

GENDER INEQUALITY IN EDUCATION IN CHINA: A META-REGRESSION ANALYSIS

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Although there is evidence that there was gender inequality in China's education system in the 1980s, the literature in China has mixed evidence on improvements in gender inequality in educational attainment over the past three decades. Some 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. This article 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 inequality in the case of girls in urban areas or in the case of the 9 years of compulsory education (primary school and junior high school). Girls, however, still face inequality in rural areas (although inequality is falling over time) and when they reach high school or beyond. (JEL I24)

I. INTRODUCTION

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. Girls who receive more education have more opportunities to improve their own vocational opportunities, living conditions, and social status; they also contribute more to economic growth (Glewwe and Kremer 2006). There are also particular externalities from female education in terms of reduced population growth, better child health, and household investments in children, more generally (Song and Appleton 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, who 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%—UNESCO 2005). The elementary school drop-out rate of

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ABBREVIATIONS

GER: Gross Enrollment Rate
MDG: Millennium Development Goal

girls is twice as high as that of boys in Equatorial Guinea and Grenada. The secondary school drop-out rate of girls in many developing countries 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 before 2015. 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 were developed countries and most had already achieved parity by 1999. 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).

Despite the considerable body of evidence, the finding of research on gender inequality in education in the case of China is still mixed in 2000s. Some researchers say that there are still significant disparities in access to education between males and females (Cao and Lei 2008; Davis et al. 2007; Hannum, Wang, and Adams 2008; Hong 2010). For example, using a 0.95 per thousand micro sample from the 2000 China population census, Hannum, Wang, and Adams found that fewer girls were enrolled in compulsory education in 2000. In contrast, other studies find that gender inequality in education has improved (Liu 2004; Wang 2010; Wu and Zhang 2010). For example, using China 1990 population census data, Liu found that there was no significant gender gap in the transition to college in urban areas in 1990. In short, there still remains great variability among the estimates of gender inequality in education in China and, according to some, it is still severe.

The goal of this article 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 three specific objectives. First, we set out to collect all 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 database which will form the basis of our study and will help us identify the channels through which the gender inequality is occurring. In this way, our article can be considered as 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 (around 1980 to the present). 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.

Why is China an interesting case study? While the gender inequality in education problem today is almost surely less severe—especially in parts of the country—than elsewhere in the world, we believe that a study of China across the past three decades is certainly of interest. Most poignantly, China's economy has grown extremely fast, rising by more than 10 times between 1980 and 2010 in terms of GDP per capita (NBSC 2011). However, the growth has been unequal between rural and urban (NBSC 2011). There also have been changes on the supply side of education and the rate of change has changed at different paces in different levels of schooling (i.e., college, high school, etc.). Because of this, China more than any place in the world over the past 30 years might be considered as a laboratory to follow the changes such rapid but differential rates of change may have had on gender inequality.

While the goal of our research is ambitious, there is a limitation. We tried to identify all papers with a set of key words (see Section III). We believe that 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 areas; (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.

The remainder of the article is organized as follows. In Section II, 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 III, we discuss our approach to the meta-analysis and describe the meta-data that are employed in this article. In Sections IV and V, we present the results of the meta-analysis and conclude.

II. 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) as well as 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% 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 and Bird (2008) and NBSC (2011), 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, today China 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 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. 2008). 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, Huang, and Rozelle 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. (2008) suggest that their research supports the conclusion that in order to support the sustainable increasing demands of skilled labor for economic growth, educational systems were 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 changes in gender inequality in education. 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, in part, there are also sharp differences in income (NBSC 2010). Between the 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. Rural educational attainment is positively related to income per capita, and girls are more likely to drop out due to financial problems of the family in rural areas (Knight and Li 1996; Brown and Park 2002). Moreover, just under 50% 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 was 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 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 since the late 1980s (Cai, Park, and Zhao 2008), the rise of off-farm employment (Zhang, Huang, and Rozelle 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 1–6 have been compulsory; since the mid-1990s grades 7–9 have been so (NBSC 1997). Since the early 2000s tuition for grades 1–9 were eliminated, and there are now subsidies for the poor to attend school (Hannum, Wang, and Adams 2008). In contrast, attendance in upper secondary schools (grades 10–12) 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).¹ 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. Minority groups accounted for 8.5% of China's population in 2011. As most of them reside in sparsely populated, relatively poor, and rural interior regions, minorities almost certainly make up more than their population share of those that are under achieving in China's education system. There are differences in the socioeconomic status and employment structure of Han and non-Han populations. For example, the

