

Resource Utilization and Disparities in Compulsory Education in China

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Abstract

Based on county-level data in 1997 and 1999, this study attempts to document resource utilization and disparities in compulsory education in China. It found that while the pattern of resource utilization was similar across different areas in the country, there were substantial disparities in the level of per-student spending across these areas. The spending gap was particularly substantial between urban and rural areas, and between coastal region and other regions. Although non-minority areas spent more than minority areas, the gap was relatively modest. Five measures of inequality were estimated and they showed a remarkable consistency in demonstrating a large degree of inequality in school spending at both primary and lower-secondary levels nationwide in 1999. Decomposition of the Theil indexes indicated that between two-thirds and three-quarters of financial inequality resided within provinces, and between one-quarter to one third of the financial inequality existed between provinces. For the urban and rural groups, the decomposition also showed that the great majority of the inequality resided within these groups instead of between these two groups. Comparison of 1997 and 1999 results showed that nationwide, there was no significant change in the overall level of inequality in per-student total spending. However, in the same period, the spending gap increased between counties at the top-end and bottom-end of the spending distribution; per-student total spending increased much faster at the top end than at the bottom end. The spending gap also increased between urban and rural areas, and between coastal areas and the rest of the country. The implications of these findings for education policy were discussed.

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I. Introduction

Despite a low level of economic development, a large population, and considerable cultural and geographical diversities, China has made substantial achievement in the education of its people since 1949, as reflected in significant progress in access to compulsory schoolingⁱ, basic adult literacy, the development of a dual system of formal and non-formal education, and the reform and expansion of higher educationⁱⁱ. Educational development is regarded as a foundation for socio-economic and political development in the larger societyⁱⁱⁱ.

In the past two decades, the universalization of compulsory education has been a focus of educational policy in China. Presumably compulsory education raises the quality of the people so that they can become more productive individuals and more informed citizens^{iv}. In recent years, however, the country has faced daunting challenges in trying to extend compulsory education of adequate quality to all population groups, particularly those in rural areas^v. The financial difficulties of poor and rural areas and the large financial disparities across areas and regions are two of the prominent problems in compulsory education. These problems are tied to how compulsory education is funded in China.

Since the early 1980s, the financing of education in China has undergone a fundamental structural change from a formerly centralized system with a narrow revenue base to a decentralized system with a diversified revenue base^{vi}. This financial reform in education took place in the context of a larger public-finance reform in the country^{vii}. Governments at the county level and below have the primary responsibility for primary and secondary education. Funds for education can be raised from both government budgetary sources and out-of-budget non-government sources. In many poor and rural areas, local governments^{viii} can hardly raise enough revenue to cover teacher salaries, not to mention other non-teacher costs. In contrast, local governments in economically more advanced areas can mobilize significantly more resources for education, from both government and non-government sources. This leads to substantial disparities in per-student educational spending across areas and regions. Similar difficulties of poor areas and disparities across areas are found outside of the education sector^{ix}. Addressing these financial problems could contribute to economic productivity, social equity, and political stability^x.

A recent study by the World Bank highlighted financial difficulties and disparities in compulsory education as a major impediment to educational development in China in the new century^{xi}. It argues for a more simplified financial structure in which the financing responsibility for compulsory education will be transferred from the village and township levels to the county level. This proposal addresses the weak fiscal capacity of the township government and reduces

financial disparities within a county. In the past two years, the central government has begun experimentation in tax reform to elevate the financing role of the county government. Another proposal calls for the establishment of a regularized and substantial system of grants from central and provincial levels to the county level to address the financial problems in compulsory education^{xii}. There is a need to both document the financial situation and to explore appropriate financing policies for compulsory education.

Based on data at the county level, this paper examines how education resources are utilized in compulsory education and documents the extent of financial disparities. The findings for 1999 are compared to those of 1997 to ascertain possible changes during this period. The implications for education policy are explored.

II. Analysis of School Spending: Methodology and Prior Studies in China

A common way to examine the utilization of education resources is to analyze school spending. For budgetary and planning purposes, school spending is often divided into recurrent and capital categories. Recurrent expenditure is spending on school inputs that last for one year or less and it is sub-divided into spending on personnel and non-personnel inputs. Capital expenditure refers to spending on school inputs (such as buildings and equipment) that last for more than one year. School expenditures are important to examine because they generally constitute the bulk of all resources devoted to schooling and they are tractable instruments of education policy. School expenditures are often compared on per-student basis. It should be pointed out that school expenditures do not capture educational spending by households (e.g. school uniform, stationery, etc.) outside of the school. They also do not include the indirect cost of schooling (such as foregone productive activities outside the school). These private resources to schooling can be substantial in some situation and could be a major source of educational inequality and inequity. However, data on these private costs are not readily available.^{xiii}

China is a large and diverse country. In the analysis of education and socio-economic inequality, it is useful to examine disparities between urban and rural areas, between different regions of the country, and between minority and non-minority areas. Even though the rural population has declined over time since the onset of the current reform era, it still constitutes 64% of the total population in 2000^{xiv}. While there are alternative ways to divide the country into different regions, one common practice in the education sector is to divide the country into three regions: Region One (*yi pian*), Region Two (*er pian*), and Region Three (*san pian*).^{xv} Region

One includes provinces which are generally most advanced economically and educationally while Region Three is the least advanced and Region Two is in between. In 2000, minority population constitutes 8.41% of the total population. There are 635 counties designated as minority nationality autonomous areas. These minority areas constitute 64% of the total geographical area of the country; and minority groups account for over 46% of the population in these areas^{xvi}.

There are several commonly used statistics to measure the extent of inequality in education and other sectors. They include^{xvii}: (1) the restricted range, which is the difference between the 95th and 5th percentiles of the per-student spending distribution. This measure eliminates extreme values in the distribution; (2) the Federal Range Ratio, which is the ratio of the 95th percentile to the 5th percentile; (3) the coefficient of variation, which is the ratio of the standard deviation to the mean; (4) the Gini coefficient, which is derived from the Lorenz curve and has a range of between zero (perfect equality) and one (perfect inequality); and (5) the Theil index which is a measure of inequality derived from the notion of entropy in information theory. The entropy measure T (overall degree of inequality) is given by:

$$T = \frac{1}{n} \sum \frac{x_i}{u} \log\left(\frac{x_i}{u}\right) \dots \dots \dots (1)$$

In this study x_i is the spending of the i^{th} unit (e.g., a county), u is the mean spending of all units, n is the number of units. The index has a potential range from zero to $\log(n)$, with lower values indicating more equal distribution. Not only does this measure estimate the overall degree of inequality, it can also allow the decomposition of the degree of inequality between groups and within groups. Assuming the population with n units can be disaggregated into some subpopulations (groups), the within-group inequality can be represented by:

$$T_w = \sum \left(\frac{n_k u_k}{nu}\right) T_k \dots \dots \dots (2)$$

Here, T_w denotes the within-group inequality; T_k is the Theil index of the k^{th} group, n_k , u_k denotes the number of units and the mean of group k respectively. One can see that T_w is actually the weighted mean of all sub-populations (groups). Between-group inequality (denoted by T_b) can be given by: $T_b = T - T_w$.

