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Regional Disparities of Chinese Middle School Students' Performance

Yuyu Mo[1,a,*]

[1]*School of International Studies, Zhejiang University, 866 Yuhangtang Rd, Hangzhou, P.R. China*
a. 3190105981@zju.edu.cn
**corresponding author*

Abstract: The development of education in China has witnessed great progress along with 30 years of social reform and the opening up policy, yet the issue of equality in relation to resource distribution has gradually become serious. It can be seen from China's results in 2015 and 2018 PISA (OECD's Programme for International Student Assessment), as it chose different regions to participate in the competition. The change in rankings reflects the differences in educational quality among several participating regions (Beijing, Shanghai, Jiangsu, Guangdong, Zhejiang). The study focuses on exploring education development of these regions and aims to take a glance of the regional inequalities in Chinese education. The data collected and comparative study of the development of basic education in these regions in the years of participation revealed that the investment in human, financial, and physical resources had a significant impact on the quality of education. This study divides the five regions into two gradients based on educational inputs and administrative divisions, suggesting possible mechanisms for the occurrence of educational quality gaps across the country, and highlighting the unbalanced distribution in human, financial and material resources.

Keywords: Educational inequality, Regional disparities, Middle School

1. Introduction

The large gap in the quality of education among secondary schools in different regions of China during the compulsory teaching stage has become a topic of concern for many researchers. For example, the inequality of educational resources among different regions can be illustrated by the results of China's participation in PISA in 2015 and 2018: other Chinese provinces and regions (e.g. Tianjin, Macao, Shanghai) scored outstandingly in previous tests and dropped to 10th place worldwide after adding Guangdong's data in 2015. In 2018, Zhejiang Province participated instead of Guangdong Province and China ranked first again. This reflects the fact that Guangdong, a province with economic strength comparable to other regions, is significantly weak in educational outcomes.

Several researches were driven by "the educational inequality in China". Chiefly, most of them put attention to urban-rural inequality which illustrate the difference of economic situation and opportunities between urban and rural students [1-3]; regional inequality, discussing the inequality in attainment [4,5], and enrollment of basic education and in educational financing and gender inequality [6,7].

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Our study starts with the evident gaps between the results of PISA 2015 and 2018 to highlight a regional disparities in educational development among the five districts of China. It will carry out further study on related indicators of education inequality by describing and comparing the data collected from five target areas on their human resources, financial resources and material resources in order to provide reliable analysis and suggestions of the circumstances for further eradication of educational inequality in China.

2. Method

2.1. Data Sources

The research used data from PISA, China's National Bureau of Statistics database and the China Education Yearbook (2016, 2019).

PISA data were retrieved from the OECD (2015,2018). And as the test subjects were 15-year-old students, who are likely in grades nine through ten, this study focused on situation of secondary education rather than middle or high school alone.

China's National Bureau of Statistics provided the study with data of number of students and teachers of both junior and middle schools of the 5 regions, their student-teacher ratio, and GDP per capita; the 2016 and 2019 China Education Yearbook gave illustration of space of schools and public and private spending on students in 2015 and 2018.

2.2. Data Analysis Method

The collected data were categorized by descriptive statistics and comparative analysis approach.

In the first part, the PISA performance (average score and ranking of each subject) of students from Chinese mainland in 2015 and 2018 is compared. In the second part, the researcher examined three perspectives: in terms of human resources, the change in student-teacher ratio between 2015 and 2018 for the five regions was shown; for financial resources, GDP per capita, investment on middle school students and investment on high school students were compared for each region from 2015 to 2018; in terms of material resources, the graph given shows the change in space provided to students per capita in middle and high schools in the five regions in the two years.

3. Results

3.1. Comparing Chinese Students' Performance in 2015 and in 2018

Table 1: Chinese Students' Performance in PISA 2015 and 2018.

	Science (OECD average)	Science Ranking	Reading (OECD average)	Reading Ranking	Mathematics (OECD average)	Mathematics Ranking
(B-S-J-G) 2015	518 (493)	10/72	494 (493)	27/72	531 (490)	6/72
(B-S-J-Z) 2018	590 (489)	1/79	555 (487)	1/79	591 (489)	1/79

The table compares Chinese students' performance in successive PISA 2015 and 2018. When Beijing, Shanghai, Jiangsu and Guangdong came as an union in 2015, China's mean score in Science was 5% higher than the OECD average, in Mathematics 8.4% higher, and almost equaled the average in Reading. While in 2018, even 7 more countries and economics added into the assessment, the union of Beijing, Shanghai, Jiangsu and Zhejiang ranked first in all three dimensions. And China's mean

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score in Science was 20.7% higher than OECD average, 14.0% higher in Reading, and 20.9% in Maths. The progress in rankings and gaps between other participants are evident. Given such result, differences in outcomes and quality of education exist among the five regions, especially between its 2015 participant, Guangdong province, and its 2018 can be drawn. Aspects and indicators to evaluate the disparities among the 5 cities and provinces will be given in following section.