1. Although the cost of going to high school in rural and urban areas is nearly the same, given differences in incomes between rural and urban residents, the cost in terms share of per capita income (i.e., what percent of per capita income is needed to pay for high school) for going to high school varies greatly between rural and urban.

average household income of the rural non-Han population was only 64.1% of that of the Han population in 1995; only 14.75% non-Han population had non-agricultural jobs compared with 24.97% Han population (Gustafsson and Li 2003). 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). The wide use of the Han language in the curriculum and the unified examination based on the Han language (which the minority children are relatively less familiar with) are examples of such cultural biases (Hong 2010). 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.

III. METHODOLOGY AND DATA

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 large number of empirical studies. In 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. 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).

Because of the almost natural inclination by authors to use their discretion, it is perhaps not surprising that the current literature in China that seeks to summarize and draw conclusions about gender inequality in education is conflicted.

Some authors have come to the conclusion that there is considerable gender inequality in education in China (Cao and Lei 2008; Davis et al. 2007; Hannum, Wang, and Adams 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 would be an inefficient way to study this question if reliable, comprehensive, disaggregated nationwide data existed. In other words, if national statistical databases 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. While national level educational statistics are released every several years, these statistics are highly aggregated. Moreover, there is reason to be suspicious of the quality of data collected by the national statistical system.²

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 database on attendance or on schooling attainment that exists for 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.

2. For example, Rawski (2001), for one, speculates that there are even problems with the data that are used by the China National Bureau of Statistics to calculate GDP. Such discrepancy can lead to arguments about the nature of conclusions made on the basis of such data. Ma, Huang, and Rozelle (2004) and Crook (1993) show that similar problems occur in the case of many of the most fundamental agricultural statistical series.

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 article. For all of its strengths, it should be remembered that the relationship expressed by a meta-data analysis is an association across studies. The relationship between the independent and outcome variable may not reflect a causal relationship. The association found in a study between the variables could be due to an omitted variable bias. There also may be heterogeneity across the studies, which means we are only reporting the average results. The reader needs to keep these considerations in mind when interpreting the results.

A. 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 (*China*), with or without the additional search term (*gender* or *difference* or *inequality* or *girl*). Relevant articles from their reference lists were also reviewed (Table A2).

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.

Our Web of Science search led to 813 references. Papers that were both concerned with gender and contained empirical analyses were

examined for whether they used any regression analysis or had enough statistical information to calculate gender differences. A total of 55 articles met these requirements.³ This does not mean, however, that we have only 55 observations. Some authors studied gender inequality over different time periods, areas, or grade levels in a single paper. In our meta-analysis, we treat these estimates as independent estimates.⁴ Each independent observation is coded separately. 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 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

3. Nine percent of studies are in Chinese.

4. 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.

TABLE 1
Descriptive Statistics about the Data for the
Meta-Analysis Study of Gender Inequality in
Educational Attainment

		Number of Studies	Percentage
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

level, and Ethnicity. Within the Time matrix, approximately 25% of studies use data from the 1980s, 44% use data from the 1990s, and 31% present data from the 2000s. Within the Area matrix, more studies use data from rural areas (32%) than from urban areas rural (20% urban); most studies (48%) use data for the whole country. Within the Grade level matrix, just over half of the studies (around 56%) focus on the years of compulsory education (20% on primary school; 36% on middle school). Twenty seven percent focus on high school. Only 17% focus on tertiary education. Within the Ethnicity matrix, about 90% of the studies use data on Han students. In contrast, only 10% focus on minorities.

