IMPACT OF PUBLIC EDUCATIONAL EXPENDITURE ON POVERTY IN CHINA

By

LIU, Jialu

Thesis

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MPP

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Approval as of August, 2019

ABSTRACT

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Liu Jialu

Over last four decades, more than 740 million people were lifted out of poverty in China. The Chinese government set the target to eliminate absolute poverty and remove all poor counties from the poverty list by 2020. In this context, the paper attempts to investigate the impact of government expenditure on education upon poverty in China, using province-level panel data during 1997-2017.

Poverty is measured by beneficiaries of social assistance programs, such as Minimum Living Guarantee System (in Chinese “Dibao”), Five Guarantee System (in Chinese “Wubao”) and Subsidies for destitute households (in Chinese “Te Kun Jiu Zhu”). The independent variable is “government appropriation for education”, which includes “public budgetary fund for education, taxes and fees collected by governments at all levels that are used for education purpose, enterprise appropriation for enterprise-run schools, income from school-run enterprises and social services that are used for

education purpose and other national appropriations for education" (China Statistical Yearbook).

Using OLS fixed effects model, we found that: 1) government expenditure on education is significantly negatively related to headcount ratio; 2) private investment in education also contributes to poverty reduction and seems to be a possible way to improve education quality; 3) rural household net income is negatively related to poverty rate, while 4) urban population has two opposite results, which raises an interesting topic to study.

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I. INTRODUCTION

Since the reform and opening up that began in 1978, China has achieved a significant development and become the second largest economy and the largest merchandise trader in the world according to the World Trade Statistical Review 2018 of the World Trade Organization. China's GDP has increased from 149,541 billion US dollars in 1978 to 12.24 trillion dollars in 2017 (World Bank). GDP growth has achieved approximately 10% per year. Trading volume has increased from 20.6 billion US dollars in 1978 to 4.1 trillion dollars in 2017 (National Bureau of Statistics of China). China's economic growth has also brought a shared prosperity: the average standard of living has been improved; more than 740 million people have been lifted above the poverty line, with near 1.9 million people each year. Rural poverty rate has dropped from 97.5% in 1978 to 3.1% in 2017, which averages a reduction of 2.4% annually (National Bureau of Statistics of China). By 2015 China has achieved Millennium Development Goals (MDGs). The World Bank recognizes China's remarkable contribution to the achievement of MDGs in the world.

However, given the vast size of Chinese population, the latest data released by National bureau of Statistics shows that currently there are still 16.6 million people living below the official poverty line, a number that exceeds the national population of Cambodia (World Bank). According to the upper middle-income International Poverty Line, set at $5.50-per-day, there are still more than 370 million Chinese people living in poverty. The Chinese government has set a goal of eliminating absolute poverty by 2020

based on the poverty standard of RMB 2300 rural net income per capita per year in 2010 constant prices. Hence, poverty eradication is still a challenging issue in China.

Over the past decades, education has been widely accepted as an important tool in fighting poverty. Education allows people to increase their means of earning money, which is an essential path out of poverty and hunger. Enabling more people to receive education has been proved repeatedly to be an effective way to alleviate poverty. Public investments in human and physical capital have been used as an instrument to achieve poverty reduction (Thorat & Fan, 2007).

According to Thorat and Fan (2007), the education level in China was one of the lowest in the world in the 1950s. Less than one half of the school-age children were enrolled in the education system, specifically primary and secondary school. In 1978, China adopted “nine-year compulsory schooling system” policy and promulgated the "Compulsory Education Law" in 1986, which requires all school-age children to take a 9-year compulsory education, which includes six years of primary education starting from age 6 or 7, and three years of junior secondary education for ages 12 to 15. By 1997, the enrolment ratio of primary school has increased to 98.9% from 49.2% in 1952, and 93.7% children enrolled later in junior secondary school (China Statistical Yearbook 1999). After years of efforts, the primary school gross enrolment ratio reached 99.91% in 2017(Ministry of Education of China). The illiterate population aged 15 to 24 years declined from 3.9 million in 1990 to 0.8 million in 2010 (UNESCO), which implicates a fundamental improvement of human capital in the labor market.

