

The Impact of Interrupted Education on Subsequent Educational Attainment: A Cost of the Chinese Cultural Revolution*

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I. Introduction

Schooling is usually thought of as a continuous process, with students progressing directly from one year of schooling to the next, but this is not always the case. Many students choose to leave school, only to return later.¹ Extreme circumstances, such as war, natural disasters, or political upheavals, however, mitigate individual choice; interrupted education may be widespread, and an entire generation may be affected. These abnormal situations are especially common in developing countries.

Very little is known about the impact of these events on subsequent educational attainment. To what extent do individuals offset such educational lacunae? After the interruption, are they able to acquire much the same level of education as they would have otherwise? At which level of schooling is interruption most serious? Is the relationship between missing schooling and subsequent education attainment linear, so that missing 3 years of schooling is three times more serious than missing 1 year? There is a large unexplored research agenda here that is of special significance for the development and education literature.

One of the largest interruptions to the usual educational process occurred during the Chinese Cultural Revolution, when most schools in urban China ceased regular operation for 6 years. Universities stopped normal student recruitment for an even longer period of time. The 11 years of the Cultural Revolution, 1966–77, affected the formal education of a whole generation of young people. This article examines the extent to which individuals were able to overcome this interruption and proceed to acquire a university degree. It also explores the points at which interruption matters most in the educational process and examines the characteristics of those individuals who were most successful in overcoming the educational upheaval.

The article is structured as follows: Section II provides the background. Section III presents the model specifications and describes the data. Section IV analyzes the empirical results. Conclusions are given in Section V.

II. Background

After the Chinese Communist Party came into power, China was in constant political turmoil until economic reform started in 1978. The Cultural Revolution, which started in 1966 and lasted for 11 years, was one of the most tumultuous political upheavals. At the beginning of the Cultural Revolution, all schools in urban China were closed for about 2–3 years. No teaching was carried out, and no new students were recruited.²

Schools were reopened during 1968–69 so that those who would have completed primary school during 1966–68 could go on to high school and children ages 7–9 could begin primary school. However, teachers were not allowed to follow the standard curriculum. Instead, students were to learn farming and manual labor from workers and peasants. Students spent most of their school time going to factories and the countryside to do manual work. Those of normal graduation age for junior high school or senior high school were given diplomas even though they had missed a traditional junior high or senior high education. Some of them were then sent to the countryside to become peasants, and others were given factory jobs or similar employment in the city. Junior high school graduates were not allowed to proceed to senior high school. This situation continued until about 1972, when the standard school curriculum was resumed gradually, although factory work and farmwork were retained as important parts of the curriculum, especially in high schools. At about the same time, senior high schools gradually began to recruit students.

Universities were closed from 1966 to 1970–71, during which time neither recruitment nor teaching took place. Those who entered the university before the Cultural Revolution and had not completed their degrees were allowed to stay there without formal teaching until 1970–71. They were then given a university degree and assigned jobs. Most of this group became schoolteachers, factory workers, or members of the army.

After 1970–71, universities began restricted recruitment based on the political attitudes of the student or family background rather than on academic merit.³ New students were drawn only from those who were workers, peasants, or soldiers. No senior high school graduates could go to college directly. The quality of university education dropped dramatically as a result of the lowered average preparation of incoming students and the lack of qualified lecturers and professors, many of whom had been sent to the countryside for reeducation.

The quality of university education and the preparedness of incoming students did not improve until 1977, when, after 11 years, universities resumed entrance exams and began recruiting on academic merit. Everyone who had missed their normal entrance point for a university education because of the Cultural Revolution was entitled to take the exams. Thus, candidates from

over 11 years before began to compete with new senior high school graduates for the limited number of spaces. This lasted for 4 years until 1981 when those who were older than age 25 were barred from university admission.

There are two other types of tertiary education degrees in China apart from the formal 4-year full-time degree: a 3-year full-time degree and a degree by correspondence (via television or night schools). Because a full-time 3-year degree is not distinguished from a degree by correspondence in most Chinese statistics, they are combined in one group in this article and designated "semidegree." Access to 3- and 4-year degrees was limited in much the same way during the Cultural Revolution. The correspondence degree, however, did not become available until after the Cultural Revolution.

After the Cultural Revolution ended, individuals who missed their opportunity to study at the university level were also allowed to acquire a semidegree. The entrance exam for the semidegree, however, is much easier than that for the formal degree, and the acquisition of a semidegree required a shorter time commitment (3 years). In addition, the maximum age limit for students who wished to enroll in a formal degree program, which was imposed 4 years after the Cultural Revolution, did not apply to the semidegree. For these reasons, the observable impact of the Cultural Revolution on students' acquisition of the two types of degrees may be different.

As a result of the Cultural Revolution, a whole generation experienced a disrupted education. Conceptually, there were three distinct effects: school years were missed, school years were completed without normal curricula, and university access was delayed beyond the normal age. Our research indicates that "missed schooling" and "at school but not under normal curricula" had a similar impact on subsequent educational achievement. Consequently, we combine the two effects and refer to them as "school years missed."

Table 1 presents the level of school years missed for each age group and the age at which university entrance was a possible choice for the age group. Several points should be noted while reading this table. First, the columns entitled "number of years missed" combine both the number of years of schooling missed and the number of years of schooling without normal curricula. Second, because senior high schools reopened in September 1972, individuals between the ages of 3 and 10 in 1966 could attend senior high school even though they had missed some primary and junior high school.

Table 1 indicates that, overall, 16 age groups were affected—those between 3 and 19 years of age when the Cultural Revolution began. The cohorts who missed the most schooling are those who were at year 4–5 (ages 11–12) in 1966.

The delay in the university entry age is indicated in column 2 of table 1, which lists the age at which each cohort had the first opportunity to take a university entrance exam. Those who had just finished senior high school in 1966 did not miss any schooling, but they could not go to college until 11 years later. Their first opportunity to take the university entrance exam came when they were 31 years of age. For those at age 7 in 1966, there was

TABLE 1

THE CULTURAL REVOLUTION AND INTERRUPTED EDUCATION FOR DIFFERENT AGE GROUPS

Age in 1966	Years of Schooling in 1966 (1)	University Entry Age (Age in 1978) (2)	Number of Years Missed in Primary School (3)	Number of Years Missed in Junior High (4)	Number of Years Missed in Senior High (5)
3		18	1		
4		18	2		
5		18	3		
6		18	4		
7		19	5		
8	1	20	5	1	
9	2	21	4	2	
10	3	22	3	3	
11	4	23	2	3	3
12	5	24	1	3	3
13	6	25	0	3	3
14	7	26		2	3
15	8	27		1	3
16	9	28		0	3
17	10	29			2
18	11	30			1
19	12	31			0

SOURCE.—Authors' own estimates.

a 1-year gap between leaving senior high school and the opportunity to take the university entrance exam.