B. 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 $y = 1$, 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. Three percent of the studies found that boys have significantly lower educational attainment than girls. 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 inequality 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 simplified “marginal model” is specified:

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

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 simplified “marginal 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.

IV. RESULTS

As shown in Table 2, without regard to disaggregation, the percentage of papers finding significant gender inequality against girls from 1980 to the 2000s and across all schools and grade levels is 66%. This means that in 66% of the studies, girls were found to be at a disadvantage in educational attainment compared with boys. Three percent of the studies found that boys have significantly lower educational attainment than girls. If one only considers this most aggregated of statistics, gender inequality

TABLE 2

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

	Number of Studies	Percentage (Column 1, Rows 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

^aIn 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.

in educational attainment in China in the Reform Era (around 1980 to the present) appears to remain 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 (.02) suggests that the level of gender inequality that a study finds against girls differs significantly across time. Specifically, the instances of finding gender inequality against girls in the literature reduces dramatically from 81% in the 1980s to 67% in the 1990s and finally to only 54% in the 2000s.

Findings of gender inequality against girls seem to differ significantly across space as well. This can be seen most clearly in the data by examining the low p value (.00) for the area indicator. There are nearly twice as many papers finding gender inequality in rural areas compared to those finding it in urban areas, suggesting a wide urban–rural gap in gender inequality. In 7 out of 10 studies conducted in rural areas, 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% of the studies.

Findings of gender inequality against girls across different grade levels seem to follow a different trend from that of time and space. The relatively high p value (.82) indicates no significant difference across grade levels (when taken as a group). The consistent findings 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 a higher percentage of studies find gender inequality among minority children (75%) than among Han children (66%); however, the difference between these numbers is not statistically significant. Because the percentages are fairly close and because the number of studies looking specifically at gender inequality in educational

TABLE 3

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

		Percentage of Studies Finding Gender Inequality	Standard Deviation	Number of Studies	p Value ^a
Time	1980s	81	0.40	42	.02
	1990s	67	0.47	73	
	2000s	54	0.50	52	
Area	Rural	68	0.47	53	.00
	Urban	36	0.49	33	
Grade level	Elementary	67	0.48	33	.82
	Lower secondary	62	0.49	61	
	Upper secondary	71	0.46	45	
	Tertiary	68	0.48	28	
Ethnicity	Han	66	0.48	151	.45
	Minority	75	0.45	16	
	Total	66	0.47	167	

^aThe p values in this column can be used to test for the differences among the subcategories in each group (Time, Area, Grade level, and Ethnicity).

attainment among minority populations is small, it is unclear from the descriptive statistics if there is any real difference in the frequency of reported gender inequality between Han and minorities. In other words, because the sample size limited the power of our analysis, it is not possible to be confident about the results for non-Han girls.

A. Econometric Considerations

As 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 one way to control for the undue influence a single paper might have. Table 4, column 1 presents the results of the simplified marginal probit regression without controlling for multiple use of a single paper. In columns 2–5, we adopt a weighting scheme: all studies from a single paper are weighted with the inverse of the number of studies contained in that paper. When doing so, the coefficient of Ethnicity becomes significant in the weighted marginal probit regression shown in column 2, indicating that the probability that a paper finds a statistically significant gender disparity in educational attainment for minority female students is higher than the probability of finding it for Han female students when we control for studies coming from a single paper.