Despite the extraordinary success achieved in the last decades, China still faces serious challenges in education. Although public spending on education has been

increased significantly in the last decade, government appropriation for education still represents 4.14% of total national GDP in 2017 (Ministry of Education of China, National Bureau of statistics of China and Ministry of Finance of China), which is lower than 4.7%, the average share of public expenditure on education of GNP in developing countries in 2005 (UNESCO, 2007). Given the insufficiency of government expenditure on education, the disparity among regions is significant. Budgetary resources in central regions have always been lower than in eastern and western regions, both for primary and secondary education. Education quality also differs region to region, rural schools to urban schools. In 2014, dangerous buildings occupy 7.3% area of primary school in western regions and the per cent in secondary school is 5.34. Every child in urban primary schools owns RMB1333 valued teaching equipments, while child in rural schools owns RMB708 valued instruments. On the other hand, in pace with the process of rapid urbanization in the last two decades, a large number of rural population moved into cities, urban schools face increasing pressure of receiving new immigrants with limited resources, while rural education resources have been wasted because of the hollowing out of school-aged children (Zhu et al., 2017). Considering that education is a state-run system in China and government funding contributes mostly to the education, at least to primary and secondary education, how to improve public investment in education to achieve poverty alleviation becomes a hot question.

Table 1: Comparison of school conditions during compulsory education stage in 2005 (Bao 2008)

	Urban area	Rural area	Ratio between urban and	Eastern region	Central region	Western region	Ratio among Eastern, Central and

				rural area				Western Region
Public budget per student (RMB)	Primary school	236	142	1.66:1	247	127	140	2.51:0.81:1
	Secondary School	307	193	1.59:1	354	166	210	1.69:0.79:1
Teaching equipment value (RMB)	Primary school	685	191	3.59:1	474	291	217	2.18:1.34:1
	Secondary School	749	332	2.26:1	588	360	276	2.13:2.30:1
Proportion of senior teacher	Secondary school	12.36%	2.33%	5.31:1	--	--	--	--

Source: China Education Yearbook, People's Education Press, 2006

Estimates of the impact of education on poverty have proliferated since it was established in the early 1960s. Many studies have been undertaken on the impact of education investment on poverty alleviation, with a growing field of research covering the relation between public expenditure and poverty in China. However, there are very few studies focusing on the direct role that public education expenditure plays on poverty reduction, especially in China. The present study attempts to fill this gap.

The rest of the paper is organized into the following sections. Section 2 provides a brief review of related literature. Section 3 states the hypothesis, and Section 4 explains the nature of the data and methodology of research. Section 5 presents the empirical results and some discussion. The last section draws conclusion.

II. LITERATURE REVIEW

1. Education, economic growth and income inequality

Extensive empirical researches have examined the relationship among education, economic growth and income inequality. Since 1960s, Bowman and Anderson (1963) started their study on relationship between literacy and economic growth. They found that literacy makes a significant contribution to economic development. Soon afterwards many studies were conducted and most of them concluded that education contributes positively to economic growth and equality. The main theory of these empirical studies consists in that education improves labor force productivity which would lead to economic development (Tilak, 1989). It was also found that the role of education as an instrument of economic growth varies across countries and over time (Tilak, 1989). Many studies (Gemmel, 1996) have noted that "primary education is the most important for economic growth in low income developing countries, secondary education for middle income developing countries, and high level education for rich countries". Using data from China Statistics Yearbooks and China Labor Statistical Yearbooks from year 1996 to 2004, Chi (2008) analyzes the role of human capital in China's economic development. He found that education, especially senior secondary education, plays a significant role in economic growth, and initial stock of human capital in provinces contributes to economic growth through fixed assets accumulation. Before the reform and opening up, the accumulation of human capital contributed to 55% of the economic growth in China. During the reform period, contribution of human capital reduces to 48%. Investing in human capital has extensive possibility to improve productivity and welfare (WANG and YAO, 2003). In order to find the sources of the remarkable economic development in

China, Wang and Yao (2002) illustrate that the accumulation of human capital contributed significantly to economic growth.

Human capital was also believed to be one of the most important determinants of income inequality (Tinbergen, 1977). Significant positive relationship was found between school enrollments and income equality (Ahluwalia, 1976; Chenery & Syrquin, 1975; Tinbergen, 1977; Winegarden, 1979; Psacharopoulos, 1977 and 1985). While examining the correlation between income growth and inequality in China, Goh et al. (2014) find that education plays a significant role in income distribution. In both urban area and rural area, income disparity increases as the gap of human capital accumulation increases. However, Tilak (1989) believes that the "relationship between education and income distribution is complex, as education's effect on income inequality depends upon not only the way education is planned, developed and financed, but also upon the socio economic factors, employment probabilities, wage structure, the fiscal base etc. ". In both urban area and rural area, income disparity increases as the gap of human capital accumulation increases. Yet the returns to education are higher for high-income households than low-income households (Knight et al., 2008).

