Impact of the Cultural Revolution on Intergenerational Mobility in China

Zixin Liu*

University of Missouri-Columbia

Abstract

This paper studies the impacts of the Cultural Revolution on intergenerational and multi-generational educational mobility in China. We use a difference-in-difference method to show that the Cultural Revolution (CR) significantly reduced the advantage of having a more-educated father on a child's educational attainment. The impact of the CR on intergenerational mobility is identified by an index that measures for each individual the number of school years during which the CR restricted education access. The decline of the effect of father's educational level on children' college degree attainment is mediated through the likelihood of obtaining a high school degree, participating in the college entrance examination, and obtaining higher exam scores for those who take the exam. However, the Cultural Revolution did not eliminate the advantage of having a more-educated father on a child's educational achievement, nor did it reduce the effect of grandfather's schooling on a grandchild's educational achievement.

Key words: Education Inequality, Intergenerational Mobility, Cultural Revolution

JEL classification: I24, J62, N35

* University of Missouri-Columbia, 118 Professional Building, Columbia, MO 65211, United States. Email address: zlxkd@mail.missouri.edu

1. Introduction

China's Cultural Revolution (CR) of 1966-1976 instituted major changes in the country's educational and economic system, including closing schooling at all levels for three years, suspending the college entrance exam for ten years, altering curricula, and expanding primary and secondary schools in rural areas. People were publicly labeled based on their family backgrounds[1] in order to achieve the stated egalitarian goals of the CR. Personal welfare was linked to group membership. Therefore, opportunities to obtain education were also altered dramatically across family backgrounds, in addition to the general changes in educational system in the CR.

The impact of the Cultural Revolution on educational opportunities, return to schooling, beliefs, etc. have been frequently studied. Meng and Gregory (2007) found that years of schooling decreased significantly for people in urban areas who received their education during the CR, which is "about 2 to 3 times the effect of World War II on the education attainment". However, the CR promoted educational attainment for children growing up in rural areas (Han, 2001). The negative impacts of the CR are expected to differ by family background since most policies in the CR treated people differently based on parental social status. In an analysis limited to households with both parents and children, Deng et al. (1997) found that people from educated or cadre families lost their advantages in obtaining higher educational achievements during the CR. In an analysis based on surveys of several cities, Giles et al. (2019) confirmed that the impact of the CR

[1] As noted in Deng et al. (1997):
I. Good-class origins, also referred to as the "five red kinds": 1. Revolutionary cadres; 2. Revolutionary army soldiers; 3. Revolutionary martyrs (the orphans of men who died in the revolutionary wars); 4. Pre-liberation industrial workers and their families; 5. Former poor and lower-middle peasant families; II. Middle-class origins: 1. Families of pre-Liberation peddlers and store clerks, etc.; 2. Former middle-peasant families; 3. Families of pre-liberation clerks, teachers, professionals, etc.; III. Bad-class origins: 1. Families of former capitalists; 2. Families of "rightists" (a label denoting those who were outspoken in the Hundred Flowers campaign of 1957); 3. Pre-liberation rich peasant families; 4. Families of "bad elements" (a label denoting "criminal" offenders); 5. Pre-liberation landlord families; 6. Families of counterrevolutionaries.

on a child's education was negatively correlated with parental occupation. The CR also changed people's beliefs. Roland and Yang (2017) found that people who were affected by the CR were less likely to believe in the value of effort for their own achievement, but they invested more in their children. Although the CR decreased people's educational attainment, it had a small impact on the returns to schooling (Zhang et al., 2007).

In this paper, we extend the literature by providing new perspectives in studying the impact of the CR on the intergenerational educational mobility. Our study differs from the previous literature by employing a sample that covers both urban and rural residents to study a full picture of intergenerational educational mobility, in contrast with most studies that include urban residents only. In addition, we use a difference-in-difference (DiD) strategy to identify impacts of educational disruptions associated with the CR on intergenerational educational mobility. The impact was identified through comparing educational attainments for people with different years of schooling affected by the CR and with different family backgrounds. We also explore the mechanism linking father's education with child's college attainment, as well as the impact of the CR on multi-generational mobility.

The paper is organized as follows: Section 2 describes the data used in this study; Section 3 introduces the background for this research; Section 4 describes the methods and models; Section 5 presents estimated results; and Section 6 concludes the paper. The appendix section of this paper is available at https://zixinliu.weebly.com/research.html.

2. Background

3.1 The Intergenerational Mobility in 20th Century China

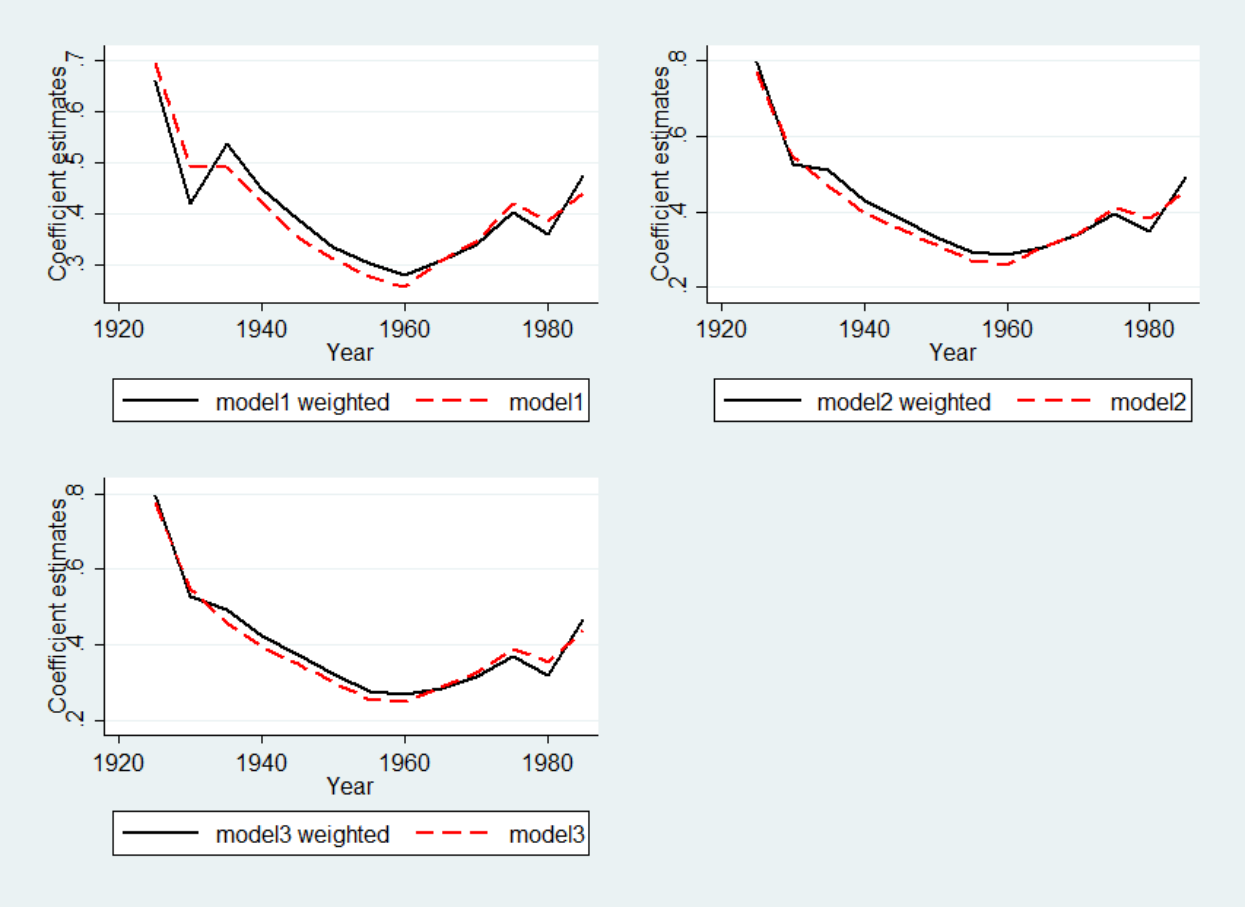
Intergenerational mobility measures inequality of opportunity across two generations. A low level of intergenerational mobility means less opportunity for people from poor families to improve their social status during their lifetime and a lower likelihood that those from rich families will move down. Variations in the level of intergenerational mobility in a region can be explained by the changes of the regional return to human capital, policy, and demographic structure (Solon, 2004). In the 20th century, China experienced tremendous institutional transitions which changed policies, return to human capital, and demographic structure. In the first two decades of the 20th century, the last feudal dynasty, the Qing, was replaced by a republican government. After the Second Sino-Japanese War and the Chinese Civil War, the People's Republic of China was established in 1949. This was followed by several political movements, including the most radical one, the Cultural Revolution (1966-1976). After Mao's death in 1976, China returned to a more traditional merit-based educational system. The institutional changes of 20th century brought social chaos, but they also provided opportunities for people at the bottom of society.