Figure 1 illustrates the impact of the Cultural Revolution on the percentage of individuals by age, on the basis of the 1990 census data, who hold degrees and semidegrees. The figure indicates a marked effect on the percentage of individuals holding formal degrees, but the effect on the percentage of individuals with semidegrees is not noticeable. Those who missed most of their junior and senior high school years suffered the most in terms of failing to acquire a formal degree. On average, in 1990, 1.1% of the group ages 22–60 possessed a university degree. But for the Cultural Revolution cohorts who missed both junior or senior high school years (those ages 35–39 years in 1990), the average incidence of students holding formal degrees is 0.40%, less than half of the total average. The least-affected cohort appears to be those students who missed primary school only and who completed all schooling but faced a delay of 11 or more years before having access to a university entrance exam. The average incidence of students with degrees for these groups is 0.87 and 0.88, respectively. These two groups not only missed the least number of years of schooling but also undertook most of their schooling before or after the Cultural Revolution when the quality of education was normal.

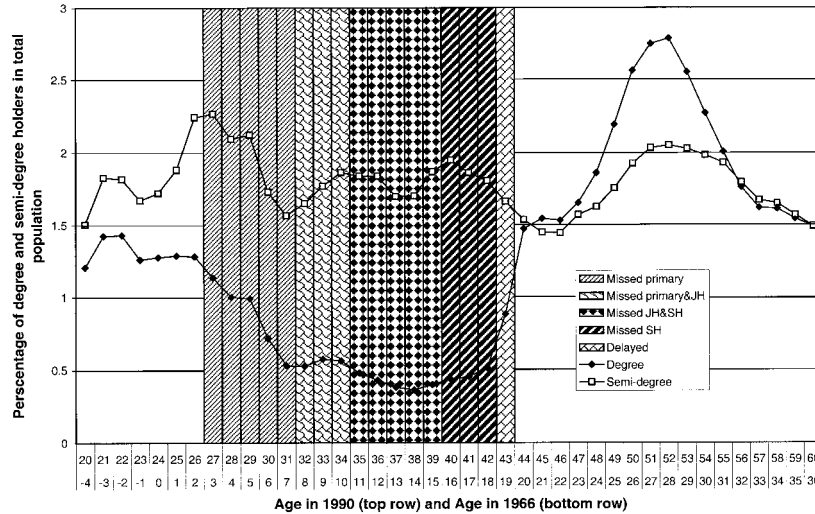


FIG. 1.—Percentage of students holding formal degrees and semidegrees by age, 1990. Source: State Statistical Bureau of China, *Population Statistical Yearbook* (Beijing: China Statistical Publishing House, 1994).

III. Model Specification and Data

Our focus is on the impact of the Cultural Revolution on individuals' subsequent acquisition of a formal university degree or a semidegree. The decision to acquire a degree or semidegree can be derived from a model of education demand.⁴ Individuals maximize their intertemporal utility, subject to a budget constraint, a human capital production function, and a time constraint. They evaluate the present value of the marginal cost of obtaining a formal degree or semidegree against the present value of future marginal benefits.

Within this general framework there are three issues of special concern. The first issue is whether there were positive returns to obtaining a university degree and semidegree during the late 1970s and early 1980s when the Cultural Revolution cohort was making education decisions. This is important in understanding why some individuals of the Cultural Revolution cohort chose to take the university entry exams when they were in their late twenties and early thirties.

To address the role of education returns properly, we need to provide an overview of the impact of the economic reform initiated in the late 1970s on the labor-market operation in China. Before the economic reform, wages in urban China were administratively determined. The factors taken into consideration when wages were determined were age, level of education, region of residency, occupation, and industry. Thus, even though returns to education were lower than in Western labor markets, they were statistically always significantly positive.⁵ This situation changed very little in the first decade of the economic reform.⁶ The earliest data available, from 1981, suggest that at

that time the returns were 29% and 22% for a formal degree and a semidegree, respectively. The rate for the formal degree increased slightly to 31% by 1987, while it was unchanged for the semidegree.⁷ It was not until the late 1980s that market forces began to influence employment and wage determination in urban China. Since then, the return on education has increased significantly.⁸

The second issue of concern is that the Cultural Revolution cohort missed schooling at different stages; thus, there is considerable variation in the amount of education acquired prior to making the decision to prepare for the university admission exam. This may affect both the cost and benefit of obtaining a degree or semidegree.

On the cost side, missed schooling is important for two reasons. First, university places were rationed by competitive examinations. Consequently, those whose previous education was interrupted the most, and at the more important stages of knowledge acquisition, needed to invest more to acquire the necessary knowledge for university admission. They faced a higher investment cost. Second, the number of years and the level of school interruption may also affect the individual's ability to acquire new knowledge at the university and hence affect the investment of time required there. These effects, however, may be less obvious for the acquisition of a semidegree, as the admission to a semidegree program is much easier. On the benefit side, missed schooling may affect the quality of a university education and, therefore, reduce future earnings.

The third issue is the age at which university entry is a feasible choice that affects both future benefits and cost of degree acquisition. Most Cultural Revolution cohorts could not take the university entrance exam until they were in their mid- or late twenties or early thirties. There are three special cost effects. It is possible that knowledge obtained previously would have deteriorated after years of work in the countryside or the factories. This implies that more time and effort would be needed to prepare for the entrance exam. In addition, those with the longest period of delay were more likely to have family responsibilities. The opportunity cost of time, therefore, is expected to be higher the longer the delay period. This effect may be more important for women than for men. Finally, forgone earnings for older individuals who decide to enter the university may be higher than for new senior high school graduates. On the benefit side, the older the individual when university entry is a choice, the shorter the length of time after obtaining a university degree to collect future returns.

These effects may be different for semidegree acquisition. A degree by correspondence requires less effort and can be obtained while an individual is still working full time. Thus, we expect less impact of delayed entry on semidegree acquisition.

Each of the above needs to be included in the decision-making process. In addition, innate ability and parental background will also affect the cost and benefit of investment in university education.