B. 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 the probability that a study finds statistically significant gender inequality in educational attainment against girls is declining significantly over time. Compared with the 1980s, the probability that a study finds gender inequality against girls decreased significantly by 27% in the 1990s. What is more, the coefficient on the 2000s is 40.47, larger than that on the 1990s (26.72), indicating that the probability that a paper finds statistically significant gender inequality is lower in the 2000s relative to the 1990s.⁵ It is

5. In another robustness check, we also added a squared year term in addition to a linear year term (results not shown for sake of brevity). If significant, it would suggest that the

important to remember, however, that although findings of gender inequality have been trending downwards over time, overall, a majority of studies continue to find significant gender inequality in educational attainment in the 21st century (Table 3).⁶

C. Gender Inequality across Regions and Time and Regions

Statistically significant gender inequality has been found 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 that a study finds a statistically significant gender disparity in educational attainment is 41% lower in urban areas 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 the probability that a study finds gender inequality against girls in rural areas decreased more over time than did the probability of finding gender inequality against girls in urban areas. Nevertheless, despite the progress that has been made since the economic reform of the late 1970s, the probability of a study finding gender inequality against rural girls in the 1990s is still significantly higher than the probability of a study finding gender inequality against urban girls (p value is .00). By the 2000s, however, the difference in these probabilities has shrunk even further (p value is .10), suggesting that the difference in gender inequality between rural and urban areas is narrowing over time.

D. Gender Inequality across Grade Levels and Ethnicity

The results of the multivariate analysis of differences in gender inequality across grade

rate of change of gender inequality in education was not linear. We tried this and found that in all specifications the coefficients on the squared year variable were insignificant. This implies one of two things: (a) the rate of change was more or less linear or (b) we do not have enough observations to pick up differential rates of change.

6. In short, the meta-regression analysis demonstrates a clear declining trend of gender inequality against girls in education. And we do not know exactly why (is it due to rising demand for the education of girls or rising supply of schools).

TABLE 4
Marginal Probit Regression Analysis of Gender Inequality in Educational Attainment
(Using Decades as Variables)

		(1)	(2)	(3)	(4)	(5)
Dependent Variable: Gender Inequality against Girls (1 = Yes, 0 = Neutral or against Boys)						
(1)	Time (ref. = 1980s)					
	1990s	-26.72*** (3.17)	-10.99 (0.81)	-171.32*** (8.54)	-13.31 (0.93)	-37.22** (2.24)
	2000s	-40.47*** (4.42)	-32.13*** (2.56)	-183.71*** (11.36)	-32.81** (2.50)	-210.79*** (10.86)
(2)	Area (ref. = rural areas)					
	Urban	-41.09*** (4.53)	-35.13*** (2.77)	-192.61*** (11.33)	-36.93*** (3.02)	-30.07** (2.58)
	Nationwide	7.04 (0.96)	2.8 (0.28)	-149.23*** (6.46)	5.1 (0.49)	6.55 (0.66)
(3)	Grade level (ref. = elementary)					
	Lower secondary	12.1 (1.32)	8.18 (0.68)	11.35 (0.88)	8.53 (0.69)	-23.88 (1.15)
	Upper secondary	27.68*** (2.70)	24.47* (1.87)	30.49** (2.27)	24.40* (1.83)	-11.79 (0.52)
	Tertiary	32.42*** (2.91)	42.60*** (3.34)	46.58*** (3.68)	45.04*** (3.50)	157.87*** (9.12)
(4)	Ethnicity (ref. = Han)	6.68 (0.56)	27.29** (2.19)	23.62* (1.67)	143.96*** (7.39)	23.69* (1.67)
(5)	Interaction Time × Area					
	1990s × urban			158.66*** (5.53)		
	1990s × nationwide			165.47*** (5.92)		
	2000s × urban			165.81*** (6.44)		
	2000s × nationwide			147.69*** (5.68)		
(6)	Interaction Time × Ethnicity					
	1990s × non-Han				-124.44*** (4.34)	
	2000s × non-Han				-122.88*** (4.54)	
(7)	Interaction Time × Grade					
	1990s × lower secondary					42.92* (1.68)
	1990s × upper secondary					35.32 (1.29)
	1990s × tertiary					-119.63*** (4.92)
	2000s × lower secondary					191.43*** (6.42)
	2000s × upper secondary					215.35*** (7.03)
	2000s × Tertiary					38.58* (1.74)
Observations		167	167	167	167	167

Notes: Robust *t*-statistics are in parentheses. In column 2, we use the inverse of number of the studies from a single paper as the weight. In columns 3–5, we do the interaction for the variables of Time and Area, Ethnicity, and Grade using the weighted marginal probit model. ref., reference.