In a paper that studied the intergenerational educational mobility in China using urban survey data, Chen et al. (2015) found an inverted U-shape pattern of the intergenerational mobility in 20th century. The level of mobility in China was low for those received schooling in the pre-Mao era (people born before the mid-1940s), reached its highest level in the Mao-era (for those born in the mid-1940s to the mid-1960s), and returned to a low level in the post-Mao era (for those born after the mid-1960s).

We replicate the analyses in Chen et al. (2015) using a nationally representative sample to see the overall pattern of the intergenerational mobility in 20th century China. Our replication uses a weighted Chinese Household Income Project sample, which is described in the data section. The sample covers both urban and rural residents and we have developed weights so that it is representative of the major regions in China, in contrast to the urban sample used in Chen et al. (2015). Rural residents make up a large proportion of the Chinese population. They accounted about 82% of the population during the CR, and still accounted for 42% of the population in 2017. Therefore, using a sample that covers the full population provides us more meaningful estimated results at the national level.

The replication results for intergenerational schooling coefficients for people born in 1920-1985 are plotted in Figure 1 for 5-year birth cohorts (the estimated numbers are listed in appendix Table A1). As can be seen from the graph, the estimated intergenerational schooling coefficients using raw data and weighted data (see appendix A1) exhibit a U-shaped pattern, indicating that intergenerational mobility exhibits an inverted U-shape in the 20th century. We thus confirm the pattern in Chen et al. (2015) using a sample that includes both urban and rural populations. The intergenerational schooling mobility reached its highest level for those who were born around 1960, almost all of whom experienced the Cultural Revolution (1966-1976) during their principal schooling years. We also plot the intergenerational coefficients when we recode years of education by rank and the intergenerational schooling correlations in appendix Figures A1 and A2 (corresponding to appendix Tables A2 and A3). Both exhibit an inverted U-shape pattern for intergenerational educational mobility.

Figure 1 Estimated Intergenerational Educational Coefficients in 1925-1985



Note: These graphs were plotted based on the estimated intergenerational schooling coefficients for the three model specifications in Chen et al. (2015). The regression model in that paper is: $EDU_{i,t} = \sum_{t=1}^{13} \beta_t FS_{i,t} + \gamma \boldsymbol{X_{i,t}} + \delta_t + \varepsilon_{i,t}$. $EDU_{i,t}$ is years of schooling of a person *i* born in cohort *t*, which is one of the five-year cohorts from 1925 to 1989 (1925-1929, …, 1985-1989, 13 cohorts in total). $FS_{i,t}$ is the years of father's schooling. δ_t is a full set of 5-year birth cohort dummies from 1925 to 1989. In model specification 1 (upper left), $\boldsymbol{X_{i,t}}$ is the empty set; in model specification 2 (upper right), $\boldsymbol{X_{i,t}}$ contains cohort-specific effects of gender, cohort-specific effects of father's age, father's age squared, age, and age squared; in the model specification 3 (lower left), $\boldsymbol{X_{i,t}}$ contains all controls in model 2, and it also includes the cohort-specific effects of living in a coastal province. The solid lines are estimated intergenerational coefficients weighted by the weights described in appendix section A1, and the dash lines are estimated coefficients without weighting.

To check whether the observed pattern holds for different demographic groups, we estimate intergenerational schooling coefficients by current residential areas (urban or rural), which we plot in appendix Figure A3, by gender in Figure A4, and by birth areas (urban or rural) in Figure A5.

Although different groups exhibit different levels of intergenerational coefficients, they all show an inverted U-shape pattern of intergenerational mobility.

3.2 Changes of the Educational System in the Cultural Revolution

Our replication of Chen et al. (2015) suggests that people received their education in the Cultural Revolution had the highest level of intergenerational educational mobility. This may relate to the severe changes of the educational system in China during the CR period.

During the Cultural Revolution, the national college entrance exam was suspended over the entire period from 1966 to 1976. At the same time, the government relaxed the standard for people from lower family backgrounds to enter college. In the later period of the CR (1972-1976), people with lowest socioeconomic backgrounds, or those who showed their passion and loyalty to the party and government could be enrolled into college by recommendations of local leaders, without taking the entrance exams. The college entrance exams were resumed in 1977.[2]

Due to frequent political disruptions during the CR, schools were closed for years. In the beginning of the CR (1966-1968), almost all schools (primary, secondary, tertiary) were closed and many teachers were forced to leave their positions. The "Down to the Countryside Movement" sent urban high school students (those who were in senior high school in 1968) to rural areas to do farm work, and they were not allowed to come back to cities until the 1970s.

[2] In the first four years after the CR, the government allowed those who had not been able to take the exams during the CR to take them regardless of their ages. This policy compensates those who delayed their entrance to college due to the CR. But from 1981 to 2001, people who were older than 25 were prohibited from taking the exams.

The curriculum taught in schools were also changed greatly in the CR, and previous teachers were often replaced by new teachers without academic qualifications. Students were taught to do farming and manufacturing work rather than standard curricula in school. The curriculum in junior high school returned to normal in 1970, and the curriculum in senior high school returned to normal in 1972.

At the same time, primary and secondary education were greatly expanded in the rural areas of China. According to Andreas (2009), the number of senior high schools in rural areas increased from 604 to 50,916 during the CR, and the number of junior high schools increased from 8,628 to 131,265. The primary and secondary enrollment rates in the rural areas increased dramatically as a result.

In summary, the Cultural Revolution suspended the college entrance exam, changed the regular curriculum, closed schools for years and sent urban students to the countryside, which greatly damaged the educational system in China. According to Du (2003), the CR caused a decrease in human capital accumulation of 14.3% based on average years of schooling. Meanwhile, the primary and secondary education were expanded in rural areas and children from lower family backgrounds were able to enter college based on recommendations from political leaders. We thus hypothesize that changes of China's educational system during the CR reduced the gap in education between children with higher socioeconomic family background and children from lower family background.

3. Data

In this paper, we use the 2013 Chinese Household Income Project (CHIP) to conduct our analyses. CHIP is a cross-sectional survey that covers urban and rural respondents in 14 provinces in China in 2012. The urban and rural sample in the CHIP selects households that had formally registered residential addresses in urban or rural areas at the time of the survey[3], respectively.

The questions in this survey covered basic demographic information of every person living in the surveyed households, such as gender, age, education, and occupation. It asked for information about the parents and children of the main respondent couples, regardless of whether the parents lived in the household, in contrast to surveys that only provide information on parents living with their children (Deng et al., 1997). The detailed information on parents and children of the main respondent couples makes the 2013 CHIP a suitable sample for us to study intergenerational mobility in China across time.

To check whether the CHIP is representative of the Chinese population, we compare it with the *Chinese Statistical Yearbook* 2013 (0.1% population survey statistics for the year 2012). The comparisons in appendix Table A4-Table A7 suggest that the CHIP is not a nationally representative sample. The CHIP under-sampled the urban population, the population of the eastern provinces, and over-sampled the population of the central provinces (Table A4). Also, it

[3] In China, the official household registration system is call "Hukou". It records the information of the registered household address and the Hukou type, either urban (non-agricultural) or rural (agricultural). The type of Hukou depends on whether the household engages in agricultural on related work. It is possible for a household to change the address or the type of Hukou, but in order to do so, household members must satisfy certain requirements established by their local governments. The Hukou system is important in China since it is directly related to welfare services a person can receive from the local government, including education, various subsidies, and pensions. In 2014, a new type of Hukou called "Resident Hukou" was created to replace the previous urban and rural Hukous. But it was initially implemented only in Henan province.

over-sampled larger-size households, 15-64 year-olds in central and western provinces, and under-sampled the migrant population[4] (appendix Table A5 and Table A6). In terms of education, the CHIP over-sampled people with at least senior high school in all age groups, under-sampled people with primary or junior high school educations, but over-sampled the population that were never educated among those older than 40 (appendix Table A7).

Since the original CHIP sample is not nationally representative, it is essential to re-weight the CHIP in order to improve its representation of the population. We weight it by using the fraction of "urban", "rural", and "migrant"[5] residents in each province from the Chinese yearbook 2013. The details of our weighting procedure are described in Appendix section A1.

We compare the summary statistics of the weighted CHIP and the Census in Tables A4-A7. After weighting, the misrepresentation problems in regional population, size of households, migrant proportions was successfully eliminated, but it helped little in correcting the over-representation problem for educated people; nor did it solve the under-representation problem for people older than 40 with less than junior high school degrees. However, these remaining differences are minor.

