

Gender Inequality in Education in China: A Meta-Regression Analysis

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Abstract

Although almost everyone agrees that there was gender inequality in China's education system in the 1980s, the economics of education literature in China has mixed evidence on improvements in gender inequality in educational attainment over the past three decades. Some papers suggest gender inequality is still severe; others report progress. We seek to understand the progress China has made (if any) in reducing gender inequality in education since the 1980s. To meet this goal, we use a meta-analysis approach which provides a new quantitative review of a relatively large volume of empirical literature on gender educational differentials. The paper analyzes differences across both time and space, and also across different grade levels and ethnicities. Our results indicate that gender inequality in educational attainment still exists, but it has been narrowing over time. Moreover, it varies by area (rural versus urban) and grade level. There is nearly no significant gender discrimination against girls in urban areas or within the nine years of compulsory education (primary school and junior high school), but girls still face discrimination in rural areas (although inequality is falling over time) or when they reach high school or beyond. We also briefly discuss gender inequality in school performance.

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The 2012 World Development Report (World Bank, 2012) focuses on gender and development and states explicitly that gender equality is a core development objective in its own right. According to the Report, gender equality enhances the productivity of the current generation and improves development outcomes for the next. One of the main mechanisms of development that arises from gender equality is the improvement in education that moves hand in hand with gender equality. Most economists and international development agencies believe that girls who receive education not only improve their own vocational opportunities, living conditions, and social status, but also promote economic growth and the social development of the entire nation (Glewwe and Kremer, 2006).

Despite the adverse role that gender inequality can have on development, many developing countries exhibit gender inequality in many dimensions, including education. Almost half of the world's elementary school-aged girls that are not in school live in Sub-Saharan Africa; around a quarter live in South Asia (World Bank, 2011). In India, the second most populous country in the world, of all the elementary school-aged children who should be in school but are not, the majority are girls (56 percent—UNESCO, 2005). The elementary school drop-out rate of girls was twice as high as that of boys in Equatorial Guinea and Grenada. In Egypt, Iraq, Liberia, Morocco, Turkey and Yemen, between three to four girls drop out for every two boys (UNESCO, 2005). The secondary school drop-out rate of girls is also high (UNESCO, 2011).

One of the Millennium Development Goals (MDGs) related to education is the elimination of gender disparity at the primary and secondary school levels. However, despite the often unsubstantiated reports of progress over the past years (at least unsubstantiated by independent sources), many countries are still far from reaching this goal. Scores of countries report that they will not make the goal of full enrollment of girls into school (UNESCO, 2008). In 2005, only 59 of 181 countries (about one-third) with data available had achieved gender parity (i.e. GPIs ranging from 0.97 to 1.03) in their gross enrollment rates (GER) for both primary and secondary education. Most had already achieved parity by 1999, and most are developed countries or countries in transition (fourteen in North America and Western Europe, fifteen in Central and Eastern Europe, five in Central Asia), or countries in Latin America and the Caribbean. In some countries, the situation is dire and there is little progress. The female GER in 2008 was still only 80% of the male GER or less in a number of sub-Saharan African countries as well as in Afghanistan, Pakistan and Yemen (World Bank, 2011). The pace of reducing gender disparity has been much slower both at a global level and in those regions with the widest disparities in 1991 (the Arab States, East Asia and the Pacific, South and West Asia, and sub-Saharan Africa—UNESCO, 2008).

Has gender equality in education been achieved in China? Many studies have and continue to investigate gender inequality in education. Despite the considerable body of record, the record is still mixed in 2000s. Some researchers say that there are still significant disparities in access to education between males and females (Davis et al.,

2007; Hannum et al., 2008a; Cao and Lei, 2008; Hong, 2010). In contrast, other studies find that gender inequality in education has improved (Liu, 2004; Wang, 2010; Wu and Zhang, 2010). In short, there still remains great variability among the estimates of gender discrimination in education in China and, according to some, it is still severe.

The goal of this paper is to understand the progress China has made (if any) in reducing gender inequality in education since the 1980s. To meet this goal, we have four specific objectives. First, we set out to collect all of the empirical papers that have examined gender inequality in education since the 1980s, focusing specifically on gender inequality in schooling attainment. The findings of this literature will be systematically categorized and turned into a data base which will form the basis of our study. In this way, our paper can be considered a meta-analysis. Second, we tabulate the results of the studies and document the nature of gender inequality in educational attainment since the reform era. Third, we decompose the overall findings and track how gender inequality in education changes over time, across regions, by grade level and between Han and minority children. Finally, we will analyze the same set of issues, albeit more briefly (due to the absence of a large volume of published research on the subject) on gender inequalities in school performance.

While the goal of our research is ambitious, there are unavoidably several limitations. We tried to identify all papers with a set of key words (see data section below). We believe we have done a thorough and convincing job using this set of papers to demonstrate how gender inequality a.) changes over time; b.) differs between rural and

urban; c.) differs by the level of education; and d.) varies between Han and minority populations. However, there is still no guarantee that our findings and conclusions would not change if the search criteria were changed. A second limitation relates to our data on school performance. Collecting data on school performance is complicated because one needs complete data on grades/test scores for different subjects by gender in order to draw informed conclusions about how male and female school performance can be compared. Unfortunately, there are not enough published studies (or unpublished working papers) to allow us to build a large, robust data base. Therefore, it is difficult to draw statistically significant estimates regarding gender equality and school performance in this meta-analysis for China. Thus, our results on gender inequalities in school performance should be taken as descriptive.

The remainder of the paper is organized as the follows. In Section 2 we introduce several of the salient features of the education system in China which may affect the nature of gender inequality (e.g., female schooling in urban and rural areas might be expected to differ). If there is reason to believe that gender inequality would differ in different dimensions of the educational system (e.g., over time; between urban and rural; by level of schooling; between Han and minority areas), it means that our empirical analysis should seek to understand how gender inequality differs by these different aspects. In Section 3 we discuss our approach to the meta-analysis and describe the meta-data that are employed in this paper. In Sections 4 and 5 we present the results of the meta-analysis and conclude.

The Nature of Education in China and Expected Shifts in Gender Inequalities

The rapid expansion of the economy over the last three decades will likely have affected gender inequality since economic changes affect both the education system (the supply of schooling) and the returns to education and the ability of parents to send their children—including their daughters—to school (the demand for schooling). There are major shifts in many dimensions. China's GDP per capita has grown by nearly 10 percent per year since the late 1970s (NBSC, 2010). During this time fiscal revenues have also risen consistently—especially since the early 1990s. According to Wong et al. (2008) and NBSC (2010), after rising gradually in absolute real terms between 1980 and the mid-1990s, total government revenues as a share of GDP more than doubled between 1995 and 2010. At the same time, the economy has been transformed from one that was based on the planning (in the 1970s) to one that is now mostly market-oriented (Brandt and Rawski, 2008). Most employment decisions are now made by individuals (firm owners and managers) that are hiring and firing in order to make their business units more profitable and efficient. Indeed, compared to the 1970s, China today is much wealthier, better able to invest in social services and its economy is (and firms in the economy are) driven in no small part by market signals.

All of these shifts have affected the ability of the state to invest in education and increase the supply of schooling. The capacity to supply educational services at all levels has risen (Hannum et al., 2008b). For example, the number of elementary schools increased monotonically between 1980 and 2000. It was not until after 2000 that the number of schools fell, but the fall was mainly due to a large school merger program that

built large centralized schools with better facilities and more qualified teachers (including boarding facilities for students that lived too far from school—Liu et al., 2010). During this same period, the number of available slots in secondary school rose—gradually during the 1980s and accelerating in the 2000s as the state began to open more vocational education and training schools (NBSC, 2010). The greatest expansion—but, the latest in terms of timing—came in tertiary schooling. Between 1998 and 2009, the number of students in college increased by more than six times (NBSC, 2010). The opportunity to go to school has clearly increased between the 1980s and 2000s.