*Significant at 10%; **significant at 5%; ***significant at 1%.

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 findings of gender inequality against girls (Table 4, column 1, rows 5–7). More specifically, while there is no

significant difference between studies of elementary school and studies of lower secondary school in the probability of finding gender inequality (Table 4, column 1, row 5), however, there is a significantly higher probability that studies of high school find gender inequality. 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 fewer findings of gender inequality in elementary and lower secondary education 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, the probability that a study finds gender inequality against girls is positive and statistically significant (Table 4, columns 1, rows 6–7). Papers looking at gender inequality at the high school level found that girls are 27.68% 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, where the probability that a study finds a statistically significant gender disparity in educational attainment increases by 32.42% when girls enter tertiary school. Beyond the compulsory education system, therefore, our evidence suggests that gender inequality is still a significant problem.

The regression results in Table 4 (column 1) show no detectable difference across ethnic groups in the probability that a study finds gender inequality. However, this may be due to the limited number of studies that consider the gender gap among minorities. Indeed, when we use the weighted marginal probit regression (column 2), the coefficient of Ethnicity becomes positive and significant, indicating that studies of minority girls are 27.29% more likely to find evidence of gender disparities than are studies of Han girls.

Although it makes some of the interpretation of the results less intuitive, using the actual year instead of a decade dummy retains more of the information in our meta-analysis. This alternative way of coding the data is presented in Table A1. The only difference between Tables A1 and 4 is that we use a variable called

“year.” This variable is coded as the year in which the study's data are collected. When we replace the decade dummies with “year,” the nature of our findings does not change. The coefficient of the “year” variable is negative and statistically significant in the most basic version of the equation, implying that over time, gender inequality in China has been falling.⁷

V. CONCLUSION

In this article, we review the existing literature on the gender inequality in education in China. We investigated 55 articles covering 167 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? Inequality against girls still exists in China today. However, our analysis suggests the existence of 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 minorities and all rural girls attending high school and above—face the greatest obstacles to enrollment in schools.

7. When we replace the decade dummies with year, and interact year with the key variables of interest, the nature of our findings does not change fundamentally.

APPENDIX

TABLE A1

Marginal Probit Regression Analysis of Gender Inequality in Educational Attainment
(Using Years as Variables)

	(1)	(2)	(3)	(4)	(5)	
Dependent Variable: Gender Inequality against Girls (1 = Yes, 0 = Neutral or against Boys)						
(1)	Time (years)	-2.33*** (5.67)	-2.56*** (4.35)	-2.82*** (3.19)	-2.57*** (4.09)	-5.65*** (3.63)
(2)	Area (ref. = rural areas)					
	Urban	-42.49*** (4.88)	-40.52*** (3.50)	-49.02** (1.96)	-40.56*** (3.45)	-33.95*** (3.00)
	Nationwide	4.84 (0.67)	3.81 (0.38)	-0.60 (0.02)	3.76 (0.37)	6.62 (0.70)
(3)	Grade level (ref. = elementary)					
	Lower secondary	10.39 (1.19)	8.47 (0.77)	9.06 (0.82)	8.4 (0.76)	-38.68 (1.26)
	Upper secondary	24.73** (2.49)	23.97** (1.98)	24.55** (1.97)	23.89** (1.97)	-39.99 (1.40)
	Tertiary	37.75*** (3.37)	51.85*** (4.13)	51.60*** (4.21)	51.81*** (4.12)	27.1 (0.96)
(4)	Ethnicity (ref. = Han)	5.68 (0.47)	22.80* (1.84)	22.73* (1.81)	21.61 (0.71)	23.88* (1.82)
(5)	Interaction Time × Area					
	Time × urban			0.61 (0.41)		
	Time × nationwide			0.27 (0.18)		
(6)	Interaction Time × Ethnicity					
	Time × non-Han				0.07 (0.05)	
(7)	Interaction Time × Grade					
	Time × lower secondary					3.71* (1.75)
	Time × upper secondary					4.83** (2.45)
	Time × tertiary					2.34 (1.26)
Observations		167	167	167	167	167