After the financial reform of education was initiated in 1985, it was apparent that by the early 1990s, a decentralized system with budgeted and out-of-budget resources for the financing of education was in place. Much of the attention has been on the mobilization of additional resources for the education sector, especially in light of the historically low level of spending on

education since the founding of the People's Republic of China^{xviii}. However, since the 1990s, there is an increasing literature on the utilization of school spending and on financial inequality in education. These studies can be put into two groups, according to the unit of analysis^{xix}. The first group employs the province as the unit of analysis^{xx}. An early example is the study by Tsang^{xxi} of 29 provinces which found that, in primary education in 1989, the top-spending province spent as much as 5.2 times that of the bottom-spending province, in terms of per-student total (recurrent plus capital) school spending; the corresponding ratio was 4.5 in secondary (lower and upper) education. Wang^{xxii} divided the 30 provinces into four regions and found that the coefficient of variation increased between 1988 and 1994. In another study^{xxiii}, the 30 provinces were divided into three regions. It found that the ratio of per-student total school spending among the three regions grew from 2.8:1.5:1.0 in 1988 to 3.0:2.0:1.0 in 1992. In a recent study, Du and Wang^{xxiv} found that, between 1978 and 1996, inequality in school spending (based on per-student total school spending) grew in primary education but not at the secondary level. Other studies focus on subsets of the provinces. For example, Jiang^{xxv} found that the ratio of per-student budgeted spending (school spending from budgeted sources on recurrent and capital inputs) between "developed" provinces (as represented by Jiangsu, Zhejiang, and Guandong) and underdeveloped provinces (represented by Anhui, Henan and Guizhou) was 1.61 in 1990 and 2.14 in 1993. Studies using provincial data are attractive because they focus on an important "administrative" level in education and data are readily available. But they do not capture education disparities within a province which are substantial and are also an important focus of educational policy.

The problem with provincial-level data prompted researchers to collect county-level data for analysis; this effort was subsequently aided by the Ministry of Education that began developing a database in the mid-1990s. The earliest reported study was conducted by Jiang^{xxvi} who analyzed data on 374 counties. The study found that a positive correlation between per-capita total school spending and per-capita income in 1990. Comparing coastal counties with counties in central China, Zhang^{xxvii} found that the ratio of per-student recurrent spending at the primary level was 1.8 in favor of the coastal region. Using information from 1753 counties, Jiang and Zhang^{xxviii} confirmed that large disparities in per-student spending at the primary and lower-secondary education persisted in 1997. And using information from 511 counties in 1994 and 1997 and estimating the GINI coefficients, the study found no change in the degree of inequality during this period; but this finding was based on a small and non-representative sample. A common problem of these studies so far is that they are based on available data on a non-random

set of counties in the country. Previous studies rarely examine financial disparities between minority and non-minority areas.

In summary, available studies indicate that there are significant disparities in per-student spending at the primary and secondary level in China. Provincial studies also point out that there was widening disparities between the 1980s and the early 1990s. However the above review indicates that there is a need to: (1) conduct a more comprehensive analysis of disparities in school spending (including the comparison of minority and non-minority areas); (2) employ a complete set of county-level^{xxix} data to minimize potential biases; (3) provide a comprehensive analysis of school spending in one year to serve as a baseline for assessing changes in the future; and (4) assess changes in financial disparities using more recent data to document the situation in the late 1990s.

III. Research Questions and Data

This study attempts to address these knowledge gaps in prior inquiries on school spending in compulsory education in China through a study based on comprehensive datasets at the county level in 1999 and 1997. It focuses its attention on three research questions: How were school resources utilized and how did they vary across the country? What was the extent of inequality in school spending in the country? Was there a change in inequality between 1997 and 1999? The implications of the findings for education policy are explored.

Data for this study comes from the financial database of the Ministry of Education, China. The data-collection instruments used by MOE are designed according to the present fiscal framework characterized by “eating from separate pots”. Within this framework, each administrative level has its own tax base and takes its own spending responsibilities. In the data sets used by this study, all government entities (above town and township level) with the responsibility to directly finance schools at primary and lower-secondary levels are included; the great majority of them are designated administratively at the county level^{xxx}.

After being cleaned up^{xxxi}, about 2950 “county-level” units remained in the data sets for the year 1999. All mainland province-level regions (provinces, autonomous regions and municipalities directly affiliated to central government) except Tibet are present in the data sets.

In the school spending accounts in China, school total spending is made up of two components: recurrent spending and capital spending. Recurrent spending is divided into “personnel” and “non-personnel”. Personnel spending includes basic salary, ancillary salary

(including governmental stipend for teachers supported by villagers, i.e. the so-called *minban* teacher), other kinds of salary, fringe benefits for staff and teachers, social security premium (for the staff), and scholarships. Non-personnel spending includes administrative spending, instructive spending, spending on equipment, spending on repair and renovation, spending on reception and “other non-personnel recurrent expenditures”. Capital expenditure consists of spending on school facilities (including land) and large equipment.

The Chinese accounts also distinguishes school spending by source: “budgeted” funds are supported by one or more levels of government, “out-of-budget” funds are education revenue from outside the government’s budget; they include education surcharges and levies, education fees (tuition and miscellaneous school fees), income from school-owned enterprises, work-study and service, and social contributions and donations^{xxxii}. Analysis of school spending by budgeted and out-of-budget categories can reveal spending disparities associated with different financing sources.

This study carries out three sets of analysis. The first set examines how school resources were utilized in 1999. It shows spending level by recurrent and capital categories (and sub-categories) as well as by budgeted and out-of-budget sources, for the national sample of counties and for subsamples of counties based on urban/rural, regional (Regions One, Two, and Three), and minority/non-minority distinctions^{xxxiii}. The second set estimates the extent of inequality of school spending in 1999, using the measure of restricted range, federal range ratio, coefficient of variation, GINI coefficient, and the Theil Index. To facilitate the comparisons with other studies, two methods were employed in computing Gini coefficients: “county-by-county” method and the “regression” method. The formula for the county-by-county method takes the following form:

$$G = \frac{2}{n} (1y_1 + 2y_2 + \dots + ny_n) - \frac{n+1}{n} \dots \dots \dots (3)$$

“G” is Gini Coefficient; “n” is the number of county-level districts in the target data set; y_i represents the share of i^{th} county in the total spending of the country. $y_1 < y_2 < \dots < y_n$.

The other is a “regression” method, for which all the counties are divided into 10 groups of the same size after being sorted in ascending order. Let “ y_i ” be the accumulative sum of the spending of the i^{th} group and the groups below; let x_i be the accumulative percentiles (10%, 20%..... 100%). Assume that the Lorenz Curve describes an exponential relation between y_i and x_i , the relationship between y_i and x_i is hypothesized to take the following form:

$$y = ax^b \dots\dots\dots(4)$$

Then the area below Lorenz Curve (denoted as “B”) can be represented as follows:

$$B = \int_0^1 ab^x dx = \frac{a}{b+1}$$

“a” and “b” can be estimated from equation (4) using ordinary least square regression method.

Then Gini coefficient (G) is given by:

$$G = 2\left(\frac{1}{2} - B\right) = 1 - 2B$$

Using county-level data, Theil Indexes are further decomposed to show the degrees of inequality between and within provinces for both primary education and lower-secondary education.

The third set of analysis compares resource utilization and disparities over two years: 1997 and 1999. Data for earlier years were not used because of limited coverage and questionable quality for some of the financial categories.

IV. Utilization of School Resources

This section presents the empirical findings on the utilization of school resources, their variations across different areas in the country, and differences in the financing sources. Table 1 gives per-student spending by category in 1999. For the country as a whole, per-student total (recurrent and capital) spending was 701 yuan at the primary level, 93.9% of which was recurrent expenditures. At lower-secondary level, per-student total spending was 1,165 yuan, 92.0% of which was recurrent expenditures. This high percentage of recurrent spending was quite common in lower-levels of schooling in other developing countries^{xxxiv}. Per-student total spending at lower-secondary level was 66% higher than that of primary education^{xxxv}.

