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Widening Gap of Educational Opportunity?

A Longitudinal Study of Educational Inequality in China

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Abstract

This study attempts to convey an accurate and dynamic account of educational inequality in China during the last decade. The study finds that there is clear evidence of rapid expansion of education, and younger students all over China are benefiting from the expansion. One of the most notable achievements is the virtual elimination of gender bias against girls in educational attainment. However, analysis of province-level school enrolment data over the last decade shows evidence of persistent regional inequality of educational attainment. Students from inland provinces continue to face strong structural inequality in educational opportunity, and this structural inequality becomes more pronounced as they progress to higher grades. Moreover, inter-cohort analysis reveals that the inter-provincial inequality in upper grades is increasing for younger cohort of students, meaning that educational inequality in China is deteriorating further. Lastly, a decomposition analysis shows that the causes of inter-provincial educational inequality are quite complex and cannot simply be explained by the urban-bias hypothesis that is often suggested as the main source of income inequality.

Keywords: China, inequality, education, regional disparity, educational inequality

JEL classification: H52, I20, J24, J62, O15, P36

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1 Introduction

Recently, rapidly growing income inequality in China has generated significant interest as well as alarm among China scholars around the world (Kanbur and Zhang 1999; Meng, Gregory and Wang 2005; Ravallion and Chen 2004; Yang 1999). A World Bank study reports that the estimated Gini coefficient of national income inequality after cost-of-living adjustment grew from 25.91 in 1981 to 39.45 in 2001 (Ravallion and Chen 2004). However, the interest in income inequality has not triggered a similar surge of interest in educational inequality. This lack of interest in educational inequality is rather puzzling given that the positive relationship between education and earnings is arguably the most well-documented finding in social science (Becker 1964; Blau and Duncan 1967; Deng and Treiman 1997; Sewell, Haller and Portes 1969). Without understanding the state of educational inequality, it would be difficult to predict future patterns of income inequality or formulate effective policy to curb growing inequality.

Education is indeed one of the most consistent predictors of a person's future income (Ashenfelter and Rouse 1999; Mincer 1974), and China is no exception to this rule. As Nee (1989, 1996) argues, as China continues its transformation into a market economy, education or human capital would emerge as more and more the central mechanism behind social stratification based on income. Recent empirical studies find clear evidence for the increased earnings returns to education in a reforming country such as China (Bian and Logan 1996; Wu and Xie 2003; Zhou 2000). The most recent study on the returns-to-education estimates that a return of an additional year of schooling of 4 per cent in 1988 has made a whopping jump to 10.2 per cent in 2001. Education has clearly emerged as an important causal factor shaping income stratification in China.

Understanding educational inequality in China is important not only in terms of identifying the source of economic and social inequality, but also in terms of devising a solution to reduce overall inequality. In the tradition of Horace Mann, education is often perceived to be the 'great equalizer' in society (Cremin 1951). This belief in education as the equalizer has facilitated the rapid diffusion of public education around the world during the last century (Meyer, Ramirez and Soysal 1992). China also adopted this philosophy when the government passed the Law on Nine-Year Compulsory Education in 1986, which guaranteed all school-age children the right to receive nine years of schooling. How did the law affect the distribution of educational attainment? Do Chinese students today have more or less equal opportunity to education regardless of their personal and environmental characteristics? If there is educational inequality, is it increasing or decreasing? The time is ripe for asking and answering these critical questions.

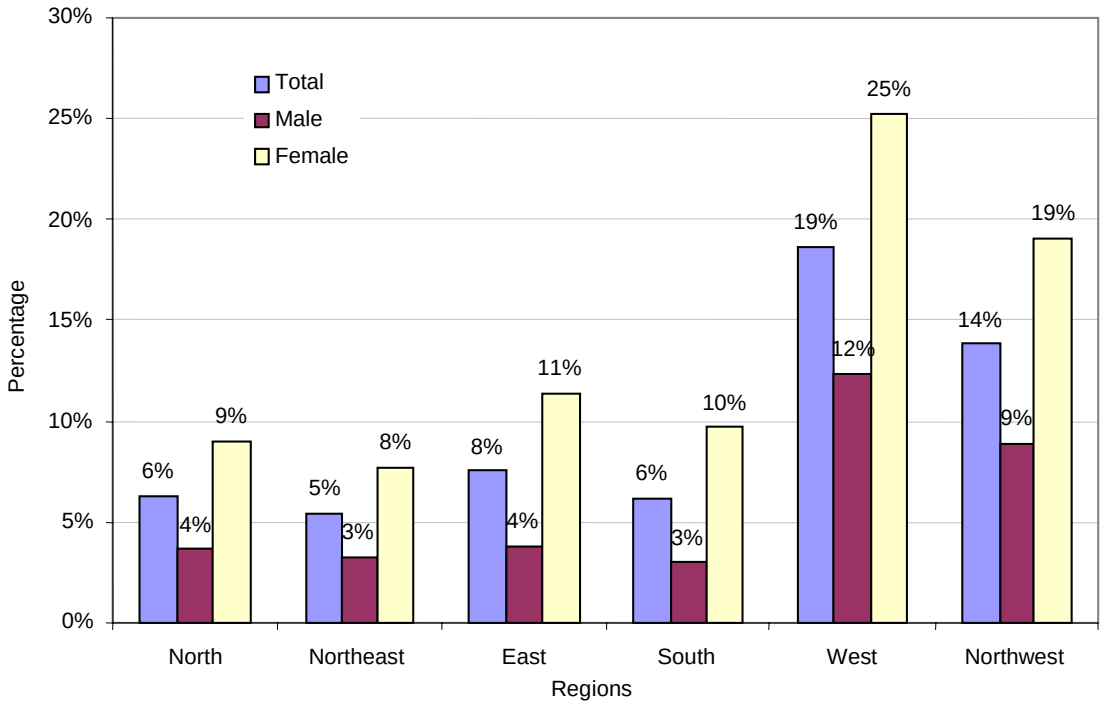
The aim of this study is twofold. First, the study examines and describes the current distribution of educational attainment in China from both static and dynamic perspectives. Second, it tests whether the urban-biased policy and institution, which is purported to be the main source of economic inequality (Yang 1999), is also the source of educational inequality. It then examines whether the continuing economic growth and accompanying urban expansion will eventually reduce educational inequality without other policy interventions. The structure of paper is as follows. The next section briefly introduces the history of education in China after the establishment of Communist government in 1949. Section 3 describes the data, measurement and methods. Section 4 analyses the within-cohort inequality (i.e., static inequality). Section 5 explores the between-cohort inequality (i.e., dynamic inequality or changes in inequality over time).