Many of the same factors—economic growth and the rise of a market economy (that demanded workers with greater levels of human capital) as well as the rise in the opportunities to go to school (i.e., more slots in schools at all levels)—also has been changing the calculus for parents and students. Studies of the returns to education have shown that between the 1980s and 2000s the returns to rural education have risen substantially (e.g., deBrauw and Rozelle, 2008; Zhang et al., 2002). Returns to education nearly tripled between 1988 and 2003 in urban areas (Zhang and Zhao, 2007). Other studies have shown significant returns to climbing high within the education system and attending college. For example, Fleisher et al. (2004) find the return to college education, in terms of the percentage return per year of college, increased sharply from 11.85% in 1995 to 23.2% in 2002. The rise in the supply of schooling opportunities and increased demand by families almost certainly increased the demand—among other things—for education for girls both by the parents of girls and by the girls themselves. Hannum et al. (2008b) suggest that their research supports the conclusion that in order to support the sustainable increasing demands of skilled labor for the economic growth, educational

systems was restructured and education was expanded by China's government, a move that provided more access to educational opportunities for all, including girls. From these analyses, for those that are looking to understand gender inequality in education, it is important to look at the changes in gender inequality over time.

Other institutional peculiarities beyond growth over time may also be important in explaining gender inequality. One of the most notable structural divides in the population of China is the urban-rural divide (Naughton, 1994). The hukou system, initiated in the 1950s and 1960s, assigned individuals into one of two groups—urban or rural. Over time the system created one with sharp differences in almost every aspect of life—health, housing, employment, social security and many other elements. Because of this there are also sharp differences in income (NBSC, 2010). Between 1980s and 2010, the urban to rural income ratio has fluctuated from somewhat greater than 2 to somewhat greater than 3. There also have been sharp differences between urban and rural areas in the implementation of China's family planning policies (Yang, 2007). Since the late 1970s and early 1980s urban city officials have almost universally implemented a one-child policy. Rural families have had more leeway and typically are allowed more than one child (except in the coastal areas).

Over and above the natural biases that give rural households lower demand for education, the systematic differences between urban and rural economies stemming from the hukou system should almost certainly be expected to change the supply and demand for schooling. In this way, the rural-urban divide most likely is an important factor to consider in understanding China's gender inequality in education. In urban areas, higher incomes and better welfare services—and perhaps higher returns to education—have

been thought to reduce the gender bias against girls (Knight and Li, 1996; Brown and Park, 2002). Moreover, fifty percent of families in urban areas have no choice but to embrace the education of their daughter, since she is their only child. Higher levels of wealth and greater access to tax revenues in China's industry-biased tax system (Wong, 1991) also mean that there are sharp differences in educational opportunities. Urban spending on elementary and secondary education were 1.4 times to 2.6 times relatively greater on a per capita basis compared to rural spending on education in 2000 (NBSC, 2001). All of these factors make it almost certain that there are differences in gender inequality between rural and urban populations and, as such, urban and rural differences need to be considered in any decomposition analysis. However, the weakening of the hukou system (Cai et al., 2008), the rise of off farm employment (Zhang et al., 2002) and falling fertility in rural areas (as well as a strengthening of family planning and successful implementation of the one-child policy in many rural areas—Yang, 2007) mean that the differences between rural and urban gender inequality in education may be changing.

Other factors may also create structural sources of gender inequality in education. For example, there are striking differences in the rules covering school attendance and the cost of attending school across different levels of schooling. Since the early 1980s, grades 1 to 6 have been compulsory; since the mid-1990s grades 7 to 9 have been so (NBSC, 1997). Since the early 2000s tuition for grades 1 to 9 were eliminated and there are now subsidies for the poor to attend school (Hannum et al., 2008a). In contrast, upper secondary school (grades 10 to 12) is not mandatory, and the tuition for rural public high schools in China is higher than that of almost all other developing countries in the world (Liu et al., 2009). College enrollment slots, despite recent expansion, are still restricted

(Li, 2010). Tuition, fees and other costs of sending a child to college can be 20 or more times higher than per capita income of a family in poverty (Liu et al., 2011). However, the emergence of scholarships (and educational loans) for the poor may have offset the rise of tuition and lowered cost as a barrier to going to college (Wang et al., 2011). While over time, the relative costs, the availability of slots in schools and the nature of the rules governing compulsory education have differed, the differences among the different levels of schooling almost certainly mean that an analysis seeking to decompose the gender inequality of education must consider this as an important factor.

Finally, ethnicity may also play a role in the determination of the gender inequality of education. It is well known that there are still fundamental differences in the socioeconomic status and employment structure of Han and non-Han populations (Gustafsson and Li, 2003). Hannum (2002) has also shown that minority groups have access to relatively poor educational infrastructure. In addition, there are certainly also well-known cultural biases (that may be reinforced by the same factors that determine the income and social gaps between Han and non-Han). Many of these factors may make it so there are differences in the education of Han and non-Han societies—especially in the case of girls.

Methodology and Data

This section is divided into three subsections. The first subsection describes why we have chosen to adopt a meta-analysis methodology and the details of how we undertake it. The second subsection documents the data. The third section reviews the econometric modeling.

Meta-analysis

Meta-analysts employ statistics to describe and explain previously reported statistical analyses that examine the same phenomenon. Therefore, in simplest terms, a meta-analysis is a statistical analysis of the survey findings of a survey of a large number of empirical studies. In a meta-analysis papers investigating one particular topic are collected and each reported empirical study becomes one or more observations.

Meta-analyses allow the evaluation of the effect of different data characteristics and methodologies on the results reported (Stanley, 2001).

While a meta-analysis has the same overall goal as a detailed literature review, there are inherent differences. When conducting a traditional narrative literature review, it is difficult to provide a full quantitative assessment of the literature. The author has full control over his/her essay and interpretation. In most literature review-based reviews many papers are discarded or not addressed due to an understandable need to distill ideas and focus effort. In doing so, authors will often choose to ignore papers based on their own perception of methodological shortcomings, the unreliability of the data and the like. Other papers, in contrast, are strongly highlighted. As a consequence, it is possible that the conclusions of literature reviews might be affected by the personal assessment of the author (Weichselbaumer and Winter-Ebmer, 2005).

Meta-analyses, on the other hand, are supposed to eliminate the discretion of narrative reports. Authors collect papers in a standardized way, a step that is purposively done to eliminate the author's personal bias. As a result, meta-analyses are considered by some as a more rigorous alternative to narrative discussions of research or literature reviews (Phillips, 1994). Meta-analyses have been most widely used in medical research. The applications of meta-analyses, however, have been growing in psychology, education and economic circles.

Because of the almost natural inclination by authors to use their discretion, it is perhaps not suspicious that the current literature in China that seeks to summarize and draw conclusions about gender disparity in education is conflicted. Some authors have come to the conclusion that there is considerable gender inequality in education in China (Davis et al., 2007; Hannum et al., 2008a; Cao and Lei, 2008; Hong, 2010). Others state strongly that there is little gender inequality in education in china (Liu, 2004; Wang, 2010; Wu and Zhang, 2010). For this reason, it seems that a careful, objective meta-analysis on the topic may be a welcome contribution to the literature.

However, a meta-analysis maybe an inefficient way to study this question if there are reliable, comprehensive, disaggregated, nationwide data. In other words, if national statistical data bases had data available by period, region (e.g., urban and rural), grade level (e.g., elementary school to college) and ethnicity for both males and females, there would be no need for a meta-analysis.

Unfortunately, China does not have and/or does not make such data available to the research community. Above all, while use of national data bases can be a useful place to start, there are many reasons that one may rely on to cast suspicion on the quality of

data, in general, that are collected by the national statistical system. Rawski (2001), for one, speculates that there are even problems with such basic data as those that go into calculating GDP. Such discrepancy can lead to arguments about the nature of conclusions made on the basis of such data. Ma et al. (2004) and Crook et al. (1993) show that similar problems occur in the case of many of the most fundamental agricultural statistical series.

For many of the same reasons, it is either impossible and/or perhaps undesirable to rely on the national education database. To our knowledge, there is no systemic data base on attendance and on schooling attainment that exists of all levels of schooling, by gender and by rural and urban. National assessment and standardized data in China are almost never made available to independent research teams. The statistics that are published are often incomplete and do not allow for systematic decomposition and analysis. In addition, there are hints in the literature that national statistics on education, including those that are used to report certain educational attainment figures, may be subject to quality problems. For example, using micro-data that they believe to be high quality, Mo et al. (2011) and Zhao and Glewwe (2010) find the dropout rates of junior high school students are nearly three times higher than the officially reported rates.