At both levels of schooling, urban areas enjoyed a substantial advantage in terms of per-student total spending; the urban-rural ratio was 1.84 at the primary level and 1.69 at the lower-secondary level. Though in per-student terms non-minority areas spent more than minority areas did, the gaps were substantially less visible compared with that between rural and urban areas: the non-minority to minority ratio was about 1.06 at the primary level and 1.24 at the lower-secondary level. The non-minority/minority gap appeared to be wider at a higher level of schooling. Large regional disparities existed between Region One and Region Two as well as Region Three. Per-student total spending in Region One exceeded Region Three by 71% at the

primary level and 75% at lower-secondary level. In 1999 Region Two actually had a lower level of per-student spending relative to Region Three^{xxxvi}.

Table 1 also shows that there was no notable difference as to how the resources were allocated between recurrent and capital expenditures in different regions in 1999. Recurrent spending as a percentage of total spending varied between 92 to 95%.

(Table 1 about here)

Table 2 shows how recurrent spending was allocated between personnel and non-personnel subcategories. Nationwide, personnel spending constituted about three quarters of the recurrent spending at the primary level and about two-thirds at the lower-secondary level. But we can see little variations across regions in the percentages at both school levels.

(Table 2 about here)

Thus Tables 1 and 2 show that while there were large disparities in the level of per-student spending across areas (particularly between urban and rural areas and between Region One and other regions) for each level of schooling, the utilization of school resources was actually very similar across areas at the same level of schooling.

In Table 3 non-personnel spending is broken down into several sub-categories. According to Table 3, there also appeared to be a common “pattern” in non-personal spending between the two levels of schooling. For both schooling levels, the largest spending item was minor repair and renovation; administrative spending was in second place. Together, these two items accounted for three-fifths of non-personnel spending. Teaching related items (Instructional Spending plus Spending on Equipment) combined for slightly more than one-quarter of non-personnel spending.

(Table 3 about here)

Table 4 shows school spending by the source of funds for 1999. We can see from this table that at the primary level nationwide 62.8% of the total spending was supported by budgeted funds from the government; at lower-secondary level the percentage was 57.6%. Although the spending patterns were similar in different areas, sources of school revenues appeared to differ. At both levels of schooling, minority areas relied more heavily on government funds than non-minority areas. Similarly Region Three relied more on government funds than the other two regions. This difference may be explained by the difference in capacity in resource mobilization; that is, non-government education resources were more abundant in non-minority areas and in areas outside Region 3. The situation for urban/rural areas was different. Table 4 also shows that the funding pattern was similar for urban and rural areas, at both levels of schooling. The

findings from Table 1 and Table 4 imply that urban areas spent substantially more than rural areas because they could mobilize more resources from both government and non-government sources.

(Table 4 about here)

Table 5 presents the various sources of out-of-budget funds; it shows that the two levels of schooling had a somewhat similar distribution of funding sources. At both levels of schooling, surcharges/levies and miscellaneous fees^{xxxvii} were the two largest sources. Together the two sources accounted for about 60% of out-of-budget fund. At the primary level, surcharges and levies were the most important out-of-budget source. At the lower-secondary level, miscellaneous fees were almost as important as surcharges and levies.

(Table 5 about here)

Table 6 compares per-student budgeted spending with per-student personnel spending in different areas. At the primary level nationwide, government spending could not even cover personnel spending (basically salaries). Government spending barely covered personnel spending at the lower-secondary level. Thus schools have to rely on non-government sources (such as education surcharges and levies as well as miscellaneous fees) to make up for the gap in recurrent funding. But for some areas, especially poor rural ones, non-government resources are meager; their financial situation is very difficult. The financial difficulties of these areas are reflected in at least two ways. The first consists in inadequate resources to support educational inputs such as teachers, instructional materials, school equipment, and school facilities. Many schools have a shortage of necessary instructional materials (such as chalk and teaching aids) and school equipment. The second is the lower rates of enrollment in primary and secondary education in poor and rural areas compared to other areas.^{xxxviii}

(Table 6 about here)

V. Inequality in School Spending

The dataset used in this study allows detailed analysis of school spending by financial category and funding source. In this section, measures of inequality are constructed for nine school spending groups: per-student total spending, per-student recurrent spending, per-student non-personnel recurrent spending, per-student total budgeted spending, per-student budgeted recurrent spending, per-student budgeted non-personnel recurrent spending, per-student total out-of-budget spending, per-student out-of-budget recurrent spending, and per-student out-of-budget non-personnel spending. Table 7 presents the results for three measures of inequality: the restricted range, the federal range ratio and the coefficient of variation^{xxxix}. Not unexpectedly,

the results show considerable degree of variations in all spending groups. All of the federal range ratios were larger than 5, indicating that the spending level of the 95th percentile was at least five times as high as that of the 5th percentile. It is interesting to compare the results in Table 7 with some of the findings in a similar study conducted by Tsang (reviewed in an earlier section). Based on provincial data and also in terms of per-student total spending, Tsang found that the top-spending region spent as much as 5.2 times that of the bottom-spending region in primary education, in 1989. The ratio of 5.32 for primary education in 1999 shown in Table 7 was thus very similar to the same ratio in 1989.^{xi}

Table 7 shows that all of the coefficients of variations in this study were about 0.7 or higher^{xli}. All non-personnel recurrent spending categories had very high degrees of variation (with federal range ratio higher than 10). At both levels of schooling, out-of-budget total spending had higher degree of inequality than total budgeted spending. It is instructive to note that among the nine spending groups, the one with the highest degree of variation was budgeted non-personnel recurrent spending. The federal range ratio could not be computed for this spending group because the spending of the 5th percentile (the denominator) was zero, indicating that in at least 5% of all counties, no governmental funds were budgeted for non-personnel use at all. It is well documented in research on education that non-personnel spending (such as spending on instrumental materials and school supplies) affects the quality of teaching and learning in schools^{xlii}. Lack of non-personnel spending in poor rural schools may have adversely affected the quality of schooling.

(Table 7 about here)

Table 8 reports the Gini and Theil coefficients for nine spending categories. Two methods for computing Gini coefficients generated nearly identical results. In table 8, primary and lower-secondary education showed similar degrees of inequality in per-student total spending for this year: the coefficients were about 0.33 to 0.34 respectively. The Theil indexes for the two levels of schooling were almost the same (about 0.23 for both levels). Among all spending categories, budgeted non-personnel spending showed the highest Gini coefficients and Theil indexes. This is consistent with other inequality measurements presented in Table 7.

(Table 8 about here)

The Theil indexes in Table 8 were subsequently decomposed to show the extent of inequality that resided within provinces as well as the extent of inequality that existed across provinces. The financing of compulsory education in China involves more than one level of government. Although the county-level government is primarily responsible for financing primary and secondary education, central and provincial governments do currently provide a

limited amount of targeted fund to county governments for use in compulsory education. For a large country like China, the central government has to work with the provincial government to deal with education matters within a province. Estimating inequality across counties within provinces as well as inequality across provinces can inform education policy, for example, by helping to identify and quantify the responsibilities of different levels of government in addressing financial challenges in compulsory education.

Table 9 presents the extent of within-province inequality, and this within-province inequality as a percentage of overall inequality, for three spending categories. In Table 9 we can see that at both levels of schooling, within-province variation accounted for two-thirds to three-quarters of the total inequality in spending. For example, within-province inequality accounted for 70.6% of the overall inequality in total school spending at the primary level, and 68.8% at the lower-secondary level. The implication of this finding for multi-level financing in China will be discussed in the last section of this paper.

The decomposition finding of this study is quite different from that of Jiang and Zhang^{xliii}. In Jiang and Zhang's study, the counties were divided into two groups, "coastal and central region" and "western region"; and within-group inequality accounted for 97% to 99% of the total inequality in 1997. The much higher within-group inequality could be mainly due to the decomposition into two groups only. A lesser factor could be that the Jiang and Zhang study used a different and much smaller dataset.