3.2. Difference in Educational Indicators among the Five Regions

The input of educational investment is taken in the study to measure the quality of education. On the input, human, financial and material resources are usually considered [8,9]. For human resources, the study chose the student-teacher ratio in middle and senior high schools; for financial resources, education revenue per student in middle schools was taken to compare with GDP per capita; and for material resources, it was demonstrated by the school space per student.

3.2.1. Human Resources

Student-teacher ratio is the number of students who attend a school divided by the number of teachers in the institution. As the number goes smaller, less students are assigned to one teacher, and thus more attention would be paid to each student. On the contrary, bigger the number is, teachers tend to cope with more students, leading to less care on individuals [10].

From 2015 to 2018, the student-teacher ratio has kept rather stable in nearly all included regions, except a sharp decrease in the ratio in senior high schools of Guangdong province. Another point to mentioned is that junior high school seems to hold a slightly higher student-teacher ratio in China. In all, compared to in other regions, teachers in junior and senior high schools in Guangdong province kept facing with more students, even the evident summit in senior high schools has gone down to about 13 students per teacher in 2018. While number of students each teacher received in Beijing, the capital of the country, remained relatively low to other regions.

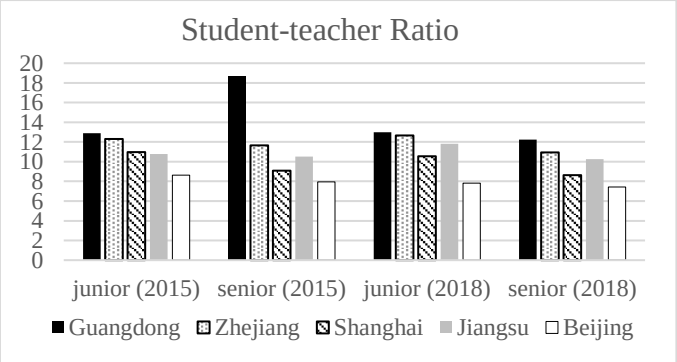

Figure 1: Student-teacher ratio in Guangdong, Zhejiang, Shanghai, Jiangsu and Beijing.

3.2.2. Financial Resources

Education revenue per student is the result dividing number of students by student education revenue, and student education revenue contains private expenses, public expenses and capital expenses.

Figure 2 compares the GDP per capita and investment per student of the five regions. From 2015 to 2018, the 5 regions have undergone an increase in GDP per capita with similar levels of growth. Numerically, Guangdong's GDP per capita starts and ends at a lower level than the other four regions, ranging from 64516 yuan to 81625 yuan. Beijing and Shanghai were the highest GDP per capita, followed by Jiangsu and Zhejiang provinces.

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The gap between GDP per capita and investment per student may indicate the willingness and expectation to invest in education, and illustrate the extent of significance that education shows among specific groups of citizens. The largest gap exists between GDP per capita and investment per student in Jiangsu, indicating that educational investment took a relatively small portion in the family; while in Beijing and Shanghai, expenditure in education occupied a large section.