The descriptive statistics of respondents and their spouses who were at least 25 in the 2013 CHIP (after weighting) are listed in Table 1. There are 32,976 individuals in our sample whose ages were older than 25. 28% of the weighted CHIP sample had obtained at least a high school degree and 11% had obtained at least a college degree. The average years of schooling, high school

[4] In this paper, we follow official government practice of defining "migrants" as people living outside of their official registered residential area in 2013, as indicated by their Hukou membership.
[5] The "urban" group here refers to people who lived in urban areas and had not change their residential area as of 2013. "Rural" group refers to people who lived in rural areas and had not change their residential area as of 2013. The "migrant" group refer to people who had changed their residential areas by 2013.

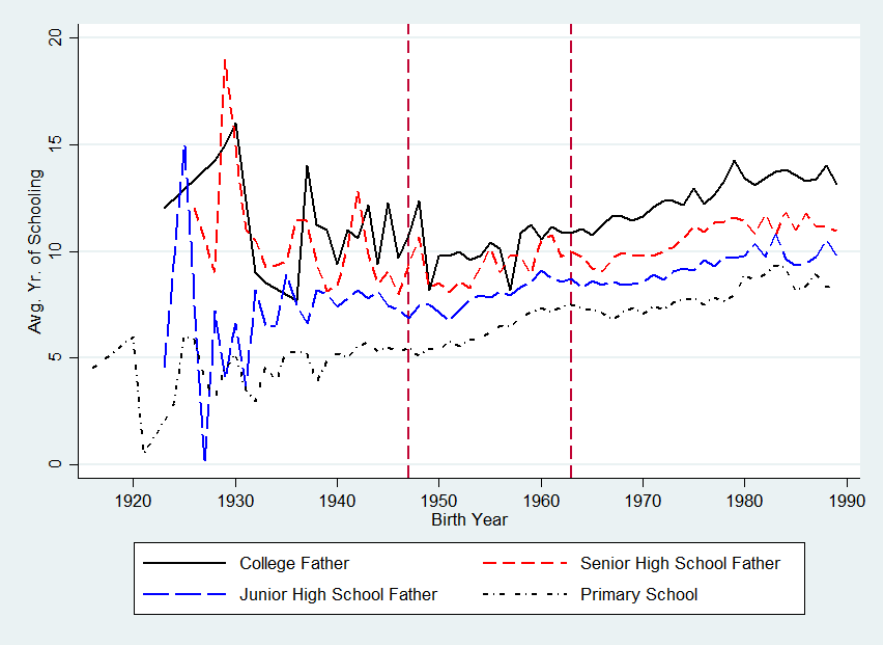
degree attainment rate, college degree attainment rate, average years of father's schooling, and average years of mother's schooling all increase over cohorts. The growth rates of parents' schooling across cohorts are larger than the growth rates for children.

Table 1 Descriptive Statistics of the Weighted CHIP Sample

	Mean	Std	Min	Max	N
	(1)	(2)	(3)	(4)	(5)
Panel A: Pre-Mao Cohort (Born before 1945)					
Age	75.09	4.59	70	98	1,915
Male	0.58	0.49	0	1	1,915
Years of Schooling	6.39	4.28	0	19	1,915
High School Degree Attainment	0.17	0.38	0	1	1,915
College Degree Attainment	0.06	0.24	0	1	1,915
Years of Father's Schooling	2.05	3.30	0	19	1,915
Years of Mother' Schooling	0.77	2.07	0	15	1,915
Panel B: Maoist Cohort (Born before 1945-1963)					
Age	58.45	5.20	51	69	13,568
Male	0.52	0.50	0	1	13,568
Years of Schooling	7.47	3.59	0	20	13,568
High School Degree Attainment	0.23	0.42	0	1	13,568
College Degree Attainment	0.06	0.23	0	1	13,568
Years of Father's Schooling	2.86	3.69	0	19	13,568
Years of Mother' Schooling	1.43	2.82	0	19	13,568
Panel C: Post Mao Cohort (Born after 1963)					
Age	41.16	6.21	25	50	17,493
Male	0.49	0.50	0	1	17,493
Years of Schooling	9.74	3.53	0	21	17,493
High School Degree Attainment	0.33	0.47	0	1	17,493
College Degree Attainment	0.16	0.36	0	1	17,493
Years of Father's Schooling	5.74	4.23	0	19	17,493
Years of Mother' Schooling	4.09	4.01	0	19	17,493
Panel D: All Cohorts					
Age	49.98	11.77	25	98	32,981
Male	0.50	0.50	0	1	32,981
Years of Schooling	8.66	3.78	0	21	32,981
High School Degree Attainment	0.28	0.45	0	1	32,981
College Degree Attainment	0.11	0.31	0	1	32,981
Years of Father's Schooling	4.40	4.21	0	19	32,981
Years of Mother' Schooling	2.86	3.69	0	19	32,981

We also divide the sample into three categories by whether the years individuals would have attended primary or higher education were covered by the regime of Mao: pre-Mao (for those born before 1945), Maoist (for those born in 1945-1963), and post-Mao (born after 1963). It suggests that the average years of schooling increased by 17% from the pre-Mao cohort to the Mao cohort, but it increased at a much higher rate (30%) from the Mao cohort to the post-Mao cohort. These statistics indicate that the human capital accumulation rate in the Mao cohort was slower than in the post-Mao period, which is likely related to the institutional changes in the Mao era. The decrease in growth of schooling years differs by family background, as can be seen from Figure 2. The average years of schooling in the CR increased least—and perhaps declined—for people whose fathers had at least a high school education, and the gaps of average years of schooling by father's education shrank greatly in the CR. Average education for those whose fathers attended primary school increased in all three periods, but growth was particularly fast for the Mao cohort.

Figure 2 Average Years of Schooling across Birth Year by Father's Education



Source: Chinese Household Income Project 2013

4. Methods

In this paper, we use the difference-in-difference method to identify the impacts of the Cultural Revolution on intergenerational and multi-generational mobility. The extent to which schooling for each individual is affected by the CR is measured by indexes that are based on a respondent's birth year. We compare the cohort differences (measured by the CR indexes) to the differences in educational attainment for people with different parental backgrounds.

People who received their education during the CR were not affected in a uniform manner. For instance, those who were in the last year of high school in 1966 may have been affected by the CR because they lost the chance to take the college entrance exam at the normal time; but people who were in middle schools in 1966 were also affected by the closure of schools, changes in curriculum, and the "Down to the Countryside" movement. We assume the impact of the CR differed by the number of years during school age a person was affected. Meng (2007) lists a measure of the number of affected years for people pursuing education in the CR period (see Column 3 in Table 2) bases on birth year and interruptions in education. The "affected years" in this measure include both the years of school closure and the years in which schools did not follow a standard curriculum. Alternatively, Zhou (2014) measured the affected years in a different way (see Column 4 in Table 2). His version of "affected years" includes only the years of school closure. Both measures of the CR-affected years display an inverted U-shape pattern during 1966-1976, and are zero before and after.

Table 2 Measures of Affected Years in the Cultural Revolution

Birth Year	Age in 1966	CR Affecting Yrs.-Meng and Gregory (2007)	CR Affecting Yrs.-Zhou (2014)	Primary and Secondary Schooling Missing Patterns (Meng et al, 2007)	Collee Entrance Delay Patterns
(1)	(2)	(3)	(4)	(5)	(6)
1947	19	0	0.5	--	College Closed (1947-1954)
1948	18	1	1	Missing Senior High School Only (1948-1950)	
1949	17	2	1		
1950	16	3	4		
1951	15	4	4	Missing Junior and Senior High School (1951-1953)	
1952	14	5	6		
1953	13	6	6		
1954	12	7	6	Missing Primary, Junior and Senior High School (1954-1955)	Recommendation Only (1955-1958)
1955	11	8	4		
1956	10	5	4	Missing Primary and Junior High School (1956-1958)	
1957	9	4	1		
1958	8	3	1		
1959	7	3	0.5	Missing Primary School Only (1959-1961)	No Entrance Delay but Faced Intense Competition (1959-1963)
1960	6	2	0		
1961	5	1	0		
1962	4	0	0	--	
1963	3	0	0		

Note: This table shows the schooling miss patterns during the CR and measures of "years affected by the CR on education" in Meng and Gregory (2007) and Zhou (2014). Column (1) shows each of the birth years for people in their prime schooling years during the CR; column (2) lists the age of those people at the beginning of the CR (1966); column (3) lists the "affected years" in the CR for those people using Meng's measure based on birth year; column (4) lists the "affected years" in the CR using Zhou's measure based on birth year; columns (5) and (6) list possible schooling miss patterns in the CR using Meng's measure, the birth years of the affected population in each pattern are listed in parentheses. Column (5) shows the miss patterns of primary and secondary school, and column (6) lists the possible delay patterns of college entrance, with affected birth year listed in parentheses.