2. Education and poverty

The Education for All (EFA) movement under the framework of the Millennium Development Goals (MDGs) shows that education is an important factor in reducing poverty incidence. Tilak (1986) found significant negative correlation between education and poverty in 29 countries. Increasing people's education level and enrollment level contributes to decrease the proportion of population below the poverty line. Based on nationwide data on households with secondary and higher education during 1995-1996,

and development indicators during 1999-2000 period in India, Tilak (2005) states that post elementary education is significantly positive to reduce absolute poverty and relative poverty. Murnan(2007) observed the situation in the United States and concluded that improving the education of children living in poverty is crucial to improving their life outcomes. Based on a study of education and poverty trap in rural China, Knight et al. (2008) find that education increases the probability of being happy, which is considered one of the criteria for poverty. Awan et al. (2011) studied the impact of education on poverty reduction in Pakistan and found that achievement in education area is negatively related with poverty, and also that higher the level of education one gets, less the possibility of being poor. In the case of Fiji, analyzing the monetary and non-monetary effects of education on poverty reduction, Gounder and Xing (2012) believe that education not only has positive impact on wages and incomes, but also on critical decisions related to poverty conditions, such as "health prevention activities and acquiring good housing facilities". Phil Brown and Albert Part (2002) found out that poverty significantly affects both family educational investments and learning, analyzing survey data from poor counties in six provinces in China.

3. Government expenditure on education and poverty

Over the last two decades, there are a growing number of studies that examine the relationship between government investment in education and poverty reduction. In India (Fan et al., 2000; Fan et al., 2007), Peru (Baca et al., 2014), Vietnam (Cloutier et al. 2008), Thailand (Fan et al. 2004), Nigeria (Odior, 2014), Indonesia (Bahtera et al. 2018) and 17 European countries (Hidalgo, 2014), government spending on education, especially on rural education, has been found significantly important to economic growth

and poverty reduction. While conducting a research relied on time series data from 1961 to 2011 in Pakistan, Zahid Ahmad and Tayyaba Batul (2013) conclude that a significant long run relationship between public spending on education and poverty was not found, although there is "a strong causal bi-directional relationship" between education status and poverty.

In case of China, few empirical labor literature that examines the direct relationship between public spending on education and poverty. Analyzing provincial-level data for 1970–97, Fan et al. (2002) note that public investment in education, agriculture research and development and infrastructure is important to boost agricultural productivity growth and reduce regional inequality and rural poverty. In particular, public investment in education has very high returns to economic growth and the largest impact on poverty reduction. Using data from 1952 to 1999, Wang and Yao (2003) find that the accumulation of human capital and the growth of total factor productivity contribute significantly to GDP growth in China. Fan et al. (2004) use provincial data during 1953-2000 to conduct a simultaneous equations model, and show that public expenditure on rural education, agricultural R&D as well as other areas all has large impact on agricultural productivity growth and rural poverty reduction, although the marginal effects vary across regions. In particular public education investment contributes the most to poverty reduction and has high returns to rural economic growth. On the national level, public education expenditure has the largest positive impact on poverty reduction and has the second largest influence on agriculture GDP, nonfarm sector GDP, as well as the whole rural GDP. Every ten thousand RMB investment in education can lift 7 individuals out of poverty, which has 30% higher return than agricultural D&G investment (Lin,

2005). Studying provincial-level data over time, Thorat and Fan (2007) conclude that government expenditure on agricultural R&D and rural education contributes most to both economic development and poverty alleviation. The marginal returns to government spending are higher in poorer regions. Based on a data set in rural China from a national household survey for 2002, Knight et al. (2008) studied if education and income as a system can generate a poverty trap in rural China. They find that poverty has an adverse effect on both the quality and quantity of education, the quality is probably more important than the quantity of education for the poor in rural China, and local government expenditure on education influence greatly the quality of education. Servaas van der Berg (2008) describes the relationship between poverty and education. The author mentioned how education influences poverty through economic growth, income-earning, labour market and health status. Good quality education boosts economic growth which can reduce poverty dramatically, as what happened in China and India. Education has a direct and positive impact in the labour market. Mother's education contributes to better health status in a household. Female education increases female labour force in the market, which brings more income-earning opportunities for many families. On the other hand, analyzing data from households in 18 Chinese provinces in 1988 and in 1995, Gustafsson and Li (2004) did not find a clear positive correlation between education and health expenditure and poverty.

Based on household and school survey data from poor counties in China, Phil Brown and Albert Park (2001) argue that poverty affect significantly educational investment and learning, while wealth improves learning. Household poverty increases the possibility of dropping out of school (Brown & Park, 2001; Knight et al., 2008).