In order to add a new dimension to the empirical gender inequality in education literature, we therefore utilize a meta-analysis approach in the rest of this paper. This approach allows us to avoid our own personal biases that might work their way into traditional literature reviews. It also will allow independent analyses that do not depend on national statistics.

Meta-Data

In the execution of our meta-analysis, we used an easily accessible but universal research database as a way to make the construction of the database as transparent as possible. Specifically, in September, 2011, we searched the Web of Science for any new listing with the phrase (*education* or *enrollment* or *academic achievement* or *academic attainment*) and (*gender* or *difference* or *inequality* or *girl* or [blank]) and (*China*).

Relevant articles from their reference lists were also reviewed.

Each study included in this meta-analysis met the following criteria:

- (1) The study must have presented an empirical estimate of the gender difference or sufficient information to calculate it; that is, a study should contain enough statistical information so that test statistics, such as those resulting from a *t* test, ANOVA, and so on, were either provided in the study or could be determined from the means and measures of variance listed in the study.
- (2) The study must have been concerned about the educational attainment (or achievement in the case of the analysis in the section below) of any level of schooling from grade 1 through college (or other tertiary educational institution). We did not include pre-school or kindergarten.
- (3) The study needed to be set in China and could have been a published or unpublished study.

Because of the nature of the criteria listed above, qualitative studies were not included in the analysis. Qualitative studies were typically impossible to code for quantitative purposes. Also, because of this (and because of an absence of a large economics of education community inside China), non-English-language studies (that is,

studies in Chinese) were underrepresented.¹ Hence, we fully admit that there is a bias toward internationally published research. On the one hand this is unfortunate. Correcting this bias, however, seems impossible. On the other hand, because the field of the economics of education—especially the part of the field that is empirical and uses statistics—is so nascent in China, this bias might be considered a welcome selection with regard to quality.

Our Web of Science search led to 813 references, of which a large fraction was not concerned with gender. The empirical papers were examined for whether they used any regression analysis or had enough statistical information to calculate the gender differences. Eventually, we found a total of 55 articles that both quantitatively examined gender differences and covered the topic of educational attainment. This does not mean, however, that we have only 55 observations. Some authors studied the gender inequality for several time periods or areas or grade levels in a single paper. For example, an author might have used data from different areas and from different time periods in a single study. In our meta-analysis, we treat these estimates as independent estimates.² In other words, in many cases we used more than one estimate from a single paper and created multiple observations. The observations, of course, would be coded differently, having come from different time periods and/or different areas and/or different grades and/or ethnicities. In the final count, we identified a total of 167 different study or sub-study observations on gender inequality in education.

According to the results of our search on educational attainment (and gender inequality), we counted studies that focused on a number of different elements of

¹ Nine percent of studies are in Chinese.

² Because we might worry that a single study could have undue influence, in the results section below we seek to control for this and eliminate any bias that would result from our decision to use multiple findings from a single study.

educational attainment. For example, we included studies that examined enrollment rates, drop-out rates, graduation rates, transition rates and years of schooling. Although these concepts are all somewhat different, all of them can be converted into an expression that measures educational attainment.

Following the discussion in the previous section, we were able to code our data in a way that will allow us to decompose (through regression analysis—see next subsection for a complete discussion) into several key dimensions. In each study we know the time period being analyzed: the 1980s, the 1990s or the 2000s. Therefore, in the case of each observation, we create a matrix of dummy variables called *Time*. We also know if the data were from a rural population (in which case a variable *Rural* is coded as 1) or urban (*Urban*) population or one that included both rural and urban (henceforth, called *nationwide*). The dummy variables for rural, urban and nationwide are collectively called *Area*. We also code the data by the grade level that was being analyzed (*elementary school*; *lower secondary*; *upper secondary*; and *tertiary*, which as a group forms a matrix that is called *Grade level*). Finally, studies could be categorized by the ethnicity of the cohort being studied, either *Han* or *minority* (non-Han). These final two variables are formed into a matrix called *Ethnicity*.

Table 1 summarizes the data employed in this meta-analysis over time, area, grade level and ethnicity. Within the Time matrix, approximately 25 percent of studies use data from the 1980s, 44 percent use data from the 1990s, and 31 percent present data from the 2000s. Within the Area matrix, more studies use data from rural areas (32 percent) than from urban areas (20 percent); most studies (48 percent) use data for the whole country. Within the Grade level matrix, just over half of the studies

(around 56 percent) focus on the years of compulsory education (20 percent on primary school; 36 percent on middle school). Twenty seven percent focus on high school. Only 17 percent focus on tertiary education. Within the Ethnicity matrix, about 90 percent of the studies use data on Han students. In contrast, only 10 percent focus on minorities.

Meta-Regression Approach

For the purposes of the current study, the dependent variable of interest, y , is a dummy variable that refers to whether the study found gender inequality against girls in terms of enrollment or educational attainment. If y is equal to 1, the study found that girls suffered a statistically significant disadvantage in terms of educational attainment. A statistical cutoff at the 10% level is employed here. If girls were not statistically disadvantaged relative to boys, the variable was equal to 0. In a small minority of the cases (in the case of 3% studies), boys were actually at a disadvantage. In those cases, we still coded the dependent variable as 0.

In order to estimate the trend and pattern of gender inequality in educational attainment, we also want to control for the variables that might influence the estimated discrimination against girls when we run the meta-regression model. Following the discussion above, we include four sets of independent variables, Time, Area, Grade level and Ethnicity.

Given these definitions, the following model is specified:

$$y = a_0 + a_1 * \text{Time} + a_2 * \text{Area} + a_3 * \text{Grade level} + a_4 * \text{Ethnicity} + e \quad (1)$$

where y is a dummy variable equal to 1 if there is gender inequality against girls. In equation (1), Time is a matrix that includes three dummy variables (1980s, 1990s and 2000s) and is included to examine how gender inequality in educational attainment

changes over time. The matrix Area includes three variables (Rural, Urban and Nationwide) and is included to examine whether there is a difference in gender inequality between rural and urban areas. Grade level is a matrix that includes four variables (elementary schools, lower secondary schools, upper secondary schools, and tertiary schools). Ethnicity is a dummy variable equal to 1 when the study population is non-Han. It is included to examine whether there is a difference in gender inequality between Han and Minority groups. The other terms in equation (1) are defined as: e is an error term and a_0, a_1, a_2, a_3 and a_4 are parameters to be estimated.

Estimation approach

Because of the conditional nature of the dependent variable, we estimate equation (1) using a Probit estimation. In our estimation, we report marginal coefficients of our independent variable. Because of this, the coefficients can be interpreted as the probability that the gender inequality of educational attainment increased or decreased.

Results

As shown in Table 2, without regard to disaggregation, the overall rate of gender inequality against girls from 1980 to the 2000s and across all schools and grade levels is 66%. This means that in 66 percent of the studies, girls were at a disadvantage in educational attainment compared with boys. In 3 percent of the studies, boys were at a disadvantage in educational attainment compared with girls. Clearly, if one only looks at this most aggregated of all statistics, gender inequality in educational attainment in China in the Reform Era (around 1980 to the present) is an issue.

A more nuanced analysis, however, is presented in Table 3, decomposing the results by time, space, grade level, and ethnicity. The low p-value on the time indicator (0.02) suggests that gender inequality against girls differs significantly across time. Specifically, gender inequality against girls reduces dramatically from 81% in the 1980s to 67% in the 1990s and finally to only 54% in the 2000s.

Gender inequality against girls seems to differ significantly across space as well. This can be seen most clearly in the data by examining the low p-value (0.00) for the area indicator. The rate of gender inequality in rural areas is nearly twice as high as that in urban areas, indicating a wide urban-rural gap in gender inequality. In rural areas, 7 out of 10 studies, the analysis shows that girls have inferior access to education relative to their male counterparts; in the urban areas, this is only true for 36 percent of the studies.

Gender inequality against girls across different grade levels seems to follow a different trend from that of time and space. The relatively high p-value (0.82) indicates no significant difference across grade levels (when taken as a group). The high rates of gender inequality against girls—between 62% and 71% across all levels of schooling—suggest that girls suffer high levels of gender inequality in educational attainment throughout the entire educational system.

