Impact of fiscal poverty alleviation funds on poverty mitigation and economic expansion: evidence from provincial panel data in China

Received 29 April 2024
Revised 27 May 2024
5 August 2024
Accepted 12 September 2024

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Abstract

Purpose – Since 2013, China has implemented targeted poverty alleviation policies, successfully eradicating absolute poverty nationwide by 2021. The fiscal funds allocated for poverty alleviation have significantly contributed to reducing poverty in impoverished areas. However, to date, there has been a lack of scholarly research specifically examining the effects of these fiscal poverty alleviation funds on both poverty reduction and economic growth. This study aims to address two key questions: What role do fiscal poverty alleviation funds play in reducing poverty? Additionally, do these funds contribute to economic growth?

Design/methodology/approach – Provincial panel data in China from 2010 to 2020 are used to test the impact of fiscal poverty alleviation funds on poverty reduction and economic growth. The empirical study of this paper primarily employs panel data within difference and two-stage least squares (2SLS) estimation for causal identification.

Findings – Poverty alleviation funds positively influence China's economic growth and significantly reduce the rural poverty rate. During the sample period, the contribution of poverty alleviation funds to economic growth reached 7.3%, and the contribution to the reduction of the poverty incidence rate was 8.4%.

Originality/value – The key contribution of this study lies in its novel approach of using empirical methods to probe the impacts of fiscal poverty alleviation funds on provincial economic growth. Additionally, this paper also empirically tests the mechanisms by which fiscal poverty alleviation funds promote growth and reduce poverty, mainly by improving the infrastructure development conditions in impoverished areas.

Keywords Fiscal poverty alleviation funds, Economic growth, Poverty reduction

Paper type Research paper

1. Introduction

Over the past 4 decades, China has achieved remarkable success in poverty alleviation. According to the poverty standard set in 2010, China's rural impoverished population was a staggering 770 million in 1978, with a poverty rate of 97.5%. By the year 2000, this number had decreased to 460 million, resulting in a poverty rate of 49.8%. Further progress was made, and by 2010, the impoverished population had reduced to 166 million, with a poverty rate of 17.2%. Following the Third Plenary Session of the 18th Central Committee of the Communist Party, China set an ambitious goal to build a comprehensively well-off society by 2020. The strategy of "targeted poverty alleviation" was introduced in 2014, with a commitment to lift all impoverished counties out of poverty by 2020. Starting from 2014, China significantly increased its fiscal support for poverty reduction, leading to a further decline in the rural poverty rate to 0.6% by 2020, effectively achieving comprehensive poverty eradication. The decade from 2010 to 2020 witnessed the elimination of absolute poverty in rural areas—a significant achievement in targeted poverty alleviation. This study

This article is supported by National Social Science Foundation of China [grant number 22AZD050 & 23ZDA047].

China Agricultural Economic Review
Vol. 17 No. 1, 2025
pp. 114-130

1756-137X
DOI 10.1108/CAER-04-2024-0136

aims to address two key questions: What role do fiscal poverty alleviation funds play in reducing poverty, and do these funds also contribute to economic growth?

Eradicating poverty is a fundamental goal regarding the development of human society. Experience from various countries indicates that relying solely on market forces is insufficient to eliminate poverty; instead, government intervention is crucial. Taking China as an example, data from 2010 show significant disparities in rural poverty rates. Over the subsequent decade, the government mobilized resources for poverty alleviation, resulting in a marked decrease in poverty rates across all provinces by 2020. Notably, areas with historically high poverty rates received increased financial investment and experienced higher rates of capital formation and economic growth than areas with lower poverty rates, indicating a national strategy of increased financial input in poverty-stricken provinces and a trend of absolute convergence in provincial economic development.