(Table 9 about here)

Finally, consider the decomposition of Theil indexes for urban and rural groups. In the data sets available to this study, each county-level observation could be divided into two subgroups: one for rural schools and one for urban schools. By regrouping the observations, we obtained an urban group and a rural group for each province. For each province we computed the Theil index and then decomposed the index into within-group and between-group inequalities. By definition, the between-group index for each province measures the extent of inequality between the rural and urban groups of each province therefore can be seen as the inequality associated with the urban/rural distinction. The within-group index, which is the weighted average of the Theil inequality indexes of the rural group and the urban group in a province, can be seen as the inequality that cannot be attributed to urban/rural distinction.

Table 10 shows, for each province, the decomposition of the Theil index for one financial category: per-student total spending. As shown on this table, urban/rural distinction accounted for between zero and 38.4% of the overall extent of inequality in a province. The province with largest between-group (urban vs. rural) inequality was Guangxi, where the between-group

inequality accounts for 38.4% of the overall inequality in per-student total spending. In Qinghai, the between-group inequality accounted for zero percent of the overall inequality in per-student overall spending and per-student recurrent spending^{xliv}, indicating that in this province there was no measurable difference in per-student spending between rural and urban schools.

(Table 10 about here)

VI Changes over Time

In order to explore the change in financial disparities over time, this study identified the set of counties that were found in both the 1997 and 1999 datasets^{xlv}. The sample consisted of 2,471 counties at the primary level and 2,417 at the lower-secondary level^{xlvi}. Measures of inequality were computed for both years. Table 11 shows the results for the financial category of per-student total spending^{xlvii}.

(Table 11 about here)

According to Table 11, per-student total spending increased significantly between 1997 and 1999 at both the primary and lower-secondary levels nationwide. However, the pattern in disparity varied across areas. During this period, the gap between urban areas and rural areas increased at both levels of schooling. But the gap between non-minority areas and minority areas actually decreased at the primary level and was almost constant at the lower-secondary level. At both levels of schooling, Region One increased their lead over Region Three while Region Two lost relative to Region Three. Thus, at the regional level, Region One (developed coastal provinces) was pulling away from the rest of the country. In fact, in 1999, Region Two and Region Three were very similar in per-student total spending. In other words, in terms of this spending category, the country behaved as if there were two regions: coastal provinces and the rest of the country.

The five measures of inequality show different patterns of inequality over time. Based on the restricted range, federal range ratio, and the coefficient of variation, there was an increase in inequality at both levels of schooling. But according to the Gini coefficient, there was basically no change in inequality, while Theil indexes show some decrease in inequality. Overall, the results in Table 11 seem to suggest that there was increased polarization at both ends of the spending distribution; but for the entire country, the inequality in per-student total spending was rather stable. This pattern of results seems to be consistent with two observations during the 1996-2000 period: there was an increased national effort to provide more education resources to poor areas, and local governments had discretion in their spending decisions^{xlviii}. In other words, there was a conscious effort to raise “the bottom” but not put a cap at the top. It is important to

point out that, because of data limitations; we have examined the change in per-student spending in a short period of time. The Gini coefficients might have changed more if we had studied a longer time period. Nevertheless, this study provides some baseline to observe change in the coming years.

One thing worth noting is that the Gini coefficients and Theil indexes computed using the “follow-up” data (about 2,417-2,471 observations) were lower for both years relative to those computed with the full samples (about 2,600 observations in 1997 and 2,950 observations in 1999), for the per-student total spending category. Consider first the Gini coefficient. In 1997, the Gini coefficient was 0.35 for primary education and 0.34 for lower-secondary education, based on the full sample; the corresponding values were 0.33 and 0.31 based on the follow-up sample. In 1999, the Gini coefficient was 0.34 for primary education and 0.33 for lower-secondary education based on the full sample; the corresponding values were 0.33 and 0.32 for the follow-up sample. The Theil indexes dropped more dramatically between the two samples. In 1997, the Theil index was 0.27 for primary education and 0.27 for lower-secondary education, based on the full sample; the corresponding values were 0.23 and 0.24 based on the follow-up sample. In 1999, the Theil index was 0.23 for primary education and 0.23 for lower-secondary education, based on the full sample; the corresponding values were 0.20 and 0.20 based on the follow-up sample. These results show that the estimates of inequality based on the Theil indexes were more sensitive to sample selection than those based on the Gini coefficients.

Most of the prior studies examined changes in spending between the late 1980s and early 1990s and they found substantial disparities across areas, based on ratios of per-student spending. Large disparities between urban and rural areas and between Region One and the rest of the country are also reported in this study for the late 1990s. Thus, in terms of ratios of per-student spending, our findings are consistent with those of prior studies. But because of a lack of county-level data, most of the prior studies did not estimate Gini coefficient and Theil index; thus it is not possible to compare these measures between the late 1980s, early 1990s, and the late 1990s. A recent study by Jiang and Zhang did compare the Gini coefficient between 1994 and 1997. Their study examined per-student recurrent spending for only 511 counties. According to their study, the Gini coefficient was 0.24 in 1994 and 0.25 in 1997 at the primary level; and it was 0.23 in 1994 and 0.24 in 1997 at the lower-secondary level. Thus there was no significant change in inequality in per-student recurrent spending between 1994 and 1997 for the 511 counties. According to our study, the Gini coefficient was 0.33 in 1997 and 0.33 in 1999 at the primary level; and it was 0.32 in 1997 and 0.32 in 1999 at the lower-secondary level. Thus there was no

significant change in inequality in per-student recurrent spending between 1997 and 1999 in the roughly 2,400-2,500 counties. But there was an obvious difference in the magnitude of the Gini coefficient between the two studies. One possible explanation is the different samples employed by the two studies; the Jiang-Zhang study was based on a much smaller sample which might not be representative of the entire country.

VII Summary and Discussion

Nationwide in 1999, personnel spending accounted for three quarters of recurrent spending; and recurrent spending amounted to 94% of total school spending in primary education. At the lower-secondary level, two-thirds of recurrent spending was devoted to personnel input and 92% of total school spending was devoted to recurrent input. This pattern of resource utilization was consistent across areas in the country. Different areas, however, did vary significantly in the level of per-student school spending. The spending gap was particularly substantial between urban and rural areas, and between Region One and other regions. Although non-minority areas spent more than minority areas, the gap was relatively modest. The variation in per-student spending was related to how school spending was financed; variation in the capacity to raise resources from non-government sources is a major contributing factor. Schools in less advantaged areas depend more on government funds which were mostly used on personnel inputs. In particular, schools in poor rural areas have meager capacity in raising revenue from non-government sources and have little spending on non-personnel school inputs. Financial difficulty was a contributing factor to lower education quality for these schools.

The five measures of inequality show a remarkable consistency in demonstrating a large degree of inequality in school spending at both primary and lower-secondary levels nationwide in 1999. Among all spending groups, non-personnel spending exhibited the largest degree of inequality. Methodologically, it is useful to compute both the Gini and Theil inequality measures because they provide different information about the characteristics of the spending distribution.

The Theil indexes were decomposed by provincial groups and by urban/rural groups. The decomposition indicates that between two-thirds and three-quarters of financial inequality resided within provinces, and between one-quarter to one third of the financial inequality existed between provinces. For the urban and rural groups, the decomposition also showed that the great majority of the inequality resided within these groups instead of between these two groups.

Comparison of 1997 and 1999 results shows that there was no significant change in the overall level of inequality in per-student total spending, for the country as a whole. However, in the same period, the spending gap increased between counties at the top-end and bottom-end of

the spending distribution; per-student total spending increased much faster at the top end than at the bottom end. The spending gap also increased between urban and rural areas, and between Region One (coastal areas) and the rest of the country.

The substantial financial disparities in compulsory education across areas are a reflection of the highly uneven socio-economic development in Chinese society documented in other studies of China in the post-1978 reform period^{xlix}. Even though the overall extent of inequality nationwide did not change dramatically between 1997 and 1999, the financial disparities in compulsory education did show signs of widening across areas and regions during this period.