Section 6 tests the urban-bias hypothesis by decomposing the differences in transition rates and estimating the proportion that population composition contributes to total inequality. The last section concludes with summary of results and some theoretical and policy-related implications.

2 Historical background

Education has been an important channel of social mobility in China for over a thousand years (Wang 1960). Since the founding of the People's Republic of China in 1949, however, education was subject to a series of disruptions under various political manipulations and state policies (Pepper 1980; Zhou, Moen and Tuma 1998). First disruption came immediately after the complete failure of the 'great leap forward' economic policy in the late 1950s. The failed economic plan resulted in severe economic contraction which, in turn, ushered in one of the worst famines in human history. Prolonged starvation sharply raised mortality rates all over China. By the end of the famine in 1961, it had already claimed millions of lives. During this period when most rural residents did not even have enough to eat, education was a luxury they simply could not afford. The new student enrolment rate for school-age children dropped 38 per cent in 1961 and another 5 per cent in 1962. Even 20 per cent of the students who had already been enrolled in school dropped out. During this period more than one-third of China's population was deprived of even basic education.

Figure 1
Percentage of the population aged over 6 years who never attended school



Note: Data are based on the 5th national population census in 2000.
Source: SSB (2002).

The second major disruption came during the infamous Cultural Revolution (1966-76). The main causal force that affected educational attainment during this period was political rather than economic. Soon after Mao declared the 'great proletarian cultural revolution', many secondary and post-secondary schools were forcibly closed down. Individuals with high education were often labelled as 'bourgeoisie' and became the target of political persecution. The original intention of the Cultural Revolution was to level the opportunity structure between rural peasants and workers versus urban intelligentsia and cadre families. The revolution probably did achieve its intended effect of more egalitarian educational attainment between classes (Deng and Treiman 1997), but the unintended side effect was serious disruption of the entire education system, and national enrolment which was gradually recovering after the great famine dropped almost 60 per cent of the 1957 level. The drop in new student enrolment rate extended also to the primary school.

The effect of these two major disruptions on the educational system is clearly evident in the relatively high proportion of the population over 6 years of age who have never attended school—these are people who have had no formal schooling experience during their lifetime. About 10 per cent of the population aged over six years have never attended school and the figure goes as high as 46.4 per cent in Xizang (Tibet).

Figure 1 presents the current state of educational inequality in six large geographic regions of China.[1] The interregional variation of educational attainment is clearly visible. The percentage of the population who never attended school in the western provinces is almost four times higher than that of the northeastern provinces. In general, the coastal provinces have much smaller percentage of uneducated people than the inland provinces. The figure also indicates sharp gender inequality in educational attainment. The proportion of female population who never attended school is more than twice as large as that of the males. One caveat in interpreting the observed gender inequality is that the statistics are affected by differences in male-female population composition due to the longer life expectancy of females. However, considering that significant gender differences in the population composition occur mostly after 70 years of age, which accounts for less than 3 per cent of the population, the gender gap in education after age-composition standardization still remains very large.

In order to remedy the high regional disparity in educational attainment, the Chinese government passed the Law on Nine-Year Compulsory Education in 1986. Although the government did not immediately offer nine years of free education for all, it significantly stepped up the effort to improve education in the semi-urban and rural areas in terms of both quantity and quality. The government's effort to expand education is clearly evident in the increased annual education budget which grew almost 26 times from 1978 to 1998 (nominal). The share of the educational budget in total government expenditure also grew from 6.8 per cent in 1978 to 18.8 per cent in 1998. The increasing willingness to invest in education among individuals and families is also evident from the fact that a sharp increase in tuition had no effect on enrolment rates

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1 The north region includes the provinces of Beijing, Tianjin, Hebei, Shanxi and Neimenggu. Northeast region includes the provinces of Liaoning, Heilongjiang and Jilin. Eastern region includes the provinces of Shanghai, Jiangsu, Zhejiang, Shandong, Anhui, Fujian, Jiangxi. Southern region includes the provinces of Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan. Western region includes the provinces of Sichuan, Chongqing, Guizhou, Xizang (Tibet) and Yunnan. Northwest region includes the provinces of Shaanxi, Gansu, Ningxia, Qinghai and Xinjiang.

between 1990 and 1998. Tuition continued to increase much faster than income—especially at higher educational levels of schooling—but enrolment in post-secondary educational institutions continued to skyrocket, doubling in every four years (Studwell and Kroeber 2004).

The increased educational investment resulted in a rapid expansion of education over the last two decades. Elementary school enrolment rate for school-age children grew from 93.9 per cent in 1980 to 98.9 per cent in 1998, and the percentage of primary-school graduates entering junior high grew from 75.9 per cent in 1980 to 94.3 per cent in 1998 (Ministry of Education 1995-2003). According to almost every measure, China's overall performance in improving the educational system is impressive. The question is whether the expansion of education has been consistent and distributed fairly throughout China. Interestingly, in spite of the importance of education in the study of inequality, surprisingly little attention has been paid to the trend and extent of educational inequality in China. There are a small number of studies on educational inequality that draw insightful and eclectic pictures of educational inequality in China. Yet, most of the existing studies examine educational inequality through a magnifying glass focused on subjects such as the urban area and political shift (Zhou, Moen and Tuma 1998), ethnicity and education (Hannum 2002; Hannum and Xie 1998), and labour market and education (Wu and Xie 2003). There has yet to be a systematic analysis on the trend and source of educational inequality at the national level.

