



On Poverty Rates: The Influences of Government Expenditure and Tertiary Industry in Rural Areas in China

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Abstract. Poverty is a critical issue that requires attention that not only on a global scale but also on a national scale within China. As widespread societal challenges, the issue of poverty has profound implications for the well-being of people and development of nations. This study aims to examine the influences of policy related variables on poverty rates in the rural areas within China. Data acquired from 267 prefecture-level cities from years 2011-2019 were collected and analyzed, and the results demonstrate that government expenditure on education, government expenditure on technology and the ratio of tertiary industry all have significantly negative relationships with poverty rates. The interaction effects between these three variables reveal that when each of the two factors are both higher, the poverty rates would be further lower. The findings in this study indicate that government expenditure on education and technology and the ratio of tertiary industry can substantially diminish the level of poverty in rural areas within China. The implications of these findings for policymaking and potential future research directions are thoroughly discussed.

Keywords: poverty rates, government expenditure, the ratio of tertiary industry.

1 Introduction

Poverty is a complex societal challenge that encompasses a lack of access to resources, opportunities, and basic services. It represents a state of economic vulnerability and social disparities, where individuals struggle to meet their basic needs and experience limited prospects for upward mobility. The poverty rate serves as a crucial indicator, quantifying the extent of poverty within a given population. It measures the proportion of individuals living below the poverty line, shedding light on the prevalence and severity of poverty (World Bank, 2018) [1].

Globally, poverty eradication and the reduction of poverty rates are essential for achieving sustainable development. Recognizing the urgency of poverty alleviation, the United Nations has prioritized this issue through its Sustainable Development Goal 1, which aims to end poverty in all its forms and dimensions by 2030 (UN, 2021) [2]. In China, poverty eradication is one of the top priorities due to its large population and

regional disparities. The Chinese government has implemented comprehensive poverty reduction programs, such as the targeted poverty alleviation strategy, to address rural poverty and improve the well-being of its citizens. These initiatives recognize the multifaceted nature of poverty and emphasize the need for tailored interventions to address the diverse challenges faced by different regions and population groups (Liu et al., 2020 [3]; Xinhua, 2020 [4]).

Understanding the factors that influence poverty rates is crucial for formulating effective policies and interventions. Education is one of the most critical factors for poverty reduction. By investing in education, societies can equip individuals with the skills and knowledge necessary to break the cycle of poverty and achieve socio-economic mobility. At the same time, technological advancements and innovation are instrumental in poverty reduction by driving economic growth and job creation. Government expenditure on technology can foster an environment conducive to technological innovation, which in turn promotes economic productivity and reduces poverty rates (Fong, 2009) [5]. Moreover, the ratio of the tertiary industry, which includes sectors such as services, information technology, and finance, is another possible critical factor influencing poverty rates. The development of the tertiary industry promotes economic diversification, job creation, and income generation, which contribute to poverty alleviation.

Given the notions above, this study focuses on three specific variables: government expenditure on education, government expenditure on technology, and the ratio of the tertiary industry- to provide a comprehensive analysis of their impacts on poverty rates in rural areas. The investigation within the specific context of rural areas within China is necessary to account for the country's unique demographic composition, regional disparities, and evolving socio-economic landscape.

1.1 Government Expenditure and Poverty Rates

Research conducted by the World Bank (2018) [6] in their World Development Report on learning and education's promise highlighted the significance of government investment in education for poverty reduction. The report emphasized that access to quality education empowers individuals by providing them with the skills and knowledge necessary for economic and social advancement. Education assists individuals acquire better employment prospects, leading to increased incomes and a reduced risk of falling into poverty. In addition, it can also help break the intergenerational cycle of poverty. By providing children with quality education, governments offer them the opportunity to acquire knowledge, develop critical thinking skills, and pursue higher education or vocational training, thereby improving their prospects and reducing their likelihood of falling into poverty (Gnangoin et al., 2020 [7]).

Increased investment enables the construction of schools, hiring of qualified teachers, provision of educational resources, and implementation of educational programs tailored to the specific needs of rural communities. Government spending on education has been found to have a positive association with poverty reduction, as it promotes access to quality education and reduces educational disparities. Evidence from a study by Anderson and Wassmer (2018) [8] on the effects of local government expenditure

on education and poverty improvement in the American states revealed a positive relationship between education investment and poverty reduction. The study demonstrated that increased government spending on education led to better educational outcomes, which, in turn, resulted in higher incomes and lower poverty rates. Similarly, a study by Fan, Hazell and Thorat (2000) [9] investigating the impact of government expenditure on education and poverty in rural India provided evidence of the positive relationship between education investment and poverty reduction. The study revealed that increased government spending on education resulted in higher literacy rates, improved employment opportunities, and reduced poverty levels in rural areas.