III. HYPOTHESIS STATEMENT

China has achieved remarkable economic development in the last four decades. The country, which suffered serious hunger problem in history, now became the second largest economy in the world, and has lifted more than 60 million people out of poverty, and the poverty rate has dropped from 10.2 percent to less than 4 percent (Xi, 2017). In 2017 the Chinese government set a new goal to lift out all rural poor residents out of poverty by 2020, which raises new challenges. Education has been proved to be an effective way to alleviate poverty. Chinese President Xi (2017) recognized the all-round progress in the development of national education, especially in the central and western regions and in rural areas, and promise to give priority to strengthening education.

The purpose of this empirical study is to analyze the role of public education in poverty alleviation. The hypothesis of study is that increasing public investment in education is not significant to poverty reduction.

There are a growing number of studies that examines this relationship in many countries, including rural China. With very few exceptions, most of the studies recognize the significant contribution of public education to economic growth and poverty reduction. This paper contributes to the literature by relating government role on education with poverty nationwide, while most of the studies in China mainly focus on impact of education on poverty, or the relationship between government expenditure on education and poverty in rural China.

This paper uses data from China Statistical Yearbooks (1997-2017) and Quarterly Data on Social Services of all Provinces (2007-2018) for study. Poverty is measured by beneficiaries of social assistance programs, such as Minimum Living Guarantee System,

Five Guarantee System and Subsidies for destitute households. The independent variable is “government appropriation for education”, which includes “public budgetary fund for education, taxes and fees collected by governments at all levels that are used for education purpose, enterprise appropriation for enterprise-run schools, income from school-run enterprises and social services that are used for education purpose and other national appropriations for education” (China Statistical Yearbook).

IV. DATA AND METHODOLOGY

1. DATA

The data we use in this paper is collected from China Statistical Yearbook 1997-2017 compiled by National Bureau of statistics of China and Statistical Data on Social Services of all Provinces 2007-2017 conducted by Ministry of Civil Affairs. It is a nationally representative provincial-level data set, covering 22 provinces, 5 autonomous regions and 4 municipalities directly under the Central Government. Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan Province are not considered in this study.

China Statistical Yearbook is an annual statistical publication. It provides a comprehensive database on divisions of administrative areas, national economy and social development in a specific year, and includes key statistical historical data in recent years at national and provincial level. Statistical Data on Social Services is a national and provincial database published quarterly by the Ministry of Civil Affairs. It includes information of social services that the government provides to both urban and rural areas, such as disaster relief, subsidies to unemployed people or household who live below the poverty line.

1) Dependent variable

In this paper we attempt to analyze the effect that public spending on education might cause to poverty. Measurement of poverty has been one of the major methodological issues in our study. No provincial poverty rate data set, neither the number of poor was found through open resources. Since 2008, we have used $1.25 as the International Poverty Line. The World Bank updated the global line to $1.90 using

2011 prices in 2015. Poverty line "usually reflect the line below which a person's minimum nutritional, clothing , and shelter needs cannot be met…richer countries tend to have higher poverty lines, while poorer countries have lower poverty lines" (World Bank, 2015).

In China, there is a Minimum Living Guarantee System (Zui Di Sheng Huo Bao Zhang, abbreviated as Dibao), which was established in 1993 as an urban social assistance program in Shanghai, aimed to provide subsidies to people who live below the poverty line. Yang (2018) quotes that "whether or not the poor have the ability to work, no matter what their value is, whatever the cause leads to poverty, all of them can get supports from government" according to Dibao regulations. The fundamental condition is that the average per capita income in the household falls below the minimum living standard (Solinger, 2008), which is called "Dibao line". In 2007 Dibao was implemented nationwide in all counties. Given the disparities of living cost in different parts of China, Dibao poverty lines differ cross region. Local governments set the Dibao line according to local standard of living and update the line quarterly (see Table 2). As the system kept developing since its implementation, beneficiaries increase rapidly (see Table 3). Yang (2018) believes that Dibao has become the most important social assistance program in China.

Table 2: The Level of Dibao poverty lines in Urban and Rural (2003-2016) (Yang, 2018)

Unit: Yuan per month

Year	Urban *Dibao*	Rural *Dibao*	Year	Urban *Dibao*	Rural *Dibao*
2003	149.0	—	2010	251.2	117.0
2004	152.0	—	2011	287.6	143.2
2005	156.0	—	2012	330.1	172.3
2006	169.6	70.9	2013	373.3	202.8
2007	182.4	70.0	2014	410.5	231.4
2008	205.3	82.3	2015	451.1	264.8
2009	227.8	100.8	2016	494.6	312.0

Source： *Statistical report of Ministry of Civil Affair.*

Table 3: The trend of Dibao Beneficiaries in Urban and Rural (2003-2016) (Yang, 2018)