Finally, looking at the case of gender inequality among minority students, we find that gender inequality is slightly higher among minorities (75%) than among Han children (66%). The differences between these numbers is not statistically significant. Because the numbers are fairly close and because the number of studies on gender inequality in educational attainment is small for the case of ethnic minorities, it is unclear

from the descriptive statistics if there is any real difference in the nature of gender inequality between Han and minorities.

Econometric Considerations

As has been mentioned, multiple studies are available for each paper. In order to eliminate the potential bias from our use of multiple findings within a single paper, we employ two ways to control for the undue influence a single paper might have. Table 4, column 1 presents the results of the marginal probit regression without controlling for the multiple use of a single paper. In column 2, we add a simple dummy variable (*Single Paper*) which is equal to 1 when the study is the only one from a single paper, and equal to 0 otherwise (that is, if the observation is from a study that has produced two or more observations). The results using this method are nearly identical to those in column 1, which does not control for this potential bias. In column 3, we adopt a more complex weighting scheme: all studies from a single paper are weighted with the inverse of the number of studies contained in that paper. The coefficient of Ethnicity becomes significant in the weighted probit regression shown in column 3, indicating that minority female students are more likely to be disadvantaged when we control for studies coming from a single paper.

Gender Inequality across Time

Simultaneously looking at gender inequality and our other variables using Equation 1, we find the results are mostly consistent with the descriptive findings. The coefficients on the different time periods are all negative and significantly distinguishable from zero (Table 4, column 1, rows 1 and 2), indicating that gender inequality against girls is declining significantly over time. Compared with the 1980s, the probability of

gender inequality against girls significantly decreased by 27 percent in the 1990s. What's more, the coefficient on the 2000s is 40.47, larger than that on 1990s (26.72), which means that even more inequality against girls disappeared in the 2000s.

It is important to remember, however, that although gender inequality has been trending downwards over time, girls continue to experience significant discrimination in educational attainment in the 21st century, as more than half of the studies from the past ten years confirm (Table 3).

In short, the meta-regression analysis demonstrates a clear declining trend of gender inequality against girls in education. While we do know exactly why (is it due to rising demand for girls or rising supply of schools), our findings are consistent with those from Hunnum (2005), Wu and Zhang (2010) and Connelly and Zheng (2007).

Gender Inequality across Regions and Time and Regions

Gender inequality exists in both urban and rural areas. However, urban and rural China are so different that each requires its own careful analysis. The significant negative coefficient on urban areas (Table 4, column 1) shows that the probability of gender inequality against girls in urban areas is 41 percent less than that in rural areas. This is consistent with our descriptive analysis (Table 3).

Column 4 in Table 4 shows estimates for interactions between time and region. The significant positive coefficients on the interaction variables suggest that gender inequality against girls in rural areas improved more over time than that gender inequality between boys and girls in urban areas. Nevertheless, despite the progress that has been

made since the economic reform of the late 1970s, the probability of gender inequality against rural girls in the 1990s is still significantly higher than that of their urban counterparts (p-value is 0.00). By the 2000s, the difference in the probability of gender discrimination between rural and urban girls has decreased (p-value is 0.10), indicating that the difference in gender inequality between rural and urban areas is narrowing over time. Such findings are consistent with Wu (2010) and Hannum et al. (2008a).

Gender Inequality across Grade levels and Ethnicity

The results of the multivariate analysis of differences in gender inequality across grade levels differ from the results of the descriptive analysis. Once Time, Area and Ethnicity are taken into account, Grade level is shown to be significantly correlated with gender inequality against girls (Table 4, column 1, rows 5 to 7). More specifically, there is no significant difference in gender inequality between lower secondary school and elementary school (Table 4, column 1, row 5). There is, however, significantly more gender inequality once girls reach high school. China appears to have made noticeable progress achieving gender equality in elementary and lower secondary education, particularly in terms of enlarging and equalizing access (Wang, 2010). The higher enrollment rate and smaller gender gap may reflect the low or non-existent fees for compulsory schooling and the lower opportunity cost of keeping young children out of the workforce, as farming has become less important over the course of China's development during the 1980s, 1990s and 2000s (Song and Appleton, 2006).

Once students ascend beyond compulsory education, however, gender inequality against girls appears as the difference in educational attainment is shown to be statistically significant (Table 4, columns 1, rows 6 to 7). Papers looking at gender inequality at the high school level are 27.68 percent more likely to suffer from gender inequality in access to school, relative to girls of primary school age. The situation becomes even worse when girls enter tertiary schools, with the probability of papers studying gender inequality increasing to 32.42 percent. Beyond the compulsory education system, therefore, our evidence suggests that gender inequality is still a significant problem and this is consistent with the findings in Yang (2007); Wu and Zhang (2010); and Liu et al. (2010).

The regression results in Table 4 column 1 show no detectable difference in gender inequality between different ethnic groups. However, this may be an underestimate due to the limited information collected on the gender gap among minorities. Indeed, when we use the weighted marginal probit regression (column 3), the coefficient of Ethnicity becomes positive and significant, indicating that minority girls are 27.29 percent more likely to face gender inequality in access to education than are Han girls. Our findings are consistent with Davis et al. (2007), Xue and Shi (2001) and Hong (2010).

Gender Inequality in School Performance

We conduct the same analyses as above on gender inequality in school performance, as measured by standardized test scores. To do so, we searched the Web of

Science using the phrase (*education* or *school performance* or *academic achievement*) and (*gender* or *difference* or *inequality* or [blank]) and (*China*). Using the same general criteria used to identify papers for the educational attainment outcome, we were able to find 30 papers from a total of 431 papers on the website, and split them into 66 separate studies. About 65 percent of the studies relate to the 2000s. The proportion of studies decreased as the school level increased, and no study investigated the gender difference in school performance in tertiary educational institutions.

As shown in Table 6, only 14 percent of studies find that girls do not perform as well as boys. In fact, half of the studies actually find that girls significantly outperformed boys. Such results might be considered ironic by some, since although girls have higher test scores than boys, they have lower levels of educational attainment (as seen in the analysis above).

Our descriptive statistics in Table 7 show that the gender inequality against girls in school performance does not vary by Time, Area, Grade level or Ethnicity. Only a few studies report that girls get lower scores than boys; instead, more studies show that girls do as well as boys or even better. Since there are no test scores available for any subject at the tertiary level, we could not compare the gender difference in higher education.

Conclusion

In this paper, we review the existing literature on the gender inequality in education in China. We investigated more than 85 articles covering 223 studies from the

1980s to present day. Meta-regression analysis allows us to review and compare these studies in a concise and systematic way and offers more convincing evidence for the change in gender inequality against girls.

What have we learned about gender inequality in educational attainment from the meta-regression analysis? Discrimination against girls still exists in modern China. However, the analysis shows that there is a downward trend over time. Girls' access to education improved noticeably with China's economic development during the 1980s, 1990s and 2000s, which was concomitant with a series of government policies which addressed issues that likely affected education inequality. Gender inequality in educational attainment varies between urban and rural areas. In urban areas, gender inequality reduced dramatically and has now all but disappeared; indeed, urban girls seem to have advantages in educational opportunities. By contrast, the educational penalty for living in a rural area is substantially greater for girls than boys, and somewhat greater for minorities than for Han. There is nearly no gender inequality against girls within the compulsory education system, even in poor areas. Beyond the compulsory level, however, gender is still linked to educational attainment. Girls are still significantly less likely to matriculate to senior high school than are boys, and they are less represented in higher education. In short, females from rural areas—especially ones that are high school aged and above (and especially minorities) face the greatest obstacles to enrollment in schools.

Despite lingering gender inequality in educational attainment, girls do not seem to face significant disadvantages in school performance. In fact, in many cases, girls perform better than boys. Unfortunately, due to the small sample size we were unable to conduct a more nuanced analysis of gender inequality in school performance; however, this is an area that could benefit from future research.