Moreover, numerous studies have confirmed the substantial poverty reduction effect of government investment. For instance, Montalvo and Ravallion (2010) utilized provincial panel data to examine the impact of China's fiscal input on poverty reduction since 1980, with results showing a clear effect of government spending on poverty alleviation. Similar findings were reported by Zhang and Wang (2013), as well as Hu and Fan (2014) in analyses based on national data. Conversely, some researchers have identified drawbacks in the government-led poverty alleviation model, such as insignificant poverty reduction outcomes (Zhang, 2010; Li *et al.*, 2014) or inefficiencies in the use of poverty alleviation funds (Lai and Cheng, 2014). Considering these issues, Central Government introduced the concept of "targeted poverty alleviation" in 2013, which has since been extensively studied by scholars.

On the one hand, some scholars have meticulously examined the current landscape and inherent challenges of targeted poverty alleviation in China. Huang and Qin (2015) have elucidated the concept's fundamental principles, scope, and theoretical foundations, emphasizing its critical significance. Additionally, several academics contend that China's targeted poverty alleviation faces formidable obstacles, impacting its practical effectiveness (Liu, 2015; Deng, 2014; Li and Ye, 2015). Wang and Xing (2015) have specifically identified predicaments, including imprecise identification of the impoverished, an incomplete resident official support system, insufficient intrinsic motivation for poverty alleviation through industrial development, challenges in consolidating poverty alleviation funds, and inequitable resource distribution.

On the other hand, certain researchers have directed their focus on the poverty mitigation effects of fiscal poverty alleviation funds. Studies conducted by Yu *et al.* (2017) reveal that ample dispensation of these funds to poverty-stricken regions has made notable strides in poverty eradication. Nevertheless, the comprehensive performance evaluation of fiscal poverty alleviation funds seems to solely concentrate on the economic growth in impoverished areas, failing to enhance the impoverished individuals' capacity to counteract poverty or consider the quality of the economic growth. Consequently, substantial wealth disparities persist across different regions. Hence, it is particularly crucial to magnify the role of governmental poverty alleviation funds in reducing poverty, resorting to methods such as integration of poverty alleviation funds, formation of project collaboration mechanisms, and establishment of a multifaceted oversight system.

In summary, although the existing literature has conducted numerous valuable investigations into targeted poverty alleviation, there is still a marked scarcity of studies quantitatively examining the poverty reduction effects of poverty alleviation funds. Montalvo and Ravallion (2010) utilized provincial panel data for a quantitative analysis of the role of fiscal inputs in poverty reduction. However, given the fact that the data employed by this study pertains to an earlier period, it does not encompass the efficacy of fiscal poverty relief funds in the wake of Chinses Government's introduction of the targeted poverty alleviation strategy in 2013.

The study examines the dual impact of fiscal poverty alleviation funds, positing that these funds directly reduce poverty by increasing disposable income and indirectly stimulate economic growth by improving infrastructure and human capital. Specifically, this study aims to investigate the effects of fiscal poverty alleviation funds on poverty reduction by utilizing provincial panel data from 2010 to 2020. Additionally, this paper will substantiate the impact of fiscal poverty alleviation funds on economic growth. In this article, we simultaneously examine the impact of poverty alleviation funds on economic growth and the reduction of poverty for several reasons. Firstly, economic growth has long been the most important driving factor in reducing poverty, and we want to see if poverty alleviation funds can reduce poverty by promoting economic growth. Secondly, we want to see if poverty alleviation funds can effectively reduce the incidence of poverty; if the answer is affirmative, it means that during the sample period, the use of poverty alleviation funds has achieved its policy goal. The third reason is that if poverty alleviation funds can both promote economic growth and reduce the incidence of poverty, it indicates that during the sample period, the existing growth effect of poverty alleviation funds also has an effect on improving income distribution. If the funds only reduces the incidence of poverty, the poverty alleviation funds during the sample period only have the effect of improving income distribution.

The key contribution of this study lies in its novel approach of using empirical methods to probe the impacts of fiscal poverty alleviation funds on provincial economic growth. Another contribution is that we have explored the mechanisms by which fiscal poverty alleviation funds reduce poverty and promote growth, mainly finding that fiscal poverty alleviation funds effectively promote the development of infrastructure in impoverished areas, and the lack of infrastructure is often one of the important factors restricting the economic development of impoverished areas. The third contribution lies in the fact that this empirical research results indicate that during the period from 2010 to 2020, China's poverty alleviation funds have a significant effect in reducing the incidence of poverty, and they also have a certain effect on economic growth.

