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Prashant Loyalka, James Chu, Jianguo Wei, Natalie Johnson, Joel Reniker, and Scott Rozelle

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However, policymakers in China have paid less attention to the possibility that inequalities in college access may also arise earlier in the pathway to college. The purpose of this paper is to understand where inequalities emerge along the pathway to college in China, focusing on three major milestones along the pathway to college after junior high. By analysing administrative data on over 300,000 students from one region of China, we find that the largest inequalities in college access emerge at the first post-compulsory milestone along the pathway to college: when students transition from junior high to high school. In particular, only 60% of students from poor counties take the high school entrance exam (compared to nearly 100% of students from non-poor counties). Furthermore, students from poor counties are about one and a half times less likely to attend academic high school and elite academic high school than students from non-poor counties.

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**Inequalities in the Pathway to College in China:
When Do Students from Poor Areas Fall Behind?**

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Abstract

Inequalities in college access are a major concern for policymakers in both developed and developing countries. Policymakers in China have largely tried to address these inequalities by helping disadvantaged students successfully transition from high school to college. However, policymakers in China have paid less attention to the possibility that inequalities in college access may also arise earlier in the pathway to college. The purpose of this paper is to understand where inequalities emerge along the pathway to college in China, focusing on three major milestones along the pathway to college after junior high. By analysing administrative data on over 300,000 students from one region of China, we find that the largest inequalities in college access emerge at the first post-compulsory milestone along the pathway to college: when students transition from junior high to high school. In particular, only 60% of students from poor counties take the high school entrance exam (compared to nearly 100% of students from non-poor counties). Furthermore, students from poor counties are about one and a half times less likely to attend academic high school and elite academic high school than students from non-poor counties.

Key words: Inequality; College Access; Pathway; Poor; China

Inequalities in the Pathway to College in China: Where Do Poor Rural Students Fall Behind?

Inequalities in college access—in which disadvantaged students fail to attend college at the same rate as advantaged students—are a major concern for policymakers and researchers in many countries.¹ Because disadvantaged students benefit less from the high economic payoffs associated with attending college, inequalities in college access can drive economic and social inequality.² Since attending college increases lifetime earnings, inequalities in college access can magnify economic disparities across lifetimes, affecting future generations.³ Thus, inequalities in college access can profoundly influence a country's future economic development and social mobility.⁴

Policymakers in China have taken action to narrow inequalities in college access. China has expanded college enrolment quotas to accommodate more students. For example, the Ministry of Education expanded college enrolments by over five times over the last one and half decades. In 2000, the number of college enrollees was 4.1 million.⁵ By 2011 this number had increased to 23 million.⁶ Policymakers in China also have provided disadvantaged students with needs-based financial aid to address concerns about their inability to pay for college—by 2007 the amount of mandated financial assistance for college students had expanded to 27.3 billion yuan (about 3.7 billion US dollars).⁷ Education officials have additionally created an online

¹ Corak 2013; Deming and Dynarski 2009; Haveman and Smeeding 2006.

² Carnoy et al. 2013.

³ Torche 2011.

⁴ Thorbecke and Charumilind 2002; Fan and Sun 2008.

⁵ NBS 2000.

⁶ NBS 2012.

⁷ Loyalka et al. 2012.

informational platform (*yangguang gaokao* at <http://gaokao.chsi.com.cn>) that is supposed to help disadvantaged students make informed decisions about the transition from academic high school to college. Finally, in some regions/provinces, policymakers have given disadvantaged students bonus points on the college entrance exam so that they can more easily access college.⁸

In spite of these efforts, researchers remain concerned that policies have not done enough to reduce inequalities in college access in China.⁹ One concern is that current government efforts (despite their scope and intensity) rarely address the fact that inequalities in college access may be based on inequalities that exist earlier on the education pathway. That is, current policies mostly focus on students that have successfully reached the end of academic high school (e.g., in the case of providing online informational resources) or have already entered college (e.g., in the case of determining financial need and allocating financial aid for college), rather than on students that are still proceeding through earlier stages of schooling.¹⁰ In short, current policies to help disadvantaged students access college largely benefit students that already have the ability and means to succeed in earlier stages of schooling (pre-school through high school).

By contrast, efforts to address inequalities in college access may be more effective when they account for the entire pathway that students must navigate before they arrive at college.¹¹ We conceptualize this pathway in terms of distinct “milestones.” For example, attending primary school is a critical early milestone along the pathway to college—students cannot continue on in school unless they go to primary school. Another example of a milestone further along the pathway would be taking the college entrance exam—students are ineligible to apply for college

⁸ Loyalka et al. 2014a.

⁹ Wang et al. 2013; Wang et al. 2011; Hannum et. al. 2011; Wu and Zhang 2010; Hannum and Wang 2006.

¹⁰ Loyalka et al. 2012.

¹¹ Horn and Carroll 1997; Mare 1980.

unless they choose to participate in this test. Paying attention to each milestone is important since the pathway to college in China is perhaps best characterized as a one-way, limited access street—once a student misses a milestone, it is often difficult (or impossible) to get back onto the pathway.¹² In other words, in China’s education system, failure to complete any particular milestone usually means that future milestones cannot be completed.¹³ By understanding when disadvantaged students miss milestones and fall off the pathway to college, policymakers may be able to better target policies and programs to help these students improve their access to college.¹⁴

Although several studies have documented inequalities in education during primary and junior high schooling in China, few studies have examined how inequalities *emerge* after primary and junior high school.¹⁵ This is unfortunate, as students in China spend most of their time and effort preparing and competing for access to college precisely during “post-compulsory schooling.” By “post-compulsory schooling”, we mean the stages of schooling that students can choose to go through after they graduate junior high school. It is possible that inequalities that emerge during post-compulsory schooling in China may contribute significantly to later inequality in college access.

In fact, there are a number of reasons why disadvantaged students in China may be more likely to leave the pathway to college during post-compulsory schooling. First, even when after they graduate from compulsory schooling, disadvantaged students (that tend to score lower, on average, on competitive entrance exams) may decide that their chances of admission to academic

¹² Fields 1988.

¹³ Alspaugh 1998; Mare 1980.

¹⁴ Domina 2009.

¹⁵ Wang et al. 2012; Lai et al. 2011; Luo et al. 2011; Yi et al. 2012; Chung and Mason 2012.

high school and college are too low to make it worth seeking promotion to high school or college.¹⁶ Second, disadvantaged students in China may find the tuition of academic high school or college prohibitively expensive.¹⁷ Third, the quality of school at the high school level may be low in poor areas.¹⁸ This may increase inequality along the education pathway either by encouraging students from poor areas to not attend or to drop out from high school (due to perceived low returns to continued schooling). It may also be that disadvantaged students are simply not learning as much in high school as their more advantaged peers and, therefore, are not prepared to compete for college admissions. Failures at any of these milestones could induce students to leave the pathway to college.