In short, government expenditure on education in rural areas enhances social mobility by providing equal educational opportunities to disadvantaged populations. Education acts as a pathway for individuals from low-income backgrounds to improve their circumstances, overcome barriers, and achieve upward social mobility. A report from the World Bank (2018) [6] emphasized the role of education in promoting social mobility and reducing poverty. It stressed that government investment in education helps bridge the educational attainment gap between different socioeconomic groups, enabling individuals from rural areas to access better opportunities and escape poverty. Based on the discussion above, we are able to propose the following hypothesis:

Hypothesis 1: Government expenditure on education has a negative relationship with poverty rates in rural areas within China.

1.2 Government Expenditure on Technology

Government expenditure on technology in rural areas facilitates the development of essential infrastructure such as broadband connectivity, telecommunications networks, and electricity supply. These infrastructure investments are vital for enabling access to information and communication technologies (ICTs), which can improve economic opportunities and enhance social development. It can also improve transportation and logistics systems, facilitate e-commerce platforms, and connect rural producers with larger markets, thereby expanding their income-generating prospects. Evidence from a study by Robinson (2019) [10] on the impact of government technology investment on poverty reduction in rural Colombia demonstrated a positive relationship between technology expenditure and poverty alleviation. The study revealed that improved access to markets and economic opportunities through technology interventions led to increased incomes and reduced poverty levels in rural areas.

In addition, government expenditure on technology includes initiatives aimed at promoting digital skills development in rural communities. By acquiring training and capacity-building programs, individuals are able to cultivate the skills necessary to participate in the digital economy, fostering entrepreneurship and enhancing employability. Lechman and Popowska's research found that expanding ICT deployment, boosting school enrollment, and nurturing growth in material wealth can profoundly reduce poverty in developing economies. These factors contribute considerably to poverty reduction and pave the way for sustainable development in these regions (Lechman and Popowska, 2022 [11]). Research by Mora-Rivera and García-Mora (2022) [12] on the influences of government technology programs on poverty reduction in rural Mexico

showcased the significance of digital skills development. Their study underlined that technological investment that focused on training programs and digital literacy initiatives resulted in improving livelihoods and lower poverty rates in rural areas.

Furthermore, investment in technology improves access to essential services such as healthcare, education, and financial services in rural areas. Technology interventions, such as telemedicine and online education platforms, can overcome geographical barriers and provide remote communities with vital services, ultimately contributing to poverty reduction. A study by Leng (2022) [13] on the role of technology in income increase in rural China demonstrated the positive impact of technology-enabled services. The research emphasized that government investment in technology infrastructure and digital service drastically improved access to employment, entrepreneurship, and part-time work, thereby dropping rates of poverty in rural areas.

In sum, increased investment in technology facilitates infrastructure development, expands access to markets and economic opportunities, promotes digital skills development, and enhances access to essential life-sustaining services. The evidence underscores our second hypothesis as stated below:

Hypothesis 2: Government expenditure on technology has a negative relationship with poverty rates in rural areas within China.

1.3 Ratio of Tertiary Industry and Poverty Rates

The tertiary industry encompasses sectors such as services, healthcare, education, and tourism, which possess the potential to create jobs and stimulate economic growth. The expansion of service-related sectors facilitated the creation of employment opportunities, leading to improved incomes and decreased poverty levels in rural areas. The tertiary industry often offers higher-paying jobs compared to the primary or secondary sectors, thereby contributing to income increase and poverty alleviation in rural regions. The provision of higher-quality services and specialized skills in sectors like healthcare and education can enhance individual and household incomes. The World Bank's report on the changing nature of work (2019) [14] emphasized that a higher ratio of the tertiary industry was associated with better income levels and subsequent reductions in poverty rates. Research conducted by Chen (2020) [15] explored its influence on poverty reduction revealed that an increase in the tertiary industry ratio resulted in reduced poverty rates.

Barrientos and Lloyd-Sherlock (2018) [16] conducted a study on the impact of non-contributory pensions on poverty reduction in low-income countries. Their findings emphasized the importance of diversifying the economy through the expansion of the tertiary industry. The research demonstrated that diversification, particularly in service-related sectors, played a crucial role in reducing poverty rates. A higher ratio of the tertiary industry in rural areas also promotes economic diversification, reducing dependency on agriculture or primary industries. Diversification enhances resilience to economic shocks, providing alternative income sources and mitigating risks of falling behind on the socioeconomic level.

Simultaneously, a higher ratio of the tertiary industry improves access to essential services such as healthcare, education, and financial services in rural areas. This

increased access positively impacts poverty rates by providing individuals and communities with the necessary resources and opportunities for upward mobility. Research by Torero and von Braun (2019) [17] on the role of information and communication technologies (ICTs) in agriculture and rural finance indicated that the development of the tertiary industry facilitated improved access to financial services and agricultural information, leading to poverty reduction in rural areas. The study highlighted the role of service-oriented sectors in enhancing rural development and poverty alleviation.

