Educational Inputs and Intra-county Education Inequality in a Western Province of China

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ABSTRACT

China has determined to narrow intra-county education gap and held county level governments accountable for achieving this goal through state evaluation. This study examines the relationship between intra-county education inequality and county level educational inputs. Based on statistical analysis of county level data in a western province, firstly, it finds for counties unqualified in the evaluation, there are less educational inputs compared with counties qualified, and then, inputs are negatively correlated with intra-county education inequality, indicating resource insufficiency may impede closing education gap. It also discovers for counties qualified in the evaluation, educational inputs are positively correlated with intra-county education inequality, implying possible distortion in resource allocation and ineffectiveness of the extant evaluation system. The results suggest increasing resources may be essential for counties unqualified to further narrow intra-county education gap, while redistributing resources and new institutions may be warranted for counties qualified to continuously advance this undertaking.

Keywords: compulsory education, educational inputs, intra-county education inequality, China

1. INTRODUCTION

Huge disparities in educational inputs and outcomes extant across regions, between rural and urban areas, and among schools in China have raised widespread public concerns as it is widely accepted that every child is entitled to access equal education and as China needs to improve the overall quality of next generation workforce. In response to these concerns, the national government has issued serial policies to achieve a more balanced development of compulsory education. As county level areas are the basic unit of public service provision, the state has determined to first narrow intra-county education gap. The progresses that have been made and problems extant in this process have attracted much scholarly attention.

1.1. Research Background

Compulsory education, that is year 1-9 in China, is a basic public service that should be provided to all school-aged children. After this aim was allegedly achieved in 2001, the Ministry of Education (MOE) started to pursue more balanced development of compulsory education, which generally refers to efforts in narrowing inter-regional, rural-urban or intra-county gaps in terms of education conditions and quality [1]. Albeit with multiple dimensions, this concept has been operationalized as reducing education inequality among schools within a county level area in recent decade. County level areas include counties, districts, and municipalities without subordinate counties or districts, which will be abbreviated as counties hereinafter in this paper. The state has planned two stage policies to moderate intra-county education inequality.

The first stage began in 2012 when MOE released *Interim Measures for the Inspection and Evaluation of County level Balanced Development of Compulsory Education*, mandating counties must meet the minimum standard of balanced development and evaluation will be undertaken to determine whether counties are qualified or not. In the meanwhile, MOE signed *Memorandum of Balanced Development of Compulsory Education* with 31 provincial level governments, assigning them the responsibility for conducting the evaluation on counties in their jurisdiction. Subsequently, inspectorate groups directly reported to the national government were sent to monitor how the policy was being implemented.

In 2017, MOE promulgated *Measures for Inspection and Evaluation of County level High-quality and Balanced Development of Compulsory Education*, marking the start of the second stage. This document stipulates that all counties should reach a higher standard of balanced development and improve the overall education quality. The evaluation is now only piloted in a few provinces and will be extended to the whole nation after 2020.

1.2. Related Work

Researchers have undertaken studies to uncover the uneven educational development in China since the 1990s. The early study focused on inequality in financing

compulsory education at regional and provincial level [2]. But subsequent studies based on county level data found that intra-provincial inequality in financing compulsory education was much larger than inter-provincial inequality, suggesting more attention warranted to county level variation as county government has been designated as the primary funder of compulsory education since 2000 [3-5]. In addition, studies revealed that schools in the same county did not receive equal funds, with a few schools, namely the key schools attaining more funding on per capita basis compared to other schools [6-7]. Moreover, researchers also reported that intra-county inequality in educational inputs existed and varied across counties [8].

As to what factors might explain intra-county inequality in funding and educational inputs, scholars focusing on education marketization argue schools with better reputation may collect higher fees from parents and thus generate more income and purchase more resources [9]. Besides, some researchers looking to government behavior speculate county level governors prefer key schools when apportioning monetary or other resources as their kids attend these schools [6]. Finally, some scholars contend that educational resources of a county may impact on government's capacity to subsidize disadvantaged schools in its jurisdiction [8].