The goal of our study is to document the degree to which inequalities in college access accumulate along the pathway to college, particularly across three key milestones during post-compulsory education. Using one northwest region in China (Ningxia) as a case study, we first examine the college and four-year college admission rates of students from poor (disadvantaged) and non-poor (advantaged) areas. We then seek to explain the inequalities between students in these two groups by comparing each group's progress at three key post-compulsory milestones along the pathway to college: Gaining Access to High School, Attending High School, and Gaining Access to College.

The rest of the paper is organized as follows. Section 2 defines the three post-compulsory milestones that we consider along the pathway to college. Section 3 describes the data. Section 4 details our analytical approach. Section 5 reports the size of the gap in college access and where

¹⁶ White 1982; Yi et al. 2012.

¹⁷ Liu et al. 2009.

¹⁸ Loyalka et al. 2013.

(at which post-compulsory milestone) in the pathway the gap emerges. Section 6 discusses the implications of these results and concludes.

Three Key Post-Compulsory Milestones in the Pathway to College in China

We define the first key post-compulsory milestone in the pathway to college as *Gaining Access to High School*. Because high school is a necessary prerequisite for college admission, students who do not gain access to high school effectively forfeit any opportunity to attend college.¹⁹ We further split this first milestone into two measurable indicators. To measure progress of students along the pathway at the first milestone, the measures are: *Indicator A*, whether a given student chose to participate in the high school entrance examination (*zhongkao* 中考 or, as we call it in the rest of the manuscript, the HSEE); and *Indicator B*, the student's performance on the HSEE. These two measures are critical to progress along the pathway because, in China, admission to academic high school is almost solely dependent on taking and scoring well on the HSEE.

We define the second key post-compulsory milestone in the pathway to college as *Attending High School*. Students in China cannot make it to college unless they first attend and finish high school. We evaluate whether students attend high school by examining two indicators: *Indicator A*, whether or not a given student enrolled in high school (or elite high school) in the first place; and *Indicator B*, whether or not the student chose to participate in the High School General Examination (*huikao* or as we call it in the rest of the manuscript, the HSGE).²⁰ The

¹⁹ In this paper we only focus on the role of academic and not vocational high school in the pathway to college. We do this both because academic high school is by far the main pathway to college. We also were only able to obtain administrative data on academic (and not vocational) high school students.

²⁰ Examining enrollment rates in elite high schools is important because the college admissions process in China is so competitive. Often, students who attend elite high schools have a better chance of gaining access to college

HSGE is required for all students who wish to proceed onto their third and final year of high school, and is therefore a proxy for high school completion.

We define the third key post-compulsory milestone in the pathway to college as *Gaining Access to College*. Like admission to high school, college admission is based almost exclusively on performance on a standardized examination: the College Entrance Exam (*gaokao* 高考 or the CEE). If students choose not to take the CEE or do not perform adequately on the CEE they cannot be admitted to college. We therefore use two indicators to measure achievement of milestone 3: *Indicator A*, whether a given student chose to participate in the CEE; and *Indicator B*, the student's performance on the CEE.

In sum, the pathway to college in China can be divided into three key post-compulsory milestones—Gaining Access to High School, Attending High School, and Gaining Access to College (Figure 1). The gap in college access is said to widen when a greater proportion of disadvantaged students than advantaged students fail to achieve any of these milestones.

Data

The data from our study come from the Ningxia Autonomous Region (or Province) in northwest China. Ningxia has a population of over 6 million people and is mostly comprised of two ethnic groups: Han (>60%) and Hui (>30%). The region's average annual per capita disposable income was 21,470 yuan in 2008. Ningxia ranked 18th out of China's 31 provinces (NBS, 2010). However, more importantly (for our study), the average income level masks wide income differences between individuals in poor and non-poor counties. Of Ningxia's 22 counties, 9 are nationally designated as poor counties; their average annual disposable per capita income

(Loyalka et al., 2014b). Therefore, inequality in access to elite high school between advantaged and disadvantaged students could be a critical factor in bringing about inequality in college admissions.

falls between 2,500-7,500 yuan. In contrast, the remaining 13 counties have average annual disposable per capita incomes ranging between 9,000 and 30,000 yuan (NBS, 2010).

Our main source of information on Ningxia's education system comes from three administrative datasets provided by the Ningxia Department of Education. We use these datasets to describe where inequalities in college access arise (between students from poor and non-poor counties in Ningxia) as students seek to reach the three post-compulsory milestones on the pathway to college.

The first dataset includes information on all 242,771 students that participated in the high school entrance exam (HSEE) in 8 poor and 7 non-poor counties from 2004 to 2009 (and that were slated to graduate from high school from 2007 to 2012—hereafter referred to as the “HSEE data”).²¹ The HSEE data contain information on the county in which the student attended junior high school. The HSEE data from 2007 also contain information on student HSEE performance. We use the HSEE data to measure differences in progress of disadvantaged and advantaged students at milestone 1 of the pathway to college (Gaining Access to High School). The data are used to create two variables: HSEE participation; and HSEE performance.

The second dataset contains information on all 135,944 students that entered high school in Ningxia in 2004, 2005, and 2007 (and that would graduate from high school—barring school dropout—in 2007, 2008 and 2010 respectively). We refer to these data as the “High School Entrants data.” This dataset has information on high school students from all 22 counties/districts in Ningxia, both poor and non-poor. The main variables in this dataset are each student's unique id (given when students enter high school), birthdate, gender, ethnicity, and high school attended. We use this dataset (as well as information provided by the Ningxia Department of Education on

²¹ Policymakers in Ningxia only collected (and could thus only make available) HSEE data for 15 out of 22 counties.

which high schools were “key” or “elite” high schools) to examine gaps in indicator A of milestone 2: high school (or elite high school) enrolment.

The third dataset contains information on all 342,209 students (in 22 counties) that took the college entrance exam (CEE or *gaokao*) for the first time from 2001 to 2010. We call this our “full CEE data.” The dataset includes a unique student id (given to a student when he/she enters high school) that matches the student id in the High School Entrants data. The dataset also includes information on each student’s birthdate, gender, ethnicity, high school, county of high school, CEE test type (science or humanities track), and total score on the CEE. The dataset also includes information on whether each CEE participant was admitted into college. We use the full CEE data to assess inequality in the outcome of the college pathway—college admission rates. We also use this dataset to evaluate the gap (between students from poor and non-poor counties) in indicator B of milestone 3 in the pathway to college (CEE performance).

We construct one more dataset based on these three primary datasets. First, to understand HSGE participation and CEE participation—indicator B of milestone 2 and indicator A of milestone 3—we construct a fourth dataset using a two-step process. First, we obtained data on 43,359 students (from 22 counties) that took the high school general exam (HSGE) in 2009 (only) and were therefore slated to take the CEE in 2010 (we call this our “HSGE data”).²² Like the full CEE and High School Entrants data, the HSGE data contain the same unique student id (given when a student enters high school). Second, because all three datasets (the full CEE dataset, the High School Entrants dataset, and the HSGE dataset) have a unique identifier for each student, we are able to construct and track a cohort of students through high school. Specifically, we use the student ids to merge the 2010 full CEE data, the 2009 HSGE data, and the 2007 High School

²² As a robustness check, we also conducted the same analysis with the 2008 HSGE data and found consistent results.

