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Fiscal Decentralization and Public Education Provision in China[1]

LA DÉCENTRALISATION FISCALE ET L'OFFRE D'ÉDUCATION PUBLIQUE EN CHINE

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Abstract: After reform and opening up, China is experiencing rapid economic growth but inefficient public services provision. Public education expenditure-to-GDP ratio is too low to keep sustainable growth of China's social and economic development. Some scholars believe that fiscal decentralization is an important reason. Firstly, this paper analyzes the main factors and path of how fiscal decentralization affects public education provision. While the 1994 tax-sharing reform raised the fiscal revenue of central government, it also increased the fiscal expenditure burden of local governments. Under local officials' yard-stick competition regime, fiscal decentralization on expenditure may make local governments tend to allocate fiscal expenditure in infrastructure, to attract outside capital to develop local economy, but in the same time, reduce provision of public services, such as education, which has positive externalities. Then, empirical tests based on 1996-2007 prefectural jurisdications panel-data verifies that this phenomenon does exist in China. Further empirical tests make comparisons among different regions and we find that negative effect of fiscal decentralization on public education provision is the highest in Cenral and West China, and the lowest in Northeast China. At last, according to the analysis and empirical results, we give policy proposals on how to improve the public education provision in China.
Key words: Fiscal Decentralization; Tax-Sharing Reform; Public Education Provision; Externalities; Panel Data

Résumé: Après la réforme et l'ouverture, la Chine connaît une croissance économique rapide mais une provision de services publics inefficace. Les dépenses en éducation publique par rapport au PIB est trop faible pour maintenir la croissance durable du

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développement social et économique de la Chine. Certains chercheurs pensent que la décentralisation fiscale est une raison importante. Tout d'abord, cet article analyse les facteurs principaux et la façon dont la décentralisation fiscale affecte l'offre d'éducation publique. Tandis que la réforme de partage des recettes fiscales de 1994 a soulevé les revenus fiscaux du gouvernement central, elle a également augmenté le fardeau fiscal des gouvernements locaux. Sous le régime de concurrence des fonctionnaires locaux, la décentralisation fiscale sur les dépenses peut inciter les gouvernements locaux à allouer des dépenses fiscales dans les infrastructures, afin d'attirer des capitaux extérieurs pour développer l'économie locale, et à réduire en même temps l'offre de services poublics, telle que l'éducation, qui a des externalités positives. Ensuite, des tests empiriques basés sur les données de panel receuillies des jurisdications préfectorales de1996-2007 montrent que ce phénomène existe réellement en Chine. Des tests empiriques approfondis font des comparaisons entre des régions différentes et nous constatons que les effets négatifs les plus importants de la décentralisation fiscale sur l'offre d'éducation publique sont dans le centre et l'ouest de la Chine, et les plus faibles sont dans le nord-est de la Chine. Enfin, conformément à l'analyse et aux résultats empiriques, nous donnons des propositions de politiques sur la façon d'améliorer l'offre d'éducation publique en Chine.

Mots-cles: décentralisation fiscal; réforme de partage des recettes fiscales; offre d'éducation publique; externalités; données de panel

1. INTRODUCTION

There is no doubt that, as an important human resources output industry of China's economic and social development, education is always being highly concerned by central government. The absolute value of public education expenditure is increasing from 86.78 billion yuan in 1993 to 869.08 billion yuan in 2007, and it has increased by 10 times in 15 years. However, if we look at relative value we can find that, public education expenditure-to-GDP ratio is always below 3.5% (see Figure 1), and it is much less than the world average of 4.6%. Shortage of education is harmful to socio-economic sustainable development of China. In May 2010, the State Council pointed out in "State Long-term Education Reform and Development Plan (2010-2020)", that fiscal education expenditure-GDP ratio should be increased to 4% in 2012. Therefore, we need to find out main factors for education provision shortage in China in public finance regime, and this issue is critical for China's social and economic sustainable development in the next few decades and even in longer term.

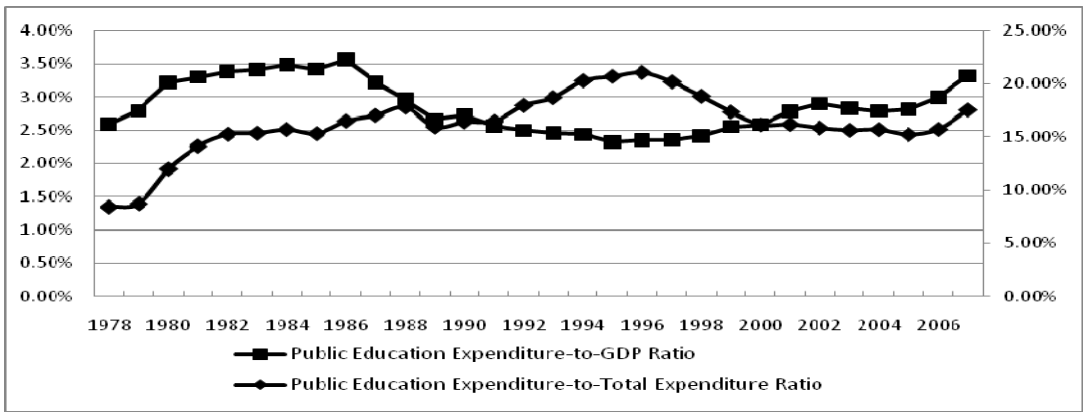

Figure 1: China's Public Education Expenditure-to-GDP Ratio and Total Expenditure (1978-2007)