Using these measures of affected years, we first model the impact of the CR on the intergenerational educational mobility using a linear probability model:

$$\mathrm{EDU}_{i,t} = \sum_{j=1}^{3} \beta_j \left(\mathrm{Ftype}_{i,j} * \mathrm{YA}_i\right) + \beta_4 \mathrm{YA}_i + \sum_{j=1}^{3} \beta_{j+4} \mathrm{Ftype}_{i,j} + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \qquad (1)$$

$EDU_{i,t}$ is a dummy variable indicating whether a person obtained at least a high school degree ($HS_{i,t}$), or a college degree ($CD_{i,t}$) in cohort *t*, YA_i is the index for the number of years a person *i* was affected by the radical educational interventions during the CR, using either Meng's or Zhou's measures (see Table 2). YA_i equals 0 for those who would have received their education in periods other than the CR. $Ftype_{i,j}$ is father's education which is categorized into four levels ($j = 1,2,3,4$, correspondingly): at least high school degree, middle school degree, primary school degree and no education (the base group). $\boldsymbol{X_i}$ are control variables including gender, age, age squared, number of siblings, father's age and father's age squared. δ_t is child's birth cohort fixed effect, which is a dummy for those born in the pre-CR cohorts. β_1, β_2, and β_3 measure the impact of duration of the CR for people with three different levels of father's education, relative to those whose fathers had less than a primary education. β_4 measures the impact of the CR on education for people whose fathers with less than primary education. β_5, β_6 and β_7 measure the effects of the levels of a father's education on children's educational attainment for children whose schooling was not affected by the CR. These three coefficients are of interest to us since they estimate the DiD effect of the CR on the relative advantage of having a father with different levels of education.

We also study impacts of the CR on intergenerational mobility for people grew up in rural and urban areas:

$$\mathrm{EDU}_{i,t} = \beta_1 \mathrm{YA}_i + \beta_2 \mathrm{Rural}_i + \sum_{k=1}^{3} \beta_{3k} \mathrm{Ftype}_{i,k} + \beta_4 (\mathrm{YA}_i * \mathrm{Rural}_i)$$
$$+ \sum_{k=1}^{3} \beta_{5k} \left(\mathrm{YA}_i * \mathrm{Ftype}_{i,k}\right) + \sum_{k=1}^{3} \beta_{6k} \left(\mathrm{Ftype}_{i,k} * \mathrm{Rural}_i\right) \quad (2)$$
$$+ \sum_{k=1}^{3} \beta_{7k} \left(\mathrm{YA}_i * \mathrm{Ftype}_{i,k} * \mathrm{Rural}_i\right) + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t}$$

Rural_i is a dummy for people who were born in rural areas. Since rural-urban migration was extremely low in the Maoist period (1949-1976), we assume people grew up and received most of their education in the same type of areas where they were born. YA_i is the index for the years affected by the CR using Meng's measure. All the other variables are the same as those in equation (1). β_4 estimates the difference in the impact of the CR for those who grew up in rural areas relative to those who grew up in urban areas and whose father had only a primary school education; $\beta_{6,1}$, $\beta_{6,2}$, $\beta_{6,3}$ estimate the differences in effect of parental education for rural-born people, relative to urban-born people. $\beta_{7,1}$, $\beta_{7,2}$, $\beta_{7,3}$ estimate the differences in impact of the CR by parental education for people born in rural areas, relative to people born in urban areas.

We then study the impact of the CR on multi-generational educational transmission. Specifically, we study whether the transmission pattern between grandfather and grandchild changed if the father was affected by the CR:

$$\mathrm{EDU}_{i,t} = \beta_1 (GFS_i * \mathrm{YA}_i) + \beta_2 \mathrm{YA}_i + \beta_3 GFS_i + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \quad (3)$$

$$\mathrm{EDU}_{i,t} = \alpha_1 (FS_i * \mathrm{YA}_i) + \alpha_2 \mathrm{YA}_i + \beta_3 FS_i + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \quad (4)$$

$$\mathrm{EDU}_{i,t} = \omega_1 (GFS_i * \mathrm{YA}_i) + \omega_2 (FS_i * \mathrm{YA}_i) + \omega_3 \mathrm{YA}_i + \omega_4 GFS_i + \omega_5 FS_i \quad (5)$$
$$+ \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t}$$

$\mathrm{EDU}_{i,t}$ is a dummy for whether a grandchild (child of the main respondent) obtained at least a high school degree ($\mathrm{HS}_{i,t}$), or a college degree ($\mathrm{COL}_{i,t}$) in cohort *t*. GFS_i and FS_i are the years of schooling for the grandfather (father of the main respondent) and the father (the main respondent), respectively. YA_i is the index for the years the father (the main respondent) was affected by the CR using Meng's measure. Control variable $\boldsymbol{X_i}$ includes grandchild's gender, age, age squared, number of siblings in equations (3)-(5); grandfather's age, grandfather's age squared in equations (3) and (5); and father's age and its square in equations (4) and (5). δ_t denotes the birth cohort fixed effect for grandchild (dummies of birth cohorts in before 1962, 1962-1967, 1968-1972, 1973-1977, 1978-1982). The estimate of $\beta_1$shows us whether the relationship between a grandfather's schooling and grandchild's schooling was weakened by the CR either directly or indirectly. Equation (4) estimates whether the CR has any effect on the next generation. If having a father who is affected by the CR reduces the advantage of having a more educated father for the next generation, we would expect to find negative estimate of α_1 in equation (4). Finally, we include both the grandfather's and the father's years of schooling in the model in equation (5), which estimates how the CR altered the direct effect of the grandfather's education on the grandchild's education through ω_1.

Next, we study the mechanism behind the effect of father's education on the child's college degree attainment by decomposing the process into three parts: obtaining a high school degree, participating the college entrance exam (CEE), and obtaining a CEE score:

$$\mathrm{COL}_{i,t} = \beta_1(FS_i * \mathrm{YA}_i) + \beta_2 \mathrm{YA}_i + \beta_3 FS_i + \alpha \boldsymbol{A_i} + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \qquad (6)$$

$\boldsymbol{A_i}$ denotes the step indicators of college degree attainment. We add one step indicator in each of the four model specifications: specification (1) includes none of these indicators, so it estimates the overall effect of father's schooling on college degree attainment; specification (2) includes high

school degree attainment (HS_i); specification (3) further adds a dummy for whether person *i* took college entrance exam (CEE_i); specification (4) also includes the CEE scores (CEEscore_i). The control variables $\boldsymbol{X_i}$ in model specifications (1), (2) and (3) are the same as in equation (1). In model specification (4), it also includes the year when the person took the CEE and its squared and cubic forms, the province where the CEE was taken, the type of CEE exam (art, science, or other types). To allow comparability across different model specifications in equation (6), we assign the CEE scores for those who did not report their scores the sample average score and create a dummy for this missing group. We also assign the year of taking the CEE for those who did not report it to be the year when they were 19 years old and create a dummy for those people. In addition, we add a dummy for people who did not report the province where they took the CEE and a dummy for the type of CEE exam taken. All the other variables in equation (6) have the same definition as shown in equation (2).

Comparing the estimated coefficients of β_1 across model specifications allows us to estimate the direct effect and indirect effects of father's schooling on child's college degree attainment. We also identify the direct and indirect impacts of the CR, and the impacts of the CR on college degree attainment by father's education through each of the step indicators by comparing the changes in estimated coefficients of β_2 and β_3.

Finally, we use occupation as a proxy for father's status, to examine whether the impact of the CR on the intergenerational mobility changes using different status proxy. Also, we study the effects of mother's schooling on child's educational attainment and the impact of the CR on this relationship using:

$$\text{EDU}_{i,t} = \beta_1(MS_i * \text{YA}_i) + \beta_2 \text{YA}_i + \beta_3 MS_i + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \qquad (7)$$

$$\mathrm{EDU}_{i,t} = \alpha_1(FS_i * \mathrm{YA}_i) + \alpha_2 \mathrm{YA}_i + \beta_3 FS_i + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \quad (8)$$

$$\mathrm{EDU}_{i,t} = \omega_1(MS_i * \mathrm{YA}_i) + \omega_2(FS_i * \mathrm{YA}_i) + \omega_3 \mathrm{YA}_i + \omega_4 MS_i + \omega_5 FS_i + \gamma \boldsymbol{X_i} + \delta_t + \varepsilon_{i,t} \quad (9)$$

where MS_i denotes years of mother's schooling, and FS_i denotes years of father's schooling. All the other variables in equations (7)-(9) have the same definition as shown in equation (2). The control variables in $\boldsymbol{X_i}$ include the mother's age and its squared in equations (7) and (9), and also includes father's age and age squared in equations (8) and (9). In equation (9), $\omega_1$estimates how the CR changed the direct effect of mother's schooling on child's educational attainment, and ω_4 estimates the direct effect of mother's schooling on child's educational attainment in the non-CR period.