References

- Brandt, Loren and Thomas Rawski, 2008, "China's Great Economic Transformation," in *China's Great Economic Transformation*, ed. by Loren Brandt and Thomas Rawski, Cambridge University Press.
- Brown, Philip and Albert Park, 2002, "Education and Poverty in Rural China," *Economics of Education Review*, Vol. 21, pp. 523-41.
- Cai, Fang, Albert Park, and Yaohui Zhao, 2008, "The Chinese Labor Market in the Reform Era," in *China's Great Economic Transformation*, ed. by Loren Brandt and Thomas Rawski, Cambridge University Press, pp. 167-214.
- Cao, Huhua and Fenglian Lei, 2008, "Girls Education in Gansu," September 6th, posted at <http://www.chinaeam.uottawa.ca/icas5/book/22.pdf>
- Connelly, Rachel and Zhenzhen Zheng, 2007, "Enrollment and Graduation Patterns as China's Reforms Deepen, 1990-2000," in *Education and Reform in China*, ed. by Emily Hannum and Albert Park, London and New York: Routledge.
- Crook, Frederick, 1993, "Underreporting of China's Cultivated Land Area: Implications for World Agricultural Trade," in *China International Agriculture and Trade Report*, pp. 33-39, Situation Outlook Ser. RS-93-4, U. S. Dep. Of Agricul., Washington, D. C.
- Davis, Deborah, Pierre Landry, Yusheng Peng and Jin Xiao, 2007, "Gendered Pathways to Rural Schooling: the Interplay of Wealth and Local Institutions," *The China Quarterly*, 189, pp. 60-82.
- deBrauw, Alan and Scott Rozelle, 2008, "Reconciling the Returns to Education in Off-Farm Wage Employment in Rural China," *Review of Development Economics*, Vol. 12, No. 1, pp. 57-71.
- Fleisher, Belton M., Haizheng Li, Shi Li, and Xiaojun Wang, 2004, "Sorting, Selection, and Transformation of the Return to College Education in China," IZA Discussion Paper No. 1446.
- Glewwe, Paul, and Michael Kremer, 2006, "Schools, Teachers and Education Outcomes in Developing Countries," In *Handbook of the economics of education*, ed. by Eric Hanushek et al., North Holland.
- Gustafsson, Björn and Shi Li, 2003, "The Ethnic Minority-Majority Income Gap in Rural China during Transition," *Economic Development and Cultural Change*, Vol. 51, No. 4, pp. 805-22.
- Hannum, Emily, 2002, "Educational Stratification by Ethnicity in China: Enrollment and Attainment in the Early Reform Years," *Demography*, Vol. 39, No. 1, pp. 95-117.
- Hannum, Emily, 2005, "Market Transition, Educational Disparities, and Family Strategies in Rural China: New Evidence on Gender Stratification and Development," *Demography*, Vol. 42, No. 2, pp. 275-99.

- Hannum, Emily, Jere Behrman, Meiyang Wang and Jihong Liu, 2008b, "Education in the Reform Era," in *China's Great Economic Transformation*, ed. by Loren Brandt and Thomas Rawski, Cambridge University Press: pp. 215-249.
- Hannum, Emily, Meiyang Wang and Jennifer Adams, 2008a, "Urban-Rural Disparities in Access to Primary and Secondary Education Under Market Reforms. One Country, Two Societies?" *Rural-Urban Inequality in Contemporary China*, ed. by Martin King Whyte, Harvard University Press.
- Hong, Yanbi, 2010, "Ethnic Groups and Educational Inequalities: An Empirical Study of the Educational Attainment of the Ethnic Minorities in Western China." *Social Chinese Journal of Sociology*, 2 CJS Vol. 30
- Knight, John and Li Shi, 1996, "Educational Attainment and the Rural-Urban Divide in China," *Oxford Bulletin of Economics and Statistics*, 58, No. 1. pp. 83-117.
- Li, Chunlin, 2010, "Expansion of Higher Education and Inequality in Opportunity of Education: A Study on Effect of "Kuo Zhao" Policy on Equalization of Educational Attainment," *Sociological Studies*, No. 3, pp. 82-113.
- Liu, Chengfang, Linxiu Zhang et al., 2009, "Development Challenges, Tuition Barriers and High School Education in China," Center for Chinese Agricultural Policy, Chinese Academy of Science, Working Paper 2009-01-23.
- Liu, Chengfang, Linxiu Zhang et al., 2011, "Early Commitment on Financial Aid and College Decision Making of Poor Students: Evidence from a Randomized Evaluation in Rural China," *Economics of Education Review*, No.2, pp. 1-13.
- Liu, Chengfang, Linxiu Zhang, Renfu Luo, Scott Rozelle, Prashant Loyalka, 2010, "The Effect of Primary School Mergers on Academic Performance of Students in Rural China," *International Journal of Educational Development*, 30, pp. 570-85.
- Liu, Fengshu, 2004, "Basic Education in China's Rural Areas: a Legal Obligation or an Individual Choice?" *International Journal of Educational Development*, Vol. 24, pp. 5-21.
- Ma, Hengyun, Jikun Huang and Scott Rozelle, 2004, "Reassessing China's Livestock Statistics—An Analysis of Discrepancies and the Creation of New Data Series," *Economic Development and Cultural Change*, Vol. 52, No. 2, pp. 445-73.
- Mo, Di, Hongmei Yi, Linxiu Zhang, Renfu Luo, Scott Rozelle and Carl Brinton, 2011, "Transfer Paths and Academic Performance: The Primary School Merger Program in China," LICOS Discussion Paper Series. Discussion Paper 283.
- Naughton, Barry, 1994, "Growing out of the Plan: China's Economic Reform, 1978-1993," Cambridge, England: Cambridge University Press.
- NBSC, National Bureau of Statistics of China, 1997, 2001, 2010. *China Statistical Yearbook*.
- Phillips, Joseph, 1994, "Farmer Education and Farmer Efficiency: a Meta-analysis," *Economic Development and Cultural Change*, Vol. 43, pp. 149-65.
- Rawski, Thomas G, 2001, "What is Happening to China's GDP Statistics?" *China Economic Review*, Vol. 12, No. 4, pp. 347-354.

- Song, Lina and Simon Appleton, 2006, "Why Do Girls in Rural China Have Lower School Enrollment?" *World Development*, Vol. 34, No. 9, pp. 1639-53.
- Stanley, T. D. 2001, "Wheat from Chaff: Meta-analysis as Quantitative Literature Review," *Journal of Economic Perspectives*, Vol. 15, No. 3, pp. 131-50.
- UNESCO, 2005, "Children out of school: measuring exclusion from primary education," UNESCO Institute for Statistics.
- UNESCO, 2008, "Education for All by 2015 Will We Make it?" EFA Global Monitoring Report, United Nations Educational, Scientific and Cultural Organization.
- UNESCO, 2011, "Comparing Education Statistics Across the World: Focus on Secondary Education," Global Education Digest, UNESCO Institute for Statistics.
- Wang, Xiaobing, Chengfang Liu et al., 2011, "What is Keeping the Poor out of College? Enrollment Rates, Educational Barriers and College Matriculation in China," *China Agricultural Economic Review*, Vol. 3, Iss: 2, pp. 131-49.
- Wang, Xiaojun Grace, 2010, "Girls' Access to Education in China: Actors, Cultures and the Windmill of Development Management," Consortium for Research on Educational Access, Transitions and Equity, Create Pathways to Access Research Monograph, No. 39.
- Weichselbaumer, Doris, and Rudolf Winter-Ebmer, 2005, "A Meta-Analysis of the International Gender Wage Gap," *Journal of Economic Surveys*, Vol. 19, pp. 479-511.
- Wong, Christine P., 1991, "Central–Local Relations in an Era of Fiscal Decline: The Paradox of Fiscal Decentralization in Post-Mao China," *The China Quarterly*, Vol. 128, pp. 691-715.
- Wong, Christine P., Richard M. Bird, 2008, "China's Fiscal System: a Work in Progress," in *China's Great Economic Transformation*, ed. by Loren Brandt and Thomas Rawski, Cambridge University Press, pp. 429-466.
- World Bank, 2011, The World Bank Education Statistics Newsletter, August, Vol. V, Issue 1.
- World Bank, 2012, "World Development Report 2012: Gender and Development," Washington, DC, World Bank.
- Wu, Xiaogang and Zhuoni Zhang, 2010, "Changes in Educational Inequality in China, 1990-2005: Evidence from the Population Census Data," in *Globalization, Changing Demographics, and Educational Challenges in East Asia Research in Sociology of Education*, ed. by Emily Hannum et al., Vol. 17, pp. 123-152.
- Wu, Xiaogang, 2010, "Economic transition, school expansion and educational inequality in China, 1990–2000," *Research in Social Stratification and Mobility*, Vol. 28, pp. 91-108.
- Xue, Lanrong and Tianjian Shi, 2001, "Inequality in Chinese Education," *Journal of Contemporary China*, Vol. 10, No. 26, pp. 107-24.