Unit: million person

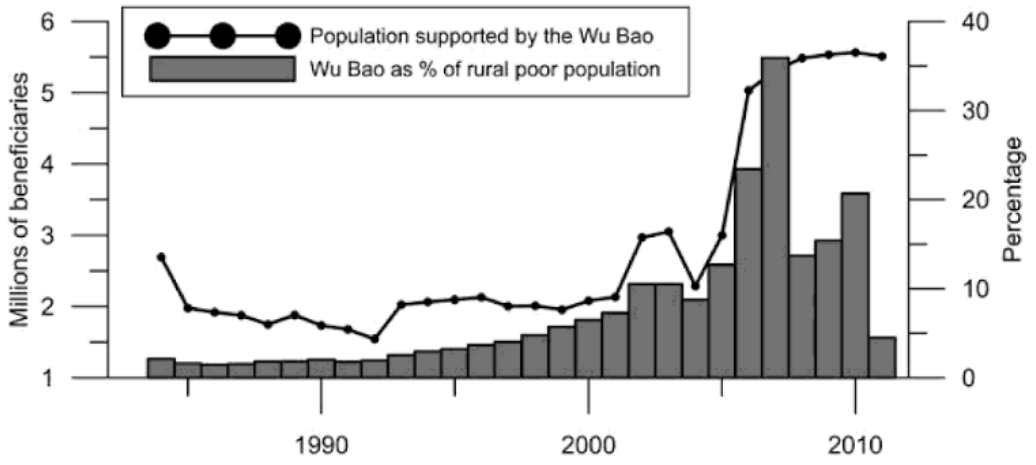
Year	Urban *Dibao*	Rural *Dibao*	Year	Urban *Dibao*	Rural *Dibao*	Year	Urban *Dibao*	Rural *Dibao*
1997	0.892	—	2004	22.050	4.88	2011	22.768	53.057
1998	1.84	—	2005	22.342	8.25	2012	21.435	53.445
1999	3.701	—	2006	22.401	15.931	2013	20.642	53.880
2000	4.026	3.002	2007	22.721	35.663	2014	18.770	52.072
2001	11.707	3.046	2008	23.348	43.055	2015	17.010	40.936
2002	20.647	4.078	2009	23.456	47.600	2016	14.802	45.865
2003	22.468	3.671	2010	23.105	52.140			

Source: *Statistical report on the Development of Social Services of the Ministry of Civil Affairs, and Statistical report of Ministry of Civil Affairs*

Five Guarantee System (Wubao in Chinese) is another important rural social assistance system. Wubao was established in the 1950s, aimed to provide five basics of life: food, clothing, shelter, medical care and burial (Wu et al., 2008; Ding, 2011). According to Ministry of Civil Affairs, Wubao targets rural households who are old, vulnerable, orphaned, widowed, or disabled and those who have no ability to work, no income source and no support by family (Three no, Sanwu in Chinese). From 1984 to 2011, Wubao coverage increased from 2.7 million to 5.5 million (see Table 4, Dunford &

Liu, 2014). Wubao program is operated separately from the rural Dibao. By 2014 Wubao recipients was 5.2 million, almost 10% of rural Dibao beneficiaries (Qin, 2017).

Table 4: Development of Wubao in China, 1984-2011 (Dunford & Liu, 2014)



Source: NBS, various years (Dunford & Liu, 2014).

"Subsidies for destitute households" (Te Kun Jiu Zhu in Chinese) is another support program that targets households that lack labor because of age, illness or death. The program is gradually being absorbed by Dibao system (Li et al., 2013). Yet in the quarterly statistical report that publishes Ministry of Civil Affairs, the number of rural Te Kun Jiu Zhu recipients still counts certain component.

The above mentioned programs are all targeted to the poor and vulnerable households. Since the support programs are correlated with many other omitted variables and "behaviors of interest", using the number of beneficiaries from these programs as the number of poor can be biased (Chen et al., 2006). However, it seems still worth to see whether there are indications in our data of behavioral responses to the study. Given the scenarios above, we decided to use number of households receiving Dibao, Wubao and

Te Kun Jiu Zhu as number of poor. With the number of poor and the total population we compute an estimated headcount ratio. All data are collected from Statistical Data on Social Services of all Provinces (2007-2014) conducted by the Ministry of Civil Affairs of China.