Entrants data. In this way our datasets allow us to track the cohort of 2007 high school entrants and measure if they took the HSGE after two years or the CEE after three years (as reflected by whether the student's information is recorded in the HSGE and full CEE datasets). We call this fourth, aggregated dataset our "High School Testing" dataset. This dataset helps us measure indicator B of milestone 2 (HSGE participation) and indicator A of milestone 3 (CEE participation).

Finally, we also obtained information on the number of primary school graduates from the Ningxia Educational Statistics Yearbooks for years 1994-2010. This data is used in our analysis to as a reference point in examining levels of college enrolment, high school enrolment, and HSEE participation for advantaged and disadvantaged students in our sample.

Analytical Approach

Inequality at the end of the pathway

We use simple descriptive statistics to examine trends in the percentages of students from poor counties and non-poor counties that attend college—our "outcome" (Figure 1). Specifically, we use the full CEE data to calculate the numbers of students from poor and non-poor counties that gained admissions to any college and four-year college from 2001 to 2010. We then divide these numbers by the numbers of primary school graduates six years earlier (from 1995 to 2004 respectively). We are thus able to calculate the percentages of students from poor and non-poor counties that attended college and four-year college from 2001 to 2010.

Descriptive measures on inequalities

We next use simple descriptive statistics to estimate where (at which milestone) inequalities (between students from poor and non-poor counties) arise along the pathway to

college. We measure inequalities in HSEE attendance and HSEE performance—indicators A and B of milestone 1 (Gaining Access to High School). First, we use the HSEE data to calculate the numbers of students from poor and non-poor counties that participated in the HSEE from 2004 to 2009 (and that were slated to graduate high school from 2007 to 2012). We then divide these numbers by the numbers of students that graduated from primary school three years earlier (from 2001-2006).²³ We are thus able to calculate the rate of HSEE participation from 2004 to 2009. Second, we compare the HSEE score distributions of students from poor versus non-poor counties by using kernel density functions. Comparing the HSEE score distributions of students from poor versus non-poor counties allows us to identify how far behind participating students from poor counties are compared to participating students from non-poor counties (in terms of academic preparedness for high school).

Next, we examine inequality at indicator A of milestone 2 (high school enrolment). We use the High School Entrants data to calculate the number of students that gained admission to high school and elite high school in poor and non-poor counties in 2004, 2005, and 2007 (and were therefore slated to graduate high school in 2007, 2008, and 2010). We then divide the numbers of students that gained admissions into high school and elite high school by the number of primary school graduates three years earlier (in 2001, 2002, and 2004). We are thus able to calculate the percentages of students from poor counties and non-poor counties that attended high school and elite high school in 2004, 2005, and 2007.

²³ As a robustness check to using the number of primary school graduates three years earlier, we also use 2000 Census data to estimate the number of “potential students” in different age cohorts. For example, we use the numbers of 17 year olds across poor and non-poor counties in the 2000 Census as substitutes for the numbers of 18 year olds in poor versus non-poor counties in 2001. Inequality measures (that compare students in poor and non-poor counties) are similar regardless of whether we use the primary school graduate or “potential student (age cohort)” estimates in the denominator.

Estimating HSGE and CEE test participation

We use a binary outcomes (logistic) model to estimate the rate at which students from poor counties participated in the HSGE—indicator B of milestone 2 (HSGE participation)—and the rate at which students from poor counties participated in the CEE—indicator A of milestone 3 (CEE participation). Specifically, we analyse our High School Testing data using the following logistic regression model:

$$\begin{aligned} \text{logit}\{E(Y_{ij}|\text{Poor_county}, X)\} = \text{logit}\{P(Y_{ij} = 1|R, X) = \text{logit}(p_{ij}) = \beta_0 + \\ \text{Poor_county}_i' \beta + X_i' \alpha \end{aligned} \quad (2)$$

where Y_i is a (binary) dependent variable equal to 1 if student i did not take the test and 0 otherwise. The right hand side of equation (2) includes a dummy variable for whether a student is from a poor county (Poor_county_i) or not. The equation also controls for other student characteristics X_i including age, gender and minority status.

Comparing CEE performance between students from poor and non-poor counties

To examine inequalities in CEE performance—indicator B of milestone 3—we estimate a quantile regression model using our full CEE data. The purpose of using the quantile regression model is to describe the relationship between CEE performance and being from a poor or non-poor county at different points (quantiles) of the CEE performance distribution. Whereas OLS regression estimates the conditional mean of the dependent variable at given values of the covariates, quantile regression estimates quantiles (percentiles) of the dependent variable at given values of the covariates. This allows us to examine how the relationship between CEE performance and county poverty status differs for students at different points in the CEE performance distribution.

To examine the relationship between CEE performance and whether a student is from a poor or non-poor county at various quantiles of the CEE distribution, we estimate the following quantile regression model:

$$y_i = \beta_0^{(p)} + \beta_1^{(p)} \text{Poor_county}_i + X_i' \alpha^{(p)} + \varepsilon_i^{(p)} \quad (1)$$

where $0 < p < 1$ indicates the proportion of CEE takers having scores below the p^{th} quantile, As above, Poor_county_i is a dummy variable for whether a student is from a poor county or not, and X_i again represents other control variables such as age, gender, and minority status. We use equation (1) to estimate $\beta_1^{(p)}$ at different deciles ($\beta_1^{0.1}, \beta_1^{0.2} \dots \beta_1^{0.9}$). For example, $\beta_1^{0.1}$ reflects the CEE performance differences between students from poor and non-poor counties at the bottom decile of the CEE distribution, whereas $\beta_1^{0.9}$ reflects the CEE performance differences between students from poor and non-poor counties at the top decile. This allows us to examine how the relationship between CEE performance and county poverty status differs for students at the top, middle, and bottom deciles of the CEE performance distribution.

Results

Inequality in outcome: Gaps in college and four-year college access from 2001 to 2010

We find that there is a considerable gap in college access between students from poor and non-poor counties. Drawing on analyses using our full CEE data, our results show that while 11.9% of students from non-poor counties attended college in 2001, only 8.3% of students from poor counties did the same. In other words, in 2001, students from poor counties were 1.43 times less likely (than students from non-poor counties) to be enrolled in any college (Figure 2, Panel A). This difference was slightly larger for four-year college enrolment. Students from poor

counties were 1.7 times less likely to enrol in four-year college (Panel B) than students from non-poor counties.