3 Data and method

The data for this study are derived from the *Educational Statistics Yearbook of China* and *China Statistical Yearbook* for the years 1994-2002. Ideal data for examining educational inequality would be longitudinal individual-level data from a nationally representative sample. However, such data are not yet available in China. Instead, we use the aggregate province[2] level data and employ what Kanbur and Zhang call the spatial inequality approach, i.e., the examination of variations across 31 provinces (Zhang and Kanbur 2003). After the decentralization reform was initiated in 1980, each province in China took a very different development trajectory. The administration and financing of education were also effectively decentralized as of 1985. Since then, provinces have been independently making most of the core decisions regarding educational policies and financing. Moreover, the migration of population between provinces is still quite limited due to the persistence of the household registration system (*hukou*). From this perspective, provinces can be conceived to constitute a form of restricted social system which effectively shapes the differential opportunity structure and aspirations of individuals. Therefore, provinces are an appropriate unit for examining the pattern of educational inequality in China. The *Educational Statistics Yearbook of China* reports detailed data on student enrolments in each grade at the province level, thus offering the advantage that the data are not limited to the sample data, but cover the entire population. Therefore, there are no problems concerning

2 The main administrative divisions in the statistical yearbooks include 22 provinces, four municipalities (province-level cities) and five autonomous regions. For simplicity, we use 'province' as the generic inclusive term to cover all three types of administrative divisions.

sampling bias. We augment the enrolment data with other economic and social characteristic data on the provinces from the *China Statistical Yearbooks*.

The standard method in investigating educational inequality is the sequential logit model of educational transition developed by Mare (1980, 1981). Mare suggests that the best method of measuring educational inequality is to observe student transition in the educational attainment process. At each level of the process, a student decides whether to continue to the next level or to drop out. Thus, educational attainment can be measured by a series of probabilities of continuation which represent the probability of a student continuing to a specific level of schooling, given that the preceding level has been completed. The obvious advantage of dividing the attainment process into separate grade transitions is that it allows us to analyse the differentials in schooling at various stages. The model enables the efficient estimation of the impact of social environment on the variation in the transition process. Although we do not fully adopt Mare's statistical model in this paper, we apply his measurement method for educational attainment, i.e., the probability of a student making the transition to the next level, given that they have completed the previous level.

It is clear that significant variations in educational inequality exist between geographic regions and gender among the adult population of China today. The question we want to examine in detail is whether gender-based and regional-based inequality has been diminished or increased with the expansion of education since 1978. Educational inequality over time can be measured in two different ways. The first measure used is the within-cohort variation over time, which primarily provides information on whether children from a particular gender group or geographical location are more likely to stay in school longer than others. From the spatial inequality perspective, the within-cohort inequality measure will tell us whether growing up in a certain province will impact differently on the child's likelihood of staying in school and obtaining higher education than growing up in other provinces.

The second measure employed is the inter-cohort variation over time. By focusing on just one schooling transition point over time, we observe the variations in transition rates between cohorts. The inter-cohort inequality measure reveals whether children from successive cohorts face more inequality or less inequality over time.

4 Within-cohort inequality

In spite of the nine-year compulsory education law promulgated over 15 years ago, the national average of the probability of making the transition from grade 1 to grade 9 between 1994 and 2002 was less than 75 per cent. The nine-year compulsory education programme achieved almost immediate results in some provinces, but had slow effects in others. The probability of making the transition to 9th grade among the cohort who entered primary school in 1994 can be calculated using a simple conditional probability measure:

$$\Pr(T) = \Pr(N_9 \mid N_1) = \frac{\text{Number of students among the cohort } C_{94} \text{ who remained through grade 9}}{\text{Number of students in the cohort } C_{94} \text{ entering grade 1}} \quad (1)$$

where Pr(T) is the conditional probability of graduating to grade 9 in 2002 given that the person entered grade 1 in 1994, N_9 is the number of enrolled 9th grade students in 2002, and N_1 is the number of enrolled 1st grade students in 1994. Table 1 presents the computed within-cohort transition probabilities by provinces and gender. The results show that a high level of inter-provincial disparity exists in educational attainment, and the transition probabilities vary significantly, ranging from 0.93 in Zhejiang to 0.20 in Xizang (Tibet). In other words, if a student entered the first grade in 1994 in Zhejiang, he/she is almost 5 times more likely to stay in school through 9th grade than a student from Xizang in the same cohort.

Table 1
Transition probability from grade 1 to 9 among the cohort
who entered primary school in 1994, by provinces