5. Results

5.1 The Impact of the CR on Intergenerational Educational Mobility

5.1.1 General Impact of the CR on Intergenerational Educational Mobility

The debate over the importance of genetic factors and environmental factors on intergenerational transmission is longstanding and continues to the present (Mazumder, 2008, Björklund et al., 2005, Clark, 2015, Dahl, 2012). Analyzing the impact of the Cultural Revolution on the intergenerational mobility provides new empirical evidence on this topic since the CR is a radical environmental change for Chinese students in the period 1966-1976.

Table 3 lists the estimated coefficients for the effect of the CR on the intergenerational mobility, as shown in equation (1). We use Meng's measure of years affected by the CR in columns (1) and (3), and Zhou's measure in columns (2) and (4). For those not affected by the CR, both sets

of results imply that having a father with a high school degree (or above) increases the likelihood of the child obtaining a high school degree by 39 percentage points and increases the likelihood of obtaining a college degree by 31 points, relative to those with an uneducated father.

Table 3 suggests that the advantages of having a high school degree (or above) decreased significantly for a child experiencing more years of CR educational disruption. Each year affected by the CR decreased the advantage of having a father with a high school degree by about 1.9 percentage points in terms of high school attainment. Therefore, for those affected by the CR, on average the advantage of having fathers with high school degrees declines by about 6 percentage points (the average years affected by CR is 3.2), which shrinks the advantage by about 15%[6] compared with those born in non-CR cohorts. For college degree attainment, the decrease of the advantage of having a father with high school degree is on average about 16.5%-18.5% for people whose fathers with at least high school degree. The estimated decreases in the advantage of having a father with a junior high school or primary high school education due to the CR are negative but small and statistically insignificant. People with uneducated fathers were 1.3-1.5 percentage points less likely to obtain a high school degree per year affected by the CR, relative to those who received their educations in other periods. This reflects the negative impact of the CR on human capital. However, we do not find a statistically significant effect of the CR on the probability of obtaining a college degree for people whose fathers had less than a high school education. This result is most likely explained by the "recommendation only" policy in the CR that provided college enrollment opportunities for people from traditionally less advantaged family backgrounds, and the relaxation of the maximum age of taking the college entrance exam after the CR (1977-1981).

[6] This was obtained by using the average decrease rate in the advantage, 6, divided by the advantage of having a high school degree father in other cohorts, 39.

Table 3 Estimated Coefficients of the Impact of Affected Years in the CR on Education

	High School Degree		College Degree	
	(1)	(2)	(3)	(4)
Ftype1*YA	-0.019**	-0.019**	-0.018*	-0.016*
	(0.007)	(0.008)	(0.009)	(0.009)
Ftype2*YA	-0.001	-0.003	-0.003	-0.005
	(0.004)	(0.008)	(0.005)	(0.007)
Ftype3*YA	-0.003	-0.005	-0.002	-0.004
	(0.002)	(0.003)	(0.002)	(0.003)
YA	-0.015**	-0.013***	0.001	-0.001
	(0.005)	(0.003)	(0.003)	(0.002)
Ftype1	0.394***	0.392***	0.312***	0.309***
	(0.014)	(0.014)	(0.024)	(0.024)
Ftype2	0.251***	0.252***	0.139***	0.142***
	(0.017)	(0.017)	(0.017)	(0.017)
Ftype3	0.115***	0.116***	0.043***	0.045***
	(0.013)	(0.013)	(0.007)	(0.007)
Measure	Meng	Zhou	Meng	Zhou
R^2	0.3525	0.3029	0.2458	0.2456
N	32,981	32,981	32,981	32,981

Note: *** significance level <0.001; ** significance level <0.005; * significance level <0.01. This table reports the regression results for obtaining high school and college degrees based on equation (2). Ftype1 denotes a person's father has a high school degree; Ftype2 denotes a person's father has a middle school diploma; Ftype3 denotes a person's father has a primary school diploma. YA is the measure of years of schooling affected by the CR, using either Meng's measure or Zhou's measure. Control variables include child's birth cohort dummies, gender, number of siblings, age and age squared, father's age and father's age squared (results were not shown in this table). The standard errors were clustered at the child's residential province level.

Although the CR successfully reduced the advantage of having an educated father, the advantage was not eliminated by the CR. For example, even when a person experienced the maximum possible disruption during the CR (8 years), having a father in the highest education category increased the chance of receiving a high school degree by 25 percentage points, relative to those have uneducated fathers, 15 points higher than those with fathers with a primary school education, and about the same for those whose fathers with a middle school education. Similarly, for people affected by the CR for the maximum possible years, those with a high school educated

father were still 16 percentage points more likely than those with an uneducated father to obtain a college degree, 13 percentage points more likely than those with a primary school educated father, and 4.5 percentage points more likely than those with a father with a middle school education.

To check the robustness of the above results, we drop older respondents from the sample, control for family fixed effects using a sample of siblings, apply Logit and Probit models, and change the school entry age in Meng's measure. In particular, one possible source of bias is that older respondents may be a selected sample since they survived and were able to take the survey themselves, indicating that they are more advantaged relative to others in the same cohort. Thus, we omit people who were older than 67 years of age from the sample, i.e., we omit the pre-CR group, and re-estimate equation (1), leaving about 94% of the full sample. The estimated results can be seen in the appendix Table A8, which are similar to our estimates in Table 3.

The results report the marginal effects based on the Logit and Probit regressions are shown in appendix Table A9. The estimated results for high school attainment are similar with the results in Table 3, but the estimated coefficients on the advantage of having a father with a high school degree or higher on college degree attainment are smaller in magnitude than in those in Table 3. This may be due to the small sample for respondents with college degrees. Nevertheless, the basic patterns we observe in Table A9 are similar to those of the linear probability results.

When we use years of father's schooling as the measure of father's education to study the impact of CR-affected years on educational attainment, these results, reported in in appendix Table A10, confirm our results in Table 3.

We also use information on sibling education that is obtained from respondents. Although this approach increases the effective sample size, it may also introduce systematic errors if education

of siblings is misreported. We have weighted cases by the inverse of the total number of siblings in a family, so the distribution of family background will not change. We find that when replicating our analysis using the same methods as described above, coefficient estimates for interactions between the CR and father's educational type (appendix table A11) are somewhat larger, although patterns are unchanged. We control for family fixed effects to estimate the same model to see if unmeasured differences between families may causes the patterns we observed in Table 3. The results are shown in the appendix Table A12, which show similar patterns to those shown in Table 3 and confirms that the CR decreased the advantage of having an educated father. This suggests that the negative effect of the CR on the advantage of having an educated father in educational achievement also occurred within a family.

Meng's measure assumes the school entry age to be 7, which is the minimum age of school entry. We change the school entry age to 6 and 8 in Meng's measure and see if that affects our results. These results for Meng's measure of YA are listed in appendix Table A13, which are similar to the results in Table 3.

5.1.2 Area Differential Impacts of the CR on Intergenerational Educational Mobility

During the Cultural Revolution periods, primary and secondary schools were greatly expanded in rural areas. We explore whether this expansion changed the general pattern of the CR on the intergenerational mobility we observed in Table 3 by estimating the coefficients in equation (2).

The estimated results are listed in Table 4. Columns (1) to (3) summarize the estimated coefficient for rural-born people, urban-born people, and their differences in terms of high school

degree attainment. Columns (4) to (6) list the results of rural-born people, urban-born people, and their differences in terms of college degree attainment. The estimated effects for people who grew up in rural areas were obtained by adding the estimated effects for people in urban areas and the differential effects between these two effects.

Comparing the coefficients of the father's educational level ($Ftype_1$, $Ftype_2$, $Ftype_3$) between the rural and urban people, we see that the advantage of having a more educated father is significantly smaller for people who grew up in rural areas than those who grew up in urban areas. For example, the probability of obtaining a college degree for a person whose father has at least high school degree is 21.4 percentage points higher than if the person grew up in a rural area.

For people who grew up in rural areas and had an uneducated father, the negative impact of the CR on the high school or college degree attainments are significantly smaller than for those who grew up in urban areas. The negative effect for each year affected by the CR on high school degree attainment is 1.7 percentage points less for people who grew up in rural areas, and for college degree attainment it is 1 percentage point less, relative to people grew up in urban areas. This result supports our hypothesis that the CR benefited children who grew up in rural areas from the traditionally least advantaged backgrounds.

However, although the CR benefited people who grew up in rural areas with the least educated backgrounds, it decreased the advantage of having a more-educated father for those who grew up in rural areas. For example, the decrease in the advantage of having high school degree fathers for those who were born in rural areas is 7.8 percentage points greater than those who grew up in urban areas in terms of obtaining a high school degree.