The credibility of the first explanation has been largely modulated as the national government has determined to reassert the public interest in education via de-marketization policies [10]. More specifically, education finance reform since 2009 has prohibited most of schools' fee collection activities and thus largely curtailed schools' capacity to attain resources more than the norm. In another vein, state evaluation on intra-county balanced development of compulsory education can also change county level government's preferential policy in resource allocation as they are under mounting pressure to meet the state standard. It can be expected that counties unqualified in the evaluation will use available resources to reduce education inequality among schools. Hence resources may impact local governments' capacity to address education gap. On contrary, counties qualified in the evaluation may resume the previous preferential policy in resource allocation as the pressure is lifted. Therefore, the relationship between resources and intra-county education inequality may be negative for unqualified counties, while become insignificant or even positive for qualified counties.

1.3. Purpose of This Study

This study aims to examine the relationship between intra-county education inequality and county level educational inputs for counties that are qualified in state evaluation and those that are unqualified in a western province of China. We confine our analysis to one province as provincial government is primarily responsible for implementing the evaluation and there could be systemic differences across provinces. We choose a western province as their eastern counterparts have successfully made all counties meet the national standard by the end of 2019 and samples from western provinces can enable the comparison between qualified counties and those that are not in the evaluation.

The rest of the paper is organized as follows. Section 2 introduces the dataset and how it is analyzed. Next results generated from data analysis will be presented in Section 3. Finally, Section 4 concludes the paper and discusses policy implications.

2. METHODS

Intra-county education inequality is measured by the average coefficient of variation on eight school educational inputs indicators, as is regulated in national government document. This intra-county education inequality index (G) is computed for year 1-6 and year 7-9 respectively for each county each year. Educational inputs are measured by eight indicators. The teaching area in square meters per student (I1) and sports hall in square meters per student (I2) are two indicators measuring infrastructure. Expenditure on equipment and instruments per student (E1), computers per 100 students (E2), and number of books per student (E3) are three indicators measuring equipment. Teacher-student ratio (T1), number of teachers above required educational attainment per student (T2), and number of teachers with middle and senior professional rank per student (T3) are all related to teachers, with the first associated with quantity, and the latter two related to quality.

Table 1. Descriptive statistics for all variables

		Obs.	Mean	SD	Min	Max
Year 1-6	G	182	0.41	0.12	0.10	0.82
	I1	182	4.89	1.35	2.07	13.59
	I2	182	8.84	2.64	2.03	17.09
	E1	182	2278	958	399	4967
	E2	182	11.55	6.17	1.11	62.9
	E3	182	21.80	6.50	9.94	68.97
	T1	182	0.07	0.02	0.03	0.22
	T2	182	0.07	0.02	0.03	0.22
	T3	182	0.03	0.01	0	0.11
Year 7-9	G	182	0.29	0.12	0	0.67
	I1	182	5.73	1.64	2.68	13.43
	I2	182	11.28	6.51	1.03	88.66
	E1	182	2928	1950	529	2266
	E2	182	13.32	7.29	2.15	53.57
	E3	182	31.94	9.64	7.53	90.13
	T1	182	0.09	0.03	0.03	0.19
	T2	182	0.07	0.02	0.02	0.17
	T3	182	0.05	0.02	0.01	0.14

County level data in 2018 is generated from an officially published monitoring report. In total, there are 183 counties, with 163 counties qualified in the evaluation and 20 counties unqualified. Data is missing for one county unqualified. Descriptive statistics for all variables are presented in Table 1.

First, the distribution of intra-county education inequality is presented for both groups of counties. Second, an independent sample t-test is conducted in order to compare educational inputs between counties that are qualified in the evaluation and those which are not. Levene's test is applied to evaluate the homogeneity of variance before we perform the t-test. Results show non-significant outcome, suggesting that the sample has homogenous variances, which supports the usage of t-test. Next Pearson correlation is conducted to examine the association between educational inputs and intra-county education inequality.

3. RESULTS AND DISCUSSIONS

3.1. Intra-County Education Inequality

Table 2 shows that intra-county education inequality for year 1-6 is higher than that for year 7-9 in both groups of counties, indicating education inequality is more prominent among primary schools.