One of the most important features of China's tax-sharing fiscal regime is fiscal decentralization. The definition of fiscal decentralization is that, central government decentralizes some fiscal authoritie to local governments. If the authorities of local government has reached a certain level, we can say that this country is fiscal decentralized.

Some scholars believe that fiscal decentralization is an important reason of the decrease of public education provision. Busemeyer (2008) uses a pooled-data of 21 OECD countries analysis, and finds out that fiscal decentralization decreases public education expenditures at national level but increases public education spending at regional level. Lu and Li (2006) develop a linear model which is derived from utility function, through empirical test, they believe that financial decentralization has caused the backwardness of rural compulsory education, and has widened the gap between urban and rural educations. However, their utility function models assume that government is "benevolent", which does not meet the current theory of fiscal decentralization in the field of incentive compatible framework. Moreover, existing studies are based on the data above provincial level, but using provincial and national data ignores the "concentrated down" feature of China's public education expenditure – fiscal education expenditure of local governments takes a large proportion. Thus, our research tries to enrich the theoretical and empirical literature of this issue.

Therefore, this paper analyses main factors of education provision shortage from the perspective of public financial regime, and then after panel-date regression empirical tests, we provide policy proposals according to empirical test results. Main contributions and innovations of this paper are: Using all of the prefectural jurisdictions panel data in China to make this research more detailed; using UNESCO uniform education provision indicators; Comparing public education provisions in different regions (East, Middle, West and Northeast).

This paper is organized as follows: Section 2 and 3 briefly analyse two main factors of how fiscal decentralization reduces public education provision. Section 4 summarizes impact path of fiscal decentralization on public education provision. Section 5 describes data and regression model. Sections 6 presents empirical analysis results, and Section 7 concludes and provides policy proposals.

2. DECENTRALIZED PUBLIC FINANCE REGIME AND EDUCATION FINANCE REGIME

Since 80s of 20th century, federal index, which is the degree of decentralization, has increased steadily in most developed, developing and transition countries. In fiscal expenditure side, China is one of the most decentralized countries in the world, and local governments should bear more than 70% of the expenditure responsibility in recent years. However, this number is only about 15% in developing countries, and about 26% in transition countries, even in OECD countries it is only about 32%. Therefore, Wang (1997) believes that China is over decentralized.

What make things worse, major responsibilities fall on local governments in China, in many areas, in which central government should take major responsibilities. For example, Wong and Deepak (2003) point out that China's education expenditure regime is over decentralized. 90% of China's education expenditure is taken by local governments, and 70% happens in the governments below prefectural level, which is different from international common structure of education expenditure, and proportion of local government expenditure is higher. Central government accounts for a relatively higher proportion of education expenditure in major unitary countries, while local governments take a lower proportion, which is 35.3% in average (see Table 1). They believe that this may lead to distortion in government expenditure structure.

First-generation theory of fiscal decentralization[4] believes that, market failure occurs in the provision of public goods and public services with positive externalities, which is usually called "tragedy of the

[4] The first-generation theory of fiscal decentralization comes from AMS public economics theory which contains research of Paul A. Samuelson, Richard A. Musgrave and Kenneth J. Arrow in the 50s of 20th century. In addition, Tiebout (1956) also creates an effective theory, however, the basic assumptions of his theory is too strong that this theory cannot be used in other countries.

commons[5]". So the government should enter these areas, and correct these market failures through appropriate policies. As public service with positive externalities, if education is only provided by the market, the equilibrium value will be less than the social optimum. What's more, the first-generation theory of fiscal decentralization believes that the beneficiaries of education are all of the citizens in the region[6], and the local governments could understand local conditions better than central government. Therefore, providing local public goods by local governments will make local citizens "better-off" than providing local public goods uniformly by the central government. Fiscal decentralization theory of Tiebout (1956) was very famous and influencial, but his theory is based on several restricted assumptions, and cannot be used in countries outside United States, as he said. For example, "Hukou" system in China prevents a lot of population from moving to other regions, which is not consistent with basic assumptions of Tiebout model.