- Yang, Juhua, 2007, "The One-Child Policy and School Attendance in China," *Comparative Education Review*, Vol. 51, No. 4, pp. 471-95.
- Zhang, Junsen and Yaohui Zhao, 2007, "Rising Schooling Returns in Urban China," in *Education and Reform in China*, ed. by Emily Hannum and Albert Park, London and New York: Routledge.
- Zhang, Linxiu, Jikun Huang, and Scott Rozelle, 2002, "Employment, Emerging Labor Markets, and the Role of Education in Rural China," *China Economic Review*, Vol. 13, pp. 313-28.
- Zhao, Meng and Paul Glewwe, 2010, "What Determines Basic School Attainment in Developing Countries? Evidence from Rural China," *Economics of Education Review*, Vol. 29, pp. 451-60.

**Table 1. Descriptive Statistics about the Data for the Meta Analysis
Study of Gender Inequality in Educational Attainment**

	Number of Studies	Percent
Time		
1980s	42	25
1990s	73	44
2000s	52	31
Area		
Rural	53	32
Urban	33	20
Nationwide	81	48
Grade Level		
Elementary	33	20
Lower secondary	61	36
Upper secondary	45	27
Tertiary	28	17
Ethnicity		
Han	151	90
Minority	16	10
Total	167	100

Table 2. Gender Inequality in Educational Attainment (in the Aggregate) in China, 1980s, 1990s and 2000s.

	Number of Studies	Percent (column 1, row 1 or 2 divided by row 3).
Girls do NOT Suffer from Gender Inequality ^a	56	34
Girls Suffer from Gender Inequality	111	66
Total	167	100

^a In category we combine the counts of studies that find no gender differences and gender inequality against boys. It should be noted that only 3% studies found evidence in gender inequality against boys.

Table 3. Gender Inequality (against Girls) in Educational Attainment by Time, Area, Grade Level and Ethnicity in China in the 1980s, 1990s and 2000s.

	Percent of Studies Finding Gender Inequality	SD	Number of Studies	p-value ^a
Time				
1980s	81	0.40	42	0.02
1990s	67	0.47	73	
2000s	54	0.50	52	
Area				
Rural	68	0.47	53	0.00
Urban	36	0.49	33	
Grade Level				
Elementary	67	0.48	33	0.82
Lower secondary	62	0.49	61	
Upper secondary	71	0.46	45	
Tertiary	68	0.48	28	
Ethnicity				
Han	66	0.48	151	0.45
Minority	75	0.45	16	
Total	66	0.47	167	

^a The p-values in this column can be used to test for the differences among the sub categories in each group (Time; Area; Grade level and Ethnicity)

Table 4. Using Marginal Probit Regression to Conduct Meta-Analysis of the Determinants Gender Inequality in Educational Attainment in China, 1980s, 1990s and 2000s.

	(1)	(2)	(3)	(4)
Dependent Variable: Gender Inequality against Girls (1=yes, 0=neutral or against boys)				
(1) Time (ref.=1980s)				
1990s	-26.72*** (3.17)	-26.56*** (3.18)	-10.99 (0.81)	-152.14*** (10.21)
2000s	-40.47*** (4.42)	-41.44*** (4.67)	-32.13*** (2.56)	-161.51*** (10.73)
(2) Area (ref.=rural areas)				
Urban	-41.09*** (4.53)	-41.47*** (4.56)	-35.13*** (2.77)	-166.64*** (10.81)
Nationwide	7.04 (0.96)	6.5 (0.88)	2.8 (0.28)	115.23*** (6.79)
(3) Grade Level (ref.=elementary)				
Lower Secondary	12.1 (1.32)	13.33 (1.47)	8.18 (0.68)	13.18*** (1.39)
Upper Secondary	27.68*** (2.70)	28.92*** (2.79)	24.47* (1.87)	32.01*** (3.07)
Tertiary	32.42*** (2.91)	32.98*** (2.96)	42.60*** (3.34)	33.53*** (3.12)
(4) Ethnicity (ref.=Han)	6.68 (0.56)	7.56 (0.61)	27.29** (2.19)	6.07 (0.48)
Single Paper (ref.=non single paper)		-10.04 (0.77)		
(5) Interaction Variables				
1990s*Urban				119.86*** (5.27)
1990s*Nationwide				131.83*** (6.66)
2000s*Urban				140.60*** (6.11)
2000s*Nationwide				113.88*** (5.50)
Observations	167	167	167	167

Note: Robust t-statistics are in parentheses. The symbols *, **, and *** indicate significance at 10%, 5% and 1%, respectively. In column 2, we add a single paper dummy variable to control for whether the study is the only study from a single paper. In column 3, we use the inverse of number of the studies from a single paper as weights. In column 4, we include interactions for the variables: time and area.

Table 5. Descriptive Statistics about the Data for the Meta-Analysis Study of Gender Inequality in School Performance

	Number of Studies	Percent
Time		
1980s	11	17
1990s	12	18
2000s	43	65
Area		
Rural	26	39
Urban	22	33
Nationwide	18	28
Grade Level		
Elementary	28	42
Lower secondary	23	35
Upper secondary	15	23
Tertiary	0	0
Ethnicity		
Han	60	91
Minority	6	9
Total	66	100

Table 6. Gender Inequality in School Performance (in the Aggregate) in China, 1980s, 1990s and 2000s.

	Number of Studies	Percent
Girls do NOT Suffer from Gender Inequality ^a	57	86
Girls Suffer from Gender Inequality	9	14
Total	66	100

^a In category we combine the counts of studies that find no gender differences and gender inequality against boys. It should be noted that about 50% studies found evidence in gender inequality against boys in school performance.

Table 7. Gender Inequality (against Girls) in School Performance by Time, Area, Grade Level and Ethnicity in China in the 1980s, 1990s and 2000s.

	Percent of Studies Finding Gender Inequality	SD	Number of Studies	p-value ^a
Time				
1980s	18	0.40	11	0.81
1990s	17	0.39	12	
2000s	12	0.32	43	
Area				
Rural	12	0.33	26	0.75
Urban	18	0.39	22	
Grade Level				
Elementary	11	0.31	28	0.25
Lower secondary	9	0.29	23	
Upper secondary	27	0.46	15	
Ethnicity				
Han	12	0.32	60	0.14
Minority	33	0.52	6	
Total	14	0.35	66	

^a The p-values in this column can be used to test for the differences among the sub categories in each group (Time; Area; Grade level and Ethnicity)

Appendix Table 1. List of Papers Used in the Meta-Regression Analysis

No.	Paper Name	Author	Source
1	A Comparative Study on the Gender Differences of Higher Education Opportunity, School Work Achievement and Graduate Employment In China(in Chinese)	Dongmao Wen	Research on Education Tsinghua University, 2005, Vol. 5.
2	A Study of Educational Disparity in Urban China (1949-2003) (in Chinese)	Dahai Hao	Social Science in China, 2007, Vol. 6.
3	Access to higher education: Targeted recruitment reform under economic development plans in the People's Republic of China	Vilma Seeberg	Higher Education, 1993, Vol. 25, No. 2, pp. 169-88.
4	Adolescent Transitions to Adulthood in Reform-Era China	Emily Hannum and Jihong Liu	National Research Council, 2005, The Changing Transitions to Adulthood in Developing Countries: Selected Studies, ed. by Cynthia Lloyd et al., Washington, DC: The National Academies Press.
5	An analysis of gender disparity in the demand for higher education and choice of study subject (in Chinese)	Genshu Lu, Shan Liu and Yuping Zhong	Journal of Higher Education, 2009, Vol. 30, No. 10.
6	An empirical study of gender differences in Chinese students' science achievement	Jianjun Wang and John Staver	The Journal of Educational Research, 1997, Vol. 90, No. 4, pp. 252-255
7	An investigation of gender differences in cognitive abilities among Chinese high school students	Jiafen Huang	Person. Individ. Diff. 1993, Vol. 15, No. 6, pp. 717-719, 1993
8	An Investigation Report on School Work Achievement of Chinese Primary Students in Grade Six (in Chinese)	Central Institute of Educational Sciences in the achievement of primary and secondary research group	Educational Researcher, 2011, Vol. 1.
9	Anemia in rural China's elementary schools: prevalence and correlates in Ningxia and Qinghai's poor counties	Renfu Luo, Linxiu Zhang, Chengfang Liu et al.	Working paper from REAP, posted at http://iisdb.stanford.edu/pubs/23093/215_-_Prevalence_%26_Correlates_in_NX_%26_QH.pdf
10	Are boys left behind? The evolution of the gender achievement gap in Beijing's middle school	Fang Lai	Economics of Education Review, 2010, Vol. 29, pp. 383–99.