From the discussion above, we recognize a higher ratio of the tertiary industry contributes to the increase of employment opportunities, incomes, economic diversification, and enhance access to services. It can consequently help the reduction of poverty rates in rural areas.

Hypothesis 3: Ratio of the tertiary industry will have negative relationship with poverty rates in rural areas within China.

1.4 The Interaction Effects of Government Expenditure on Education, Government Expenditure on Technology and Ratio of Tertiary Industry

To begin, the interaction effect between government expenditure on education and government expenditure on technology can facilitate the development of a digitally skilled workforce. The integration of technology in education can enhance the effectiveness of teaching and learning processes, facilitating personalized and interactive learning experiences. This can lead to improved educational outcomes, higher literacy rates, and better acquisition of skills, which in turn can contribute to higher employability and income levels, reducing poverty rates. From the investment in technology and incorporating technology into educational curricula, students can gain the necessary digital literacy and technical skills required for the modern job market. This can increase their chances of finding quality employment and reduce the possibility of poverty.

Secondly, the interaction effect between government education expenditure and the ratio of the tertiary industry is noteworthy. A higher ratio of the tertiary industry signifies a greater emphasis on service-based sectors, which often require specialized skills and education. When government education expenditure is targeted towards developing competencies aligned with the needs of the tertiary industry, individuals in rural areas can acquire the necessary qualifications to access employment opportunities within these sectors. This can lead to increased incomes and improved socio-economic conditions, consequently reducing poverty rates.

Lastly, when there is a higher government expenditure on technology and a higher ratio of the tertiary industry, it can lead to a positive interaction effect on poverty reduction. This is because investments in technology can enhance the productivity, efficiency, and competitiveness of service-based sectors, thereby creating more job opportunities and increasing income levels in those sectors. Additionally, technological advancements can improve access to services, such as healthcare and education, which are essential components of the tertiary industry. This improved access can positively impact poverty rates by providing individuals in rural areas with better opportunities for skill development, employment, and income generation. Technological advancements can enable the expansion and development of new service-based sectors, leading

to a more balanced and resilient economy. This diversification can reduce dependency on traditional industries and create additional employment opportunities, thereby contributing to poverty reduction.

H4a: There will be significant interaction effects of government education expenditure and government technology expenditure on poverty rates.

H4b: There will be significant interaction effects of government education expenditure and the ratio of tertiary industry on poverty rates.

H4c: There will be significant interaction effects of government technology expenditure and the ratio of tertiary industry on poverty rates.

2 Method

The data that was used in this study was derived from the following sources: “Statistical Year Book of China Cities”, “China Research Data Platform”, “China Statistical Year Book of Education”, “China Statistical Year Book of Tertiary Industry” and “China Statistical Year Book of Rural Areas”. After matching and sorting relevant data, the final dataset consists of 267 prefecture-level cities from year 2011-2019. The total sample size of the dataset is 2403. The information below represents the measurements of employed variables.

Control variables:

- (1) Financial ratio: Government expenditure/Government revenue
- (2) Wages on the job: The average wage for employees in the cities

Independent variables:

- (1) Education expenditure: Government expenditure on education/Total government expenditure
- (2) Technology expenditure: Government expenditure on technology/Total government expenditure
- (3) Ratio of tertiary industry: Total tertiary value of the city/ City GDP

Dependent variables:

- (1) Poverty rates: Total population classified to be in poverty in the rural area of the specific city/ Total population of the rural area in the specific city
- (2) Engel's Coefficient: Average food expenditure of the rural household in the specific city/Average expenditure of the rural household in the specific city

3 Results

Panel data analysis with OLS was used in the analysis of the data. The independent variables are entered the analysis with t-1 period after standardized transformation. The descriptive statistics are shown in Table 1.

The correlations between the variables are presented in Table 2. Based on the results, it is evident that education expenditure, technology expenditure and ratio of tertiary industry all have negative correlations with both poverty rates and Engel's coefficient. These discoveries lay the groundwork for conducting additional regression analysis.

Table 1. Mean and standard deviation of the sample.

Variable	N	Mean	SD	Min	Max
Poverty rate	2403	0.786	0.0680	0.488	0.962
Engel's Coefficient	2403	.753	.0780	.416	0.952
Ratio of Tertiary Industry	2403	40.79	9.535	10.15	79.23
Education Expenditure	2403	.180	.0400	.0440	0.356
Technology Expenditure	2403	.017	.0160	.00100	0.207
Financial Expenditure	2403	.470	.217	.0700	1.541
Wages on the job	2403	5.445	1.666	.496	12.96

In Table 3, the results show that education expenditure, technology expenditure and ratio of tertiary industry all have sizeable impacts on poverty rates and the Engel coefficients. It points to the idea that the increase of all these factors will decrease the poverty rates and Engel's coefficients. We find that hypotheses 1 to 4 are all corroborated by the data. Furthermore, the results indicate that all three interaction effects are statistically significant.