Table 2. Distribution of intra-county education inequality

	Counties qualified in the evaluation		Counties unqualified in the evaluation	
	year 1-6	year 7-9	year 1-6	year 7-9
Obs.	163	163	19	19
Mean	0.40	0.29	0.45	0.24
SD	0.11	0.11	0.19	0.18
skewness	-0.04	-0.35	0.41	0.74
Min	0.10	0	0.16	0
Max	0.71	0.52	0.82	0.67

For year 1-6 intra-county education inequality is higher in counties unqualified in the evaluation than the other group, and the distribution of intra-county education inequality is wider in this group judging by the higher standard deviation and skews to the right, suggesting more counties in this group accumulating at the higher end of the distribution with huge intra-county education inequality. On contrary, for year 7-9 intra-county education inequality in these counties is lower than that in counties which are qualified, albeit still with wider distribution and more counties concentrating at the higher end. In general, for counties which are unqualified in the evaluation, the reduction of education inequality among primary schools should be prioritized over secondary schools.

Further, for counties qualified in state evaluation, distribution of intra-county education inequality for both year 1-6 and 7-9 skews to the left, indicating more counties in this group concentrating at the lower end of the distribution. But since the maximum inequality is 0.71, much higher than the mean, suggesting huge intra-county education inequality still exists in this group.

3.2. County Level Educational Inputs

It can be observed from Table 3 that there are more educational inputs in counties qualified in state evaluation than that in counties unqualified. The results of t-test show that the difference is significant for three input indictors for year 1-6 and seven input indicators for year 7-9, indicating differences in educational input are more salient in among secondary schools.

Table 3. Comparison of educational inputs between counties qualified and those unqualified in state evaluation

		Counties qualified in the evaluation	Counties unqualified in the evaluation	T
Year 1-6	I1	4.95 (1.33)	4.38 (1.48)	1.77
	I2	8.95 (2.35)	7.96 (4.41)	0.96
	E1	2311.39 (924.68)	1995.34 (1198.87)	1.36
	E2	11.89 (6.31)	8.58 (3.78)	2.24*
	E3	22.4 (6.47)	16.62 (4.00)	3.81**
	T1	0.07 (0.02)	0.06 (0.03)	0.98
	T2	0.07 (0.02)	0.06 (0.03)	1.13
	T3	0.033 (0.014)	0.025 (0.015)	2.3*
Year 7-9	I1	5.81 (1.67)	4.74 (1.44)	2.68**
	I2	11.64 (6.68)	8.22 (3.70)	3.42*
	E1	2987.36 (2006.87)	2420.48 (1291.96)	1.69
	E2	13.87 (7.43)	8.61 (3.17)	4.66**
	E3	33.02 (9.26)	22.7 (7.80)	5.34**
	T1	0.09 (0.02)	0.07 (0.02)	4.03**
	T2	0.07 (0.02)	0.04 (0.02)	6.7**
	T3	0.05 (0.02)	0.03 (0.02)	5.02**

** $P < 0.01$, * $P < 0.05$.

More specifically, for year 1-6, counties unqualified in state evaluation have significantly less computers per 100 students, fewer books per student and fewer teachers with middle and senior professional rank per student, indicating that these counties have less equipment and lower quality teachers. For year 7-9, these counties have significantly smaller teaching and sports space per student, fewer

computers per 100 students, fewer books per student, lower teacher-student ratio, less teachers above required educational attainment per student, and less teachers with middle and senior professional rank per student, showing that counties unqualified in state evaluation have worse infrastructure, less equipment and lower quality teachers.

In sum, the above results suggest that counties unqualified in state evaluation may not have adequate education resources to support education development in very school within their jurisdictions and some schools may suffer extremely low level of educational inputs.

3.3. Association between Educational Inputs and Intra-County Education Inequality

It can be found based on the correlation coefficients in Table 4 that the association between educational inputs and intra-county education inequality is categorically different for counties qualified in the evaluation and counties unqualified.