11	Basic education in China's rural areas: a legal obligation or an individual choice?	Fengshu Liu	International Journal of Educational Development, 2009, Vol. 24, pp. 5-21
12	Behind before they begin: the challenge of early childhood education in rural China	Renfu Luo, Linxiu Zhang, Chengfang Liu, et al.	Working paper from REAP, posted at http://iis-db.stanford.edu/pubs/22722/Behind_before_they_begin_-_AJEC_-_2011.pdf
13	Changes in Educational Inequality in China, 1990-2005: Evidence from the Population Census Data	Xiaogang Wu and Zhuoni Zhang	Globalization, Changing Demographics, and Educational Challenges in East Asia Research in Sociology of Education, 2010, Vol. 17, 123-52.
14	Child Malnutrition and school performance in China	Dean T. Jamison	Journal of Development Economics, 1986, Vol. 20, pp. 299-309.
15	Children's Social Welfare in China, 1989-1997: Access to Health Insurance and Education	Jennifer Adams and Emily Hannum	The China Quarterly, 2005, Vol. 181, pp. 100-21.
16	College education and the poor in China: documenting the hurdles to educational attainment and college matriculation	Xiaobing Wang, Chengfang Liu, Linxiu Zhang et al.	Working paper from Reap, posted at http://iis-db.stanford.edu/pubs/22723/210_Wang_et_al_What_is_Keeping_the_Poor_out_of_College_China_Journal.pdf
17	Does Computer-Assisted Learning Improve Learning Outcomes? Evidence from a Randomized Experiment in Migrant Schools in Beijing	Fang Lai, Renfu Luo, Linxiu Zhang, Xinzhe Huang and Scott Rozelle	Working paper from Reap, posted at http://iis-db.stanford.edu/pubs/23239/228_-_computer_assisted_learning_draft1_complete_may_2011_sdr_mwb_-_full_-_compressed.pdf
18	Correlates of early language development in Chinese children	Yiwen Zhang, Xingming Jin et al.	International Journal of Behavioral Development, 2008, Vol. 32, No. 2.
19	Cultural capital, the state, and educational inequality in China, 1949-1996	Yuxiao Wu	Sociological Perspectives, 2008, Vol. 51, No. 1, pp. 201-227
20	Determinants of school enrollment and completion of 10 to 18 year olds in China	Rachel Connelly, Zhenzhen Zheng	Economics of Education Review 2003, Vol. 22 pp. 379-88.
21	Does taking one step back get you two steps forward? Grade retention and school performance in pool areas in rural China	Xinxin Chen, Chengfang Liu, Linxiu Zhang et al.	International Journal of Educational Development, 2010, Vol. 30, pp. 544-59.
22	Early commitment on financial aid and college decision making of poor students: evidence from a randomized evaluation in rural China	Chengfang Liu, Linxiu Zhang, Renfu Luo et al.	Economics of Education Review 2011. No. 2.
23	Economic transition, school expansion and educational inequality in China, 1990-2000	Xiaogang Wu	Research in Social Stratification and Mobility, 2010, Vol. 28, pp. 91-108.
24	Education and earnings in the People's Republic of China	Dean Jamison and Jacques Van Der Gaag	Economics of Education Review, 1987, Vol. 6, No. 2, pp. 161-66.
25	Education and poverty in rural China	Philip Brown and Albert Park	Economics of Education Review, 2002, Vol. 21, pp. 523-41.

26	Education and the Poverty Trap in Rural China	John Knight, Li Shi and Deng Quheng	Research Consortium on Educational Outcomes and Poverty, 2007, RECOUP Working Paper, No. 11.
27	Education in the Reform Era	Hannum, Emily, Jere Behrman, Meiyang Wang, and Jihong Liu	in China's Great Economic Transformation, edited by Loren Brandt and Thomas Rawski, Cambridge University Press, 2007.
28	Education, gender and Islam in China: The place of religious education in challenging and sustaining 'undisputed traditions' among Chinese Muslim women	Maria Jaschok, Hau Ming Vicky Chan	International Journal of Educational Development, 2009, Vol. 29, pp. 487-94.
29	Educational access for China's post-Cultural Revolution generation Enrollment patterns in 1990	Rachel Connelly and Zhenzhen Zheng	in Education and Reform in China ed. by Emily Hannum and Albert Park, 2007, Routledge, London.
30	Educational attainment and rural-urban divide in China	John Knight and Li Shi	Oxford Bulletin of Economics and Statistics, 1996, Vol. 58, No. 1.
31	Educational engagement in China: A case from the Northwest	Mary Maslak, Juhu Kim, Andrea McLoughlin	International Journal of Educational Development, 2010, Vol. 30, pp. 254-62.
32	Educational stratification by ethnicity in China: Enrollment and attainment in the early reform years	Emily Hannum	Demography, 2002, Vol.39, No. 1, pp. 95-117.
33	Educational Stratification in Urban China: 1949-94	Xueguang Zhou, Phyllis Moen and Nancy Tuma	Sociology of Education, 1998, Vol. 71, No. 3, pp. 199-222
34	Enrollment and graduation patterns as China's reforms deepen, 1990-2000	Rachel Connelly and Zhenzhen Zheng	in Education and Reform in China ed. by Emily Hannum and Albert Park, 2007, Routledge, London.
35	Ethnic Groups and Educational Inequalities: An Empirical Study of the Educational Attainment of the Ethnic Minorities in Western China (in Chinese)	Yanbi Hong	Society, 2010, Vol. 2.
36	Ethnic Stratification in Northwest China: Occupational Differences between Han Chinese and national minorities in Xinjiang, 1982-1990	Emily Hannum and Yu Xie	Demography, 1998, Vol. 35, No. 3, pp. 323-333
37	Examinations and educational opportunity in China: mobility and bottlenecks for the rural poor	Emily Hannum, Xuehui An, HuaYu, and Sebastian Cherng	Oxford Review of Education, 2011, Vol. 37, No. 2, pp. 267-305.