Notes: Robust *t*-statistics are in parentheses. In column 2, we use the inverse of number of the studies from a single paper as the weight. In columns 3–5, we do the interaction for the variables of Time and Area, Ethnicity, and Grade using the weighted marginal probit model. ref., reference.

*Significant at 10%; **significant at 5%; ***significant at 1%.

TABLE A2
List of Papers Used in the Meta-Analysis

No.	Paper Name	Author	Source
1	A Study of Educational Disparity in Urban China (1949–2003) (in Chinese)	Dahai Hao	<i>Social Science in China</i> , 6, 2007
2	Access to Higher Education: Targeted Recruitment Reform under Economic Development Plans in the People's Republic of China	Vilma Seeberg	<i>Higher Education</i> , 25(2), 1993, 169–88
3	Adolescent Transitions to Adulthood in Reform-era China	Emily Hannum and Jihong Liu	National Research Council. <i>The Changing Transitions to Adulthood in Developing Countries: Selected Studies</i> , edited by Cynthia Lloyd, Jere Behrman, Nelly Stromquist, and Barney Cohen. Washington DC: The National Academies Press, 2005
4	Basic Education in China's Rural Areas: A Legal Obligation or an Individual Choice?	Fengshu Liu	<i>International Journal of Educational Development</i> , 24, 2009, 5–21
5	Changes in Educational Inequality in China, 1990–2005: Evidence from the Population Census Data	Xiaogang Wu and Zhuoni Zhang	<i>Globalization, Changing Demographics, and Educational Challenges in East Asia Research in Sociology of Education</i> , 17, 2010, 123–52
6	Children's Social Welfare in China, 1989–1997: Access to Health Insurance and Education	Jennifer Adams and Emily Hannum	<i>The China Quarterly</i> , 181, 2005, 100–21
7	Cultural Capital, the State, and Educational Inequality in China, 1949–1996	Yuxiao Wu	<i>Sociological Perspectives</i> , 51(1), 2008, 201–27
8	Determinants of School Enrollment and Completion of 10 to 18 Year Olds in China	Rachel Connelly and Zhenzhen Zheng	<i>Economics of Education Review</i> , 22, 2003, 379–88
9	Economic Transition, School Expansion and Educational Inequality in China, 1990–2000	Xiaogang Wu	<i>Research in Social Stratification and Mobility</i> , 28, 2010, 91–108
10	Education and Earnings in the People's Republic of China	Dean Jamison and Jacques Van Der Gaag	<i>Economics of Education Review</i> , 6(2), 1987, 161–66
11	Education and Poverty in Rural China	Philip Brown and Albert Park	<i>Economics of Education Review</i> , 21, 2002, 523–41
12	Education and the Poverty Trap in Rural China	John Knight, Li Shi, and Deng Quheng	Research Consortium on Educational Outcomes and Poverty, RECOUP Working Paper, No. 11, 2007
13	Education in the Reform Era	Emily Hannum, Jere Behrman, Meiyang Wang, and Jihong Liu	<i>In China's Great Economic Transformation</i> , edited by Loren Brandt and Thomas Rawski, Cambridge University Press, 2007
14	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, and Vicky Chan	<i>International Journal of Educational Development</i> , 29, 2009, 487–94