However, second-generation theory of fiscal decentralization believes that appropriate incentive mechanisms must be designed to ensure that local government has sufficient incentives to provide efficient public goods and public services (Oates, 2005; Qian and Weingast, 1997). The largest difference between second-generation and first-generation theories of fiscal decentralization is that, second-generation theory holds the thinking that governments are not pure "Guardians of Public Interests", they concern about their own private interests, and behavior distortions may occur if there is no restriction for local officials. Therefore, an efficient government structure should fulfill the incentive compatibility between local governments and local citizens' welfare. But without appropriate incentive regime constraints, citizens can not enjoy benefits of fiscal decentralization, but are "worse-off" because of distorted behaviors of local governments (Luo, 2010). China is centralized in politics, but decentralized in fiscal regime and administration regime, whether such government structure is able to restrict the self-interest of local government officials, and whether it is able to promote local economic development and local public services, are both worth being studied.

Table 1: Education Expenditure (%) Distribution among All Levels of Governments, in Major Countries

Federal Counties	Share of Education Expenditure			Unitary Countries	Share of Education Expenditure	
	Central	State	Local		Central	Local
Australia	8.5	91.3	0.2	France	75.3	24.7
Canada	4.8	34.5	60.7	United Kingdom	12.7	87.3
Germany	1.0	73.8	25.2	Denmark	46.8	53.2
Switzerland	6.2	57.5	36.3	Kenya	94.0	6.0
US	4.2	24.5	71.3	Thailand	94.8	5.2
Unweighted Average	4.9	56.3	38.7	Unweighted Average	64.7	35.3

3. POSITIVE EXTERNALITIES OF EDUCATION AND COMPETITION AMONG REGIONS

The second factor is positive externalities of education. Definitely, people can benefit a lot from education, especially from its internal influences. Haveman and Wolfe (1984) points out five types of internal influences of education, for instance, it leads to higher wage and human capital efficiency. On the other hand, education has positive externalities. In economic theories, the definition of positive externalities is: some behaviors have spillover effects on other people or public interest, but the beneficiaries do not have to compensate. People can get private benefit and generate social benefit when they are in education. They can not only improve themselves, but also increase the social productivity and the degree of social civilization (Psacharopoulos and Patrinos, 2004).

[5] Tragedy of the commons: Because property rights of public goods are difficult to define (high transaction costs of defining their property rights), they are usually over-used or encroached.

[6] Of course, this argument deserves further discussion.

However, the positive externalities of education will cause reduction of provision of education. Specifically, if education is provided by market, the equilibrium value of education provision is probably lower than social optimum (Zhao, 2008). Therefore, the main provider of education should be government.

The inter-regional relationship in China is competition but not cooperation (Shen and Fu, 2006), and the competition among regions makes local governments more inclined to invest in infrastructure to attract outside capital, but not willing to invest in public services, such as education, to prevent spillover effects of public services investment. For example, education can improve the degree of civilization of local citizens, and then decrease crime rate of adjacent regions. Additionally, educated citizens may be employed in other regions. The objective of local government officials is to internalize investment benefit as much as possible. If we take a region as an rational individual, when local governments think that if they invest in education to themselves, some of the investment benefit will be externalized, the regions will all decrease investment in education. Calabrese et al (2009) finds that, fiscal decentralization causes lower efficiency of public services, and they consider the positive externalities of public services as the main reason.

4. HOW DOES FISCAL DECENTRALIZATION AFFECT PUBLIC EDUCATION PROVISION: THE PATH

In our current economic situation, to promote economic development, local governments can invest directly in infrastructure[7] or in provision of public services. However, since 80s of 20th century, in evaluation criteria of yard-stick competition among local government officials, the most important "fixed target" is economic growth, especially GDP growth rate, while public services are lower ranked as "soft target", such as education, health care, etc. In the constraints of fiscal capacity, local government officials must make choice between infrastructure investment and public services provision.

In this selection process, local officials usually choose to maximize "political achievements", rather than maximize local public interest, because they are assigned by upper governments but not voted by local citizens, that is also an important reason for rapid economic growth and low efficiencies of local public service provisions (Zhou, 2007).As long as the investment is beneficial to maximize their "political achievements", local officials will strive to provide. In general, investment in infrastructure can contribute directly in GDP, and can attract outside capital and promote local economic development, thus, infrastructure investment will become the first choice for local officials. On the other hand, public services such as education and healthcare needs more fiscal expenditure but can provide less “political achievements”, so local governments are not willing to provide public services.

China’s fiscal decentralization can stimulate enthusiasm of local governments for economic developement, but inappropriate decentralization degree intensifies competition among regions, and then leads to distortion of local government behaviors. In decentralized fiscal expenditure regime and decentralized education expenditure regime, local governments have more power to determine education expenditures. However, education has positive externalities, the investment in education will not only bring return to local citizens, but also cause benefit to other regions. Therefore, under fiscal decentralization and blind pursuit of local officials for "political achievements", "vacancy" and "offside" behaviors of local governments will occur, such as over-investment in competitive areas, like infrastructure, but under-investment of basic public services. Ultimately, these factors will result in inadequate supply of local public services, for example, in education area.

