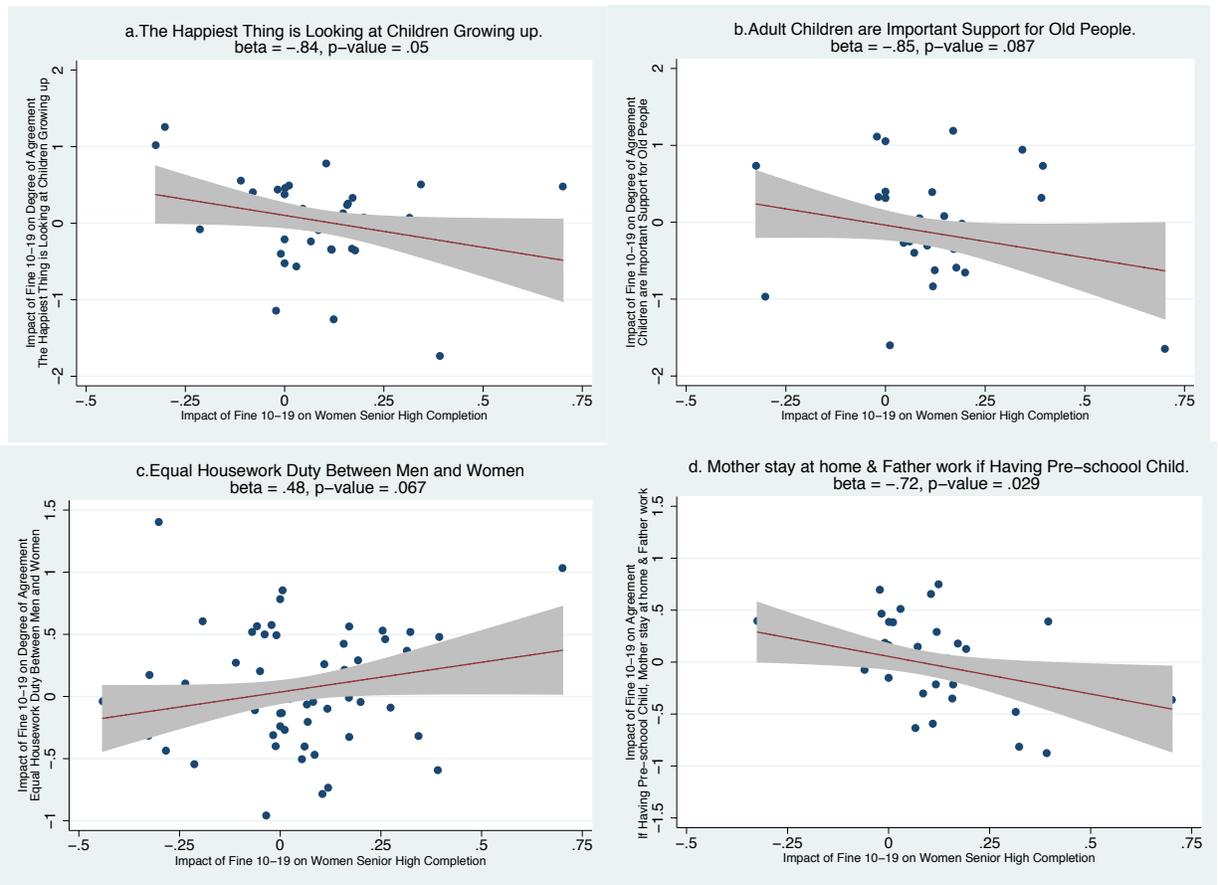
Figure 7a-7d: Correlation between Impact of Policy Fine on Education and that on Subjective
Attitudes Towards Children and Gender-Equality, Birth Cohorts 1945-1980 in CGSS
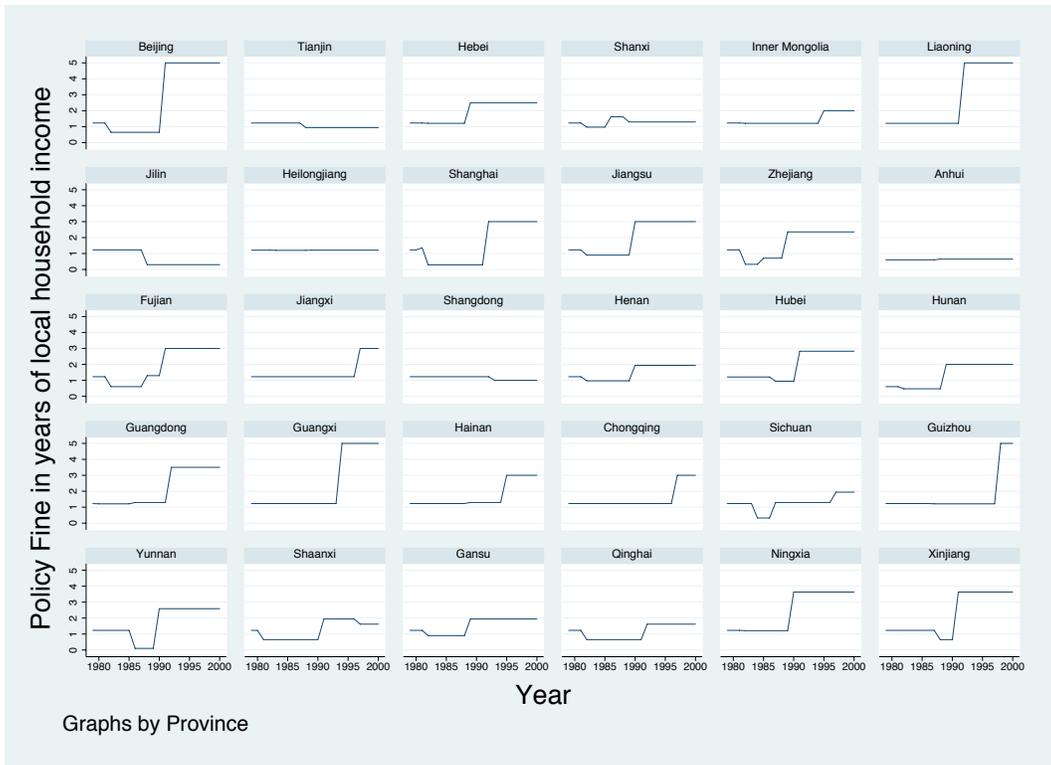
Appendix Figure 1. OCP Fine Rate Against Year, By Province