TABLE A2
Continued

No.	Paper Name	Author	Source
15	Educational Access for China's Post-Cultural Revolution Generation Enrollment Patterns in 1990	Rachel Connelly and Zhenzhen Zheng	<i>In Education and Reform in China</i> , edited by Emily Hannum and Albert Park. London: Routledge, 2007
16	Educational Attainment and Rural-Urban Divide in China	John Knight and Li Shi	<i>Oxford Bulletin of Economics and Statistics</i> , 58(1), 1996
17	Educational Stratification by Ethnicity in China: Enrollment and Attainment in the Early Reform Years	Emily Hannum	<i>Demography</i> , 39(1), 2002, 95–117
18	Educational Stratification in Urban China: 1949–1994	Xueguang Zhou, Phyllis Moen, and Nancy Tuma	<i>Sociology of Education</i> , 71(3), 1998, 199–222
19	Enrollment and Graduation Patterns as China's Reforms Deepen, 1990–2000	Xueguang Zhou, Phyllis Moen, and Nancy Brandon Tuma	<i>In Education and Reform in China</i> , edited by Emily Hannum and Albert Park. London: Routledge, 2007
20	Ethnic Groups and Educational Inequalities: An Empirical Study of the Educational Attainment of the Ethnic Minorities in Western China (in Chinese)	Rachel Connelly and Zhenzhen Zheng	<i>Society</i> , 2, 2010
21	Ethnic Stratification in Northwest China: Occupational Differences between Han Chinese and National Minorities in Xinjiang, 1982–1990	Emily Hannum and Yu Xie	<i>Demography</i> , 35(3), 1998, 323–33
22	Examinations and Educational Opportunity in China: Mobility and Bottlenecks for the Rural Poor	Emily Hannum, Xuehui An, Hua Yu, and Sebastian Cherng	<i>Oxford Review of Education</i> , 37(2), 2011, 267–305
23	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	<i>Sociological Studies</i> , 3, 2010
24	Expansion of Higher Education in China and Inequality in Entrance Opportunities: 1978–2003 (in Chinese)	Jingming Liu	<i>Society</i> , 3, 2006, 158–79
25	Family Background, Financial Constraints and Higher Education Attendance in China	Wenli Li	<i>Economics of Education Review</i> , 26(6), 2007, 724–34
26	Family Background, Gender and Educational Attainment in Urban China	Montgomery Brooded and Chongshun Liu	<i>The China Quarterly</i> , 145, 1996, 53–86
27	Family Sources of Educational Gender Inequality in Rural China: A Critical Assessment	Emily Hannum, Peggy Kong, and Yuping Zhang	<i>International Journal of Educational Development</i> , 29, 2009, 474–86
28	Gender Inequality and Higher Education	Jerry Jacobs	<i>Annual Review of Sociology</i> , 22, 1996, 153–85