What fiscal decentralization brings is incentive for self-interest of local governments. This incentive is necessary for local economic growth. However, maximization of local governments’ utilities, does not necessarily lead to maximization of local citizens’ utilities, because local governments are not necessarily representatives of local citizens; and, maximization of local citizens’s utilities in each region does not lead to maximization of population’s utilities in nationwide, because when each region competes with each other for its own benefit, “prisoners’ dilemma” may happen, and it will bring damage to each region.

[7] In this paper, infrastructure is “hardware infrastructure” which can attract outside capital, and do not include education, health and other public services.

After clarifying the path of how fiscal decentralization affect public education provision, we examine whether this situation exists in China through empirical tests based on panel-data of all prefectural jurisdictions (including prefectural cities, prefectures, Autonomous regions and Leagues) 1996-2007.

5. DATA AND EMPIRICAL TEST

5.1 Dependent Variables

In this paper, we use indicators used uniformly in "World Education Report" and "Education Statistical Yearbook" published by UNESCO (United Nations Educational, Scientific and Cultural Organization) as indicators of public education provision and denoted by EDU.

(1) Public education expenditure-to-GDP ratio;
(2) Public education expenditure-to-total government expenditure ratio;
(3) Public education expenditure per student.

5.2 Independent Variables

We construct fiscal decentralization (indicated as FD) as: prefectural expenditure per person/consolidated expenditure per person, to measure the degree of fiscal power of this prefectural jurisdiction government. The formula of FD is:

$$FD_{ijt} = \frac{\frac{PRX_{ijt}}{P_{ijt}}}{\frac{PRX_{ijt}}{P_{ijt}} + \frac{PX_{it} - \sum_j^m PRX_{ijt}}{P_{it}} + \frac{CX_t}{P_t}} \quad (1)$$

In this formula, *i* denotes province *i, j* denotes prefectural jurisdiction *j* in province *i, t* denotes year *t.* FD_{ijt} denotes fiscal authorities of prefectural jurisdiction *j* in province *i* in year *t,* PRX_{ijt} denotes fiscal expenditure of prefectural jurisdiction *j* in province *i* in year *t,* P_{ijt} denotes population of prefectural jurisdiction *j* in province *i* in year *t.* Therefore, PRX_{ijt} / P_{ijt} denotes fiscal expenditure per person of prefectural jurisdiction *j* in province *i* in year *t.* PX_{it} denotes fiscal expenditure of province *i* in year *t,* P_{it} denotes population of province *i* in year *t,* CX_t denotes central fiscal expenditure in year *t,* P_t is population in year *t.* Therefore, PX_{it} / P_{it} denotes fiscal expenditure per person of province *i* in year *t,* CX_t / P_t denotes fiscal expenditure per person in year *t*[8]. $0 < FD < 1$, the closer to 1 FD is, the more fiscal authorities of this prefectural jurisdiction has.

The economic sense of this indicator is that: PRX_{ijt} / P_{ijt} denotes the fiscal expenditure prefectural jurisdiction *j* in province *i* spend on one person in year t, $\sum_j^m PRX_{ijt}$ denotes summer of fiscal expenditures of all m prefectural jurisdictions in province *i* in year *t*, $\frac{\left(PX_{it} - \sum_j^m PRX_{ijt}\right)}{P_{it}}$ is provincial government fiscal expenditure spend on one person in province *i* in year *t,* therefore,

[8] The assumption here is that fiscal expenditure is spent equally on each citizen at all levels of jurisdictions.

$\frac{PRX_{ijt}}{P_{ijt}} + \frac{\left(PX_{it} - \sum_j^m PRX_{ijt}\right)}{P_{it}} + \frac{CX_t}{P_t}$ denotes the fiscal expenditure spent on one person of the whole country in year *t*.

Thus, FD_{ijt} denotes the share of fiscal expenditure spent on this person of prefecture *j* in the fiscal expenditure spent on this same person of the whole country in year *t*. By using this indicator, we can get rid of population effect in fiscal expenditure and effect of grant transfers from central government to local governments, and fully denotes the share of local government fiscal power. Many scholars have used this indicator (Ying, 2004; Qiao et al, 2005).

Other control variables are:

(1)GDP per capita in prefecture: economic development affects education provision. We take natural logarithm of per capita GDP to reflect economic development, denoted by *LNGDPPC*;
(2)Public expenditure-to-GDP ratio in prefecture: denoted by *PE_GDP*;
(3)Number of Students in School in prefecture: to control demand for education, denoted by *TS*;
(4)Year dummy variables: to control different education and public finance policies each year[9], denoted by $D= [D_1, D_2,...D_{11}]$.

5.3 Data Descriptions

The panel data we use is all prefectural regions in China from 1996 to 2007 (including urban and rural areas; excluding four municipalities: Beijing, Tianjin, Shanghai and Chongqing[10], and excluding Taiwan, Hongkong and Macau), 12 years, 3980 observations in all[11].