Thus, the reduced form of the probability of individual i obtaining a university degree can be written as:

$$\begin{aligned} & \text{Prob}(E_i = \text{edu}_j) \\ & = f_i(Y_i, \text{uniage}_i, \text{Parent}_i, \text{Msch}_i, W_i, F_i, \text{Abil}_i, P^E X_i^E), \end{aligned} \quad (1)$$

where

edu_j is the choice of formal degree, semidegree, or no degree;
 Y_i is individual i 's expected future earnings;
 uniage_i is i th individual's age at which university entry is a feasible choice;
 Parent_i is individual i 's parental background;
 Msch_i is number of years and level of schooling missed by individual i ;
 W_i is the amount of forgone earnings incurred for individual i ;
 F_i is the loss in time for individual i to meet family responsibilities;
 Abil_i is individual i 's innate ability;
 P^E is an average price for all goods and services purchased by individual i for the purpose of further education; and
 X_i^E is all goods and services purchased by individual i for the purpose of further education.

Given that individuals have a choice between obtaining a formal 4-year university degree or a semidegree, where neither is conditional on the other, the reduced-form econometric model used to estimate educational attainment is a multinomial logit model. This model is used to estimate the way in which different variables affect the probability of individual i choosing to acquire education j .

The decision to proceed to the university level during normal times is conditional on obtaining a senior high school diploma, which, in turn, depends on earlier junior high school and primary school educational attainment. However, when the universities reopened after the Cultural Revolution, everyone whose education was interrupted by the Cultural Revolution, including those with only a junior high school education, had the chance to take the university entrance exam. Thus, for the Cultural Revolution cohort, the completion of senior high school was not a university entry requirement. Consequently, we group junior high and senior high school graduates together.⁹

Data used in this study are from two surveys. The first is the 1988 Urban Income Distribution Survey (UIDS), conducted by the Institute of Economics at the Chinese Academy of Social Sciences in 1989. The second is the 1995 Shanghai Residents and Floating Population Survey (RFPS), conducted by the Institute of Population Studies at the Shanghai Academy of Social Sciences.

The 1988 UIDS is a nationwide survey, but the variables included in the

questionnaire are limited. In particular, parental background information, which is important to this study, is not available.¹⁰ The 1995 Shanghai RFPS has much richer information on individual and parental characteristics, but the sample covers one region only—Shanghai—and the sample size is relatively small (less than 3,000). We use both data sets to examine whether the results from both samples reinforce each other.

According to equation (1), the vector of exogenous variables should include the individual's expected future earnings, university entry age, parental background, interrupted schooling, forgone earnings, family responsibilities, innate ability, and the direct cost of education. Given the lack of data, the variables of forgone earnings, the direct cost of education, and innate ability are not included in the empirical work. In addition, expected earnings are not available either. The decision to obtain a formal university degree or a semidegree was made in the late 1970s to early 1980s. Over the next 2 decades, the wage structure changed gradually, and it is impossible to measure expected future earnings at that time by current earnings information obtained from the 1988 and 1995 data sets. Nevertheless, expected earnings at the time of decision making may be proxied by university entry age and gender variables, as they in many ways determine individuals' future earnings.

The impact of the Cultural Revolution is captured by the level of schooling missed and "university entry age," which measures the lapsed time or the delay before possible university entrance. The Cultural Revolution variables require more discussion.

The variable university entry age is defined as the age at which an individual could first take the university entrance exam. This variable is defined as 18 years for the non-Cultural Revolution cohorts. For Cultural Revolution cohorts, it is set equal to an individual's age in 1978, when university entry first became a feasible choice.

It is apparent from table 1 that, with the exception of two age groups, there is an overlap between the variable university entry age and the level and years of schooling that an individual missed. One age group, for which there is no overlap, comprises individuals who missed 4 or fewer years of primary schooling. This group had just graduated, or was about to graduate, from senior high school when the university reopened for recruitment based on academic merit. Thus, for this group, there is no university delay, and university entry age is the same as for the non-Cultural Revolution cohort, namely, 18 years, although members of this group missed up to 4 years of primary schooling. Likewise, there is no overlap between university entry age and missed schooling for the group who completed 12 years of education before the Cultural Revolution started. This group missed no schooling, but there was a substantial delay, as they did not have an opportunity to go to the university until they were 31 years old.

For all other age groups, there is an overlap between schooling missed and university entry age.¹¹ This overlap means that the degree of correlation between university entry age and schooling missed may make it infeasible to

include both variables in the estimated equations. Consequently, we report two sets of equations, one that includes university entry age only and the other that includes a set of dummy variables to measure the level of schooling missed. In each instance, each variable will inevitably capture some of the effects associated with the other.

When university entry age is the included variable, it may represent the following effects related to years and levels of schooling missed: if both the length and the level of school interruption contribute to the probability of university entry, then it might be expected that those who missed only primary school or only senior high school education might have a better chance to gain admission to the university than those who missed both junior and senior high school. Thus, university entry age may have a U-shaped relationship, with the middle group representing the longest and more important stage of previous schooling missed. University entry age may also capture the effect of a delayed university entry, as discussed previously. These delay effects suggest a negative (downward sloping) relationship between university entry age and the probability of acquiring a university degree. The result depends on whether the missed schooling effect (U-shaped) or the delay effect (downward sloping) dominates.

As an alternative to university entry age, we generated dummy variables for each school level missed to identify the relative importance of different levels of schooling. The dummy variables are missed primary school only, missed both primary school and junior high school, missed both junior high school and senior high school, and missed senior high school only. We also included a dummy variable for those who were in the last year of senior high school when the Cultural Revolution started. This last group did not miss any schooling, but their possible university entry time was delayed for more than 11 years.

In addition to university entry age, the effect of family responsibilities on degree attainment can also be captured by a dummy variable to measure gender and a dummy variable for whether individuals were married before they had a chance to enroll in a university. The gender variable is available for both data sets, but the marriage variable is available only for the 1995 data set.

Parental background information in the 1995 data includes both parents' years of schooling, occupations, and party membership status. To eliminate the possibility of multicollinearity, we restrict these variables in the regression to the mother's years of schooling, a group of dummy variables for the father's occupation, and one for the father's party member status.

In most countries, the proportion of individuals holding degrees is positively correlated with age, after standardizing for other effects. Many degree holders do not go to college directly after high school graduation, and, as a result, university degree acquisition increases with the age of the cohort. In China, education policy and other political and social changes also may be associated with particular age groups, as is evident in figure 1. Thus, age is

included in the estimated equation to measure possible cohort effects. In addition, regional dummy variables are included to capture variation in previous school quality across regions and other regional effects. Ideally, one would like to use a “place of birth” variable, but this is not available in the 1988 data. However, as there was little labor mobility in China before the 1990s, an individual’s current place of residence may be a close proxy for birthplace. For the 1995 data, the place of birth variable is used.