38	Expansion of Higher Education and Inequality in Opportunity of Education: A study on effect of “Kuo Zhao” policy on equalization of educational attainment (in Chinese)	Chunlin Li	Sociological Studies, 2010, Vol. 3.
39	Expansion of Higher Education in China and Inequality in Entrance Opportunities: 1978-2003(in Chinese)	Jingming Liu	Society, 2006 Vol. 3, pp.158-79.
40	Family background, financial constraints and higher education attendance in China	Wenli Li	Economics of Education Review, 2007, Vol. 26, Iss. 6, pp. 724-34.
41	Family Background, Gender and Educational Attainment in Urban China	Montgomery Broaded and Chongshun Liu	The China Quarterly, 1996, No. 145, pp. 53-86.
42	Family sources of educational gender inequality in rural China: A critical assessment	Emily Hannuma,, Peggy Kong, and Yuping Zhang	International Journal of Educational Development, 2009, Vol. 29, pp. 474–86.
43	Food for Thought: Poverty, Family Nutritional Environment, and Children's Educational Performance in Rural China	Shengchao Yu and Emily Hannum	Sociological Perspectives, 2007, Vol. 50, No. 1, pp. 53-77.
44	Gender and Mathematics Achievement in China and the United States	Ming Tsui	Gender Issues, 2007, Vol. 24, pp. 1–11.
45	Gender inequality and Higher Education	Jerry Jacobs	Annual Review of Sociology, 1996, Vol. 22, pp. 153–85.
46	Gender Inequality in Urban China: Education and Employment	John Bauer, Wang Feng, Nancy Riley and Xiaohua Zhao	Modern China, 1992, Vol. 18, pp. 333
47	Gendered pathways to rural schooling: the interplay of wealth and local institutions	Deborah Davis, Pierre Landry, Yusheng Peng and Jin Xiao	The China Quarterly, 2007, Vol. 189, pp.60-82.
48	Girls Education in Gansu, China	Huhua Cao and Fenglian Lei	September 6th, posted at http://www.chinaeam.uottawa.ca/icas5/book/22.pdf
49	Girls in Gansu, China: expectations and aspirations for secondary schooling	Emily Hannum and Jennifer Adams	Gansu Survey of Children and Families Papers, University of Pennsylvania, 2008.
50	Girls’ Access to Education in China: Actors, Cultures and the Windmill of Development Management	Xiaojun Wang	Consortium for Research on Educational Access, Transitions and Equity, Create pathways to access Research Monograph, 2010, No. 39.
51	Health shocks and children’s school attainments in rural China	Ang Sun and Yang Yao	Economics of Education Review, 2010, Vol. 29, pp. 375-82.

52	Household decisions and gender inequality in education in rural China	Danke Li and Tsang, Mun	China: An International Journal, 2003, Vol. 1, No. 2, pp. 224-48.
53	Inequality in Chinese Education	Xue Lan Rong and Tianjian Shi	Journal of Contemporary China, 2001, Vol. 10, No. 26, pp. 107-24.
54	Institution and inequality: the hukou system in China	Zhiqiang Liu	Journal of Comparative Economics, 2005, Vol. 33, pp. 133-57.
55	International migration and education of left-behind children in Fujian, China	Hideki Morooka and Zai Liang	Asian and Pacific migration journal, 2009, Vol. 18, No. 3, pp. 345-70.
56	Market transition, educational disparities, and family strategies in rural China: new evidence on gender stratification and development	Emily Hannum	Demography, 2005, Vol. 42, No. 2, pp. 275-99.
57	Mathematics Achievement of Children in China and the United States	Harold Stevenson, Shin-ying Lee et al	Child Development, 1990, Vol. 61, No. 4, pp. 1053-66.
58	Migrant Opportunity and the Educational Attainment of Youth in Rural China	Alan de Brauw and John Giles	IZA Discussion Paper, 2006, No. 2326, posted at https://www.msu.edu/~gilesj/adjg1finalJune5_2008.pdf
59	Migration of the Parents and the School Achievement of the Rural Students Evidence from Shaanxi and Ningxia (in Chinese)	Xinxin Chen, Linxiu Zhang, Scott Rozelle and Yaojiang Shi	Chinese journal of population science, 2009, Vol. 5.
60	Parental investment in children's human capital in urban China	Linda Yueh	Applied Economics, 2006, Vol. 38, pp. 2089-111.
61	Physical well-being and school enrollment: a comparison of adopted and biological children in one-child families in China	Jihong Liua, Grace Wyshak, and Ulla Larsen	Social Science and Medicine, 2004, Vol. 59, pp. 609-23.
62	Political Change and the Urban-Rural Gap in Basic Education in China, 1949-1990	Emily Hannum	Comparative Education Review, 1999, Vol. 43, No. 2, pp. 193-211.
63	Poverty and Basic Education in Rural China: Villages, Households, and Girls' and Boys' Enrollment	Emily Hannum	Comparative Education Review, 2003, Vol. 47, No. 2.
64	Research into Girls' Education in Four Western Provinces of China	Wei Zhou, Tiedao Zhang, Wenpu Liu, Yuqin Ma and Jiayun Peng	Chinese Education and Society, 2001, Vol. 33, No. 5, pp. 4-28.
65	School dropouts and conditional cash transfers: from a randomized controlled trial in rural China's junior high schools	Di Mo, Linxiu Zhang, Hongmei Yi and Renfu Luo	LICOS Discussion Paper Series, Discussion Paper 283/2011
66	School performance, peer association, psychological and behavioral adjustments: A comparison between Chinese adolescents with and without siblings	Ruth Liu, Wei Lin, Zeng-yin Chen	Journal of Adolescence, 2010, Vol. 33, pp. 411-17.

67	Shyness-Sensitivity and Social, School, and Psychological Adjustment in Rural Migrant and Urban Children in China	Xinyin Chen, Li Wang and Zhengyan Wang	Child Development, 2009, Vol. 80, No. 5, pp. 1499-513
68	Son Preference and Educational Opportunities of Children in China – “I wish you were a boy!”	Wendy Wang	Gender Issues, 2005, Vol. 22, No. 2, pp. 3–30.
69	Spatial inequality in children’s schooling in Gansu, Western China: reality and challenges	Cao Huhua	The Canadian Geographer, 2008, Vol. 52, No.3, pp. 331–50.
70	Student Performance and Family Socioeconomic Status	Xiaofei Liu and Ke Lu	Chinese Education and Society, 2008, Vol. 41, No. 5, pp. 70–83.
71	The Academic, Personality, and Physical Outcomes of Only Children in China	Toni Falbo and Dudley Poston	Child Development, 1993, Vol. 64, No. 1, pp. 18-35
72	The educational consequences of migration for children in China	Zai Liang and Yiu Por Chen	Social Science Research, 2007, Vol. 36, pp. 28–47.
73	The effect of migrant parents on the academic performances of their children (in Chinese)	Hufeng and Shantong Li	Management World, 2009, No. 2.
74	The effect of parental labor migration on children’s educational progress in rural china	Chad Meyerhoefer and C. J. Chen	Review of Economics of the Household, 2011, Vol. 9, No. 3, pp. 379-96.
75	The Effect of Sibship Size on Educational Attainment in China: Period Variations	Yao Lu and Donald Treiman	American Sociological Review, 2008, Vol. 73, No. 5, pp. 813-34.
76	The effects of the gender of children on expenditure patterns in rural China: a semi parametric analysis.	Xiaodong Gong, Arthur Van Soest and Ping Zhang	Journal of Applied Econometric, 2005, Vol. 20, pp. 509–27.
77	The inequality of opportunity and its changing in the basic education in China (in Chinese)	Liu Jingming	Social Science in China, 2008, Vol. 5.
78	The One-Child Policy and School Attendance in China	Juhua Yang	Comparative Education Review, 2007, Vol. 51, No. 4, pp. 471-95.
79	The only child and educational opportunity for gills in urban China	Ming Tsui and Lynne Rich	Gender and Society, 2002, Vol. 16, No. 1, pp. 74-92.
80	The Peer Group as a Context: Mediating and Moderating Effects on Relations Between Academic Achievement and Social Functioning in Chinese Children	Xinyin Chen, Lei Chang, Yunfeng He	Child Development, 2003, Vol. 74, No. 3, pp. 710-27.
81	Transfer paths and academic performance: the primary school merger program in China	Di Mo, Hongmei Yi, Linxiu Zhang et.al	2011, LICOS Discussion Paper Series. Discussion Paper 283.
82	Urban-Rural disparities in access to primary and secondary education under market reforms	Hannum, Emily, Meiyang Wang and Jennifer Adams	One Country, Two Societies? Rural-Urban Inequality in Contemporary China, ed. by Martin King Whyte, Harvard University Press, 2008.
83	What determines basic school attainment in	Meng Zhao and Paul	Economics of Education Review, 2010, Vo. 29,

	developing countries? Evidence from Rural China	Glewwe	pp. 451–60.
84	Who gets more financial aid in China? A multilevel analysis	Po Yang	International Journal of Educational Development, 2010, Vol. 30, pp. 560–69.
85	Why Do Girls in Rural China Have Lower School Enrollment?	Lina Song and Simon Appleton	World Development, 2006, Vol. 34, No. 9, pp. 1639–53.