This paper is structured as follows: the second section explores the theoretical mechanisms by which fiscal poverty alleviation funds influence poverty reduction and economic growth, and it proposes hypotheses for empirical validation. The third section introduces the empirical analysis model and details the data sources utilized in this study. The fourth section conducts empirical tests based on the earlier proposed hypotheses. The paper concludes with a discussion of the findings and policy recommendations.

2. The impact of fiscal poverty alleviation funds on poverty reduction and economic growth: a theoretical analysis

The approach to poverty alleviation in China is characterized by the government's strategic deployment of fiscal poverty alleviation funds. These are not mere direct transfer payments to the poor but act as catalysts to stimulate economic growth and ignite the inherent drive of impoverished populations to combat poverty, thereby comprehensively addressing poverty. The existing literature indicates that these funds help reduce poverty and foster economic growth in deprived regions by leveraging financial tools such as microcredits and insurance. Research by Ly and Mason (2012) shows that microcredit policies for poverty reduction can lower credit costs for the impoverished, aiding them in managing short-term income volatility and accumulating long-term assets. Besides, recent studies have highlighted the critical role of infrastructure in economic growth. For example, Aschauer (1989) demonstrated that public infrastructure investment is a key driver of productivity and economic performance. Similarly, Calderón and Servén (2010) found that infrastructure development significantly contributes to growth in developing countries. These findings reinforce the importance of fiscal poverty alleviation funds in improving infrastructure,

which in turn stimulates economic growth. Marlier *et al.* (2009) found that integrating the poor into mandatory long-term pension savings plans can effectively prevent the risk of poverty in later life. The government's development of microcredit and pension insurance policies, supported by fiscal funds, positively impacts low-asset families by cushioning income shocks, thus hastening the poverty reduction process. Additionally, social capital, formed by interpersonal relationships, can partly explain the roots of poverty. A lack of social participation can indicate a low level of social capital, thus implying social exclusion. Ye (2018) argues that the government can leverage fiscal policy to direct more social capital toward agriculture and rural areas, significantly aiding in the alleviation of China's poverty.

Investments in education, facilitated by fiscal poverty alleviation funds, significantly enhance both the cognitive abilities and health of the impoverished demographic, serving as an effective strategy against poverty. Lydall (1976) highlighted that disparities in individual income are largely due to variations in human capital, including factors such as intelligence, health, environmental conditions, and education level. Thus, by promoting investments in education and healthcare services, the government can elevate the skill set of the impoverished, leading to increased income and improved living conditions. Liu (2016) emphasized that social exclusion in education is a major obstacle preventing the impoverished from gaining education, knowledge, and self-development skills. The government can address this through fiscal policies, such as tax reforms and substantial investments in quality education and skills training for the underprivileged, enhancing their employability and income levels (Zhang and Geng, 2021). Banerjee and Duflo (2013) observed that with more income, impoverished individuals tend to choose tastier but less nutritious food, electronic gadgets over higher education, and disease treatment over prevention, behaviors often linked to an information gap. By increasing educational funding, especially in impoverished areas, the government can improve the cognitive abilities of the poor, aiming to break the cycle of intergenerational poverty (Guo *et al.*, 2023). The correlation between capital investment and economic growth has been extensively studied in development economics. Harrod (1939) emphasizes the role of investment in generating economic growth, while the big-push model by Rosenstein-Rodin highlights the need for coordinated investment to overcome market failures (Rosenstein-Rodan, 1943). Additionally, the Solow growth model underlines the importance of capital accumulation and technological progress in sustaining long-term economic growth (Solow, 1956). These theoretical foundations underscore the significance of fiscal poverty alleviation funds in driving economic development through capital investment. Based on above analysis, we posit the following assumptions:

The fiscal poverty alleviation funds have the potential to promote economic growth and reduce poverty. These hypotheses will be empirically tested in the following sections.