The sample used to estimate the educational attainment model for 1988 data includes individuals who were ages 22–60 and held at least a junior high school diploma. Current students were excluded. The total sample size is 14,904 individuals. Among them, 53% are men, 6.8% hold formal degrees, and 7.4% hold semidegrees. The average age is 37 years. To be consistent with the 1988 data, the sample for 1995 excludes rural migrants and those who held less than a junior high school diploma. The 1995 total sample size is 2,251 individuals, of whom 51% are males, 7.7% hold formal degrees, and 7% hold semidegrees.¹²

IV. Empirical Results

The results of the multinomial logit estimation based on the 1988 and 1995 data are presented in tables 2 and 3. The comparison group is high school (junior and senior) graduates. The estimated results indicate the determinants of the probability of an individual with a high school diploma acquiring either a degree or a semidegree.

As parental background variables contribute significantly to educational attainment, the explanatory power of the model is better for the 1995 data. Nevertheless, even though the 1988 data exclude parental background data, the estimated educational attainment effects of the Cultural Revolution are broadly consistent across both data sets.

A. University Degree Attainment

For both data sets, age has a positive and significant effect on the probability that an individual will acquire a degree. This may reflect normal delays between high school graduation and obtaining a degree. It may also reflect the history of China’s education policy. Between 1950, when the Communist Party came to power, and before the Great Leap Forward, university recruitment increased markedly and, relative to the population, degree acquisition reached levels that have not been repeated (fig. 1).

The most important variables for our purposes are university entry age and the dummy variables that measure years of missed schooling. The university entry age variable has a strong U-shaped relationship with the probability of an individual acquiring a formal 4-year degree (fig. 2). Earlier we suggested that this variable would represent a combination of a U-shaped relationship measuring the effect of the number of years and a different stage of schooling missed, and a downward-sloping relationship measuring the effect of delayed university entrance. The fact that the U-shaped relationship is

TABLE 2
MULTINOMIAL RESULTS OF EDUCATIONAL ATTAINMENT, 1988

VARIABLES CONTRIBUTING TO DEGREE ACQUISITION	DEGREE HOLDERS			SEMIDEGREE HOLDERS		
	Coefficient	Marginal Effect	<i>t</i> -Ratio	Coefficient	Marginal Effect	<i>t</i> -Ratio
Specification 1:						
Age	.036	.004	10.346	-.001	-.001	-.350
University entry age	-.582	-.069	-4.088	-.221	-.013	-1.989
University entry age ²	.012	.001	3.796	.005	.000	2.090
Dummy for males	.901	.102	12.478	.613	.047	9.540
Beijing	.704	.081	4.743	.410	.030	2.703
Shangxi	.111	.012	.801	.135	.012	1.044
Liaoning	.211	.018	1.536	.468	.044	3.873
Anhui	.090	.011	.622	.026	.001	.190
Henan	.217	.022	1.637	.290	.026	2.333
Hubei	.104	.004	.751	.536	.053	4.494
Guangdong	.179	.025	1.339	-.175	-.021	-1.271
Yunnan	-.093	-.011	-.626	-.056	-.004	-.398
Gansu	.373	.065	2.549	-1.127	-.121	-4.806
Constant	2.324	.297	1.400	-.461	-.086	-.354
Number of observations			14,904			
Pseudo <i>R</i> ²			.05			
Specification 2:						
Age	.030	.003	6.892	.001	.0003	.236
Missed primary school	-.336	-.031	-2.259	.054	.010	.432
Missed primary and junior high	-.427	-.038	-2.933	-.016	.004	-.127
Missed junior and senior high	-.721	-.065	-6.113	.017	.011	.179
Missed senior high	-.520	-.049	-4.114	.146	.022	1.403
Delayed university entry	-.331	-.032	-1.653	.162	.022	.921
Dummy for males	.901	.073	12.481	.612	.055	9.527
Beijing	.716	.059	4.822	.410	.036	2.699
Shangxi	.109	.008	.786	.139	.014	1.072
Liaoning	.210	.013	1.528	.468	.048	3.865
Anhui	.089	.008	.621	.029	.002	.212
Henan	.221	.016	1.667	.293	.029	2.357
Hubei	.102	.003	.737	.538	.057	4.514
Guangdong	.182	.018	1.360	-.171	-.021	-1.243
Yunnan	-.094	-.008	-.634	-.055	-.005	-.395
Gansu	.366	.047	2.502	-1.121	-.126	-4.779
Constant	-4.147	-.336	-17.786	-2.945	-.267	-13.177
Number of observations			14,904			
Pseudo <i>R</i> ²			.05			

SOURCE.—Authors' own estimates.

NOTE.—Marginal effects in this table are computed at the variable mean for continuous variables; for the dummy variables, it is calculated at male = one, Beijing = one, missing primary school = one.

TABLE 3
MULTINOMIAL RESULTS OF EDUCATIONAL ATTAINMENT, 1995

VARIABLES CONTRIBUTING TO DEGREE ACQUISITION	DEGREE HOLDERS			SEMIDEGREE HOLDERS		
	Coefficient	Marginal Effect	<i>t</i> -Ratio	Coefficient	Marginal Effect	<i>t</i> -Ratio
Specification 1:						
Age	.035	.001	3.905	.037	.003	3.355
University entry age	-2.066	-.090	-5.129	-.548	-.032	-1.733
University entry age ²	.043	.002	4.955	.013	.001	1.838
Mother's years of schooling	.107	.004	4.510	.100	.007	4.192
Father party member	.110	.002	.441	.742	.053	3.287
Father:						
Professional, technician	1.258	.053	4.665	.637	.041	2.154
Administrator, manager	.812	.034	2.367	.517	.034	1.476
Clerical	.797	.036	2.278	-.317	-.026	-.654
Dummy for males	.505	.019	2.878	.963	.068	5.058
Married before university entry available	-1.281	-.054	-2.894	-.776	-.051	-2.229
Shanghai	-1.083	-.047	-5.003	-.230	-.013	-.839
Jiansu	-.768	-.033	-2.421	-.181	-.010	-.458
Anhui	.276	.010	.477	.569	.040	.823
Constant	19.683	.870	4.329	.753	-.017	.205
Number of observations				2,251		
Pseudo <i>R</i> ²				.12		

Specification 2:

Age	.033	.002	3.432	.044	.003	3.312
Missed primary school	-.190	-.012	-.746	.326	.022	1.047
Missed primary and junior high	-1.253	-.071	-3.636	-.027	.003	-.088
Missed junior and senior high	-1.574	-.090	-4.477	.044	.009	.164
Missed senior high	-.401	-.026	-1.063	.675	.045	2.066
Delayed university entry	-.047	-.007	-.068	.965	.062	1.795
Mother's years of schooling	.108	.006	4.534	.102	.006	4.258
Father party member	.123	.004	.493	.723	.046	3.191
Father:						
Professional, technician	1.259	.069	4.659	.638	.036	2.152
Administrator, manager	.813	.044	2.364	.520	.030	1.482
Clerical	.788	.046	2.262	-.331	-.025	-.681
Dummy for males	.508	.025	2.895	.956	.059	5.019
Married before university entry available	-1.111	-.060	-2.619	-.787	-.046	-2.305
Shanghai	-1.056	-.059	-4.845	-.258	-.012	-.933
Jiansu	-.765	-.043	-2.413	-.182	-.009	-.459
Anhui	.237	.011	.409	.584	.037	.842
Constant	-3.466	-.174	-6.275	-5.415	-.334	-7.284
Number of observations				2,251		
Pseudo R^2				.12		

SOURCE.—Authors' own estimates.

NOTE.—The marginal effects are evaluated at the mean for each continuous variable used. For the dummy variables, the calculation is conducted at male = one, father's party member = zero, father's other job = one, married before university entry available = zero, and Shanghai region = one.

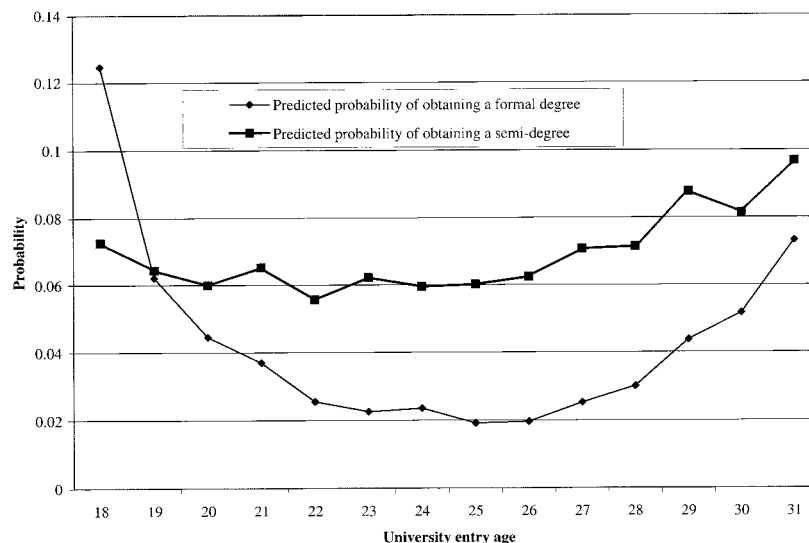


FIG. 2.—Predicted probability of being in the degree and semidegree categories by university entry age (1995 data). Source: Prediction obtained from table 3.

observed rather than a downward-sloping negative relationship indicates that the number of years and the level of previous schooling missed has a very strong effect on the probability of obtaining a formal degree and dominates the lapsed time effect.

We also attempted to estimate the effect of missed schooling and university delay separately by including in the regression the number of years of missed schooling and the number of years of delay before university entry (university entry age minus 18) for each age group in the Cultural Revolution cohort.¹³ The estimated results indicate that the delay effect is negative but not statistically significant. The missed schooling effect, on the other hand, contributes negatively and significantly to the probability of obtaining a university degree. The calculated marginal effect indicates that each year of missed schooling reduced the probability by about 1 percentage point. This analysis further confirms our results described above.

Which particular level of missed education contributes most to a reduced probability of acquiring a university degree? The U-shaped relationship associated with university entry age suggests that missed schooling mattered most for those between 23 and 26 years of age when the university entry exams were resumed in 1978. This is the group that missed the most years of junior and senior high school combined.

The model using dummy variables for school level missed reinforces this finding (bottom panels of tables 2 and 3). Those who missed both junior and senior high school education are estimated to have had the least chance of obtaining a formal degree. There are, however, minor differences across years.

The 1988 data indicate that missing school at every level reduced the probability of obtaining a formal degree. Missing primary schooling or delayed university entry, missing primary and junior high school, and missing senior high school reduced the probability by 3, 4, and 5 percentage points, respectively, whereas missing both junior and senior high school reduced the probability by 7 percentage points. The 1995 data suggest that missing both primary and junior high school as well as missing both junior high and senior high school mattered. Missed schooling at other levels is not statistically significant.

Family responsibilities at the time of the university entrance exam also mattered (1995 data). Being married before the university exams began reduced the probability of obtaining a formal degree by 5–6 percentage points. Time needed and spent on family responsibilities probably made it more difficult to put in the required study time to prepare for the exam.

In terms of parental background, it is observed that a higher level of mother's years of schooling contributes positively and significantly to individuals' probability of obtaining a formal degree; so does a higher level of father's occupational status. These results may capture the intergenerational transfer of innate ability and propensity for learning as well as family income effects. However, father's party membership does not seem to matter.

An obvious gender bias is observed. Men have a better chance of obtaining a degree. This may capture, in part, the effect of expected future earnings and, in part, a family responsibility component. To investigate the impact of gender further, the multinomial logit model is estimated for men and women, separately, for both data sets.¹⁴ The results for both men and women in both years reconfirm that those who missed junior and senior high school education had the least chance to acquire their university degrees. As expected, the most obvious difference between men and women is that being married before entering the university has a strong negative impact on a woman's probability of acquiring a university degree, but the effect is not statistically significant for men.

Finally, regional dummy variables capture both the difference in the quality of education across regions and other regional effects. The importance of Beijing is evident in the 1988 data as a large positive and significant coefficient. This may indicate that the regional variation in the quality of previous education matters in terms of subsequent educational achievement. For the 1995 data, the dummy variables for those born in Shanghai and Jiansu both exhibit a negative and significant effect, which might be regarded as surprising. However, given the lack of labor mobility for a long period, those who were born elsewhere and moved to Shanghai (not including Jiansu and Anhui, the two nearest provinces) are mostly highly skilled, and, therefore, the probability that this group had acquired a degree might be expected to be greater than those born in Shanghai. Among 242 individuals who belong to the category of "born elsewhere," 18% hold formal degrees and 9% hold semidegrees.

B. Semidegree Attainment

There are important differences between the determinants of the probability of acquiring a formal degree versus a semidegree. First, when the probability of acquiring a semidegree is considered, the effect of university entry age is statistically significant and exhibits a U-shaped relationship, but the effect is rather weak (see fig. 2). The model that directly measures missed and delayed schooling produces insignificant coefficients, with two exceptions for the 1995 data, which are the missed senior high school and delayed university entry dummy variables that produce positive and significant coefficients. This is an interesting result since we would have expected a negative coefficient.