Data sources are: Fiscal Data Statistics of All Prefectures, Cities and Counties in China (1997-2008), China Statistical Yearbook for Regional Economy (2000-2008), and Statistical Yearbooks of all provinces (1997-2008). The description statistics of all variables are in Table 2.

Table 2: Descriptive Statistics of All Variables (Dummy Variables Omitted)

	Variables	Observations	Average	Std. Err.	Min	Max
Dependent Variables	Public Education Expenditure-to-Total Expenditure Ratio	3978	20.0544	5.4209	2.0152	41.7126
	Public Education Expenditure-to-GDP Ratio	3978	2.4032	1.9294	0.1223	17.6481
	Public Education Expenditure per Student	3978	1194.8033	905.5112	120.3599	24042.0002
Independent Variables	Fiscal Decentralization	3980	0.5068	0.1275	0.2097	0.9795
	Natural Logarithm of GDP per Capita	3980	8.9393	0.7677	6.7530	11.4968
	Fiscal Expenditure as Share of GDP	3980	12.3157	10.1178	1.3841	94.7462
	Total Students in School	3980	59.3957	42.0391	3.8300	242.5697

[9] There are 12 years, therefore, 11 dummy variables are needed.
[10] Municipalities are special, so regression results can be more objective by excluding municipalities.
[11] As in these 12 years, China's prefecture level jurisdictions have changed, from 324 in 1996, to 334 in 2007; and there are some name changes. These changes have been considered, therefore, it is an unbalanced panel data model. In regression, because of some data defect, there will be some reduction of the amount of observations.

5.4 Regression Model

In the regression model, individuals are all prefectures in China, time is year. Panel data regression model can overcome multi-collinearity problem, and provide more information, more freedom degree and higher estimate efficiency. Statistical software is STATA 11.

The panel data regression model is:

$$EDU_{ijt} = \alpha_0 + \alpha_1 FD_{ijt} + \alpha_2 LNGDPPC_{ijt} + \alpha_3 PE\_GDP_{ijt} + \alpha_4 TS_{ijt} + \beta D_{ijt} + \varepsilon_{ijt} \quad (2)$$

In panel-data regression model, to avoid false regression, we need to analyze stability of data series by unit root test12. The null hypothesis H0 is that unit root exists. Fisher test rejects null hypothesis at 5% significance level, so all data series are stationary (see Table 3).

Table 3: Unit Root Test Results of Data

	Variables	χ^2 Statistic	P-Value
Dependent Variables	Public Education Expenditure-to-Total Expenditure Ratio	1639.31	0.0000
	Public Education Expenditure-to-GDP Ratio	1045.25	0.0000
	Public Education Expenditure per Student	962.94	0.0000
Independent Variables	Fiscal Decentralization	745.09	0.0209
	Natural Logarithm of GDP per Capita	739.83	0.0276
	Fiscal Expenditure as Share of GDP	990.94	0.0000
	Total Students in School	1134.12	0.0000

By covariance analysis (F statistic) to identify the model type, we find that it should be variable intercept model, which means "there is no significant difference in marginal effect of fiscal decentralization on education provision among regions, but education provision varies among regions." In addition, regression model should be fixed-effects panel-data model, because some unobservable factors should be controled for different prefectures. Hausman test also reveals that it should be fixed-effects model.

6. EMPIRICAL TEST RESULTS AND ANALYSIS

6.1 International Comparison

First of all, we make international comparisons. Public education expenditure-to-GDP ratio dropped from the highest point of 3.49% in 1984 to the lowest of 2.32% in 1995, and then slowly rose to 3.32% in 2007. As we can see from Table 4, 3.32% is closed to the level of low-income countries (GNI per capita $976-$3855), even lower than the average of Latin America and the Caribbean countries 3.5% and Sub-Saharan African countries 4.1%.

Table 4: Public Education Expenditure-to-GDP Ratio (%) in Some Countries in the World, in the Year of 2007, Grouped by Income and Region

Country, Grouped by Income	Public Education Expenditure-to-GDP Ratio	Country, Grouped by Region	Public Education Expenditure-to-GDP Ratio (%)
Middle-Income	4.5%	Europe and Middle East	4.1%
Lower Middle Income	3.2%	Europe	5.2%
Upper Middle Income	4.5%	Latin America & Caribbean	3.5%

To be continued

[12] Unit root test in STATA is Fisher test. Fisher test is a combination of multiple unit root tests.

Continued

Country, Grouped by Income	Public Education Expenditure-to-GDP Ratio	Country, Grouped by Region	Public Education Expenditure-to-GDP Ratio (%)
High Income	5.1%	Sub-Saharan Africa	4.1%
World Average	4.6%	World Average	4.6%

Source: World Development Indicator 2009

6.2 Inter-regional Comparisons

Then we look into the situation of different regions in China (see Figure 2), and we can see that public education expenditure-to-total expenditure ratio is the highest in eastern regions, then central regions, and northeast and western regions are the lowest; public education expenditure-to-GDP ratio is the highest in western regions, then central and northeast regions, and eastern regions is the lowest (see Figure 3); while public education expenditure per student is the highest in central regions (see Figure 4).