The data further show that the inequalities in college access actually *widened* between 2001 and 2010. Despite the rise of the number of college admission slots, students from poor counties became less likely to enrol in any college in the decade between 2001 and 2010 (the difference expanding from 1.43 to 1.64 times—Figure 2, Panel A). Students from poor counties also became less likely to enrol in four-year colleges (the difference expanding from 1.70 to 1.75 times—Panel B). Taken together our results show that students from poor counties had lower access to colleges (and four-year colleges) across time, despite increased college enrolments overall.

Three post-compulsory milestones where inequalities in college access may emerge

To understand at what point along the pathway these inequalities in college access between students from poor and non-poor counties emerge, we trace the inequalities backwards in time across the milestones. We look for sources of inequality in three specific milestones in the post-compulsory education pathway in reverse chronological order. Again, these milestones include the following: Milestone 3—Gaining Access to College, indicated by college entrance exam (CEE) participation and CEE performance; Milestone 2—Attending High School, indicated by rates of high school enrolment and high school general exam (HSGE) participation; and Milestone 1—Gaining Access to High School, indicated by high school entrance exam (HSEE) participation and HSEE performance.

Milestone 3: Gaining Access to College

Results from our analyses using the full CEE data show that students from poor counties perform worse on the CEE relative to those from non-poor counties (indicator B of milestone 3).

We summarize our results in Figure 3, which plots the coefficients for our adjusted quantile regression and the confidence intervals. The y-axis signifies the difference in CEE scores between students from poor and non-poor counties, and the x-axis signifies different quantiles of the score distribution (in standard deviations). Together, Figure 3 compares the scores of students from poor and non-poor counties at different parts of the CEE distribution. From this figure, we find that students from poor counties score lower on the CEE than students from non-poor counties at all parts of the distribution. For example, at the median (the 50th percentile), students from poor counties score roughly 0.1 standard deviations lower than students from non-poor counties—even after accounting for basic student characteristics like gender, age, or ethnicity. More importantly, students from poor counties score progressively lower than students from non-poor counties as they move up the score distribution. At the 90th percentile, students from poor counties score almost a full 0.3 standard deviations below their non-poor peers. In short, at least part of the observed gap in college enrolment can be explained by statistically significant performance gaps on the CEE.

By contrast, there appears to be no gap in indicator A of milestone 3: simply taking the CEE in the first place. We find that there is no significant difference in CEE participation between students from poor and non-poor counties. Students from poor counties were only 2.1 percentage points less likely to take the CEE (Table 1, column 3) and the difference between the rates of CEE participation in poor and non-poor counties was not statistically significant. When controlling for personal characteristics, the difference falls to 1.2 percentage points. As such, we conclude that there was no real difference between students in poor and non-poor counties in terms of CEE participation. Whatever inequality emerges in this final milestone on the pathway

to college is the result of differences in CEE performance, rather than differences in CEE participation.

Milestone 2: Attending High School

Noting the gap in CEE performance at this third milestone, we step backwards and examine whether students from poor counties are less likely to attend (and finish) high school than students from non-poor counties (milestone 2). To do this, we first look for a gap between students from poor and non-poor counties in HSGE participation (indicator B of milestone 2). Drawing on analyses from our High School Testing data, we find that students in poor versus non-poor counties participated in the HGSE at about the same rate. Although students from poor counties were 2.9 percentage points less likely to take the HSGE than students from non-poor counties (Table 1, column 1), this finding was not statistically significant. When we control for student characteristics, the difference falls to 1.1 percentage points—also not statistically significant (column 2). As such, we conclude that there were no differences in HSGE test participation. In other words, provided that students in poor and non-poor areas do enrol in high school, they finish high school at similar rates.

We next examine whether differences in gross high school enrolment contribute to the gap in college access (indicator A of milestone 2—high school enrolment). We compare enrolments in both academic and elite academic high schools between students from poor and non-poor counties. Overall, we find a large gap in high school enrolment. Students from poor counties are significantly less likely than their peers from non-poor counties to enrol in either academic high school or elite academic high school (Figure 4). For example, in 2010, 53% of students from non-poor counties attended high school, compared with only 38% of students from poor counties. This means that advantaged students are 1.4 times more likely to attend high

school than their disadvantaged peers ($53/38=1.4$). The gap widens to 1.6 times for elite academic high school enrolment ($29/18=1.6$). In short, students from poor counties are significantly less likely to enrol in academic and elite academic high school. Further, the gap in academic and elite academic high school enrolment between students from poor and non-poor counties is close to the same magnitude as the observed gap in college access in 2010 (students from non-poor counties are 1.64 times more likely to attend any college).

We thus conclude that a significant share of the gap in college access likely has its roots in unequal high school attendance rates between students from poor and non-poor counties. While students from poor counties are no more likely to drop out of high school before taking the HSGE (after two years of high school), they are significantly more likely than students from non-poor counties not to enrol in high school in the first place.

Milestone 1: Gaining Access to High School

Surprisingly, we find that differences in high school enrolment are not due to any differences in HSEE performance between HSEE-takers from poor counties and HSEE-takers from non-poor counties (indicator B of milestone 1). When we compare the HSEE performance of participating students from poor counties with participating students from non-poor counties (Figure 5), we find that they have a similar distribution of exam scores. In fact, the distributions appear almost identical and, when subjected to a test of differences in distributions, are not statistically different (results omitted for the sake of brevity). This—in conjunction with our findings above—suggests that one source of the gap in college access between students from poor and non-poor counties may be the result of differential learning during high school. Because they end junior high school with similar levels of achievement (as evidenced by the lack of disparity in HSEE performance), the differences in CEE performance between these groups

that we observed above must reflect differences in achievement gains during the high school period.

Although the distribution of HSEE scores is similar between HSEE-takers across poor and non-poor counties, many students in poor counties choose not to participate in the HSEE in the first place (indicator A of milestone 1). We find a significant gap in HSEE participation between students from poor counties and non-poor counties (Figure 6). From 2007 to 2009, students from poor counties lagged behind their peers from non-poor counties in HSEE participation by 34% to 50% (Figure 6, Columns 4-6). This means students from non-poor counties (in 2009) were approximately 1.6 times more likely to take the HSEE than students from poor counties. One of the most significant reasons for the gap in high school attendance therefore is that students from poor counties are simply less likely to seek admission into high school by participating in the HSEE. This suggests that the gap in college enrolment has another one of its sources as early in the pathway to college as the first milestone of post-compulsory education.

It should be noted that our analysis of HSEE attendance rates is based on the number of primary school graduates three years earlier. As noted above, existing research shows that in poor, rural areas, roughly 25% of kids drop out of junior high school.²⁴ To the extent that dropout is higher in poor than non-poor areas, a sizeable portion of the gap in HSEE attendance is likely the result of dropout during the three years of junior high school. Still, dropout during junior high school cannot fully explain the observed gap in HSEE participation. The decision not to take the HSEE among junior high school graduates also likely remains a major source of inequality along the pathway to college between students from poor and non-poor counties.