Provinces (i)	Total $Pr(T_i)$	Female $Pr(T_{i,f})$	Male $Pr(T_{i,m})$	Gender inequality index, $Pr(T_{i,m}) = 1$	Inter-provincial inequality index, $Pr(T_{xizang}) = 1$
Xizang (Tibet)	0.20	0.24	0.17	1.38	1.00
Guizhou	0.46	0.44	0.47	0.94	2.29
Qinghai	0.47	0.49	0.46	1.07	2.37
Hainan	0.49	0.47	0.50	0.95	2.43
Gansu	0.52	0.52	0.53	0.97	2.60
Ningxia	0.52	0.55	0.50	1.11	2.62
Guangxi	0.56	0.57	0.56	1.02	2.82
Yunnan	0.57	0.57	0.57	1.00	2.86
Shaanxi	0.68	0.69	0.67	1.03	3.38
Hubei	0.69	0.66	0.72	0.92	3.44
Xinjiang	0.71	0.74	0.68	1.08	3.54
Neimenggu	0.73	0.75	0.71	1.06	3.63
Jiangxi	0.73	0.69	0.76	0.91	3.64
Jilin	0.75	0.76	0.74	1.03	3.73
Sichuan/Chongqing	0.75	0.76	0.75	1.01	3.76
Jiangsu	0.78	0.76	0.80	0.95	3.89
Hebei	0.79	0.83	0.76	1.08	3.94
Henan	0.79	0.80	0.78	1.01	3.97
Liaoning	0.80	0.81	0.78	1.04	3.98
Hunan	0.80	0.80	0.79	1.01	3.98
Shanxi	0.81	0.83	0.80	1.04	4.05
Guangdong	0.81	0.80	0.82	0.97	4.07
Heilongjiang	0.83	0.85	0.81	1.04	4.15
Anhui	0.83	0.81	0.85	0.95	4.15
Shandong	0.87	0.86	0.87	0.98	4.33
Tianjin	0.91	0.92	0.90	1.02	4.54
Fujian	0.92	0.90	0.93	0.97	4.59
Zhejiang	0.93	0.93	0.92	1.00	4.63
Beijing	0.96	0.98	0.95	1.04	4.81
Shanghai	0.98	0.99	0.97	1.02	4.89

Source: Ministry of Education (1995-2003).

What accounts for such low transition rates in some provinces? The difference in the number of students between grade 1 and grade 9 is not caused simply by dropouts. Several other factors, such as death rate, contribute to the difference, as the following formula shows:

$$N_9 = N_1 + \text{immigrants} - \text{emigrants} - \text{number of deaths} - \text{dropouts} \quad (2)$$

However, the mortality rate for this age group is very low, and the difference in mortality rate between provinces is almost negligible. Therefore, we can assume that proportion of students who have died before completing the transition is constant over the provinces. What is more difficult to deal with is the contribution of immigration and emigration between provinces to the inter-provincial differences in transition probabilities. Recently, there has been a huge number of migrant manual labourers moving from rural to urban areas. However, the current migration trend lacks long-term commitment, and very few of these labourers settle down for extended stays in the cities (Zhao 1999). Workers usually leave their families behind on the farms and return home during periods of unemployment. Moreover, because of the continuing existence of the *hukou* system, it is very difficult for rural *hukou* holders to settle in the urban areas and send their children to school. Because of the high cost of uncertainty (Todaro 1969), permanent inter-provincial migration of families with school-aged children is still rare in China. Therefore, we argue that most of the difference in enrolment numbers between grade 1 and 9 can be attributed to dropouts. If school-aged children themselves migrate to find work (for some of the older students), they are then counted as dropouts.

The first surprising outcome revealed by the within-cohort probability of making the transition from grade 1 to 9 among those who entered primary school in 1994 is that gender inequality has been almost completely eliminated. The gender inequality index, which is calculated using the following equation, shows that female students in most provinces are even more likely to stay in school than male students.

$$\text{Gender inequality index for province } i = 1 + \frac{\Pr(T_{i,f}) - \Pr(T_{i,m})}{\Pr(T_{i,m})} \quad (3)$$

where $\Pr(T_{i,f})$ is the probability of female students making the transition in province i, and $\Pr(T_{i,m})$ is the probability of male students making the transition in province i. The gender inequality index is simply a standardized ratio of the female probability of transition from grade 1 to 9 in province i by setting the male transition probability in the same province as 1.

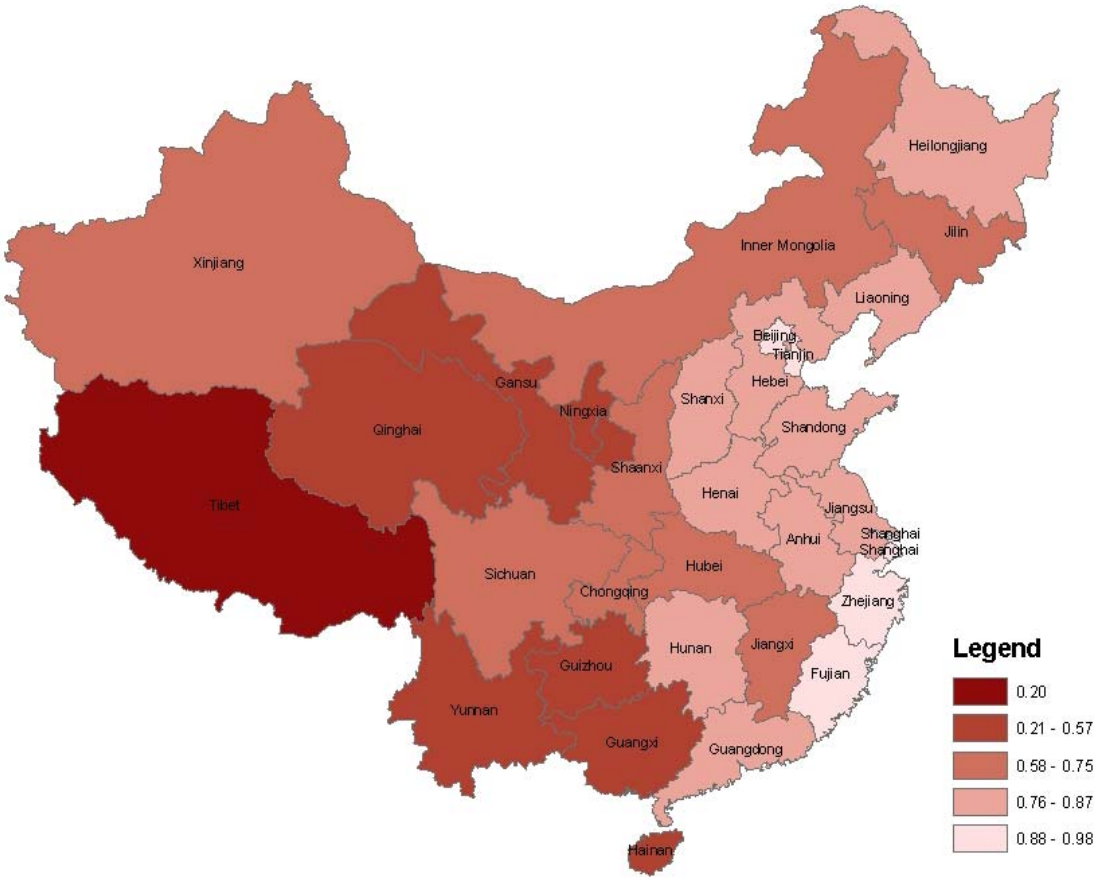
In some provinces, the substantial gender inequality presently existing among the adult population is reversed among students in this particular cohort. This reversal occurs not only in rich provinces with a high proportion of well-educated people, but also in poor provinces. For example, in Tibet, the probability of a female student graduating from grade 9 is 38 per cent higher than for a male student. Overall, it is clear that gender inequality has been significantly reduced. This result is a surprising reversal of the gender inequality that persisted throughout the early 1990s, as earlier research points out (Zhou, Moen and Tuma 1998). The expansion of education has clearly had a favourable effect on female students.