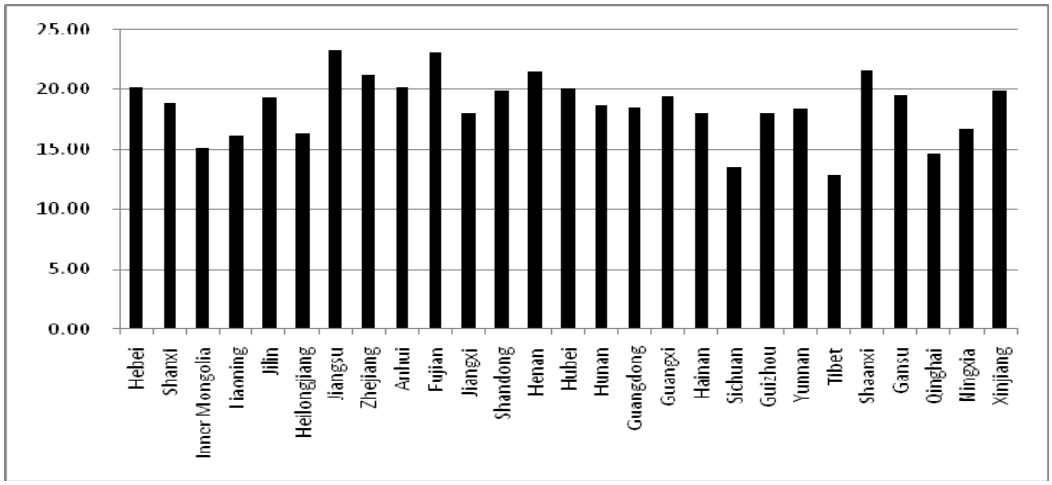

Figure 2: Provincial Public Education Expenditure-to-Total Expenditure Ratio 1996-2007, Annual Average, Excluding Four Municipalities (%)

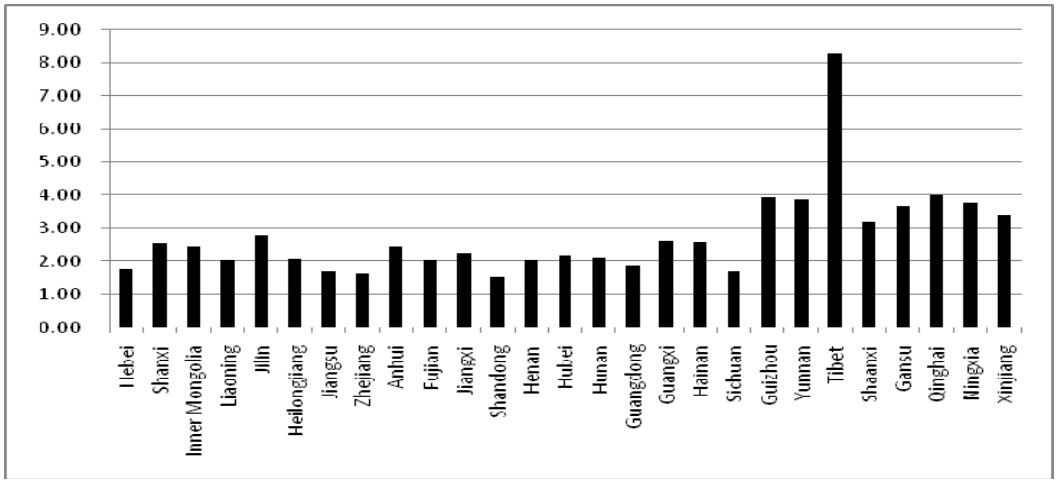

Figure 3: Provincial Public Education Expenditure-to-GDP Ratio 1996-2007, Annual Average, Excluding Four Municipalities (%)