²⁴ Yi et al. 2012; Chung and Mason 2012.

6. Conclusion

Our study shows that even after the mass expansion of college enrolments, (disadvantaged) students from poor counties in Ningxia are still 1.64 times less likely to access college than (advantaged) students from non-poor counties in 2010. Our study also assesses the extent to which each of the three key post-compulsory milestones (Gaining Access to High School, Attending High School, and Gaining Access to College) along the pathway to college contributes to this inequality.

Moving backward in time, we find that inequality exists at multiple milestones along the pathway. First, students from poor counties score significantly lower on the CEE than their peers from non-poor counties. Lower scores mean that many of these students are unable to gain access to college. In particular, we note that students from poor counties perform less well on the higher end of the CEE score distribution than do their advantaged peers, likely resulting in some differences in access to four-year colleges. Second, we note that students from poor counties tend to attend high school at a far lower rate. Although almost all students who enrol in high school stay in school until they graduate, students from poor counties are significantly less likely to enrol in academic high school (and especially elite academic high schools). Third and finally, we demonstrate that the single largest source of inequality along the post-compulsory education pathway emerges during the transition from junior high to high school. A major reason for the academic high school gap is that students are much less likely to participate in the high school entrance exam—not because they score less well on the exam when they do take it—but because they give up before even trying.

In sum, inequalities in college access emerge early in the post-compulsory education process. While modest inequalities accumulate during high school and during the transition from high school to college, the bulk of inequalities in college access occur at the beginning: the transition from junior high school to high school. Indeed, our data suggest that considerable inequality may be introduced even prior to high school, during compulsory education. While rates of primary school dropout are believed to be low, research has shown that rates of junior high dropout in poor, rural areas are high.²⁵ This is likely a contributing factor to the low rates of HSEE participation observed in this study. This suggests that further policy efforts to reduce inequality in college access by targeting high school graduates will be of limited effectiveness. Because the source of inequality in college access originates far in advance, a true reduction in that inequality is unlikely without policies targeted to reducing sources of inequality before post-compulsory education.

Why are so many students from poor counties giving up on academic high school? Although we cannot say for sure, one of the most significant reasons is that the direct costs of attending academic high school are extremely high in China today. High school tuition in China is roughly 82 per cent of the net per capita income in poor areas (this appears to be one of the highest if not the highest tuition burden in the world).²⁶ For students living in poor counties (like those in this study), such high costs of attending academic high school can be a strong deterrent to continuing on in school, and many students make decide to give up before even taking the high school entrance examination (as found in this study).

The out-of-pocket costs are compounded by high and rising opportunity costs (three years of income that a student would forego in the labour force). After remaining at a low level for

²⁵ Yi et al. 2012; Chung and Mason 2012.

²⁶ Liu et al. 2009.

roughly 20 years, the unskilled wage rate in China has been rising steadily since early 2000s.²⁷ Demand for labour in China's coastal provinces has been rising, and almost any able-bodied rural individual is able to find an off-farm job.²⁸ Huang et al. (2011) also found that a typical unskilled worker could earn in one month what the average farmer in poor, rural areas could earn in a year. These low-skill jobs are unlikely to provide long-term prospects for the students.²⁹ However, the opportunity costs that rural students face may compound the already expensive schooling options available and further encourage students to drop out and give up on further schooling.

A second reason is that the quality of compulsory education differs dramatically between students from poor and non-poor counties. That is, studies show that many students in poor counties suffer from poor nutrition and health.³⁰ They also frequently receive lower quality instruction.³¹ As such, by the time most disadvantaged students graduate from junior high, their academic achievement is so far behind that of advantaged students that they decide not to compete in the high school entrance exam at all.

A third possible reason is that the expansion in academic high school has not kept pace in with the aggressive expansion in higher education. The government rapidly increased higher education enrolments (thus reducing competition and increasing the value of academic high school) in the past decade. However, enrolments in academic high school have not increased as rapidly (thereby *increasing* competition for academic high schools). For disadvantaged students, the increasing competition for limited spots in academic high school might exacerbate their

²⁷ Cai and Du 2011.

²⁸ Huang et al. 2011.

²⁹ Cai and Du 2011.

³⁰ For example, Luo et al. 2011.

³¹ Lai et al. 2011.

perceived inability to compete with students with higher academic achievement (that is, the advantaged students).

While an empirical test for why students from poor counties are failing to even take the high school entrance examination is beyond the scope of this work, the bottom line is that factors influencing student decisions before high school seem to be driving inequality in college access (and will continue to drive inequalities in the future). In other words, disadvantaged students face the biggest hurdles early in the pathway to college: the poor quality of compulsory education, heightened competitiveness in the high school entrance examination, and the high costs of attending academic high school (by policy design). These may all be probable causes behind the current inequalities in college access in China.

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Table 1: Participation in the HSGE (*huikao*) and the CEE (*gaokao*)

	(1) Did not take the HSGE	(2) Did not take the HSGE	(3) Did not take the CEE	(4) Did not take the CEE
From poor county (yes/no)	.029 (.021)	.011 (.019)	.021 (.013)	.012 (.013)
Female (yes/no)		-.069*** (.009)		-.021*** (.004)
Minority (yes/no)		.041*** (.010)		.019*** (.056)
Age		.018*** (.004)		.009*** (.002)
N	45,299	45,217	45,327	45,245