Conceptually, efforts to address the financial problems in compulsory education involve intervention in the larger society and within the education sector^l. From a broader viewpoint, interventions in the larger society could foster socio-economic development, including poverty reduction, in the lagged areas (rural areas) and regions (particularly the western region) of the country. In the past few years, the central government has placed more emphasis in its national-development plan on the development of China's west, balanced and articulated development across regions, the strengthening of the foundational role of agriculture, and the development of the rural economy^{li}. It is important to examine the implementation of these development policies and assess their impact on poverty reduction and on regional disparities in the coming year. Our findings support the need and urgency for continuing research on this topic. An extended discussion of interventions outside the education section is beyond the scope of this study.

Within the education sector, a common approach for addressing financial problems in a decentralized system is the use of intergovernmental education grants^{lii}. Intergovernmental grants are grants from a higher level of government to a lower-level government (e.g, central level to provincial and/or county levels, or provincial level to county level). These grants may be used to strengthen the financial capacity of a local government, to reduce financial disparities across local governments, and/or to induce additional spending by local governments. In the past several years, some China observers have argued for the development of a regularized and substantial scheme of intergovernmental grants for the financing of compulsory education in China^{liii}. While there is a multiplicity of issues for careful analysis and further research related to China, five issues directly related to the findings of this study are briefly discussed in this concluding section.

The first issue deals with the relative role of the central and provincial governments in the financing of compulsory education. Since 1996, the central government has taken a leading role in providing some financial assistance to poor areas across the country. Both the provincial and county level governments are asked to match the central fund. But the use of intergovernmental grants for compulsory education has at least three problems: the use of such grants is based on ad

hoc decisions of central policymakers and is not a regularized part of the financing system, the grants are very small compared to the education needs, and the provincial governments are passive participants.

The decomposition of the Theil indexes over time show that: (1) the majority of financial inequality resides within provinces; and (2) there was increasing inequality across provinces and areas (urban vs. rural) over the 1997-99 period. Of course, our statistical analysis indicates where the inequality resides but does not attribute causality. Finding (1) implies that the provincial government should take a more active role than previously in addressing county-level financial difficulties in compulsory education. For example, provincial governments may begin spending more intergovernmental grants and making such grants a regular part of the funding source for counties. But finding (1) does not imply that provincial governments should be responsible for 60-70% of the additional intergovernmental grants. The large financial inequality within provinces can be due to a combination of factors: factors that pertain specifically to provincial policies and factors that relate to central policies. Our finding does not indicate whether, historically, provincial factors have been more important than central policies. In addition, equity consideration in the design of intergovernmental grants raises the question whether or not poor provinces in China's west have the economic capacity for addressing financial disparities by themselves. The question of economic capacity of poor provinces implies that the central government has a role to play. Finding (2) cautions against a passive and minor role of the central government. Finally, the relative financing role of the two levels of government also depends on their revenue capacity relative to their responsibility. A reasonable policy implication of our finding is that provincial governments should have a more active role than before and that, in the near future, both levels of government should remain active in the use of intergovernmental grants for compulsory education. More research on this topic is desirable.

The second issue concerns the priority in the use of (potentially) additional resources from the central and provincial governments. Findings from our study and from prior studies show the financial difficulties of poor rural areas and large inequality among areas. Since it is not desirable to suppress the socio-economic development of the fast-growing coastal areas as well as their autonomy regarding educational investment, the objective of addressing the financial difficulties of poor rural areas should have a higher priority than the objective for reducing inequality. This implies that more of the central resources should be directed at poor rural areas in poor provinces. Economically more developed provinces have a stronger fiscal capacity and should have a stronger role in helping poor areas within them.

The third issue concerns the relative role of government and non-government sources for

financing of compulsory education. Many observers point out that access to quality compulsory education is a basic right of every child and that investment in compulsory education has substantial economic, social, and political returns for society^{liv}. Thus the government should guarantee a quality compulsory education for every child. According to this perspective, governments at various levels in China should work together to make the universalization of quality compulsory education a reality for children in all areas of the country. Thus more government resources should be targeted at the poor rural counties in the country. In recent years, education choice and privatization have become hot issues in education in China^{lv}. While increased choice and privatization could attract more non-government resources for education and better accommodate parental demand for schooling, there is a concern that they will also widen social inequity and disparities. From the perspectives of promoting social equity and social efficiency, it is important that the government maintain a strong role in the financing of compulsory education while allowing for more choice and privatization in post-compulsory education.

The fourth issue concerns the comparison of minority and non-minority areas. To address the information gap on financial disparities between ethnic groups in compulsory education, this study examines per-student spending between the two types of areas. It found higher spending for non-minority areas but the spending gap was relatively small compared to the gaps for urban/rural groups and regional groups. Due to data limitation, one deficiency of our study is that we did not compare spending based on information on individuals or schools. We only compared non-minority counties (counties with very few minority population) and minority counties (counties with a significant proportion of minority population and designated by the government to be minority counties). It is possible that, within minority counties, there could be significant disparities between the educational experience of minority population and the majority Han people. Also, there could be significant disparities between the different minority groups in the different areas of the country^{lvi}. Further research on this topic is needed to ascertain financial inequality among the different ethnic groups in China.

The fifth and final issue concerns the proper monitoring of educational inequality in China. Our study shows that it could be misleading to simply track the extent of inequality for the country as a whole. Our findings indicate that widening inequality across areas could coexist with non-changing inequality nationwide. They call for continuing research on and monitoring of educational impacts on various socio-economic and ethnic groups.

Table 1 Per-student spending by category, 1999 (Yuan)

Areas	Primary			Lower-secondary		
	Total spending	Recurrent spending	Recurrent spending as % of total	Total spending	Recurrent spending	Recurrent spending as % of total
Nationwide	701	657	93.9	1165	1062	92.0
Urban areas	1062	989	94.5	1439	1315	93.0
Rural areas	576	543	93.8	851	788	92.7
Urban/Rural	1.84	1.82		1.69	1.67	
Non-minority	706	663	94.1	1194	1085	91.8
Minority	665	623	93.1	959	890	93.1
Non-Min. to Minority	1.06	1.06		1.24	1.22	
Region 1	1049	988	95.2	1679	1531	92.4
Region 2	547	514	93.9	915	831	91.6
Region 3	612	567	92.2	961	880	92.3
R1 to R3*	1.71	1.74		1.75	1.74	
R2 to R3*	0.89	0.91		0.95	0.94	

*R1, R2, and R3 refer to Region One, Region Two, and Region Three respectively

Table 2 Per-student personnel and non-personnel spending, 1999 (Yuan)

Areas	Primary			Lower-secondary		
	Personnel spending	Non-personnel spending	Personnel spending as % of recurrent spending	Personnel spending	Non-personnel spending	Personnel spending as % of recurrent spending
Nationwide	471	186	73.4	674	387	65.9
Urban areas	680	309	71.2	843	472	66.6
Rural areas	400	143	74.5	533	255	69.0
Non-minority	473	189	73.2	688	397	65.8
Minority	460	163	74.8	579	311	66.1
Region 1	689	298	71.7	954	578	64.4
Region 2	373	141	73.3	535	296	66.3
Region 3	424	143	76.3	576	304	67.6

Table 3 Per-student non-personnel spending by items, 1999 (Yuan)

	Primary		Lower-secondary	
	Amount	%	Amount	%
Total	185.63	100	387.03	100
Administrative spending	53.65	28.9	106.38	27.5
Instructional spending	24.18	13.0	46.36	12.0
Spending for Equipment	26.22	14.1	64.50	16.7
Minor repair and renovation	62.52	33.7	129.79	33.5
Spending on reception	3.05	1.6	5.62	1.5
Other	16.00	8.6	34.39	8.9