2) Independent Variables

From China Statistical Yearbook we collected annual government expenditure on education on provincial level. It is called “government appropriation for education” in Statistical Yearbook, including “public budgetary fund for education, taxes and fees collected by governments at all levels that are used for education purpose, enterprise appropriation for enterprise-run schools, income from school-run enterprises and social services that are used for education purpose and other national appropriations for education” (China Statistical Yearbook, several years). From the data we note that over the years there was and still exists a significant gap in public spending on education across regions. For instance, the governmental expenditure on education per capita in Beijing increased from 1733 RMB in 2003 to 3221RMB in 2013, while the central eastern province Jiangxi (whose public education spending per capita was the lowest in 2003) spent 1469.5 RMB per capita on education in 2013(still one of the lowest). The government spent 2.2 times more on each household in Beijing than in Jiangxi. On the other hand, in Jiangxi the expenditure increased 8.83 times from 2003 to 2013, while Beijing increased only 1.86 times. The gap of actual spending across region is still large, but is also reducing by accelerating the speed of increasing expenditure in poor regions. At the same time, the gap in public investment on education between urban and rural

areas is also significant, despite the progress that has been made from 1997 to 2011(Li & Wang, 2014).

Table 5: Comparison of Public Expenditure on Education Per Capita year 2003 and 2013

Region	Year 2003 (RMB)	Year 2013 (RMB)
Beijing	1733.10	3221.00
Tianjin	683.54	3133.77
Hebei	218.87	1142.33
Shanxi	256.46	1494.42
Inner Mongolia	296.59	1829.23
Liaoning	342.77	1525.00
Jilin	327.41	1534.18
Heilongjiang	321.66	1307.11
Shanghai	1090.52	2813.66
Jiangsu	349.56	1807.40
Zhejiang	477.75	1728.02
Anhui	186.74	1221.58
Fujian	328.64	1523.35
Jiangxi	172.34	1469.50
Shandong	250.95	1438.01
Henan	175.80	1244.53
Hubei	238.84	1190.94
Hunan	183.26	1209.84

Guangdong	424.01	1639.03
Guangxi	197.50	1292.50
Hainan	256.53	1949.92
Chongqing	248.03	1472.32
Sichuan	197.41	1278.41
Guizhou	178.92	1600.89
Yunnan	264.02	1463.69
Tibet	650.24	3434.74
Shaanxi	279.51	1886.59
Gansu	257.03	1460.22
Qinghai	314.65	2102.94
Ningxia	314.59	1726.61
Uyghur	423.80	2352.48

Source: China Statistical Yearbook 2004, 2014

Table 6: Ratio of average investment on education between urban and rural areas during compulsory education stage (Li & Wang, 2014)

Year	2011	2010	2009	2008	2007	2006	2005	2004
Ratio	1.682813	1.772191	2.696608	2.812156	3.105779	3.411902	4.115943	4.20452
Year	2003	2002	2001	2000	1999	1998	1997	
Ratio	4.424312	4.662608	4.992799	5.405836	4.807079	5.306822	4.596265	

Besides government expenditure on education, we found several other independent variables that might play an important role to poverty rate after going through relevant literature. By conducting correlation matrix between the variables, we found that proportion of urban population, urban and rural households income per capita, GDP, GDP per capita, number of compulsory education student, number of middle school student, number of higher education student, private investment in education, number of elementary school student and unemployment rate are all highly correlated with number of poor. In order to avoid multicollinearity problem among above mentioned variables, we computed a multicollinearity diagnostics in Stata and selected the following variables which do not cause multicollinearity-effect in the regression. All data are provincial-level statistics, collected from China Statistical Yearbook 1997-2017.

Table 7: Summary Statistics

	mean	sd	min	max
Poverty	6.211806	3.719039	.5854767	17.36491
GEEPer	417.9384	370.284	161.814	2183.062
PriInvPer	222.0937	203.0757	26.07777	1215.63
StuNumber	17387.84	2759.823	9936	22943.24
FamilySize	3.249477	.4291437	2.33	5.03
GDPPerCapita	22429.22	18556.07	2475	99607
CPI	102.072	2.382041	96.4	110.1
UnemployRate	3.553861	.8075889	.6	7.4
Dependency~o	37.50651	7.03295	19.27	57.58
UrbanIncPer	12680.05	6681.242	4342.61	42173.64
RuralIncPer	4848.23	3131.072	1330.81	19595
Population	4.28e+07	2.71e+07	2682400	1.12e+08
InPopulation	17.29388	.8594619	14.80222	18.53124
UrbanPop	49.71106	14.9181	20.85	89.6
SexRatio	104.129	3.624203	92.25	115.23
N	649			

Table 8: Variable description

Variable	Description
Poverty	Headcount Ratio (%)
GEEPer	Governments Expenditure on Education Per Capita (RMB)
PriInvPer	Private Investment on Education Per Capita (RMB)
StuNumber	Number of Student every 100,000 inhabitants
FamilySize	Average Family Size
GDPPerCapita	GDP Per Capita (RMB)
CPI	CPI
UnemployRate	Unemployment Rate (%)