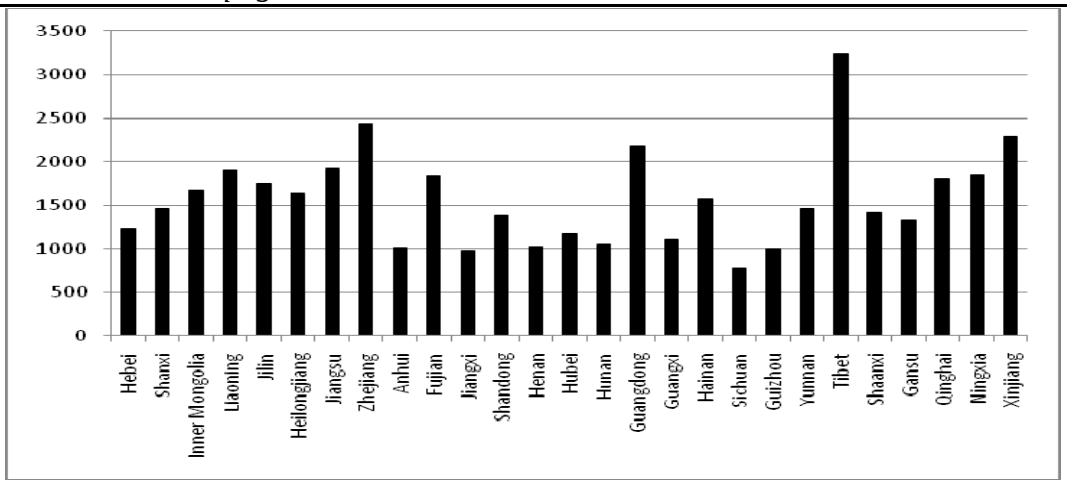

Figure 4: Provincial Public Education Expenditure per Student 1996-2007, Annual Average, Excluding Four Municipalities (yuan)

Analysis of variance (ANOVA) results also show that the description of statistical conclusion above is not false (see Table 5). Comparisons of different indicators show different comparison results, which is probably due to higher GDP in eastern region and lower GDP in western region. Therefore, we need to use indicators as a group, and detailed analysis to get conclusions.

Table 5: Comparison of Public Education Provision in Different Regions in China, Analysis of Variance

Region	Observations	Public Education Expenditure-to-Total Expenditure Ratio		Public Education Expenditure-to-GDP Ratio		Public Education Expenditure per Student	
		Average	Rank	Average	Rank	Average	Rank
East	84	20.60	1	1.88	4	1320.45	1
Central	72	19.54	2	2.25	2	899.73	4
West	132	17.25	3	3.72	1	1291.43	1
Northeast	36	17.28	3	2.30	2	1315.38	1

6.3 Results of Regression Model

Empirical test results of regression model are in Table 6 (because of limited space, year dummy variables regression results omitted; F test indicates the panel data model is significant; t test statistics corresponding to coefficients are in the parentheses).

As we can see from Table 6, fiscal decentralization significantly reduces public education expenditure-to-total expenditure ratio and public education expenditure-to-GDP ratio. If the degree of fiscal decentralization increases 1 percent, public education expenditure-to-total expenditure ratio decreases 0.301 percent, public education expenditure-to-GDP ratio decreases 0.021 percent, public education expenditure per student decreases 3.758 yuan. This empirical result is consistent with the analysis and conclusions of theoretical model above: fiscal decentralization significantly reduces public education provision. The greater fiscal expenditure authorities local governments have, the more local government officials are inclined to allocate fiscal expenditure to areas like infrastructure but not education and other public services. Therefore, the expenditure allocated to education definitely decreases.

In control variables, GDP per capita significantly increases public education provision at 1% significance level, which indicates that, economic development could enhance education, although local government may over-invest in infrastructure and under-invest in education to accelerate economic development. Public expenditure-to-GDP ratio also significantly increases public education provision,

which means education provision will increase with the increase of fiscal expenditure in prefectural cities and regions. Total students in school is only significant positively related to public education expenditure per capita, but not related to relative size of education provision.

Table 6: Empirical Test Results (Results of Year Dummy Variables Omitted)

Independent Variables		Dependent Variables		
Name	Abbreviation	Public Education Expenditure-to-Total Expenditure Ratio	Public Education Expenditure-to-GDP Ratio	Public Education Expenditure per Student
Fiscal Decentralization	*FD*	-30.11***	-2.07***	-375.75*
		(-11.75)	(-8.35)	(-1.69)
Natural Logarithm of GDP per Capita	*LNGDPPC*	1.05*	0.31***	530.13***
		(1.76)	(5.36)	(12.09)
Total Expenditure as Share of GDP	*PE_GDP*	0.04***	0.12***	36.21***
		(6.50)	(44.37)	(11.81)
Total Students in School	*TS*	-0.0006	-0.0011	3.8988***
		(-0.10)	(-1.47)	(7.87)
Constant	*_cons*	31.75***	4.76***	-4087.15***
		(6.53)	(10.13)	(-12.41)
R^2		0.47	0.83	0.68
Observations		3978	3978	3978

***Significant at 1% Significant Level; **Significant at 5% Significant Level; *Significant at 10% Significant Level

6.4 Results of Regional Comparisons in Regression Model

Next, for further research, we divide China into four regions: eastern, central, western and northeast regions. Table 7 shows marginal effect of fiscal decentralization on public education provision in prefectural cities and regions in East, Central, West and Northeast China (control variables omitted because of limited space).