Table 4: Spending from budgetary sources as a percentage of total spending in 1999

Areas	Primary	Lower-secondary
Nationwide	62.8	57.6
Urban areas	63.5	60.2
Rural areas	62.7	59.8
Non-Minority.	61.1.	56.5
Minority	73.3	65.7
Region One	59.7	55.2
Region Two	60.0	56.2
Region Three	75.8	67.3

Table 5 Sources of out-of-budget school revenue, 1999

	Primary		Lower-secondary	
	Amount	%	Amount	%
Surcharges and levies	93.48	35.2	155.57	30.1
Miscellaneous fees	71.22	26.8	141.11	27.3
School-generated income	47.54	17.9	111.20	21.5
Contribution and donation	33.64	12.7	66.97	13.0
Other	19.71	7.4	41.90	8.1
Total	265.59	100	516.76	100

Table 6 Per-student budgeted spending and per-student personnel spending, 1999 (Yuan)

	Primary		Lower-secondary	
	Budgeted spending	Personnel spending	Budgeted spending	Personnel spending
Nationwide	450	471	677	674

Urban areas	677	680	861	843
Rural areas	372	400	513	533
Non-Minority	440	473	680	688
Minority	509	460	652	579
Region One	640	689	955	954
Region Two	338	373	513	535
Region Three	479	424	661	576

Table 7 Inequality in per-student school spending: Restricted range, federal range ratio, and coefficient of variation, 1999

	Primary			Lower-secondary		
	Restricted range	Federal range ratio	Coefficient of variation	Restricted range	Federal range ratio	Coefficient of variation
Total spending	1248	5.32	0.73	1962	5.06	0.69
Recurrent spending	1172	5.39	0.71	1693	5.42	0.68
Non-personnel recurrent	441	10.97	1.03	821	11.19	0.95
Budgeted total	767	6.15	0.79	1160	5.62	0.82
Budgeted recurrent	760	6.10	0.76	1104	5.48	0.77
Budgeted non-personnel	141	**	2.31	351	157.17	1.92
Out-of-budget total	646	12.14	0.92	988	8.63	0.81
Out-of-budget recurrent	580	14.60	0.92	720	11.95	0.86
Out-of-budget non-personnel recurrent	361	14.48	0.96	555	11.16	0.90

** : Cannot be computed because the denominator (the spending of the 5th percentile) is 0.

Table 8 Inequality in per-student spending: Gini coefficient and Theil Index, 1999

	Primary			Lower-secondary		
	Gini(1)*	Gini(2)*	Theil	Gini(1)	Gini(2)	Theil
Total spending	0.34	0.34	0.23	0.33	0.34	0.23
Recurrent spending	0.33	0.33	0.20	0.32	0.33	0.21
Non-personnel recurrent	0.46	0.47	0.45	0.45	0.46	0.47
Budgeted total	0.35	0.35	0.23	0.36	0.36	0.24
Budgeted recurrent	0.34	0.34	0.21	0.34	0.34	0.22
Budgeted non-personnel	0.78	0.71	1.18	0.70	0.67	1.12
Out-of-budget total	0.46	0.45	0.45	0.44	0.44	0.43
Out-of-budget recurrent	0.45	0.44	0.37	0.45	0.45	0.42
Out-of-budget non-personnel recurrent	0.47	0.45	0.43	0.45	0.45	0.48

*Gini(1) computed using the regression method; Gini(2) : computed using “county by county” method.

Table 9 Decomposition of Theil indexes, 1999

	Primary			Lower-secondary		
	Theil Index Nationwide (1)	Theil Index Within-province (2)	(2) as % Of (1)	Theil Index Nationwide (3)	Theil Index Within-province (4)	(4) as % Of (3)
Total spending	0.23	0.16	70.6	0.23	0.16	68.8
Recurrent total	0.20	0.12	63.1	0.21	0.14	65.9
Non-personnel recurrent	0.45	0.35	78.6	0.47	0.34	73.3

Table 10 Urban-Rural Inequality in Per-Student Total Spending by Province, 1999

	Theil Index for Province (1)	Theil Index for Urban-Rural Inequality (2)	(2) as % of (1)
Beijing	0.054	0.006	11.9
Tianjin	0.071	0.007	9.1
Hebei	0.147	0.029	19.5
Shanxi	0.077	0.002	2.6
Inner Mongolia	0.117	0.001	0.4
Liaoning	0.116	0.010	9.0
Jilin	0.134	0.008	6.0
Heilongjiang	0.183	0.013	7.3
Shanghai	0.031	0.005	15.0
Jiangsu	0.097	0.014	14.5
Zhejiang	0.044	0.004	8.6
Anhui	0.104	0.033	32.0
Fujian	0.122	0.022	17.8
Jiangxi	0.062	0.009	14.1
Shandong	0.143	0.029	20.2
Henan	0.151	0.038	25.4
Hubei	0.170	0.040	23.7
Hunan	0.076	0.019	25.2
Hainan	0.248	0.028	11.4
Guangdong	0.080	0.015	19.2

Guangxi	0.044	0.017	38.4
Chongqing	0.118	0.031	26.3
Sichuan	0.325	0.037	11.5
Guizhou	0.155	0.040	25.9
Yunnan	0.096	0.014	14.3
Shaanxi	0.114	0.019	16.6
Gansu	0.191	0.007	3.7
Qinghai	0.209	0.000	0.0
Ningxia	0.101	0.005	5.2
Xinjiang	0.091	0.005	5.2

Table 11 Changes in per-student total spending between 1997 and 1999

	Primary Education		Lower-secondary Education	
	1997	1999	1997	1999
Nationwide (1999 price, Yuan ^{lvii})	570.7	701.5	1156.7	1252.0
Urban to Rural Ratio	1.80	1.88	1.62	1.71
Non-minority to Min.	1.17	1.10	1.28	1.29
Region 1 to Region 3	1.76	1.95	1.61	1.99
Region 2 to Region 3	1.07	0.95	1.13	1.05
Inequality: restricted range, nationwide	967.4	1253.1	1825.4	2317.6
Inequality: federal range ratio, nationwide	5.03	5.42	4.91	6.03
Inequality: coeff. of variation, nationwide	0.72	0.74	0.70	0.75
Inequality: Gini(1), nationwide	0.33	0.33	0.31	0.32
Inequality: Theil, nationwide	0.23	0.20	0.24	0.20
Decomposition of Theil: % within province	75.2	70.0	79.9	69.6

Notes

ⁱ Compulsory education is defined as primary and lower-secondary education in China.

ⁱⁱ Mun Tsang, "Education and national development in China since 1949: Oscillating policies and enduring dilemmas." *China Review* (2000), pp. 579-618. Z. Chen, "Great and glorious socialist cause in China: For the 50th anniversary of education in the People's Republic of China," *Educational Research* (September 1999), pp. 3-15. R. Hayhoe, G. Peterson, and Y. Lu (eds.) *Education, culture, and identity in twentieth century China*. (Ann Arbor: University of Michigan Press, 2001).

ⁱⁱⁱ People's Press. *Jiaoyu gaige de wenjian* (Documents on the Reform of the Education System) (Beijing: People's Press, 1985).

^{iv} Theodore Schultz, *Investment in Human Capital* (New York: The Free Press, 1971); World Bank, *Priorities and Strategies for Education* (Washington, DC, 1995); People's Press, *Documents on the reform of education*.

^v By the end of 2001, the gross enrollment rate was only 88.3% at the lower-secondary level. The out-of-school children are found mostly in the western region and in rural areas. See Ministry of Education, *Quanguo jiaoyu shiye fazhan tongji gongbao* (Communique of National Education Development in 2001), (Beijing, China, June 13th, 2002.)