TABLE A2
Continued

No.	Paper Name	Author	Source
29	Gender Inequality in Urban China: Education and Employment	John Bauer, Wang Feng, Nancy Riley, and Xiaohua Zhao	<i>Modern China</i> , 18, 1992, 333
30	Gendered Pathways to Rural Schooling: The Interplay of Wealth and Local Institutions	Deborah Davis, Pierre Landry, Yusheng Peng, and Jin Xiao	<i>The China Quarterly</i> , 89, 2007, 60–82
31	Girls' Education in Gansu, China	Huhua Cao and Fenglian Lei	September 6th, posted at http://www.chinaeam.uottawa.ca/ficas5/book/22.pdf
32	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
33	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, No. 39, 2010
34	Household Decisions and Gender Inequality in Education in Rural China	Danke Li and Mun Tsang	<i>China: An International Journal</i> , 1(2), 2003, 224–48
35	Inequality in Chinese Education	Xue Lan Rong and Tianjian Shi	<i>Journal of Contemporary China</i> , 10(26)2001, 107–24
36	Institution and Inequality: The Hukou System in China	Zhiqiang Liu	<i>Journal of Comparative Economics</i> , 33, 2005, 133–57
37	International Migration and Education of Left-Behind Children in Fujian, China	Hideki Morooka and Zai Liang	<i>Asian and Pacific Migration Journal</i> , 18(3), 2009, 345–70
38	Market Transition, Educational Disparities, and Family Strategies in Rural China: New Evidence on Gender Stratification and Development	Emily Hannum	<i>Demography</i> , 42(2), 2005, 275–99
39	Migrant Opportunity and the Educational Attainment of Youth in Rural China	Alan de Brauw and John Giles	IZA Discussion Paper, No. 2326, 2006, posted at https://www.msu.edu/~giles/adj1/finalJune5_2008.pdf
40	Parental Investment in Children's Human Capital in Urban China	Linda Yueh	<i>Applied Economics</i> , 38, 2006, 2089–111
41	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	<i>Social Science and Medicine</i> , 59, 2004, 609–23
42	Political Change and the Urban-Rural Gap in Basic Education in China, 1949–1990	Emily Hannum	<i>Comparative Education Review</i> , 43(2), 1999, 193–211

TABLE A2
Continued

No.	Paper Name	Author	Source
43	Poverty and Basic Education in Rural China: Villages, Households, and Girls' and Boys' Enrollment	Emily Hannum	<i>Comparative Education Review</i> , 47(2), 2003
44	Research into Girls' Education in Four Western Provinces of China	Wei Zhou, Tiedao Zhang, Wenpu Liu, Yugin Ma, and Jiayun Peng Wendy Wang	<i>Chinese Education and Society</i> , 33(5), 2001, 4–28 <i>Gender Issues</i> , 22(2), 2005, 3–30
45	Son Preference and Educational Opportunities of Children in China—"I Wish You Were a Boy!"	Zai Liang and Yiu Por Chen	<i>Social Science Research</i> , 36, 2007, 28–47
46	The Educational Consequences of Migration for Children in China	Chad Meyerhoefer and C. J. Chen	<i>Review of Economics of the Household</i> , 9(3), 2011, 379–96
47	The Effect of Parental Labor Migration on Children's Educational Progress in Rural China	Yao Lu and Donald Treiman	<i>American Sociological Review</i> , 73(5), 2008, 813–34
48	The Effect of Sibship Size on Educational Attainment in China: Period Variations	Xiaodong Gong, Arthur Van Soest, and Ping Zhang Liu Jingming	<i>Journal of Applied Econometrics</i> , 20, 2005, 509–27 <i>Social Science in China</i> , 2008, 5
49	The Effects of the Gender of Children on Expenditure Patterns in Rural China: A Semi Parametric Analysis	Juhua Yang	<i>Comparative Education Review</i> , 51(4), 2007, 471–95
50	The Inequality of Opportunity and Its Changing in the Basic Education in China (in Chinese)	Emily Hannum, Meiyang Wang, and Jennifer Adams	<i>One Country, Two Societies? Rural-Urban Inequality in Contemporary China</i> , edited by Martin King Whyte, Harvard University Press, 2008
51	The One-Child Policy and School Attendance in China	Meng Zhao and Paul Glewwe	<i>Economics of Education Review</i> , 29, 2010, 451–60
52	Urban-Rural Disparities in Access to Primary and Secondary Education under Market Reforms	Po Yang Lina Song and Simon Appleton	<i>International Journal of Educational Development</i> , 30, 2010, 560–69 <i>World Development</i> , 34(9), 2006, 1639–53
53	What Determines Basic School Attainment in Developing Countries? Evidence from Rural China		
54	Who Gets More Financial Aid in China? A Multilevel Analysis		
55	Why Do Girls in Rural China Have Lower School Enrollment?		

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