Table 7: Empirical Test Results in Different Regions (Results of Control Variables Ommited)

Region	Dependent Variables		
	Public Education Expenditure-to-Total Expenditure Ratio	Public Education Expenditure-to-GDP Ratio	Public Education Expenditure per Student
Eastern	-24.84***	-2.70***	-248.34
	(-9.36)	(-11.13)	(-0.41)
R^2	0.60	0.67	0.71
Observations	1008	1008	1008
Central	-34.69***	-3.22***	-755.35***
	(-10.33)	(-8.36)	(-3.22)
R^2	0.59	0.86	0.91
Observations	989	989	989
Western	-28.99***	-4.06***	-643.42**
	(-5.24)	(-7.92)	(-2.26)
R^2	0.39	0.84	0.74
Observations	1549	1549	1549
Northeast	-17.10***	1.73**	1249.72***
	(-3.53)	(2.52)	(2.80)
R^2	0.67	0.74	0.82
Observations	432	432	432

***Significant at 1% Significant Level; **Significant at 5% Significant Level; *Significant at 10% Significant Level

As we can see from Table 7, in four regions, fiscal decentralization reduces education provision by various degrees. The marginal negative effect of fiscal decentralization on education provision is the highest in central and western regions. In central region, if degree of fiscal decentralization increases 1 percent, public education expenditure-to-total expenditure ratio decreases 0.347 percent, public education expenditure-to-GDP ratio decreases 0.032 percent, and public education expenditure per student decreases 7.554 yuan. In western region, if the degree of decentralization increases 1 percent, public education expenditure-to-total expenditure ratio decreases 0.290 percent, public education expenditure-to-GDP ratio decreases 0.041 percent, and public education expenditure per student decreases 6.434 yuan. Eastern region is in the middle. In eastern region, if the degree of decentralization increases 1 percent, public education expenditure-to-total expenditure ratio decreases 0.248 percent, and public education expenditure-to-GDP ratio decreases 0.027 percent, public education expenditure per student does not significantly change. The marginal effect of fiscal decentralization on education provision is the lowest in northeastern region.

Possible reason of the results above is that, although the economic growth is not slow in western region in recent years, however, previous economic foundation is too weak in western region, so if western prefectures have more fiscal power, fund is still over-invested in infrastructure to attract outside capital to enhance economic development. Thus, education and other public services are neglected. Central region is facing similar problems. What's make things worse, outflow of human capital is higher in central and western regions, therefore, incentive for local governments to develop education is quite weak there.

Eastern region is the most economically developed area in China, but also need to undertake the pressure of economic development. In current yard-stick competition regime, local officials could relatively neglect education. Relatively, northeastern region has higher economic development than central and western regions, in the same time, it does not undertake as much pressure as eastern region in economic development. That is a reason why fiscal decentralization has the lowest negative effects on public education provision in northeastern region. In addition, different economic and fiscal policies from central government to different regions is another important reason.

CONCLUSIONS AND POLICY PROPOSALS

Education can improve the overall quality of population, and more importantly, it has long-term positive effects on the entire country, both on the economy and society. In China, the education expenditure-to-GDP ratio is too low, what makes things worse, decentralized fiscal regime decreases public education provision.

This paper discusses how the decentralized tax-sharing regime affects public education provision, and find out that fiscal decentralization decreases the public education provision, through empirical test based on panel data of all prefectural cities and regions 1996-2007, we verify that this phenomenon exists in China.

The degree of fiscal decentralization significantly decreases public education provision. Education has positive externalities, so investment in education by local governments will benefit both local citizens and other regions. In addition, decentralizing most of the education responsibility to local governments is inconsistent with most countries of the world. If local governments have greater autonomy in fiscal expenditure, it will reduce investment in education because of positive externalities of education provision. Therefore, it is necessary to retrieve some education responsibilities back to central government.

While fiscal decentralization increases enthusiasm and autonomy of local governments, it also brings negative effects on local public services. In fact, except for education, the under-investment in public service is also observed in other areas of local public services, such as healthcare and environment (Luo, 2010), which are also important to people's life.

From public finance regime, to improve population welfare, central government should alleviate some expenditure burden of local governments, and increase the revenue for them, to re-balance between decentralization and centralization, and relieve vertical fiscal imbalance of China's public finance regime; or subsidize public services input of local governments through direct transfer payments, especially for western region. Division of expenditure responsibilities should be clarified, and should include which public goods and services should be provided by each level of government. The public goods and services

benefited by the whole national population should be provided exclusively by central government; local government should provide public goods and services benefited by local residents; in public projects with "externalities", central government should be involved. What's more, local government officials' performance assessment regime needs to be adjusted to prevent fierce yard-stick competition, by reducing the relative importance of GDP growth rate to public services. If all of those policy proposals above can be finished, the problem of shortage of public education and other public services will be resolved essentially.

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FIGURE LEGENDS

Figure 1 China's Public Education Expenditure-to-GDP Ratio and Total Expenditure (1978-2007)
Figure 2 Provincial Public Education Expenditure-to-Total Expenditure Ratio 1996-2007, Annual Average, Excluding Four Municipalities
Figure 3 Provincial Public Education Expenditure-to-GDP Ratio 1996-2007, Annual Average, Excluding Four Municipalities
Figure 4 Provincial Public Education Expenditure per Student 1996-2007, Annual Average, Excluding Four Municipalities