Second, the role of parental background is different in the acquisition of the two types of degrees. In particular, the variable “father party member” has a positive and significant effect on obtaining a semidegree but has no effect on obtaining a formal degree.¹⁵ Many semidegree providers are night schools at factories or government departments, the places where fathers who are party members can more easily exert political influence.

Third, there is an obvious difference between men and women in the relationship between missing school and acquiring a semidegree. For men, missing school at every level for the 1988 data, and at some levels for the 1995 data, contributes positively to the probability of acquiring a semidegree, whereas for women the probability of acquiring a semidegree seems to be independent of whether any schooling was missed.

These three results prompt us to think that there may be a substitution between formal degree and semidegree attainments for the Cultural Revolution cohort. Given that the opportunity cost of obtaining a semidegree is much lower than the opportunity cost of obtaining a formal 4-year degree—that is, the academic entrance requirement is much lower, and the age restriction in obtaining a formal degree does not apply to obtaining a semidegree—substituting from formal degrees by working toward semidegrees seems to be a rational choice for the cohort. Hence, there is a positive association between missed schooling and obtaining a semidegree.

To investigate further the possible substitution effect, table 4 presents the difference in percentage of the two kinds of degree holders between the Cultural Revolution and non-Cultural Revolution cohorts. The 1988 data indicate that individuals holding formal 4-year degrees and semidegrees accounted for 4.5% and 8.2% of the subsamples for the Cultural Revolution cohort, respectively, but 9.3% and 6.6% for the non-Cultural Revolution cohort, respectively. Similar differences are found in the 1995 data. Such an obvious contrast suggests that the lower academic requirement, the shorter time commitment, and the lack of age restrictions for the semidegree have encouraged more people from the Cultural Revolution cohort to acquire this kind of degree instead of the 4-year formal degree.

To provide more detail on the size of the substitution effect, we plot the ratio of the predicted and actual percentages of those who hold 4-year degrees and those who hold semidegrees. The multinomial model is fitted to the

TABLE 4
 PERCENTAGE OF DEGREE- AND SEMIDEGREE HOLDERS FOR THE NON-CULTURAL REVOLUTION
 AND CULTURAL REVOLUTION COHORTS

Cohort	Sample Size (Persons)	Degree Holders (%)	Semidegree Holders (%)
1988:			
Non-Cultural Revolution cohort	7,713	9.3	6.6
Cultural Revolution cohort	8,565	4.5	8.2
1995:			
Non-Cultural Revolution cohort	947	11.2	5.7
Cultural Revolution cohort	1,501	4.5	6.9

SOURCE.—Authors' own calculation.

non-Cultural Revolution cohorts, using family background, region, and age variables.¹⁶ This model is then used to predict outcomes for the Cultural Revolution cohort on the assumption that the Cultural Revolution did not occur. This procedure is applied only to the 1995 data because of the lack of control variables in the 1988 data. Figure 3 presents the predicted to actual ratio for each type of degree by age group, where those ages 32–48 are the Cultural Revolution cohort. It is clear from the figure that, in comparison with the non-Cultural Revolution cohort, the Cultural Revolution cohort obtained far fewer formal degrees than they would have had the Cultural Revolution not occurred. By contrast, they obtained more semidegrees as compared with the non-Cultural Revolution cohort.

C. The Size of the Cultural Revolution Effect on the Incidence of Degree Attainment

To what extent has the educational achievement of the Cultural Revolution cohort been affected by interrupted schooling and university entrance delay? To answer this question we again utilize the multinomial model of educational acquisition for the non-Cultural Revolution cohort. The results obtained are used to predict the incidence of acquiring university degrees for the Cultural Revolution cohort on the assumption that the Cultural Revolution did not occur. The predicted results are summarized in table 5.

A comparison of predicted and actual outcomes for the Cultural Revolution cohort suggests that the number of individuals holding formal 4-year degrees would have been greater by 6 percentage points if the Cultural Revolution had not happened. There would have been 1.2 percentage points fewer individuals obtaining semidegrees for the Cultural Revolution cohort. If only Shanghai-born males are considered—to avoid any bias associated with skilled migration to Shanghai—the Cultural Revolution reduces university degree acquisition by 8 percentage points and increases semidegree acquisition by 2 percentage points.¹⁷

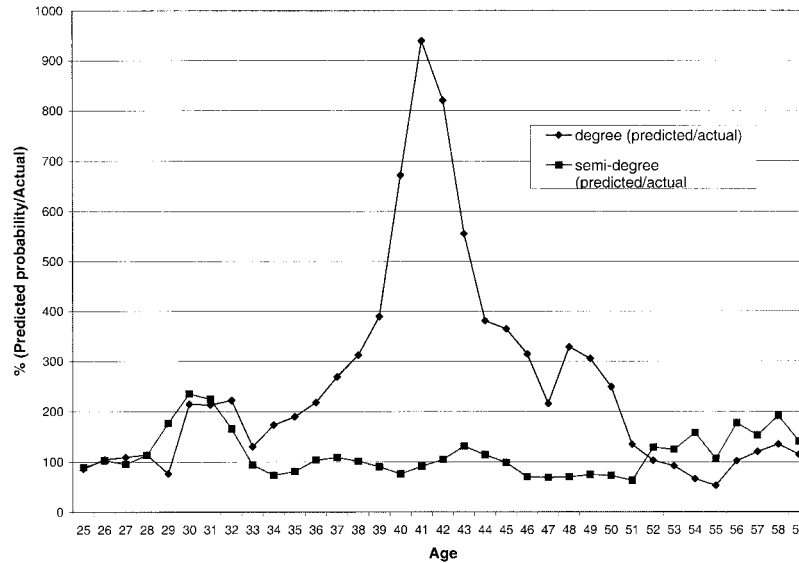


FIG. 3.—The substitution between the formal degree and semidegree for the Cultural Revolution cohort, 1995 (see n. 1). Source: Prediction obtained from regression results for the non-Cultural Revolution cohorts.

D. The Impact of the Cultural Revolution on Different Groups

The Cultural Revolution was a major attack on the Chinese educational system that was seen as maintaining social and economic gaps between the intelligentsia and educated groups, on the one hand, and workers and peasants, on the other. Did such a dramatic social upheaval equalize educational opportunities or, in relative terms, did it strengthen or weaken the ability of children from less-educated families to acquire university degrees?