Cluster robust SEs in parentheses

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

(Average) marginal effects estimates

Figure 1: The Post-Compulsory Pathway to College in China

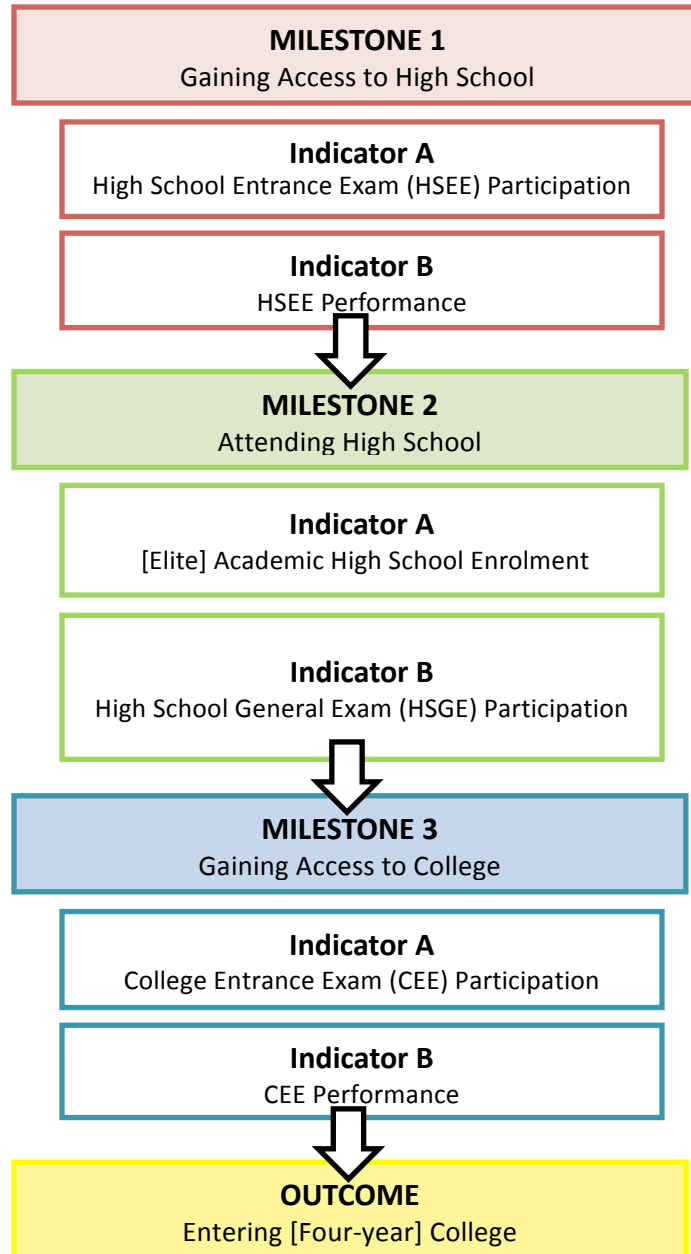
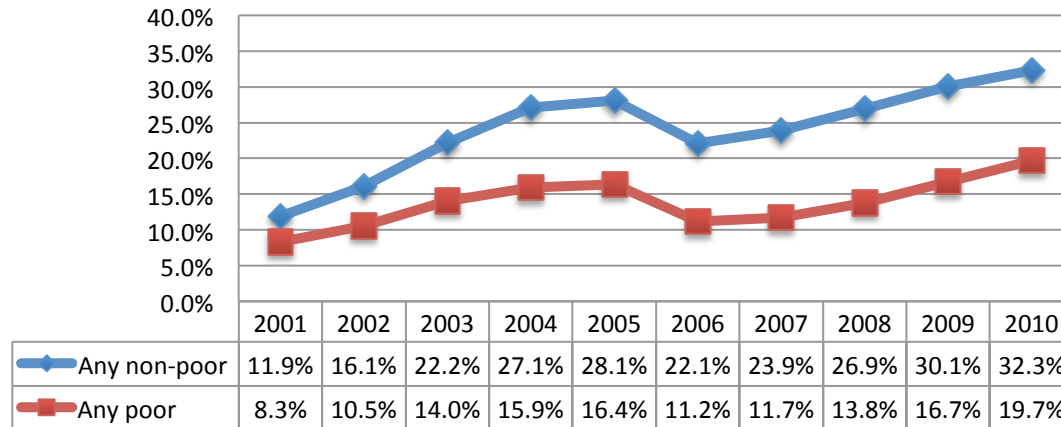


Figure 2: Gap in College and Four-Year College Access for Students from Poor and Non-poor Counties (2001-2010)

Panel A: Attendance in Any College (%)



Panel B: Attendance in 4-Year Colleges (%)

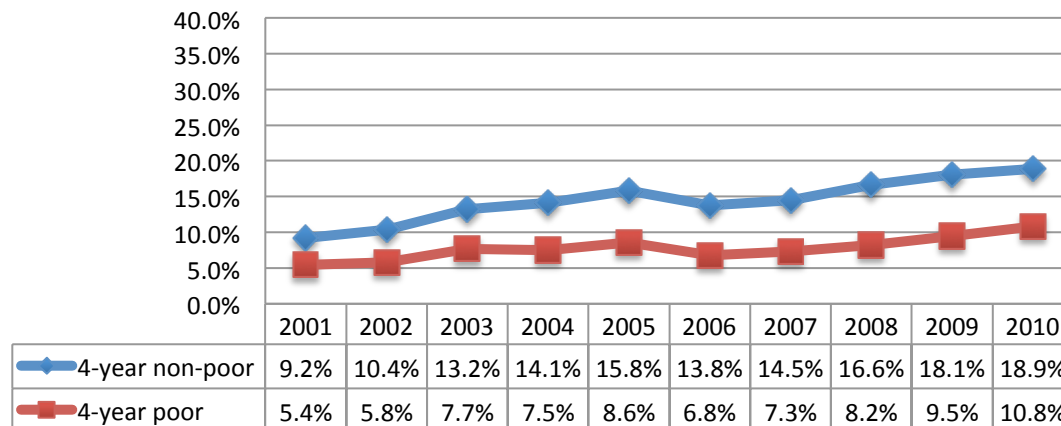


Figure 3: Quantile Regression Estimating CEE (*gaokao*) Scores of Students from Poor Counties