Table 4 Estimated Coefficients of the Impact of the CR on Education by Area of Birth

	High School Degree			College Degree		
	(1)	(2)	(3)	(4)	(5)	(6)
Ftype1*YA	-0.080***	-0.002	-0.078***	-0.037***	-0.024**	-0.013
	(0.012)	(0.010)	(0.016)	(0.008)	(0.011)	(0.012)
Ftype2*YA	-0.007	-0.001	-0.006	-0.013***	0.001	-0.014*
	(0.009)	(0.011)	(0.018)	(0.003)	(0.008)	(0.008)
Ftype3*YA	-0.001	-0.009*	0.008	-0.002*	-0.003	0.001
	(0.003)	(0.004)	(0.005)	(0.001)	(0.005)	(0.004)
YA	-0.010***	-0.027**	0.017***	0.004**	-0.006	0.010**
	(0.003)	(0.008)	(0.005)	(0.002)	(0.007)	(0.004)
Ftype1	0.410***	0.441***	-0.031	0.226***	0.440***	-0.214***
	(0.014)	(0.024)	(0.029)	(0.025)	(0.028)	(0.025)
Ftype2	0.204***	0.347***	-0.143***	0.073***	0.279***	-0.206***
	(0.020)	(0.016)	(0.028)	(0.012)	(0.025)	(0.020)
Ftype3	0.087***	0.192***	-0.105***	0.023***	0.111***	-0.088***
	(0.011)	(0.022)	(0.028)	(0.005)	(0.018)	(0.017)
AgriHK			-0.302***			-0.110***
			(0.017)			(0.011)
R^2			0.3049			0.2520
N			32,981			32,981

Note: *** significance level <0.001; ** significance level <0.005; * significance level <0.01. This table reports the regression results of equation (4). Ftype1 denotes a person's father has a high school degree; Ftype2 denotes a person's father has a middle school diploma; Ftype3 denotes a person's father has a primary school diploma. YA is the measure of years of schooling affected by the CR, using Meng's measure. Columns (1)-(3) list the results for high school degree attainment, and columns (4)-(6) list the results for college degree attainment. Columns (1) and (4) summarize the regression results for people who grew up in rural areas, which were obtained by adding the estimated effects for people in urban areas (column (2), column (5)) and the differential effects between these two effects (column (3) and column (6)); columns (2) and (5) summarize the regression results for people who grew up in urban areas; columns (3) and (6) summarize the differences between the coefficient estimates for people who grew up in rural and urban areas. Control variables include child's birth cohort dummies, gender, number of siblings, age and age squared, father's age and father's age squared (results were not shown in this table). The standard errors were clustered at the child's residential province level.

5.2 The Impact of the CR on Multi-Generational Mobility

Multi-generational mobility is the variation of status across more than two generations within a family. Since the most widely used empirical model assumes the intergenerational process to be an AR (1) process, if this assumption holds, we expect the multi-generational correlation to die out at a geometric rate. Many studies provided empirical evidence to support this assumption, showing

that the direct correlation between grandfather's social status and grandchild's social status is weak (Ridge, 1973, Behrman, 1985, Warren, 1997, Lucas, 2013). However, Stuhler (2012) argues that estimating the multi-generational correlation using such a simple assumption is an "iterated regression fallacy". Grandparent's status may also have an important direct impact on grandchild's status. Zeng et al. (2014) found that the grandfather's schooling had a significantly positive effect on a grandchild's educational achievement when grandparents are co-resident with their grandchildren in rural China. Solon (2018) suggested that the discrepancies in the literature imply that there is not a universal pattern for multi-generational mobility.

We estimate the direct and indirect effects of the grandfather's schooling on grandchild's education, as well the impact of the CR on these effects in equations (3)-(5). One of the issues we face is that the CHIP does not have complete, three-generation information, as it lacks information on children living outside of the household for rural respondents. Complete information is only available for urban respondents. However, if we only use data on urban residents, it may cause estimation bias. Luckily, what we found in the appendix Figure A3 is that the patterns of intergenerational mobility are similar for the urban sample and rural sample. Thus, we have at least some confidence that the results for the multi-generational relationship using the urban sample will be similar to that for the rural sample. We also compare the intergenerational estimated results using the full sample to the results using only the urban sample and the urban sample of families with children in appendix Table A14. Based on this comparison, we expect the results to be similar using the urban sample to those using full sample if it were available.

The estimated results for equations (3)-(5) using the urban sample are listed in columns (1), (2), and (3) for high school degree and columns (4), (5), and (6) for college degree attainment in Table 5. First, we conclude that each additional year of the grandfather's schooling increases the

probability of obtaining a high school degree by 2 percentage points, and increases the probability of obtaining a college degree by 2.3 percentage points. Adding father's schooling into the model in columns (3) and (6) suggests that the direct effect of the grandfather's schooling on grandchild's educational attainment is significantly positive. Comparing columns (1) and (3), (4) and (6), we see that about 10% of the effect of grandfather's schooling on child's high school degree attainment is transmitted through father's schooling, and about 17% of grandfather's schooling on grandchild's college degree attainment is transmitted through father's schooling. The result is consistent with the finding in Zeng et al. (2014) that the direct effect of father's schooling on grandchildren's education is significant in China. We also find that the CR had insignificant impact on the relationship between grandfather's schooling and grandchild's educational achievement, which is consistent with Clark (2015) that the long-run association across generations within a family cannot be significantly altered by radical political events or movements. Clark (2015) obtained his conclusion by tracing the average status within families with rare surnames for several centuries in various countries, while our results are obtained by analyzing the impact of the CR using regular DiD methods.

We estimate the effect of experiencing the CR for the father's generation on the child's educational attainment in column (2) and column (5). Interestingly, the results suggest that each year of disruption due to the CR would increase the probability of obtaining a college degree for his child by about 0.3 percentage points. It is likely that those who lost opportunities to receive education tended to invest more in their children's education, which is consistent with the findings in Roland and Yang (2017). Fathers may treat such investment as a compensation to their own loss from the CR.

Table 5 Estimated Coefficients for the CR Impacts on Multi-Generational Educational Transmission

	High School Degree			College Degree		
	(1)	(2)	(3)	(4)	(5)	(6)
GFS*YA	-0.002		-0.002	-0.001		-0.001
	(0.001)		(0.002)	(0.002)		(0.002)
FS*YA		0.001	0.001		0.0024**	0.0026**
		(0.002)	(0.001)		(0.0009)	(0.010)
YA	0.024	0.007	0.036	0.008	-0.008	0.003
	(0.031)	(0.018)	(0.039)	(0.033)	(0.009)	(0.030)
GFS	0.020**		0.018**	0.023**		0.019*
	(0.007)		(0.006)	(0.010)		(0.009)
FS		0.037***	0.036***		0.044***	0.042***
		(0.006)	(0.006)		(0.004)	(0.004)
R^2	4,680	4,680	4,680	4,680	4,680	4,680
N	0.080	0.1657	0.1701	0.1165	0.2183	0.2241

Note: *** significance level <0.001; ** significance level <0.005; * significance level <0.01. This table reports the regression results of equation (3) (corresponding to columns (1) and (4)), equation (4) (corresponding to columns (2) and (5)), and equation (5) (corresponding to columns (3) and (6)) in terms of high school degree and college degree attainment of grandchildren. YA denotes years father was affected by the CR; FS denotes years of father's schooling; GFS denotes years of grandfather's schooling; In column (1), we control the grandchild's gender, age, age squared, grandfather's age, grandfather's age squared; in column (2), we control the grandchild's gender, age, age squared, father's age, father's age squared; in column (3), we includes all controls in (1) and (2). The standard errors were clustered at the grandchild's residential province level.

To summarize this subsection, we find that grandfather's schooling and father's schooling significantly and positively influence children's education, and that these effects are mostly direct. Also, we do not find evidence for declines in the ability of grandfather or fathers to pass on the educational advantage to their grandchildren or children when the father's generation was affected by the CR. In contrast, the advantage from having a more educated father in attaining a college degree is even stronger for people who had fathers with schooling affected by the CR.

5.3 Potential Mechanisms

We have shown that the CR reduced the educational advantage of having a more educated father for those facing CR disruptions during their principal school ages. But we are still not clear about the mechanism explaining such reduction of advantage. We study this question using equation (6) to decompose the impacts of father's schooling on child's college degree attainment. It also allows us to identify how the CR affects the intergenerational transmission through each of the step factors.