Table 6 utilizes the results from the multinomial model fitted to the non-Cultural Revolution cohorts to predict degree acquisition for the Cultural Revolution cohort by socioeconomic background and by gender. The proportion of the group that might have been expected to attain a degree is listed as “predicted.” In the absence of the Cultural Revolution, the incidence of university degree acquisition for those whose mothers had completed primary and junior high school is estimated to be one-third of those whose mothers had completed senior high school and above. Similar results are apparent when the incidence of university achievement is classified by father’s educational level and mother’s and father’s occupational status. In China, as in the West, there is a strong family dependence effect that links the educational attainment of one generation to the next.

Table 6 also lists the observed or “actual” incidence of university degree completion for the different groups of the Cultural Revolution cohort. A comparison of the “actual” and “predicted” categories provides an estimate of the effect of the Cultural Revolution. As indicated earlier, all groups were

TABLE 5
ACTUAL AND PREDICTED PERCENTAGE OF DEGREE- AND SEMIDEGREE HOLDERS
BY COHORT, 1995

SAMPLE	TOTAL (%)		MALES (%)		FEMALES (%)	
	Actual	Predicted	Actual	Predicted	Actual	Predicted
Formal degree:						
Total sample:	7.69	11.74	9.19	13.61	6.11	9.77
Cultural Revolution cohort	4.46	10.55	5.39	12.10	3.51	8.95
Non-Cultural Revolution cohort	14.13	14.13	16.54	16.54	11.48	11.48
Born in Shanghai only:	5.79	10.61	6.81	12.33	4.76	8.87
Cultural Revolution cohort	3.50	10.03	3.70	11.56	3.30	8.48
Non-Cultural Revolution cohort	12.24	12.24	15.68	14.52	8.82	9.97
Semidegree:						
Total sample:	6.93	6.13	9.71	8.18	4.01	3.97
Cultural Revolution cohort	6.86	5.66	9.86	7.55	3.78	3.72
Non-Cultural Revolution cohort	7.07	7.07	9.41	9.41	4.48	4.48
Born in Shanghai only:	6.11	6.09	9.77	8.06	3.65	3.87
Cultural Revolution cohort	6.64	5.63	9.78	7.54	3.45	3.68
Non-Cultural Revolution cohort	6.96	6.96	9.75	9.54	4.20	4.41

SOURCE.—Authors' own calculation based on regression results for the non-Cultural Revolution cohorts.

adversely affected, and those with better-educated parents did not escape. The largest effects in relative terms, however, were experienced by those whose parents were less educated or of low occupational status. Thus, university degree acquisition fell 60% for children with mothers having primary and junior high school education but fell 47% for those with mothers having higher education levels. In all dimensions listed in table 6, the gap regarding university degree attainment widened most for children of parents with low levels of education and for children of parents in occupations of low socioeconomic status.

Table 6 indicates that there were also differences between men and women. Men had a higher incidence rate for acquiring a university degree than women. While men and women were both adversely affected, women with less-educated parents seemed to be the group most affected.

V. Conclusions

We draw four main conclusions. First, widespread and across-the-board school interruption had a substantial impact on later educational attainment, especially when the interruption occurred at the high school level. The probability that an individual who missed both junior and senior high school would obtain a formal 4-year university degree decreased by about 55%.

Second, while individuals with interrupted education had a lower probability of obtaining a formal university degree, they tended to have a slightly

TABLE 6
ACTUAL AND PREDICTED FORMAL 4-YEAR DEGREE HOLDER BY PARENTAL BACKGROUND

PARENTAL BACKGROUND	TOTAL			MALES			FEMALES		
	Actual	Predicted	Actual/ Predicted	Actual	Predicted	Actual/ Predicted	Actual	Predicted	Actual/ Predicted
Mother's education:									
Primary and junior high	3.82	9.46	40.32	4.74	11.06	42.88	2.87	7.83	36.62
Senior high and above	15.12	28.35	53.33	15.91	29.09	54.69	14.29	27.56	51.83
Father's education:									
Primary and junior high	3.19	9.21	34.70	3.75	10.67	35.18	2.62	7.70	34.01
Senior high and above	13.44	20.03	67.12	16.84	22.14	76.09	9.89	17.82	55.49
Mother's occupation:									
Blue-collar	3.80	9.57	39.68	4.87	10.15	48.03	1.69	7.17	23.60
White-collar	14.74	26.27	56.10	10.53	23.13	45.51	9.91	19.41	51.06
Father's occupation:									
Blue-collar	3.81	8.390	45.43	5.09	11.16	45.61	2.48	7.93	31.28
White-collar	10.22	21.30	48.00	17.31	26.04	66.47	12.77	25.61	49.84

SOURCE.—Authors' own calculation based on the regression results for the non-Cultural Revolution cohorts.

higher probability of acquiring a semidegree, perhaps because of the lower costs associated with obtaining a semidegree in comparison with those for obtaining a formal degree. There seems to be evidence of substitution across degree types.

Third, although many students had to wait until their late twenties or early thirties before they could sit a university entrance exam, the lapsed time effect on reduced university degree attainment was not as important as the years and level of the previous schooling missed. A 12-year delay before being able to take the university entrance exam was approximately equivalent to missing up to 5 years of primary schooling. Missing any 1 year at any level of high school was more important than university delay.

Fourth, all socioeconomic groups were adversely affected by the Cultural Revolution, but the largest negative impact was experienced by children with parents of lower educational achievement and lower occupational status. The Cultural Revolution strengthened, in relative terms, the ability of children from families with better human capital endowments to obtain a university degree.

Appendix

Description of Variables Used in the Study

University Entry Age and Dummy Variables for Missed Schooling

These variables are derived from the variable age. Definitions for these variables are presented in table A1, and summary statistics are presented in table A2 of all the variables used.

Dummy Variables for Regions

In 1988 data, Jiansu is used as default group; in 1995 data, the rest of the country is used as the default group.

Dummy Variables for Father's Occupations

The categories trade, service, and laborers are used as the default group.

Married before University Entry Was Available

This variable is a dummy variable that is defined as equal to one if university entry age is greater than or equal to the age of the first marriage; it is equal to zero otherwise.