^{vi} Mun Tsang, "Financial reform of basic education in China," *Economics of Education Review*, Vol. 15, No. 4(1996), pp. 423-444.

^{vii} C. Wong (ed.) *Financing local government in the People's Republic of China* (Oxford: Oxford University Press, 1997).

^{viii} This concerns, particularly, the village and township governments, which have primary responsibility for compulsory education.

^{ix} A. Park, S. Rozelle, C. Wong, and C. Ren, "Distributional consequences of reforming local public finance in China," *China Quarterly*, No. 147, pp. 751-778. S. Wang and A. Hu, *The political economy of uneven development: The case of China* (Armonk, NY: M.E. Sharpe, 1998).

^x Mun Tsang, "Financing compulsory education in China: Establishing and strengthening a substantial and regularized system of intergovernmental grants," *Harvard China Review* (2002), pp. 15-20.

^{xi} World Bank, *Strategic goals for Chinese education in the 21st century* (Washington, DC: Report No. 18969-CHA, the World Bank, 1999).

^{xii} Tsang (2002), "Financing compulsory education in China."

^{xiii} Private resources for school fall into three categories: direct private costs (household spending on school-related fees such as tuition and miscellaneous school fees; and household spending on other school-related non-fee items such as spending on school uniform, stationery, etc.), household contributions in cash and in kind to school, and indirect private costs (economic value of foregone opportunity of schooling). See M. Tsang, "Public and private costs of schooling in developing countries" In M. Carnoy and H. Levin, *International Encyclopedia of Economics of Education*, 2nd edition (Pergamon Press, 1995), pp. 393-398; and D. Li and M. Tsang, "Household decisions and gender inequality in education in rural China," *China: An International Journal*, Vol. 1, No. 2(2002), pp. 224-248. In the Chinese context, school expenditures are financed by government sources and non-government sources, including household spending on school-related fees and household contributions; but they do not include non-fee household spending and indirect private costs of schooling. In the past, education policymakers seldom consider these private education resources because they are not part of the budget than can be manipulated. Not only are these data not readily available; they could be costly to collect. Today, education policymakers generally understand the impact of private resources on school access, quality, and equity.

^{xiv} Communiqué of the Fifth National Census: Issue 1 (State Statistic Bureau, China 2001). Also, universalizing compulsory education remains an important issue in rural China. See E. Hannum and A. Park, "Educating China's rural children in the 21st century" *Harvard China Review*, Vol. 3, No. 2(2002), pp. 8-14.

^{xv} In 1994, the Ministry of Education grouped all province-level districts into three categories based on the progress and capacity in achieving "Two Basics" (i.e., the universalization of nine-year compulsory education and the eradication of adult illiteracy). Nine province-level districts including Beijing, Shanghai, Guangdong, Zhejiang, Shandong, Tianjin, Jiangsu, Liaoning and Jilin were designated as "Region One" provinces, which were thought to have achieved the national goal of "Two Basics" on the whole, in

other words, don't need the assistance of the central government any more. "Region One" provinces concentrate mainly in coastal areas; "Region Two" includes Hebei, Shanxi, Heilongjiang, Anhui, Fujian, Jiangxi, Henan, Hubei, Hunan, Chongqing, Sichuan and Shaanxi. Most of "Region Two" provinces are middle inland provinces believed to have "middle" level of development in term of per capita GDP. "Region Two" provinces were thought to have better progress in education and higher capacity. "Region Three" including the five province-level minority autonomous region: Inner Mongolia (Mongolian), Guangxi (Zhuang), Tibet (Tibetan), Ningxia (Hui Muslim) and Xinjiang (Uyghur), and five remote inland provinces with the lowest level of development: Hainan, Guizhou, Yunnan, Gansu and Qinghai.

^{xvi} National Bureau of Statistics, China, *China Statistical Yearbook 2000*, (Beijing: China Statistics Press, 2000), p.37.

^{xvii} See E. Cohn, and T. Geske, *The economics of education*, 3rd edition (New York: Pergamon Press, 1990), pp, 307-351; H. Theil, *Economics and information theory* (Amsterdam: North-Holland Publishing Company, 1967), pp. 91-120; C. Dagum, "A new decomposition of the Gini inequality ratio" *Empirical Economics*, Vol. 22 (1997), pp. 515-53. Note that there is no single "best" measure of inequality. Each measure has its merits and demerits. For example, the Theil index are more "bottom-sensitive" than Gini, i.e., sensitive to the changes in upper and lower tails in the distribution. While the Gini is more sensitive to the differences around the mode of the distribution. Using Theil index has another advantage: the overall degree of inequality represented by Theil index can be decomposed into within-group and between-group inequalities.

^{xviii} Mun Tsang, "Costs of education in China: Issues of resource mobilization, equality, equity, and efficiency" *Education Economics*, Vol. 2, No. 3 (1994b), pp. 287-312.

^{xix} Obviously, disparities in school spending can also be examined at the school level. The casual observer can identify significant differences in teacher qualification, instructional materials, and facilities between different types of primary and secondary schools in the countries, such as between key schools and non-key schools in urban areas, and between center primary schools, regular primary schools, and teaching points in rural areas. These differences are a deliberate policy of the government to allocate scarce educational resources and there are specific guidelines for providing different levels of equipment and instructional materials to different types of schools. Analysis of school-level data could be useful in revealing how resources are actually utilized at the school level and whether they make a difference to learning outcome. School-level data, however, do not capture administrative and other spending above the school level. Another difficulty is that such data is not readily available.

^{xx} The sample consists of the 29 (in the 1980s) and 31 (as of 2002) provinces, directly administered metropolitan areas, and autonomous regions in China.

^{xxi} Tsang, "Costs of education in China"

^{xxii} S. Wang, "Empirical study on the disparity in educational development across regions in China." *Educational Research*, No. 6 (1998), pp. 19-23.

^{xxiii} M. Jiang and H. Zhang, *Jiaoyu jinfei bupingheng* (Disparities in educational spending) (Shanghai: Shanghai Institute of Human Resource Development, 1999)

^{xxiv} Y. Du and S. Wang, "Jiaoyu fazhan de bupingheng (Disparities in Educational Development)" In M. Tsang, X. Wei, and J. Xiao (eds.), *Jiaoyu zhengce de jingji fengxi* (Economic Analysis of Education Policy) (Beijing People's Education Press, 2000), pp. 76-109.

^{xxv} M. Jiang, "Shichang jingji yu jiaoyu caizheng gaige (market economy and reform of education finance)", *Jiaoyu Yanjiu* (Education Research) No.2(1995), pp. 15-19.

^{xxvi} M. Jiang, "The pattern of education finance at the county level, China" paper presented at the Policy Seminar on Financing of Education in China, held in Dalian, China, 17-22 August 1992.

^{xxvii} Zhang, *Miandui pinkun* (Facing Poverty) (Guangxi Education Press, China, 1998).

^{xxviii} M. Jiang and H. Zhang, *Disparities in educational spending*.

^{xxix} The Chinese government is currently experimenting with "county-level" school finance in which the county government has the financial responsibility for the financing of basic education (including compulsory education), thus eliminating the financial role of the government at the township level. Thus county-level analysis has more policy relevance over time.

^{xxx} County-level units include counties and “county-level” cities. They are the basic administrative units responsible for primary and secondary education. In the three directly administered metropolitan areas of Beijing, Shanghai, and Tianjin, the basic administrative unit for primary and secondary education is the “districts”. These metropolitan districts are officially ranked at the prefecture level; but they are similar in administrative function to counties in other provinces. In addition, most central cities and provinces have primary and lower secondary schools directly affiliated to and financed by the government at these respective levels (called “own fiscal level”: *caizheng benji*). This type of fiscal units with direct finding responsibilities in compulsory education are also included in the data sets and categorized as “county level” because they are also the basic administrative unit for primary and secondary education.