Table 4. Correlations between educational inputs and intra-county education inequality

	Counties qualified in the evaluation		Counties unqualified in the evaluation	
	year 1-6	year 7-9	year 1-6	year 7-9
I1	0.32**	0.13	-0.35	-0.72**
I2	0.28**	0.04	-0.44	-0.67**
E1	-0.14	-0.08	-0.67**	-0.71**
E2	-0.01	0.05	-0.51*	-0.48*
E3	0.24**	0.20**	-0.66**	-0.68**
T1	0.49**	0.44**	-0.21	-0.54*
T2	0.47**	0.43**	-0.18	-0.44
T3	0.37**	0.42**	-0.42	-0.43

** $P < 0.01$, * $P < 0.05$

For counties qualified in the evaluation, correlations between most of educational input indicators and intra-county education inequality is positive and significant, suggesting that counties with more educational inputs tend to have higher education inequality among schools. Specifically, for year 1-6 teaching area in square meters per student, sports hall in square meters per student, number of books per student, teacher-student ratio, number of teachers above required educational attainment per student, and number of teachers with middle and senior professional rank per student have significantly positive correlations with intra-county education inequality. For year 7-9, books and the three input indicators related to teachers have significant positive correlations with intra-county education inequality.

The results may reflect the fact that once counties reached the national standard and were qualified in state evaluation, they ceased to close the gap among schools as long as intra-county education inequality were kept at the standard set by the state. In addition, local governments might also resume the preferential policies prior to the evaluation. For

these counties, new resources may not be utilized to further narrow educational gap among schools within their jurisdictions after the evaluation. In addition, compared to infrastructure and equipment, all three indicators in relation to teachers are significantly positively associated with intra-county education inequality, suggesting the distribution of high-quality teachers may be very unequal.

On contrary, for counties unqualified in state evaluation, the correlations for educational input indicators and intra-county education inequality is negative, suggesting that counties with more educational inputs tend to have lower intra-county education inequality. Specifically, for year 1-6 all three indicators relating to equipment, namely expenditure on equipment and instruments per student, computers per 100 students, and number of books per student have significantly negative correlation with intra-county education inequality. For year 7-9 the two infrastructure indicators, all three equipment indicators, and teacher-student ratio have significantly negative correlation with intra-county education gap. The results suggest that resource insufficiency might be the reason underlying intra-county education inequality and more resources are warranted to close the gap. Moreover, infrastructure and equipment are more unequal among schools in these counties compared to teachers. Therefore, resources should be prioritized in improving the physical conditions of schools.

4. CONCLUSION

In general, this study shows that counties unqualified in state evaluation may face problems essentially different from counties qualified in further reducing intra-county education inequality.

For counties unqualified in state evaluation, intra-county education inequality is higher for year 1-6 and lower for year 7-9 compared with counties qualified in the evaluation, while educational inputs are less for both year 1-6 and 7-9, suggesting these counties may suffer from resource inadequacy. In addition, for these counties, educational inputs are negatively associated with intra-county education inequality, indicating that resource insufficiency may hinder the closing of education gap among schools in their jurisdictions. Without sufficient educational inputs, county level governments will not be able to subsidize disadvantaged schools. Therefore, in order to further close intra-county education gap, county level governments should devote more resources into compulsory education, and upper level governments need to transfer funds or other resources to these counties so that local governments can use additional resources improving educational conditions, in particular infrastructure and equipment in disadvantaged schools.

For counties qualified in state evaluation, more than half of educational input indicators have significantly positive correlations with intra-county education inequality, which is particularly salient for indicators relevant to teachers. The results suggest that distortion in resource distribution may exist in these counties, especially in relation to

teachers. Redistribution of educational resources may be warranted to change this distortion. It also implies that the extant evaluation system is ineffective in having county level governments consistently promote more balanced development of compulsory education in the long run. Once counties are qualified in state evaluation, there are no other formal mechanisms to force or incentivize local governments reducing education inequality among schools within their jurisdictions. Therefore, institutions need to be designed and established to motivate county level governments to constantly narrow education inequality in their jurisdictions.

This paper has come to some preliminary findings on the relationship between educational inputs at county level and intra-county education inequality, which however warrants further study as merely correlation other than causal relationship is examined due to the limitation of available data on other variables which may have impacts on intra-county education inequality. Future studies can test the robustness of the relationship presented in this paper and examine other variables that may significantly influence intra-county education inequality.

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