Inter-provincial educational inequality, however, still remains very high. The inter-provincial inequality index, which is calculated according to the same standardization method as the gender inequality index, shows that a student attending school in Beijing in the 1994 cohort is 4.89 times more likely to make the transition to 9th grade than a student in Xizang.

$$\text{Inter - provincial inequality index for province } i = 1 + \frac{\Pr(T_i) - \Pr(T_{Xizang})}{\Pr(T_{Xizang})} \qquad (4)$$

where $\Pr(T_{i,Xizang})$ is the average transition probability in the province of *Xizang(Tibet)* which is used as the comparison province, and $\Pr(T_i)$ is the average transition probability in province *i* which is being compared with Xizang. What is clear from the figures in the index is that unlike the reduced gender bias against girls, a huge inter-provincial gap in terms of educational attainment still remains. Students in the coastal provinces have a much better probability of making the transition to grade 9 than students in the inland provinces. The pattern of coastal-inland inequality is clearly visible from the GIS projection below, where light colours indicate high transition probability and darker colours indicate lower probability (see Figure 2).

Figure 2
Average provincial transition probability from grade 1 (1994) to grade 9 (2002)



Source: Ministry of Education (1995-2003).

5 Inter-cohort inequality

In most western societies, the inequality of educational opportunity, as measured by differences in educational attainment of children from advantaged and disadvantaged families has declined steadily during industrialization (Boudon 1974; Lipset and Bendix 1967). In other words, with economic growth, younger generation of students face less inequality in educational opportunities regardless of their socioeconomic background. How is the educational opportunity changing for the successive generations of Chinese students? Is the existing inter-provincial inequality increasing or decreasing over time? In order to measure the inter-cohort variations over the years, we examine the variations in each cohort's first major education transition, i.e., going from elementary school to junior high. Junior highschools in China are divided into academic and vocational tracks, and the enrolment number used here for junior highschools is the total of both tracks.

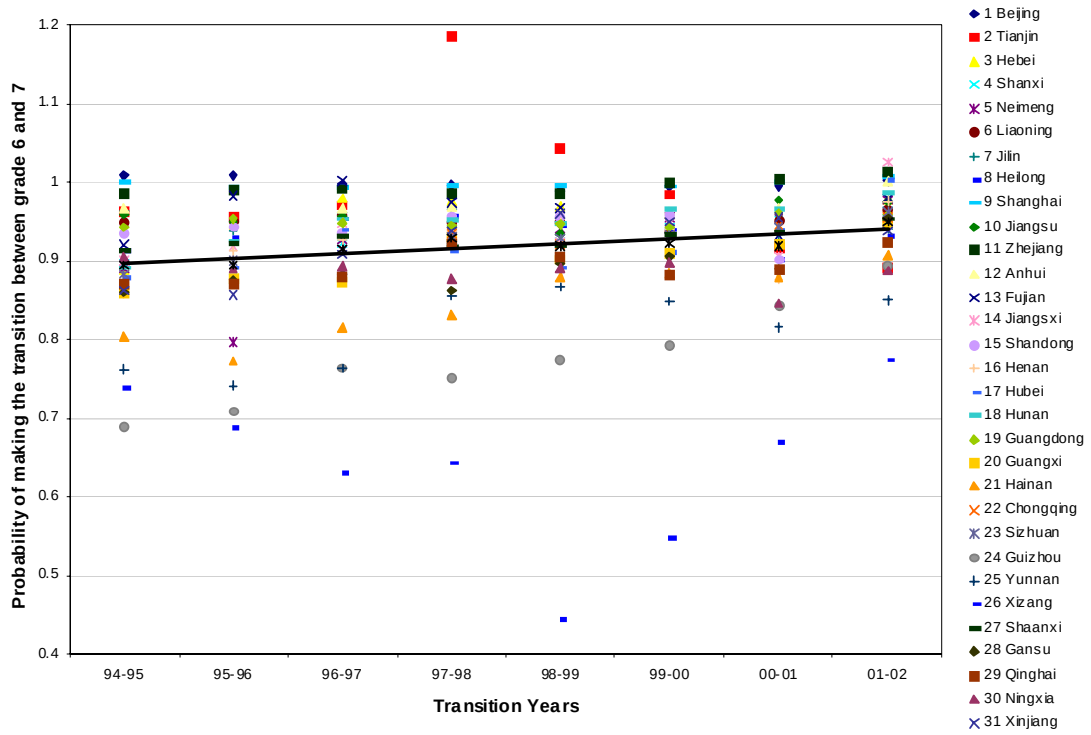
The national average transition probability between grades 6 and 7 has increased steadily over successive cohorts, as the positive slope of the fitted least squares line over the mean indicates. The mean transition rate increased substantially from 89.5 per cent for the 1994-95 cohort to 95.1 per cent for the 2001-02 cohort. What this result confirms is that elementary education has indeed been expanding over the nine-year period under observation, and that with each successive generation, a greater proportion of students are graduating from elementary school to junior high: more and more students are receiving a basic education in literacy.