Table 2. Correlation between variables.

	Poverty Rate	Engel's Coefficient	Ratio of Tertiary Industry	Education Expenditure	Technology Expenditure	Financial Expenditure
Engel's Coefficient	.980***					
Ratio of Tertiary Industry	-.298***	-.306***				
Education Expenditure	-.060***	-.058***	-.216***			
Technology Expenditure	-.158***	-.164***	.259***	-.047**		
Financial Expenditure	-.087***	-.091***	.227***	-.001	.584***	
Wages on the job	-.211***	-.221***	.584***	-.184***	.375***	.238***

** $P < .01$

** $P < .001$

Table 3. The results of panel data analyses.

	(1) Poverty rate	(2) Engal's Coefficient
Financial Expenditure	.029***	.034***
Wages on the job	-.000	-0.000
Ratio of Tertiary Industry	-.022***	-.026***
Education Expenditure	-.011***	-.012***
Technology Expenditure	-.008***	-.010***
Education *Technology	-.003*	-.004*
Education *Ratio of Tertiary Industry	-.005***	-.006**
Ratio of Tertiary Industry*Technology	-.008***	-.010***
cons	.770***	.734***
N	2136	2136
r2_a	0.129	0.138
F	44.6489	43.9013

* $p < 0.5$ ** $P < .01$ ** $P < .001$

4 Discussion

The findings of this study demonstrate noteworthy impacts of government expenditure on education, government expenditure on technology and the ratio of tertiary on the poverty rate in rural areas of China. These findings suggest that these factors have the potential to effectively reduce poverty rates, highlighting their importance in poverty alleviation strategies. These results align with and contribute to existing research, providing valuable insights into the complex relationships between these factors and rural poverty rates.

Government expenditure on technology and education nowadays have emerged as crucial factors in poverty reduction. Increased investment in technology infrastructure and digital connectivity in rural regions can narrow the digital divide, offering new economic opportunities (Lin et al., 2022) [18]. Peng et al. (2020) [19] found that improved technology access empowers rural residents to engage in online activities such as e-commerce and online education, thus enhancing income-generating capabilities and reducing poverty rates. Additionally, investing in education has consistently shown positive outcomes in poverty reduction efforts in rural areas. Previous research by Xie et al. (2023) [20] has emphasized that improving educational resources, including schools, teachers, and educational materials, equips rural residents with essential skills, enhances employability, and facilitates access to higher-paying jobs. Nonetheless, the ratio of tertiary industry has also been recognized as a key driver of poverty reduction in rural areas.

The significant interaction effects suggest that these three factors work together in harmony to collectively influence poverty rates. To effectively reduce poverty, policy-makers should consider how best to utilize the interaction effects. By adopting a comprehensive and coordinated approach, governments can create an ecosystem that nurtures education, technology, and the growth of service-oriented sectors. This involves strategic investments in educational infrastructure, curriculum development, teacher training, technological resources, and collaborations with industry stakeholders. By harnessing the synergistic effects of these factors, governments can create sustainable pathways out of poverty and promote inclusive socio-economic development in rural areas.

While these findings provide valuable insights, it is important to acknowledge the limitations of this study. One of which is the fact that this study employed secondary data from existing sources, which may be subject to measurement errors or potential biases. Future studies could benefit from collecting primary data through surveys and interviews to obtain more accurate and context-specific information. Moreover, our study focused primarily on quantitative analysis, which provides valuable insights into the statistical associations between variable, but lacks the merits of qualitative research approaches, such as in-depth interviews or case studies. Such forms of qualitative research could provide a deeper understanding of the lived experiences of individuals in rural areas and the mechanisms through which these factors influence poverty rates. Furthermore, this study solely focused on rural areas in China, which limits the generalizability of our findings to other geographical contexts. It is crucial to consider the unique socio-economic, cultural, and political factors of different regions when formulating poverty reduction policies. Forthcoming studies should aim to replicate these analyses in diverse settings to enhance the external validity of the findings.

The findings in this study contribute to the existing literature by demonstrating the significant effects of the ratio of tertiary industry, government expenditure on technology, and education expenditure on the poverty rate in rural areas of China. These factors hold promise as effective mechanisms for poverty reduction and should be considered in policy-making efforts. However, it is essential to recognize the limitations of this study and encourage further research to deepen the understanding of the complex issues of poverty. By addressing these limitations and expanding the scope of inquiry, further research can provide nuanced insights to guide evidence-based policies and interventions aimed at reducing rural poverty and fostering sustainable development.

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