Dependency~o	Dependency Ratio (%)
UrbanIncPer	Annual Disposable Income of Urban Household Per Capita (RMB)
RuralIncPer	Annual Net Income of Rural Household Per Capita (RMB)
Population	Population
InPopulation	Log(Population)
UrbanPop	Proportion of Urban Population (%)
SexRatio	Sex Ratio (Female=100)

Table 9: Selected variables through Multicollinearity Diagnostics

Variable	VIF	1/VIF
PriInv_L9	8.75	0.114295
GEE_L9	8.65	0.115570
RuralIncPer	4.79	0.208906
UrbanPop	3.20	0.312106
UnemployRate	1.25	0.797780
Mean VIF	5.33	

2. METHOTOLOGY

Since the data we use is a panel data. Fixed effect model will be used as our main methodological tool. We aim to analyze the relationship between public spending on education and poverty. As the effect of education on income or wage would take relatively long time to realize, its effect on poverty rate would take even longer. Since the compulsory education in China is nine-year, including primary school and junior

secondary school. In the 1990s poor families, especially in rural area, usually send their children to work after nine-year compulsory schooling due to lack of economic resources. In some cases they send their children to senior school or vocational school, which takes another three years, to study in order to learn more labor skills. So we construct the model assuming a nine-year and twelve-year time lag. The equation is specified as follow:

$$Y_{it} = \beta_1 + \beta_2 GEEPer_{it-9/\ it-12} + u_i + \varepsilon_{it}$$

Where, Y_{it} is Poverty rate, $GEEPer_{it-9/it-12}$ is Government expenditure on education per capita with nine-year or twelve-year time lag, u_i is fixed effect and ε_{it} is error term. In order to get more precise results, we also extended the model with more relevant variables and run the regression in double-log form.

$$Y_{it} = \beta_1 + \beta_2 GEEPer_{it-9} + \beta_3 PriInvPer_{it-9} + \beta_4 UrbanPop_{it} + \beta_5 UnemplyRate_{it} + u_i + \varepsilon_{it}$$

Where, $PriInvPer_{it-9}$ is Log Private Investment on Education with nine-year time lag; $UrbanPop_{it}$ is the proportion of urban population; $UnemplyRate_{it}$ is the unemployment rate over time.

V. RESULTS AND DISCUSSION

Descriptive statistics for all variables are reported in Table 7. In early 21st century, the average public expenditure on education was only 418 RMB per capita nationwide, which is far behind most of developing countries. At the same time, private investment in education is even lower. The inequality problem of economic growth is also significant. An average disposable income of urban household is almost three times more than rural household. Income inequality is one of the important causes of persistent poverty. Broaden access to education and improve education quality would make a difference for poor household. An increasing well targeted public spending on education should be helpful to mitigate inequality and further to alleviate poverty. Over the 2006-2014 periods, the average urban population percentage was almost 50%. Urbanization is a current and important topic in China. The effect it brings to economic growth, inequality and poverty has been in discussion for years. How to use public education to mitigate the negative effect of urbanization would be another interesting topic to study.

The results of regression (see Table 10,11) show that the significant variable to poverty rate, first of all, is government expenditure per capita on education, with both nine-year and twelve-year lag. Longer the time lag is, larger is the impact on poverty, given that it is easier for a senior school or vocational school graduate to land in a secure wage earning job than a junior school graduate who only completes the nine-year compulsory education. More educated labor force gets job easier in the market and has more opportunities to lift family out of poverty. The significantly negative relationship between rural household net income per capita and headcount ratio illustrates that increasing net income of rural household seems to be effective to alleviate poverty

nationwide. The way to increase rural household income, investing more public resources seems to be an option.

However, increasing public investment in education does not represent the improvement of educational quality. As we have stated before, the link between education expenditure and learning achievement is weak (De and Endow, 2008), the quality of public education varies throughout the country. Public education in rich communities is more likely superior to that in poor areas. Education quality is stated to be more closely related with private investment. Family educational spending plays an important role on covering the shortage of public expenditure. Moreover, during basic education stage family investment in education increases the importance that families attach to education service, which is one of the core impetuses to the improvement of educational quality (Ye, 2013). According to our regression results, increasing private investment in education is significantly related to poverty reduction. Increasing one percent of private spending, poverty will reduce 0.17%. The Outline of the National Medium- and Long-Term Program for Education Reform and Development of China (2010-2020) suggests that family investment in education continues to play a reasonable sharing role in stages of preschool, senior school and higher school education.