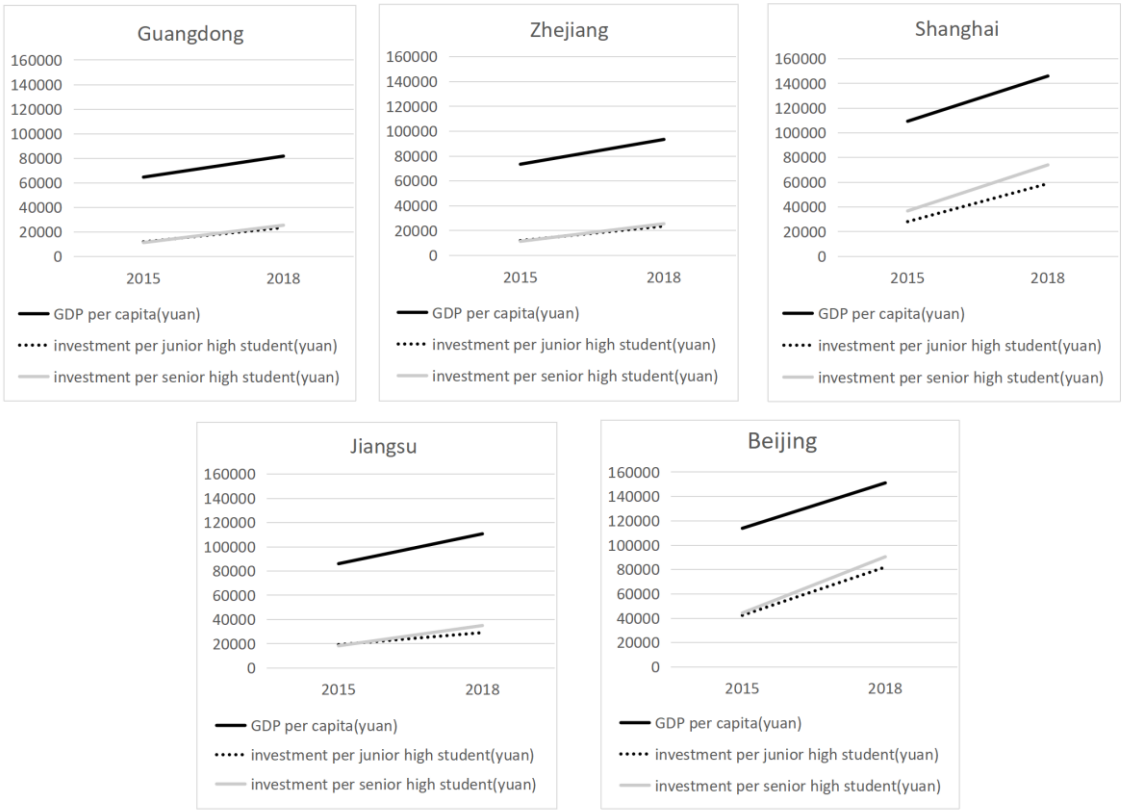

Figure 2: GDP per capita and investment per student.

Overall, with the exception of students in Shanghai, there is no evidence of higher investment as students move on to more advanced institutions, which means that parents and the community treat students in middle school and students in high school the same in terms of financial investment. But an increase together with the growth of GDP per capita appeared as time passed by.

3.2.3. Material Resources

School space per student is the ratio of school building space and number of students, reflecting the level of input of the school site. Figure 3 compares the school space per student among the 5 regions in 2015 and 2018.

Generally, senior students have a rather high share of school space than that junior high school students, while vertically comparing the data of the 5 regions, little growth in school space per student is spotted, except from 2015 to 2018, each senior high school student in Beijing has enjoyed about 20 ㎡ increase in space. Students in Guangdong shared a rather low school space than students in other regions, with about 38 ㎡ per student in junior high school, and 42 ㎡ per student in senior high, and the numbers remained stable in 2018. The same tendency happened in Zhejiang and Shanghai. For Jiangsu province, there was a drop in junior high school space per student, from 52 ㎡ to 42 ㎡ with a percentage of 19.2%.

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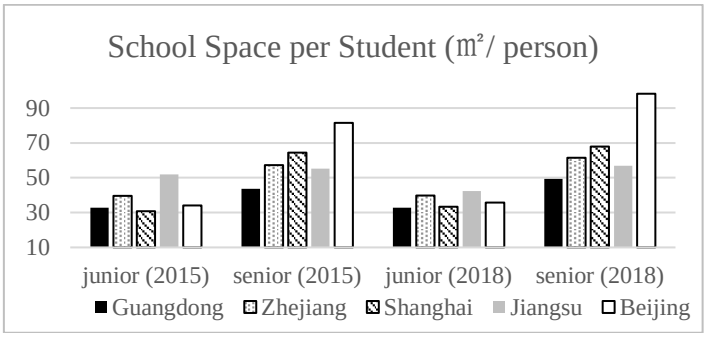

Figure 1: School Space per Student.

4. Discussion

Based on the three aspects and how they are expressed, differences among regions may be easily seen and help analyze the equity of education. The apparent disparity between China's participation in the PISA test results in 2015 and 2018 reflects the differences in educational quality among these participating regions, further reflecting the disparity in educational investment between China's relatively developed regions and hinting at broader educational inequalities:

According to data shown above, evident gaps exist among regions, highlighting all aspects of Guangdong province. Taken the results of PISA 2015 and 2018 together, Zhejiang province, rather than Guangdong province, is represented to be at the same level of education development with Beijing, Shanghai and Jiangsu. Considering the theory that educational development and regional economic levels are mutually reinforcing, it is surprising that Guangdong Province, as the region with the highest GDP, has demonstrated the level of performance in the international education assessment. However, on a micro level, through horizontally comparing indicators in Guangdong Province with other mainland regions participating in PISA in terms of investment in education, it is found that Guangdong Province has room for improvement in terms of human, financial and material resources to promote a balanced development of regional education and reach a higher level in general.

4.1. Lack of Teachers

Teacher' s allocation attention has important implications for students' educational outcomes as well as their personal development. Inadequate numbers of teachers are often associated with underfunded schools and poor allocation of resources; lack of teacher guidance and attention may cause students to lose motivation to learn [11,12]. Students in Beijing clearly enjoy more attention from their teachers: a teacher often has to deal with eight or even fewer students, whereas in other districts teachers deal with nearly 10 students, sometimes more than 12.