Not only has there been a general upward trend of the mean transition probability, but the distribution gap of the transition probability between provinces has also been narrowing. As the converging pattern of scatterplot in Figure 3 shows, the overall differences in transition probabilities between provinces are diminishing. The decreasing divergence of provincial transition rates within each cohort is clear evidence of China's diminishing regional inequality for this particular schooling transition point. The relative ranking of provinces, however, did not change significantly. In other words, students from Xizang province are still disadvantaged compared to those from Zhejiang province, but the degree of disadvantage has been significantly reduced. Overall, evidence indicates that inequality is clearly in decline.

Judging from the inter-cohort trend at this particular transition point, China has successfully achieved the primary objective of educational expansion, i.e., greater equality in educational opportunity. The question is whether this trend will continue into upper-year schooling. Are the students who achieved the junior highschool level equally likely to stay until grade 9 and graduate? To answer this question, we trace the trend for two more years for the same cohorts who made the transition from elementary school to junior high. The results are presented in Figure 4 below.

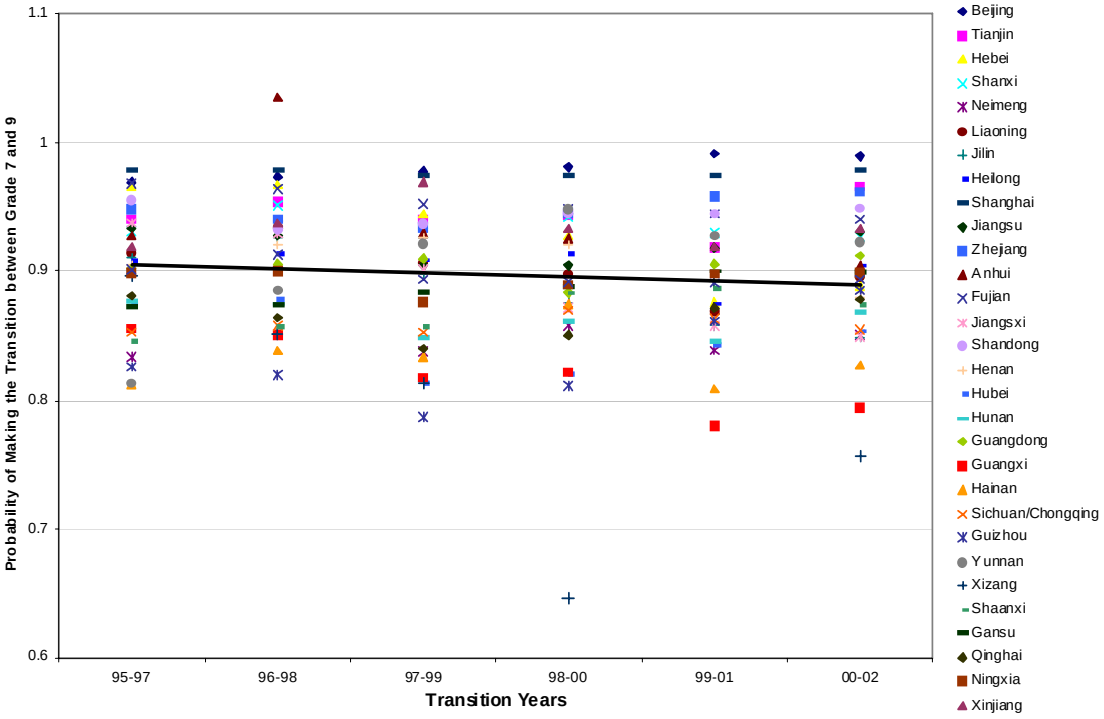
Two striking features stand out in comparison to the two sets of inter-cohort transition probabilities presented in Figures 3 and 4. Figure 4, which plots the inter-cohort comparison of transition probabilities in upper school years (from grade 7 to 9), shows a completely opposite pattern to that in Figure 3. First of all, the fitted least squares line over the mean shows a downward trend in the inter-cohort variations, indicating that the transition probability for the successive cohorts actually deteriorated slightly (from 90.2 per cent for the 1995-97 cohort to 89.4 per cent for the 2000-02 cohort). These are the same first six cohorts of students observed in the previous analysis depicted on Figure 3.

Figure 3
Inter-cohort comparison of transition probability
from elementary to junior highschool between provinces, 1994-2002



Source: Compiled from Ministry of Education (1995-2003).

Figure 4
Inter-cohort comparison of transition probability
from grade 7 to grade 9 between provinces, 1995-2002



Source: Compiled from Ministry of Education (1995-2003).

Whereas a greater number of younger cohort of students are gradually making the transition from elementary school to junior high, a smaller number of students from younger cohorts are staying in school until grade 9. Although the difference is not huge in percentages, in absolute numbers, among the cohort of students who entered junior high in 2000, almost 800,000 more pupils dropped out versus the 1995 cohort. What is even more surprising is that the dropout rate increased *in spite of* the sharp increase in the government's educational spending and the growing demand for more skilled and educated workers due to rapid economic expansion. The rational choice theory in sociology education predicts that an individual's educational decision is based on their expectation of the related costs and benefits (Breen and Goldthorpe 1997; Morgan 1998). Therefore, individuals will stay in school longer when the potential future payoff from an additional year of schooling becomes greater while the cost of education remains steady or decreases. Yet, quite interestingly, in China today, we see an opposite trend.