To obtain a college degree (either three-year or four-year) in China, a person must first obtain a high school diploma. If the person pursues a four-year college degree, he/she needs to take the national college entrance exam (CEE)[7], and the college acceptance depends on CEE scores.[8] Thus, several key issues jointly determine whether a person can obtain a college degree: obtaining a high school degree, taking the CEE, obtaining a sufficient CEE scores to meet the admission requirement of a specific college, and finishing all college course requirements to obtain the college degree. Parental background can directly affect the probability of children obtaining a college degree attainment, as well as indirectly affecting the probability through affecting each step in the process. When a radical political intervention occurs, like the Cultural Revolution, it may weaken the direct or the indirect links between a person's parental background and their college degree attainment.

[7] The exam was administered annually beginning in 1952 but was suspended in 1966-1976. The exam can be taken more than once but in 1981-2001, it was open only to high school graduates who were younger than 25.

[8] A small number of students are enrolled into college through other channels, for example, students who win awards in math, physics, chemistry or biology contests and students admitted for outstanding athletic or artistic accomplishments.

In the CHIP sample, there are 32,981 father-respondent pairs. Among them, 9,182 respondents are at least high school graduates, which is about 28% of the sample. 3,364 respondents reported that they had taken the CEE, which is 11% of the full sample and 37% of all high school graduates. 2,697 people reported their CEE scores, which amounts to 8% of the full sample and 80% of people who reported they took the CEE. Finally, 3,620 people had college degrees (three-year and above) in the sample, which is about 134% of people who reported their CEE scores, 108% of people who reported they took the CEE, 39% of all high school graduates and 11% of the full sample. The number of college graduates exceeds the numbers of reported CEE takers, which may occur because some three-year colleges did not require the CEE score for admission, and some respondents who took the CEE may not have reported it. One of the potential biases in conducting this analysis is that the CEE participation rate and scores in our sample may not be representative. In Appendix A2, we compare the CEE participation rate using CHIP data with the rate obtained from the Census 2000 and an online administrative file.[9] These comparisons suggest that CEE participation in the CHIP is similar to that of the full population (see appendix Figure A6).

The estimated results of the four model specifications of equation (6) are listed in Table 6. First, we observe that the coefficient of father's schooling is decreasing as we add more step indicators into the model. For instance, when there is no step indicator, it suggests that an additional year increase in the father's schooling improves the probability of obtaining a college degree by 3 percentage points. When adding all of three indicators into the model, it drops to 0.8 percentage points. The result suggests these three step indicators we propose in Figure 3 can jointly explain about 72% of the association between father's schooling and the college degree attainment

[9] "Number of People Took CEE and College Acceptance Rate in 1949-2012" (in Chinese), Ministry of Education of P.R.C.. 2012. Accessed 8 May, 2018. https://wenku.baidu.com/view/e4a5434b2b160b4e777fcf04.html.

of children. Specifically, high school completion explains about 48%[10] of the association, taking the CEE explains about 14%, and obtaining a higher CEE scores explains another 3%, leaving about 28% of the coefficient unexplained by these three step indicators.

Table 6 Decomposition of the Effect of Father's Schooling on College Degree Attainment

	No Controls	Add HS	Add CEE Participation	Add CEE Score
	(1)	(2)	(3)	(4)
FS*YA	-0.0020***	-0.0015***	-0.0009**	-0.0004
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
YA	-0.010***	-0.003**	-0.002**	-0.0003
	(0.002)	(0.001)	(0.001)	(0.001)
FS	0.029***	0.013***	0.009***	0.008***
	(0.002)	(0.001)	(0.001)	(0.001)
HS		0.378***	0.234***	0.230***
		(0.018)	(0.019)	(0.019)
CEE			0.421***	0.162**
			(0.022)	(0.101)
CEE score				0.002***
				(0.0001)
R^2	0.1648	0.3728	0.4826	0.5229
N	32,981	32,981	32,981	32,981

Note: *** significance level <0.001; ** significance level <0.005; * significance level <0.01. The table reports the regression results for the four specifications in equation (6). FS denotes years of father's schooling; CR denotes whether the person was affected by the CR; HS denotes whether the person obtained a high school degree; and CEE denotes whether the person took the CEE; CEEscore is defined as the CEE score. Control variables for specification (1) to (3) are: age, age squared, gender, father's age and father's age squared; for specification (4) are: age, age square, gender, year when took CEE, province where took CEE, CEE exam types and the missing dummies for those variables. The standard errors were clustered at the child's residential province level.

At the same time, we observe that the advantage of having a more educated father was reduced for people who were affected by the CR. When no step indicator was included, the reduction of advantage on per year of father's schooling is 7% (-0.002/0.029) per year affected by the CR, and

[10] This was calculated using the coefficient of the father's schooling in model (2) minus the coefficient of father's schooling in model (1) and divided by the coefficient of the father's schooling in model (1).

when we include all of the step indicators into the model, the reduction of the advantage drops to 5% (-0.0004/0.008), suggesting that the CR also reduced the advantage of having a father with more schooling through these three step indicators. On the other hand, the results suggest that those with uneducated fathers benefited from these procedures if they were affected by the CR, which significantly improved their probability of obtaining college degrees. Their probability of obtaining a college degree increased by 3 percentage points per year affected by the CR. However, after controlling these three indicators in the model, the effect of the CR on those with uneducated fathers drops to 0.8 percentage points, indicating that 73% of the decrease can be explained by these three factors.

6. Extensions

6.1 The Intergenerational Association between Parental Occupation and Children's Education

To this point, we have measured the intergenerational relationship between parental education and children' education. One of the unique features of the CR is that people were classified by their parental occupation (see footnote 1), which largely determined how government and other people treated them in the CR period. The normally “advantaged" types of parental occupation became “inferior" ones during the CR, and that may have made it difficult for people who were in the in school during the CR to obtain more education. This subsection discusses the impact of the father's and grandfather's occupations on child's educational attainments. We re-estimate equations (2), (4), (5), (6), and change the main explanatory variables to be dummies for four types of parental

occupations: 1. Principal[11], manager, technician or professional; 2. Clerk, commercial and service personnel; 3. Farmers or manufacturing related personnel; 4. Other types of occupations. We also include their interactions with the CR.

Estimates of the association between child's educational attainment and father's occupation, and between child's educational attainment and grandfather's occupation are shown in Tables A15 and A16. In appendix Table A15, we find a pattern similar to that of the educational measure in Table 3, that having a higher-status occupation father helps in obtaining high school and college degrees. Also, when children were affected by the CR, the advantage of having a father with a higher-status occupation on educational attainment was significantly reduced. A difference between the results in appendix Table A15 and Table 3 is that we observe a significant decline in the advantage of having a father who was in the second and the third occupational categories. This may suggest that the policies related to family backgrounds in the CR were more closely tied to parental occupation than parental educational level.

In appendix Table A16, we study the impact of grandfather's occupation on child's educational attainment. Having a grandfather who held a higher-status occupation helps a grandchild in obtaining both high school and college degrees. However, we find that having a grandfather who worked as clerk or commercial personnel helped a grandchild to obtain a high school or a college degree more than having a grandfather who was a manager or technician. But the advantage of having a grandfather who was a clerk or commercial personnel was significantly decreased if the father's generation was affected by the CR. This result is different from our conclusion using education as proxy for grandfather's status, suggesting that the transmission of grandfather's

[11] In the CHIP survey, the principal includes school principal, company principal, and government officials.

advantage to grandchild was significantly reduced for people with a father who worked as a clerk or in commercial activities.

6.2 The Intergenerational Educational Association between Mother's Schooling and Child's Education

Some studies, such as Heckman et al. (1986), Schultz (1994) and Thomas et al. (1996) have found that mother's schooling is more important for children than the father's schooling, Other studies, like Behrman and Rosenzweig (2002), suggest that the observed association between the mother's schooling and the children' achievement may due to heritability and assortative mating. In this section, we use the CHIP sample to analyze the impact of the mother's schooling on high school and college degree attainment, the effects of the CR, and the role of assortative mating in explaining the relationship in equations (7)-(9).

The estimation results using equations (7), (8) and (9) are reported in appendix Table A17. We observe similar effects of mother's schooling and father's schooling on high school and college degree attainment. When we control for both father's and mother's education, we see that each of their coefficients declines about 40%. Hence, the importance of assortative mating is similar in explaining observed effects for fathers and mothers. However, the decrease of the advantage of having a more educated mother on college degree attainment in the CR is mainly because those with more educated mothers are more likely to have more educated fathers—and it is father's education that experiences a penalty during the CR. The different effects of the CR for mother's and father's schooling is likely related to policies during the CR, which directly targeted people with higher status fathers rather than higher status mothers.

7. Conclusion

In this paper, we study the impact of the Cultural Revolution on intergenerational educational mobility, multi-generational mobility and analyze the mechanisms behind it. Using survey data that covers both urban and rural population in China and weighting it to be geographically representative at the national level, we obtain more reliable estimates than previous studies. We confirm the results in Chen et al. (2015) that the intergenerational educational mobility exhibits an inverted U-shape pattern in 20th Century China, with the highest mobility occurring for those who received education in the years of radical change in the educational system.