^{xxxii} The quality of the financial data for the late 1990s was much better than that for earlier years, through better data collection and refinement of the instrument. The raw 1999 data (composed of several separate data sets, each served to collect information in one specific aspect of schooling) actually is a mixture of county-level and township observations. The authors first aggregated township observations in each data set by administrative to change the data sets into “county-level” ones, then horizontally merged the county-level data sets for primary and lower secondary education. Meanwhile the data were cross-checked and the observations with different values for the same key variable were excluded. Some without key information (such as the number of students) were also deleted. Then the comprehensive county-level data sets were checked for extreme values and some important averages (such as average teacher salary) or ratios (such as student-teacher ratio). The observations with questionable values or averages were examined more closely. Some of the “absurd values” were identified as data entry mistakes and were corrected in conformity to statistical yearbooks. Those remained questionable were assigned missing values.

^{xxxiii} Tsang, “Financial reform of basic education in China.”

^{xxxiii} In China urban/rural and minority/non-minority areas are officially designated. In “rural areas” the economy is based primarily on agriculture; the residents hold Rural Resident Cards (*nong cun hu kou*). “Urban areas” are major metropolitan areas, central cities (of the provinces and prefectures) and central towns (of counties or county-level cities), where the residents hold Urban Resident cards (*cheng shi hu kou*). Minority areas are designated by the state according to some criteria (such as the percentage of minority people in the population and whether there are one or more “dominant” ethnic groups in terms of culture and population). Nationwide there are 5 province-level minority regions (*zi zhi qu*), 30 minority autonomous prefectures (*zi zhi zhou*) and 121 minority autonomous counties.

^{xxxiv} Developing countries typically spend over 90% of recurrent cost on personnel at the primary level and 80-85% at the secondary level. See M. Tsang, “Cost analysis and educational policymaking: A review of cost studies in education in developing countries,” *Review of Educational Research*, Vol. 58, No. 2 (1988), pp. 181-230.

^{xxxv} This could be partly attributed in a large part to the difference in the student-teacher ratio. Using available education data, this study found that, nationally, the student-teacher ratio averaged 17.1 at the lower-secondary level and 22.3 at the primary level. Lower-secondary teachers have higher educational qualifications and are paid a bit more than primary teachers.

^{xxxvi} Our study also found that, at both education levels, the student-teacher ratio was somewhat lower for non-minority areas than minority was, and was discernibly lower for Region One than the other two regions.

^{xxxvii} In China schools at primary and lower secondary levels (compulsory education) are not allowed to charge tuition. To bridge the gap between revenue and spending, schools charge “miscellaneous fees” as a complement revenue source. “Miscellaneous fees” play an important role in supplementing school revenue; in many areas are the only sources of revenue supporting school day-to-day operations.

^{xxxviii} M. Tsang, “Intergovernmental grants and the financing of compulsory education in China” paper presented at the seminar on educational reform in China, held at Harvard Graduate School of Education, Cambridge, Massachusetts, July 13-14, 2001.

^{xxxix} The coefficient of variation has been often used in prior studies in China but not the restricted range and the federal range ratio.

^{xl} The top-to-bottom ratio was 4.5 in 1989 for lower and upper secondary education; it is 5.06 for lower secondary education in 1999 as shown in Table 7.

^{xli} Pan calculated the coefficients of variation in his study for both 1997 and 1998. For 1997, the coefficients of variation in per-student total spending were 0.79 and 0.69 at primary and lower-secondary

levels respectively, close to what the authors obtained in this study for the same year, which, at primary and lower secondary levels were 0.70 and 0.69 respectively. But in Pan's study, these coefficients declined dramatically in 1998 to 0.58 and 0.55 (at primary and lower secondary respectively). By contrast, in this study the corresponding figures for 1999 are 0.73 and 0.69, indicating a slight increase at primary level while showing no changes for lower secondary education.

^{xlii} M. Lockheed, and A. Verspoor. *Improving primary education in developing countries: A review of policy options*. (Washington, DC: The World Bank, 1990).

^{xliii} Jiang and Zhang, "Disparities in educational spending".

^{xliv} Qinghai is a province on Qinghai-Xizang Plateau where the population is scarcely distributed and student-teacher ratio is extremely low in many rural areas, which leads to relatively high level of per-student spending.

^{xlv} This is done so that the observed change, if any, will reflect the change over time and not change in the sample.

^{xlvi} The sample accounted for more than 80% of the total number of observations in 1999 and all of the provinces, except Tibet were represented.

^{xlvii} Although data were available for as early as 1994, they were not used in this study because their quality was problematic and the coverage on counties was not as extensive as the data in 1997.

^{xlviii} For the first time, the central government launched the compulsory education in poor areas project during the 1996-2000 period. 3.9 billion yuan from the central government was matched with similar amounts at the provincial and local levels to provide targeted assistance in compulsory education to poor areas. See, M. Tsang, "An intergovernmental grant system for financing compulsory education in China". Much of the externally-funded projects, including those from the World Bank and UNICEF, were directed at compulsory education in poor areas.

^{xlix} See, for example, S. Wang and A. Hu, *The political economy of uneven development: The case of China*. (Armonk, NY: M.E. Sharpe, 1998).

¹ For more details on the argument for education and non-education interventions as well as strategies for educational interventions, see M. Tsang, "Financial reform of basic education in China", pp. 437-440.

ⁱⁱ See, for example, People's Daily, "Zhonggong zhongyang guangyu zhiding guomin jingji he shehui fazhan di shi ge wunian jihua de jianyi" (The proposal of the Central Committee of the Chinese Communist Party for the national economy and social development in the Tenth Five-Year Plan). (Beijing, October 19, 2000, pp. 1-2); and People's Daily, "Zhonghua Renmin Gongheguo guomin jingji he shehui fazhan di shige wunian jihua gangyao" (Framework of the Tenth Five-Year Plan for the national economy and social development of the Peoples' Republic of China) (Beijing, March 19, 2001), pp. 1-3.

ⁱⁱⁱ See, for example, M. Tsang and H. Levin, "The impact of intergovernmental grants on educational spending" *Review of Educational Research*, Vol. 53, No. 3(1983), pp. 329-367; and A. Odden and L. Picus, *School finance* (New York, NY: McGraw Hill, 2000).

ⁱⁱⁱⁱ See Tsang, "Financial reform of basic education in China" (1996), "Financing compulsory education in China: Establishing and strengthening a substantial and regularized system of intergovernmental grants" (2002), and "Intergovernmental grants and the financing of compulsory education in China" (forthcoming). S. Wang and Y. Du, "Theoretical and empirical analysis of intergovernmental grants in compulsory education in China" in M. Tsang, X. Wei, and J. Xiao (eds.) *Jiaoyu zhengce de jingji fengxi* (Economic analysis of education). (Beijing: People's Education Press, 2000), pp. 110-135.

^{lv} World Bank, *Priorities and strategies for education: A World Bank review*. (Washington, DC: The World Bank, 1995). Inter-Agency Commission, *Meeting basic learning needs: A new vision for the 1990s*. (New York, 1990).

^{lv} See, for example, M. Tsang "School choice in the People's Republic of China" in D. Plank, and G. Sykes (eds.) *Choosing choice* (New York: Teachers College Press, 2004). J. Lin *Social transformation and private education in China* (Westport, CT: Praeger Press). J. Kwong. "The reemergence of private schools in socialist China" *Comparative Education Review*, Vol. 41, No. 3 (1997), pp. 244-259.

^{lvi} See G. Postiglione, *China's national minority education*. (Falmer Press, New York, 1999).

^{lvii} Constant price was based on price information given in National Bureau of Statistics, *China Statistical Yearbook2000* (Beijing, China Statistics Press), p. 289.