The second striking difference between the two transition patterns is that the dispersion of transition probability between provinces shows a gradually diverging pattern over time, indicating that the inter-provincial inequality of educational attainment at junior highschool level is being aggravated. The diverging pattern is clearly visible in the scatterplot. In fact, the rise in the national dropout rate in successive cohorts is mostly due to the increasing dropout rates in provinces where the transition rate had already been comparatively low. Students in provinces with already high transition rates are continuing to stay in school, while successive cohorts in the already disadvantaged provinces are dropping out in greater numbers.

The patterns presented in Figures 3 and 4 indicate that while educational inequality is decreasing during the earlier years of school, it is increasing in the later years. Evidence from the analysis indicates that the situation is becoming worse. This implies that even though China is moving towards greater equality in terms of basic literacy, inequality is increasing with regard to more advanced technical skills and knowledge. Technical skills and expertise in certain fields often necessitate longer training than nine years of schooling, and those dropping out before 9th grade will not do well in the modern labour market. If markets continue to expand and employers place greater emphasis on the skill and knowledge that require higher education, as Nee (1989) predicts, then income inequality will continue to increase in China.

6 Decomposition

A theoretical as well as a policy-related issue that arises from this analysis is the source of the existing inequality and whether it is something that policymakers should be concerned about. The primary candidate for the source of educational inequality is the urban-bias evident in the government's policies and institutional investment. Previous studies find that students living in large cities have a significant advantage over those in small cities or rural areas with regard to the odds of obtaining higher education (Kanbur and Zhang 1999; Zhang and Kanbur 2003; Zhou, Moen and Tuma 1998). The main locus of income inequality is also argued to be between urban and rural areas (Yang 1999). Looking at the transition probability between grade 7 and 9 for the period 2000-02, there is clear urban-rural difference: the average national transition probability for urban students was 0.95, whereas it was 0.77 for rural students. Consequently, the

inference that emerges from this is that the different ratio of urban and rural population composition should explain a big portion of the spatial educational differential.

A central empirical question needs to be addressed for theoretically confirming the urban-bias hypothesis for spatial inequality: how much of the inter-provincial difference in transition probability among provinces is attributable to variations in their urban-rural population composition? The within-province difference in enrolment rate between two points in time (ΔE_i) can be separated into three sectoral components that represent differences in urban, semi-urban (xiang/zhen) and rural areas:

$$\sum_i \frac{\Delta E_i}{N} = \sum_i \frac{\Delta E_{iU}}{N} + \sum_i \frac{\Delta E_{iX}}{N} + \sum_i \frac{\Delta E_{iR}}{N}, \ (i=1,\ldots,N) \tag{5}$$

where N represents the number of provinces and ΔE_i denotes the difference in enrolment rate in province i during the period under observation. The sectoral subscripts U, X and R denote urban, semi-urban (*xiang/zhen*) and rural areas, respectively. Each province has a very different population composition between urban and rural areas. For example, in Beijing which is practically an extended city with some annexed rural counties, over 44 per cent of students live in urban areas where the educational system is usually better. On the other hand, in the neighbouring province of Hebei, only 10 per cent of the students live in urban areas. The urban-rural difference hypothesis assumes that each component contributes unequal weights to the total difference. In order to isolate the different contribution of the population composition to the inter-provincial totals in educational attainment, we use a standard demographic technique of decomposing the differences in rate (Kim and Strobino 1984; Kitagawa 1955; Preston, Heuveline and Guillot 2001). Let the original difference between two provinces be defined as Δ:

$$\Delta = T_A - T_B = \sum_i C_i^A \cdot D_i^A - \sum_i C_i^B \cdot D_i^B \tag{6}$$

where T_A denotes the transition probability of province A and T_B the transition probability of province B. C_i^A is the proportion of population in sector i in province A, and D_i^A is the sector specific transition probability in sector i in province A, and vice versa. Using simple algebraic methods, we can recombine the terms on the right-hand side of Equation (6) and produce:

$$\Delta = \sum_i (C_i^A - C_i^B) \cdot \left[\frac{D_i^A + D_i^B}{2} \right] + \sum_i (D_i^A - D_i^B) \cdot \left[\frac{C_i^A + C_i^B}{2} \right] \tag{7}$$

The first part of Equation (7) is the contribution of the sectoral population composition difference to the total Δ and the second part of the Equation (7) is the contribution of the rate schedule differences to Δ. Due to space limitations, only a few sample results are presented in Table 2.

For this decomposition analysis, we use the transition probability from grade 1 to 4 among the cohort who entered grade 1 in 1994. This particular transition period is used because this is the age when the student population is more or less stable. For older

Table 2
Decomposition results and population compositions in the sampled provinces

	Xizang	Zhejiang	Xizang	Xinjiang
Provincial transition rate	0.56	0.99	0.56	0.83
Urban population composition, %	5.2	13.4	5.2	11.6
Xiang/Zhen population composition, %	10.4	62.8	10.4	9.9
Rural population composition, %	84.4	23.8	84.4	78.5
Contribution of population composition, %	36.4		6.8	
Contribution of other inter-provincial differences, %	63.6		93.2	

	Hunan	Guizhou	Sichuan/CQ	Gansu
Provincial transition rate	0.98	0.73	0.98	0.71
Urban population composition, %	9.2	4.6	6.7	7.3
Xiang/Zhen population composition, %	13.9	7.2	26.6	7.0
Rural population composition, %	76.9	88.2	66.6	85.6
Contribution of population composition, %	28.2		1.4	
Contribution of other inter-provincial differences, %	71.8		98.6	

Source: Ministry of Education (1995-2003).

pupils (especially from grade 6 or 7), there is substantial inter-sectoral movement because many rural areas do not have schools for older students. However, most children in grade 4 or lower still attend the local school.