We also found that the proportion of urban population is significant to poverty as well. In the traditional fixed effect model, urban population is negatively related to poverty. For every additional percentage of urban population, the expected poverty rate reduces by 0.11 on average, holding all other variables constant. In the double log form, for every additional increase of urban household proportion, the expected changing of poverty rate is 0.03. The contrast of results illustrate the classic theoretical formulation of

"Kuznets process" of urbanization, which consists in that urbanization do not only bring growth, but also increase inequality, but the inequality will eventually start to decline, and the turning point relies on certain conditions (Anand and Kanbur, 1985, 1993). Unemployment rate was not found significantly related to poverty as we expected.

Table 10: Fixed effect model regression

	(1) Poverty	(2) Poverty	(3) Poverty	(4) Poverty	(5) Poverty
GEEPer_L9	-0.00191***		-0.000705	0.000748	0.00233
	(0.000548)		(0.000873)	(0.00110)	(0.00126)
GEEPer_L12		-0.00308**			
		(0.00105)			
PriInvPer_L9			-0.00103	0.00141	0.000390
			(0.00169)	(0.00202)	(0.00263)
UrbanPop			-0.111*	-0.0154	0.142
			(0.0420)	(0.0613)	(0.0737)
RuralIncPer				-0.000253*	-0.000372**
				(0.000121)	(0.000135)
UnemployRate					0.106
					(0.400)
_cons	7.259***	6.640***	13.01***	8.784**	0.423
	(0.232)	(0.445)	(2.143)	(2.908)	(4.169)
N	102	102	102	102	71
R-sq	0.148	0.110	0.258	0.303	0.310
F	12.14	8.652	7.870	7.289	3.150

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 11: Fixed effect model regression double-log form

	(1) InPoverty	(2) InPoverty	(3) InPoverty	(4) InPoverty	(5) InPoverty
InGEEPer_L9	-0.415***		-0.408**	-0.00326	0.333
	(0.0585)		(0.120)	(0.130)	(0.196)
InGEEPer_L12		-0.644***			
		(0.0891)			
InPriInvPe~9			-0.403**	-0.0591	-0.206
			(0.128)	(0.128)	(0.176)
UrbanPop			0.0550***	0.0315*	0.0502**
			(0.0131)	(0.0121)	(0.0156)
RuralIncPer				-0.0000696***	-0.0000926***
				(0.0000137)	(0.0000204)
UnemployRate					0.0605
					(0.0619)
_cons	4.043***	5.169***	3.124***	0.833	-1.407
	(0.341)	(0.519)	(0.383)	(0.556)	(1.109)
N	102	102	102	102	71
R-sq	0.418	0.427	0.541	0.669	0.658
F	50.36	52.26	26.70	33.86	13.45

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

VI. CONCLUSION

The contribution of education to development is widely recognized. Since 1985 Work Bank started giving priority to poverty reduction and highlighted the importance of primary education for poverty alleviation, which draw world-wide attention. Policy makes, planners and development thinkers shifted very systematically in favor of primary education (Tilak, 2005).

This study aims to estimate the effect of government expenditure on education upon poverty in China. We empirically investigate the poverty situation in China during last decade. Since the traditional standard of living cost-based poverty line is hard to get, we extend the measurement of poverty to social assistance program-based number, given that these social programs are targeted to the poor or Three no who live under living standard. The data is collected from China Statistical Yearbooks (1997-2014) and Quarterly Data on Social Services of all Provinces (2007-2014) conducted by the Ministry of Civil Affairs of China.

Since the relationship between education expenditure and poverty reduction suffers from sources of multicollinearity problem, we choose carefully selected variables to avoid it. Omitted variables were also been controlled using fixed effects model. From a cross-section of 31 provinces, autonomous regions and 4 municipalities directly under the Central Government, we find strong evidence that public expenditure on education is negatively related to poverty. The result is confirmed by two forms of fix effects model. We also find that private investment in education and rural household net income is significantly negatively related to poverty, while urban population has two opposite results, which raises an interesting topic to study.

Given the imperfection of our database, this paper might suffer data weakness problem. For instance, as we observed, there is an increasing number of beneficiaries from social assistance program from 2007 to 2012 in most of the regions. The number mostly decreases since 2014, but in some cases, including Zhejinag, Qinghai, Uygur, the number reached to another boom in 2016 or 2017. It could be that government strengthened efforts to help the poor, so as to achieve the goal of "by the year 2020, all rural residents living below the current poverty line have been lifted out of poverty, and poverty is eliminated in all poor counties and regions" (Xi, 2017) . The number of beneficiaries of social support system might present more the willingness and efforts of government to reduce poverty rather than the real number of population in poverty.

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