TABLE A1

DEFINITIONS OF DUMMY VARIABLES

University Entry Age (Age in 1978)	Description of the Missing School Dummy Variables	Age in 1988	Age in 1990	Age in 1995	Number of Years Missed Primary School	Number of Years Missed Junior High	Number of Years Missed Senior High
18	Missed primary school	25	27	32	1	...	...
18	Missed primary school	26	28	33	2	...	...
18	Missed primary school	27	29	34	3	...	...
18	Missed primary school	28	30	35	4	...	...
19	Missed primary school	29	31	36	5	...	...
20	Missed primary and junior high	30	32	37	5	1	...
21	Missed primary and junior high	31	33	38	4	2	...
22	Missed primary and junior high	32	34	39	3	3	...
23	Missed junior and senior high	33	35	40	2	3	3
24	Missed junior and senior high	34	36	41	1	3	3
25	Missed junior and senior high	35	37	42	0	3	3
26	Missed junior and senior high	36	38	43	...	2	3
27	Missed junior and senior high	37	39	44	...	1	3
28	Missed senior high	38	40	45	...	0	3
29	Missed senior high	39	41	46	...	...	2
30	Missed senior high	40	42	47	...	...	1
31	Delayed university entry	41	43	48	...	...	0

TABLE A2
SUMMARY STATISTICS OF THE VARIABLES USED

CONTINUOUS VARIABLE	1988		1995	
	Mean	SD	Mean	SD
Age	38	9.73	42	8.87
University entry age	21	4.26	21	4.12
Mother's years of schooling	...	...	4	3.58
Father's years of schooling	...	...	6	3.65
Dummy Variable	Frequency	% of Total	Frequency	% of Total
Males	7,912	53.07	1,156	51.29
Females	6,997	46.93	...	48.71
Missed primary school	1,949	13.07	384	17.04
Missed primary and junior high	1,630	10.93	343	15.22
Missed junior and senior high	2,962	19.87	479	21.25
Missed senior high	1,583	10.62	233	10.34
Delayed university entry	441	2.96	62	2.75
Total primary	3,132	17.36	260	10.34
Total high school	12,640	70.06	1,924	76.53
Total semidegree	1,176	6.52	157	6.25
Total degree	1,093	6.06	173	6.88
University entry age:				
18	7,922	53.14	1,054	46.76
19	371	2.49	83	3.68
20	538	3.61	99	4.39
21	515	3.45	131	5.81
22	577	3.87	113	5.01
23	566	3.80	107	4.75
24	586	3.93	109	4.84
25	662	4.44	109	4.84
26	589	3.95	80	3.55
27	559	3.75	74	3.28
28	590	3.96	99	4.39
29	494	3.31	68	3.02
30	499	3.35	66	2.93
31	441	2.96	62	2.75
Father being party member	...	...	338	15.00
Father being professional or technical	...	...	144	6.39
Father being managerial	...	...	101	4.48
Father being clerical	...	...	94	4.17
Married before university entry available	...	...	334	14.82
Total sample including primary	18,041		2,514	
Total sample excluding primary	14,909		2,254	

Notes

* We would like to thank seminar participants at the Department of Economics, the Research School of Social Sciences, and the Research School of Pacific and Asian Studies, Australian National University. We would also like to thank Junsen Zhang for allowing us to use the data from the 1995 Shanghai Residents and Floating Population Survey.

1. In developed countries, many individuals choose to interrupt their education, leaving school as teenagers to return to further education as adults. This is an important behavior pattern, at least in the United States, and there have been some studies of this phenomenon. See, e.g., Audrey Light, "Hazard Model Estimates of the Decision to Reenrol in School," *Labour Economics* 2, no. 4 (1995): 381–406; Richard D. Marcus, "Measuring the Rate of Return to Interrupted Schooling," *Journal of Education Statistics* 9 (Winter 1984): 295–310. We have not found any studies of the economics of this behavior pattern in developing countries.

2. Zhong Deng 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, no. 2 (1997): 391–428.

3. A necessary condition for university entrance during this time was that a student's parents should be workers, peasants, or soldiers rather than intellectuals or "capitalist walk dogs" (cadres).

4. Joseph G. Altonji, "The Demand for and Return to Education When Education Outcomes Are Uncertain, Part 1," *Journal of Labor Economics* 11, no. 1 (1993): 48–83; Gary S. Becker, "Human Capital and the Personal Distribution of Income: An Analytical Approach," in *Human Capital*, ed. G. S. Becker (Chicago: University of Chicago Press, 1993); Light.

5. Xin Meng, *Labour Market Reform in China* (Cambridge: Cambridge University Press, 2000).

6. Xin Meng and Michael Kidd, "Wage Determination in China's State Sector in the 1980s," *Journal of Comparative Economics* 25, no. 3 (1997): 403–21.

7. *Ibid.*

8. In a normal market situation, the effect of a large cohort being denied access to a university education may have a significant macroeconomic impact. A sudden reduction in the supply of degree holders may be expected to increase returns to a university degree, while after the Cultural Revolution a sudden increase in the supply of laborers holding degrees will reduce the returns. However, the administratively determined wage system in China during the prereform, as well as at the beginning of the economic reform periods (the 1970s until the late 1980s), may have smoothed these macroeconomic impacts.

9. Because individuals with only primary school diplomas were not allowed to take the entry exam, we exclude from our sample those who reported their completed schooling as less than junior high school. Thus, the choice of obtaining a formal university degree or semidegree is conditioned on acquiring a junior or senior high school diploma.

10. The 1988 survey did not include questions specifically asking for the individuals' parental background. Although it is a household survey, the majority of individuals who were between the ages of 22 and 60 were not living with their parents. We were only able to identify the parental backgrounds for about 3,000 individuals of approximately 15,000 valid observations. These are children who lived with their parents. This subsample is biased toward young people. The mean age for the total sample is 37 years and 23 years for the subsample of individuals living with parents. The Cultural Revolution cohort accounted for 44% of the total valid sample but only 17% of the subsample. Thus, parental background information is not used in the 1988 data.

11. For those who missed some primary as well as junior high schooling, the university entry age is between the ages of 19 and 22. For those who missed both junior and senior high school, the university entry age is from age 23 to age 27. For those who missed senior high school, the university entry age is between the ages of 28 and 30.

12. See the appendix for detailed definitions, explanation, and basic statistics of the variables used in this study.

13. Both of the variables are assigned to zero for the non-Cultural Revolution cohort. The estimated results are available from the authors on request.

14. The results are available from the authors on request.

15. Another version of the model with both parents' years of schooling, as well as the father's party membership and occupation, indicates that the father's party membership only affects an individual's semidegree acquisition and that the father's educational level only affects formal degree acquisition. The reason that the model used in the study excludes the father's educational level is because the educational levels of both parents' education are highly correlated. The simple correlation coefficient is 60%.

16. The results are available from the authors on request.

17. The other group of dummy variables identifies the father's occupation. However, as the sample size is small, further controls may generate even smaller samples and hence reduce the reliability of prediction.