The first set of provinces to be compared is Xizang (Tibet) and Zhejiang. Xizang has the lowest average transition probability between grade 1 and 4 at 0.56, and Zhejiang has the highest among all the provinces at 0.99 (excluding the three province-level municipalities). Is the difference in rates mainly attributed to differences in the urban-rural population composition? As the population composition data in Table 2 indicate, the two provinces have significantly diverging urban-rural population composition: in Xizang nearly 85 per cent of the students live in rural communities whereas the corresponding figure for Zhejiang is only 24 per cent. The difference in population composition does indeed account for over 36 per cent of the variance. However, the remaining 64 per cent constitutes a difference in rates that cannot be explained by the different population composition. In other words, even if the population composition between Xizang and Zhejiang were identical, the differential in transition rate between the two would still be 0.27, implying that 27 per cent more students in Xizang will *not* make the transition from grade 1 to 4.

The population composition-controlled difference in rates is much more pronounced if we compare Xizang with Xinjiang. The two are neighbouring provinces in northwestern China with similar urban-rural population structure. However, the average provincial transition probability between grade 1 and 4 shows a large gap. When the same decomposition technique is applied to these two provinces, the variance in population composition accounts for only 7 per cent of the total difference in rates; 93 per cent of the difference in rates comes from other factors. We also compare two sets of neighbouring provinces with shared borders: Hunan and Guizhou and Sichuan (including Chongqing) and Gansu. There were, however, marked differences in their respective transition rates between grade 1 and 4. Again, population composition contributes a rather small amount to the overall inter-provincial differences in transition probabilities.

Contrary to the urban-bias hypothesis, the inter-provincial difference does not primarily originate from differences in the population or geographical composition. The source of inequality is much more complex and systemic. Students in the rural areas of Zhejing or Jiangsu have a much better chance of making the transition from grade 1 to 4 than students in rural Xizang or Guizhou. There are other, yet unidentified, structural barriers that discourage students in inland provinces from staying in school, and economic expansion of inland provinces will not automatically solve the problem.

7 Conclusion

This study attempts to achieve two objectives: (i) to examine and present an accurate picture of the current distribution of education attainment in China from both static and dynamic perspectives, and (ii) to test the urban-bias hypothesis. On the one hand, there is clear evidence of the rapid expansion of education, and younger students all over China are benefiting from the expansion. One of the most notable achievements is the virtual elimination of gender bias against girls in educational attainment. On the other hand, however, inter-provincial inequality of educational attainment still remains large, and has even grown worse among upper grade students. Students from inland provinces continue to face considerable structural inequality in educational opportunity, and this becomes more pronounced in the upper grades.

The decomposition analysis shows that this inter-provincial inequality does not originate from differences in urban-rural population composition, as can be inferred from earlier research on income inequality. The source is much more complex. From a policymaker's perspective, this is a worrisome outcome. One hypothesis on the trend of educational inequality implies that it follows the famous Kuznets inverted-U shaped curve. As the economy expands and the overall level of schooling increases, educational inequality initially increases but diminishes after a certain threshold (Ram 1990). However, the results from this study suggest that economic expansion, as represented by the size of urban population, is unlikely to automatically reduce educational inequality—a much more sophisticated and province-specific measure is needed.

The natural next step is to identify the causal influences on differential transition probabilities among provinces. Several scholars have indirectly suggested potential reasons. Zhang and Kanbur (2003) suggest that the fiscal decentralization of educational funding resulted in unbalanced educational investments among the provinces, and aggravated inter-provincial inequality. Hannum's study (2002) suggests that the proportion of minorities in each province would affect inter-provincial differences. Nee's theory of transition economy (1989, 1996) suggests that the different level of marketization in each province will affect the importance of educational credential, which in turn produces variations in educational attainment between provinces. The next research project extending on this study will involve the identification and estimation of causal factors that affect inter-provincial differences in educational attainment.

Another research direction highlighted by this study is the relationship between the present educational inequality and future earnings inequality. Classical economic theory postulates that the expansion of education will negatively affect inequality through the increased supply of skilled workforce which in turn reduces the educational premium

(Gottschalk and Smeeding 1997; Knight and Sabot 1983). But the expansion of education in China had no impact on earnings inequality, and even in some cases aggravated inequality (Hannum and Xie 1998). This study shows that educational expansion in China did not have the well-known equalizing effect because expansion was highly uneven and opportunities unequally distributed. Such an uneven educational development has strong implications for China's future socioeconomic inequality. Education has repeatedly been proven to be the most consistent and significant predictor of future earnings for individuals (Ashenfelter and Rouse 1999; Becker 1964; Blau and Duncan 1967; Mincer 1974; Polacheck and Siebert 1993; Sewell, Haller and Portes 1969). Therefore, assuming that reform polices for greater marketization and privatization will continue in China, the growing inter-provincial educational inequality at the upper level of schooling will fuel greater earnings inequality between provinces (Nee 1996; Nee 2004; Nee and Matthews 1996; Wu and Xie 2003). This hypothesis is waiting to be tested with a more adequate dataset.

There are largely two types of policy interventions to address the problem of inequality. The first approach directly targets the outcome through stratified collection and redistribution of resources by central authority (Jencks *et al.* 1972; Moller *et al.* 2003). The second approach focuses on the equalization of opportunity by removing structural barriers to social mobility. Being an important predictor of social status and economic wellbeing, education is often linked to the opportunity for social mobility. Equal opportunity in education will not eliminate inequality in outcome (Coleman 1990), but *unequal* opportunity in education will most likely solidify, if not increase, social and economic inequality. China has experimented with direct redistribution to an extreme degree but without success, and is now moving away from the redistribution system in favour of market economy that places greater emphasis on market mechanisms and individual freedom in the redistribution of resources. It is unlikely that the Chinese government will go back to equal outcome for all. Therefore, an important question is how to implement policy to reduce inequality without reversing the direction of reform? We hope this study is an important initial step toward finding a solution to this essential question.

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