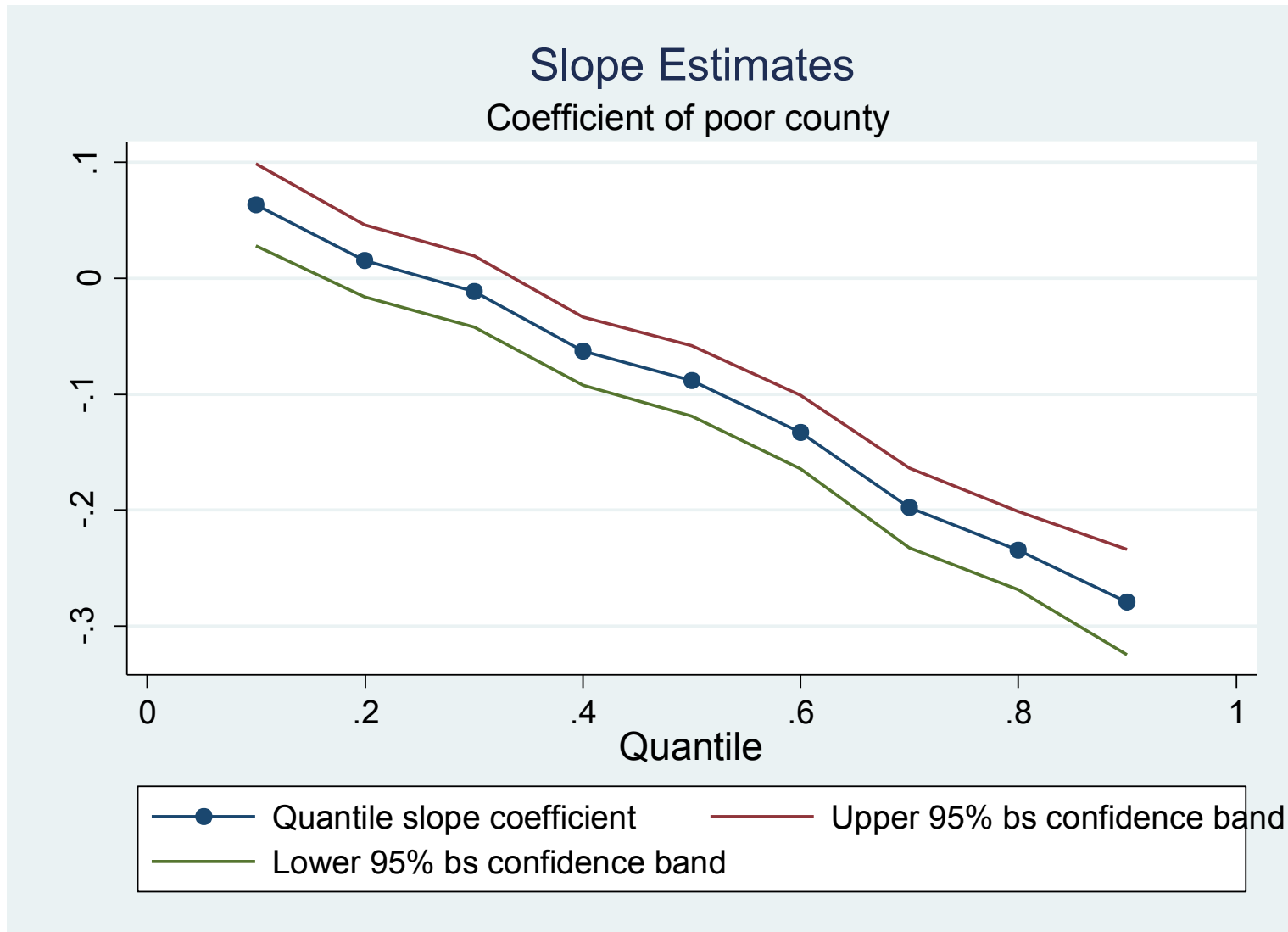


Figure 4: Regular & Elite High School Gross Enrolment Estimates, 2007-2010

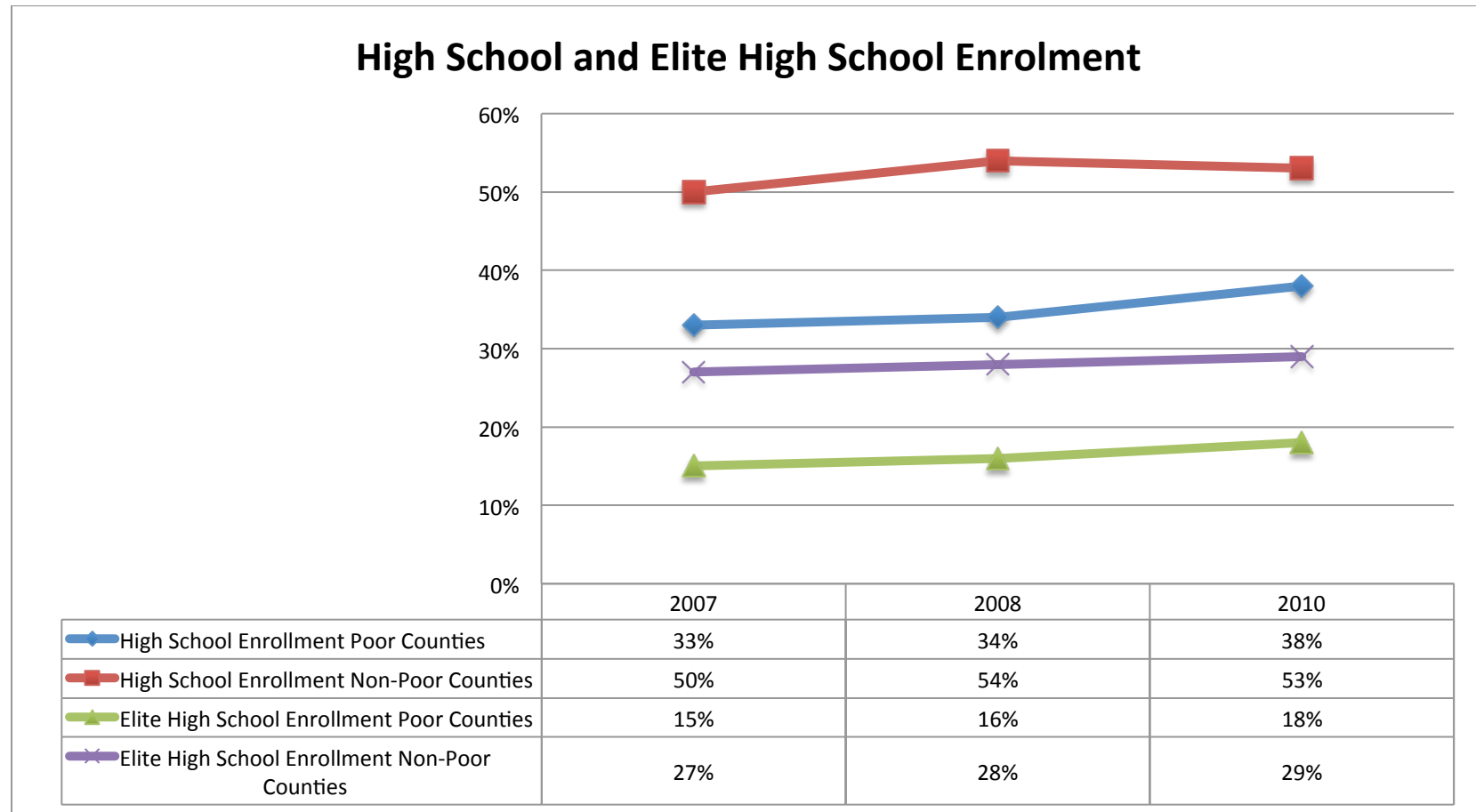


Figure 5: Comparison of Poor and Non-poor Area HSEE (*zhongkao*) Scores, 2007

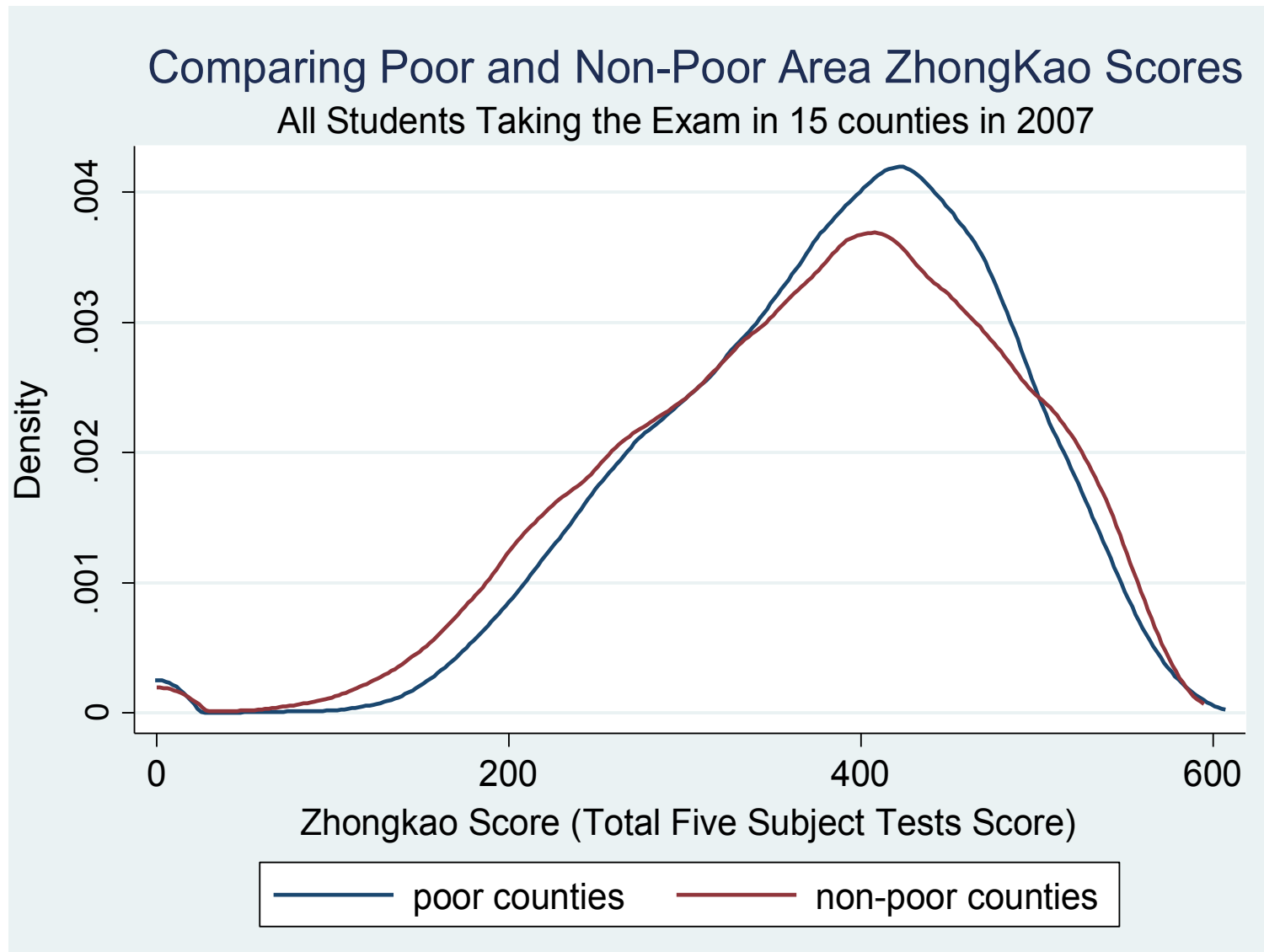