We study the impact of the CR on high school and college degree attainment and how the impact differed across levels of parental education. We find that the advantage of having a high school educated father on the probability of obtaining a high school or college degree was reduced by 2 percentage points for every additional year the child's schooling was affected by the CR. The decrease in the advantage of having a father with at least a high school degree is greater for people who grew up in rural areas. The negative impact of the CR on educational achievement is smaller for people from traditionally disadvantaged family background who grew up in rural areas, due to the school expansion in rural areas. Although the CR decreased the advantage of having an educated father on child's educational attainment, the advantage of having an educated father was not eliminated.

We decompose the process of obtaining a college degree to that of obtaining a high school degree, participating in the College Entrance Exam (CEE), and obtaining a high CEE score. We find that the advantage of having a more educated father helps a person in obtaining a college degree through each of these steps, although a portion of the effect seems to be independent of them.

We also study the impact of the CR on the multi-generational transmission of educational achievement. Grandfather's schooling has a direct positive impact on grandchild's educational attainment. Having a father who received his education in the CR did not reduce the advantage of having an educated grandfather on grandchild's education. Interestingly, we find that the longer a father received education in the CR, the higher is the probability of his children obtaining a college degree.

The CR benefited people whose fathers worked as farmers or manufacturing workers in obtaining college degrees, but reduced the advantage of having a father with traditional "better occupations". We also estimate the effect of maternal schooling on children's educational attainments. Assortative mating explains about a third of the observed effect of either paternal or maternal education on the child's educational attainment. We do not observe any significant decline in the advantage of having an educated mother for those affected by the CR after controlling for father's schooling.

The Cultural Revolution was marked as a radical change in China's educational system. It shut down many educational resources and decreased the quality of education, but it also provided new educational opportunities to rural children and children from traditionally disadvantaged family backgrounds. Previous to the CR, most people in China were illiterate, as only those from higher socioeconomic family backgrounds could afford education. Therefore, the destruction of the previous educational system in the CR had large negative impacts on those from what had been more privileged family backgrounds, but had little impact for most others. Meanwhile, the policies in the CR benefited people in rural areas and those from poor family backgrounds, increasing their access to education, providing a level of opportunity that was nearly impossible before the CR.

Acknowledgement

I would like to give special thanks to my advisor, Peter Mueser, for providing many valuable comments to this paper. I would also thank Cory Koedel, Saku Aura, Oded Gurantz, and Jan Stuhler for sharing their comments on the paper with me. I would thank the department of economics at the University of Missouri for providing a grant to me to conduct this research.

Reference

Andreas, Joel. *Rise of the Red Engineers: The Cultural Revolution and the Origins of China's New Class*. Stanford University Press, 2009.

Behrman, Jere, and Paul Taubman. "Intergenerational Earnings Mobility in the United States: Some Estimates and a Test of Becker's Intergenerational Endowments Model." *The Review of Economics and Statistics* (1985): 144-151.

Behrman, Jere R., and Mark R. Rosenzweig. "Does Increasing Women's Schooling Raise the Schooling of the Next Generation?" *American Economic Review* 92.1 (2002): 323-334.

Björklund, Anders, Markus Jantti, and Gary Solon. "Influences of Nature and Nurture on Earnings Variation." *Unequal Chances: Family Background and Economic Success*, edited by Samuel Bowels et al., Princeton University Press, 2005, pp. 145-164.

Chen, Yuyu, Suresh Naidu, Tinghua Yu, and Noam Yuchtman. "Intergenerational Mobility and Institutional Change in 20th Century China." *Explorations in Economic History* 58 (2015): 44-73.

China Institute for Income Distribution. (2014). Chinese Household Income Project, 2013 [data file with permission]. Retrieved from http://www.ciidbnu.org/chip/chips.asp?year=2013.

Clark, Gregory. *The Son Also Rises: Surnames and the History of Social Mobility*. Princeton University Press, 2015.

Dahl, Gordon B., and Lance Lochner. "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit." *American Economic Review* 102.5 (2012): 1927-56.

Deng, Zhong, and Donald J. Treiman. "The Impact of the Cultural Revolution on Trends in Educational Attainment in the People's Republic of China." *American Journal of Sociology* 103.2 (1997): 391-428.

Du, Fang Cai Yang. "Destructive Effects of Cultural Revolution on Physical and Human Capital." *China Economic Quarterly* 3 (2003): 2.

Giles, John, Albert Park, and Meiyan Wang. "The Great Proletarian Cultural Revolution, Disruptions to Education, and the Returns to Schooling in Urban China." *Economic Development and Cultural Change* 68.1 (2019): 131-164.

Han, Dongping. "Impact of the Cultural Revolution on Rural Education and Economic Development: The Case of Jimo County." *Modern China* 27.1 (2001): 59-90.

Heckman, James J., and V. Joseph Hotz. "An Investigation of the Labor Market Earnings of Panamanian Males: Evaluating the Sources of Inequality." *Journal of Human Resources* (1986): 507-542.

Lucas, Robert EB, and Sari Pekkala Kerr. "Intergenerational Income Immobility in Finland: Contrasting Roles for Parental Earnings and Family Income." *Journal of Population Economics* 26.3 (2013): 1057-1094.

Ma, Jiantang, et al. *China Statistical Yearbook 2013*. China Statistics Press, 2013. Web (in Chinese). Accessed May 8, 2018. http://www.stats.gov.cn/tjsj/ndsj/2013/indexch.htm.

Ma, Jiantang, et al. *Population Census of the P.R.C. 2010*. Office of Population Census at the State Council of P.R.C. and Department of Population and Employment Statistics National Bureau of Statistics of P.R.C., 2011. Web (in Chinese). Accessed May 8, 2018. http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm.

Mazumder, Bhashkar. "Sibling Similarities and Economic Inequality in the US." *Journal of Population Economics* 21.3 (2008): 685-701.

Meng, Xin, and Robert Gregory. (2007) *Exploring the Impact of Interrupted Education on Earnings: The Educational Cost of the Chinese Cultural Revolution*. IZA Discussion Paper No. 2548. https://www.iza.org/publications/.

Zhu, Zhixin, et al. *Population Census of the P.R.C.*, 2000. Office of Population Census at the State Council of P.R.C. and Department of Population and Employment Statistics National Bureau of Statistics of P.R.C., 2001. Web (in Chinese). Accessed May 8, 2018. http://www.stats.gov.cn/tjsj/pcsj/rkpc/5rp/index.htm.

Ridge, John M. "Three Generations." *Mobility in Britain Reconsidered*, Clarendon Press, 1974, pp. 47-71.

Roland, Gerard, and David Y. Yang. (2017) *China's Lost Generation: Changes in Beliefs and Their Intergenerational Transmission*. No. w23441. National Bureau of Economic Research. https://www.nber.org/papers/w23441.

Schultz, T. Paul. "Human Capital, Family Planning, and Their Effects on Population Growth." *The American Economic Review* 84.2 (1994): 255-260.

Solon, Gary. "A Model of Intergenerational Mobility Variation over Time and Place." *Generational Income Mobility in North America and Europe*, edited by Miles Corak, Cambridge University Press, 2004, pp. 38-47.

Solon, Gary. "What Do We Know So Far about Multigenerational Mobility?" *The Economic Journal* 128.612 (2018): F340-F352.

Stuhler, Jan. (2012) *Mobility across Multiple Generations: The Iterated Regression Fallacy*. IZA Discussion Paper No. 7072. https://www.iza.org/publications/dp/7072/mobility-across-multiple-generations-the-iterated-regression-fallacy.

Thomas, Duncan, Robert F. Schoeni, and John Strauss. (1996) *Parental Investments in Schooling: The Roles of Gender and Resources in Urban Brazil*. Labor and Population Program, No. 96-02. https://www.rand.org/pubs/drafts/DRU1303.html.

Warren, John Robert, and Robert M. Hauser. "Social Stratification across Three Generations: New evidence from the Wisconsin Longitudinal Study." *American Sociological Review* (1997): 561-572.

Zeng, Zhen, and Yu Xie. "The Effects of Grandparents on Children's Schooling: Evidence from Rural China." *Demography* 51.2 (2014): 599-617.

Zhang, Junsen, Pak-Wai Liu, and Linda Yung. "The Cultural Revolution and Returns to Schooling in China: Estimates Based on Twins." *Journal of Development Economics* 84.2 (2007): 631-639.

Zhou, Dong. "The Long Term Impacts of the Cultural Revolution on Economic Performance of Urban Residents in China." *University of California, Riverside,* Sep. 2014. https://economics.ucr.edu/wp-content/uploads/2019/10/Dong-Zhou-paper-for-10-6-14-seminar.pdf.