In reality, Shanghai and Beijing, as Chinese municipalities, have more concentrated economic, political, and educational resources and are better managed on a macro level; in contrast to these two cities, Guangdong, Jiangsu, and Zhejiang, as provinces that cover a much larger geographic and administrative area, have to face more complex situations in their development: their provincial capitals and other cities and rural areas have huge gaps in all aspects of development. There are huge gaps in all aspects of development. Thus, while a developed city within a province may be able to attract more teachers with its resources, rural areas and less developed cities will have difficulty maintaining even the size of the pool of teachers they already have without recourse to political and economic means [13]. Educated individuals (e.g., teachers) are more likely to move to developed cities, while the presence of rural areas in general and their households is relatively stable, so the student-teacher ratio may rise and increase the overall ratio.

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4.2. Gaps in GDP Per Capita and Input in Education

The GDP of the five regions from highest to lowest is Guangdong Province, Jiangsu Province, Zhejiang Province, Shanghai, and Beijing; however, the GDP per capita ranking is Beijing, Shanghai, Jiangsu Province, Zhejiang Province, and Guangdong Province. In both 2015 and 2018, Beijing's GDP per capita was nearly twice as high as Guangdong's. This reflects the differences in development within cities and provinces, echoing the previous section, and the significant problems in economic development in Guangdong Province. In terms of education investment, all five regions have seen an increase in education investment as a percentage of GDP per capita from 2015 to 2018, yet Zhejiang, Jiangsu, and Guangdong are one level closer than Beijing, which has a high investment rate of 59.8% at the high school level, and Shanghai, which has a high investment rate of 50.7%, yet Guangdong's households still have the lowest rate of investment in education. Many studies have demonstrated the positive effect of educational investment on student achievement, and given this premise and the regional differences within provinces, Guangdong residents and the government could consider investing more resources in students; however, as children's educational investment gradually takes up the lion's share of household spending, the academic stress of students may subsequently rise and citizens' willingness to have children may drop significantly[14].

4.3. Limited Space and Facilities

The space of school building rather than of classroom focuses on the overall development of students. Ensuring that students have enough space to study, play sports, and live on campus allows them to better enjoy school life, gain more satisfaction and self-esteem, and further encourage their motivation. There is also a high correlation between school space per student and investment. When school space per student increases, so does the overall investment in students, and school operators have the funds to build more functional, larger buildings with, for example, study rooms and laboratories.

The presence of private schools may also drive down school space per student: In other countries, private schools tend to mean more expensive tuition, improved facilities, and high-quality instruction, but in China, only the first of these is common. China's basic education consists of both public and private schools to support a large student population, yet private schools in China receive less financial support from the government than schools in other countries, so schools have to consider more about the cost of building the school and invest in attracting and retaining students (hiring experienced teachers at high prices, offering a scholarship to well-performed students).

5. Conclusions

The close relationship between educational outcomes and educational inputs is revealed by the PISA test and depicted by the all-around comparisons of the five regions. The five regions can be divided into two levels, with Shanghai and Beijing on one side; and Guangdong, Zhejiang, and Jiangsu on the other. This division takes into account the ratio of educational inputs to income, as well as administrative divisions. Shanghai and Beijing, as developed cities with smaller areas, enjoy richer educational resources on average throughout the region; the other three provinces contain vast rural lands, which are evenly distributed, and the level of education in developed cities is pulled down. Among these three provinces, Guangdong is more evident in the unbalanced distribution of resources; it has the highest total economic volume, but the lowest GDP per capita and education investment.

The uneven distribution of educational inputs and educational outcomes reflected in five regions with similar economic profiles in general hints at several points that education administrators and policy makers need to be aware of when developing in the future.

First, improve the urban and rural development mobility. In order to narrow the teacher gap between urban and rural areas and between key schools and ordinary schools, the government and

the Education Bureau should pay attention to the teacher rotation system to promote educational equity in human resources for all schools. It is important to note that the “rotating” teachers may face material and psychological pressure and resist the policy, thus a compensation mechanism is needed to alleviate their worries; rural teachers should also receive more policy and financial support so as to maintain the attractiveness of rural areas and reduce the brain drain. Second, make material resources more accessible to all students and families. If sufficient funds are available, schools should give more consideration to improving their infrastructure so that students can enjoy more space and access to equipment and other resources; if sufficient funds are not available, neighboring schools in a district can consider sharing some of their facilities and working together, which can narrow the gap between schools and improve the overall average quality of education in the district.

This study draws reliable data from international measures of educational quality and uses them to verify educational inequality in China. Analyzed from multiple perspectives, this paper argues that differences in educational inputs contribute to regional disparities in the quality of education in China. It found that differences in economic and political development between regions profoundly affect educational development; it also reminds schools, educational administrators, and policymakers to adopt more flexible instruments and invest more in resource inputs.

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