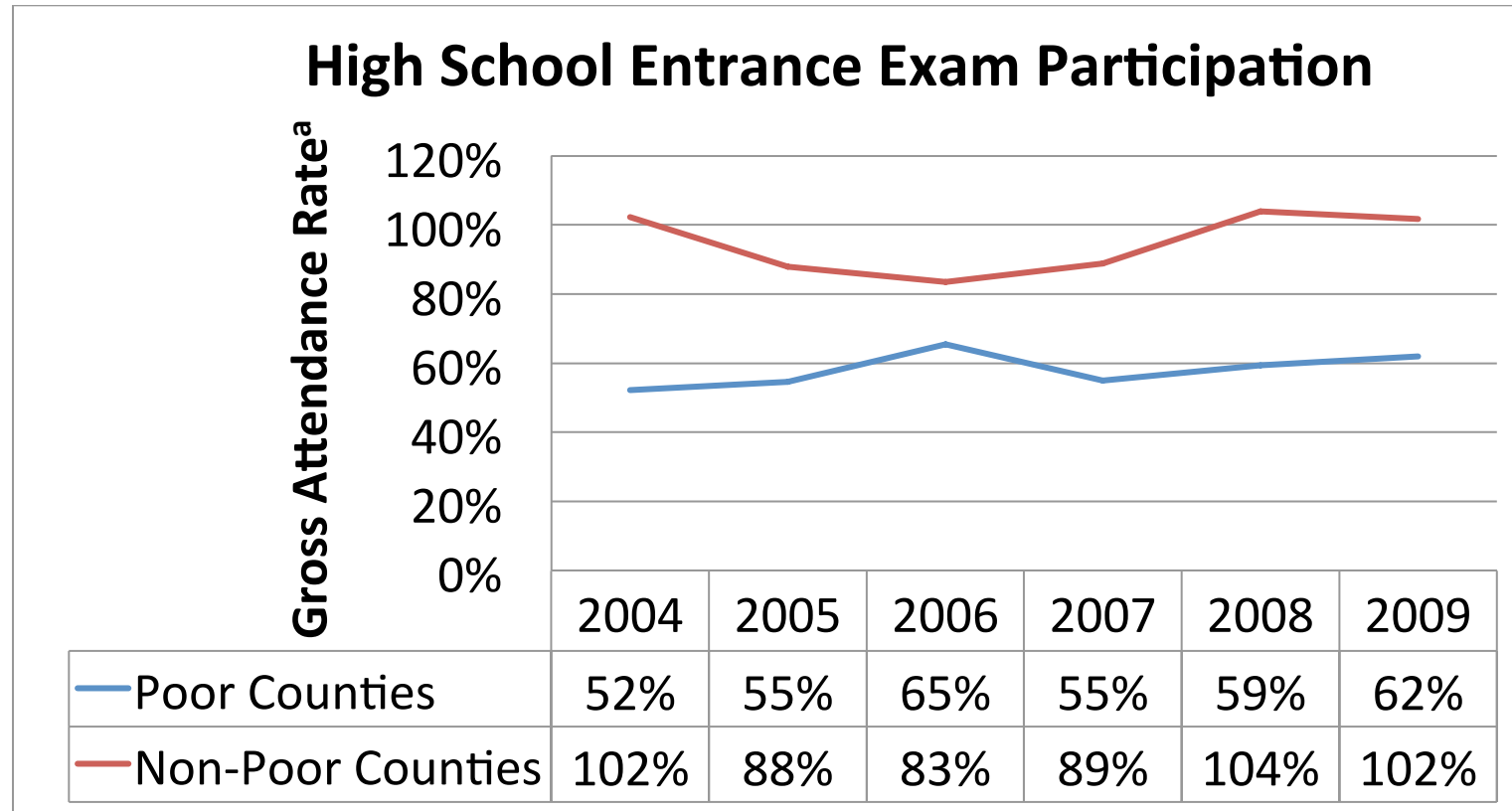


Figure 6: Differences in HSEE (*zhongkao*) Participation Between Students from Poor and Non-poor Counties, 2004-2009



Notes:

^a We report gross participation rates (by dividing the number of exam attendees by the number of primary school graduates from 3 years earlier).