3. Empirical model construction, data collection, and descriptive statistics of variables

3.1 Empirical model

To assess the impact of poverty alleviation fund allocation on poverty rate and economic growth rates, we conduct our analysis based on the following panel data model:

$$y_{it} = \alpha_0 + \alpha_1 fpzjbz_{it} + X_{it}\beta + f_i + v_t + \varepsilon_{it} \quad (1)$$

In Equation (1), the dependent variables include two categories: one is the annual economic growth rate, denoted as "growth". To account for price fluctuations, we calculate the actual GDP growth rate using the GDP index. The other is the poverty rate (povindex) for each province (i) in year (t). The equation's key explanatory variable is the proportion of poverty alleviation fund expenditure to GDP (fpzjbz), measured by the combined expenditure of the

central and local government poverty alleviation funds as a percentage of GDP. We also use the logarithmic form of the poverty alleviation fund amount as the core explanatory variable, replacing the proportion of poverty alleviation funds for robustness testing. To differentiate the individual impacts of central and local government poverty alleviation funds on poverty reduction and growth, we introduce two additional variables: the central government poverty alleviation fund ratio (fpzybz) and the local government poverty alleviation fund ratio (fpdfzb).

The vector (X) includes a set of control variables: the capital formation rate (zbxc), represented by the total capital formation as a proportion of GDP; educational investment (edu), indicated by the ratio of fiscal education expenditure to total fiscal expenditure; openness (open), calculated as the ratio of the total value of imports and exports, adjusted by the actual exchange rate, to GDP; total population (pop) and urbanization rate (urban), measured by the proportion of urban residents to the total population. In the poverty rate equation, the dependent variable also includes the real GDP growth rate. The terms (f_i) and (v_t) represent the provincial and annual fixed effects, respectively.

3.2 Data sources

The rural poverty rate data for each province in this study are obtained from the *Household Income and Expenditure Survey* conducted by the National Bureau of Statistics. The expenditures of central or local government poverty alleviation funds are sourced from the annual *Poverty Alleviation Development Yearbooks*. Other pertinent data are gleaned from the *China Statistical Yearbooks* or the respective provincial statistical yearbooks, covering the period from 2010 to 2020. The year of 2010 was selected as the starting point because it represents the beginning of available provincial-level statistical data.

3.3 Descriptive statistics of variables

Figures 1 and 2 depict the trends of China's GDP growth rate, rural poverty rate, and the proportion of poverty alleviation funds since 2010[1]. Initially, a noticeable trend is the decline in China's GDP growth rate from a rapid 10.6% to a more moderate 7.7% between 2010 and 2013, transitioning to an economic "new normal". This trend persisted, with a steady decline to 6.0% in 2019, and a further decrease to 2.2% in 2020 due to the COVID-19 pandemic's impact. In contrast, the proportion of poverty alleviation funds in GDP saw a significant increase during this period, reflecting the central government's heightened focus on poverty issues. As depicted in Figure 2, the share of poverty alleviation funds in GDP initially rose slowly from 0.07 to 0.10% between 2010 and 2013. With the introduction of "targeted poverty alleviation" in 2013, both central and local governments intensified their efforts accelerating the rise in the proportion of poverty alleviation fund expenditures to GDP, which reached 0.25% by 2020—an increase of 0.15% over seven years. Alongside the increased fiscal

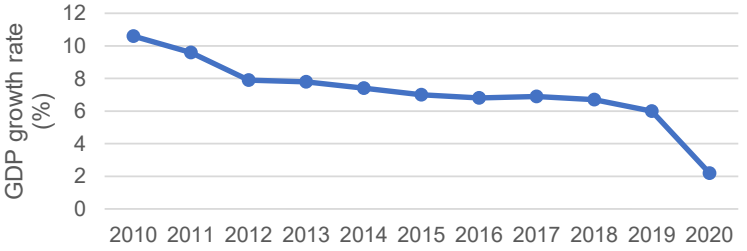

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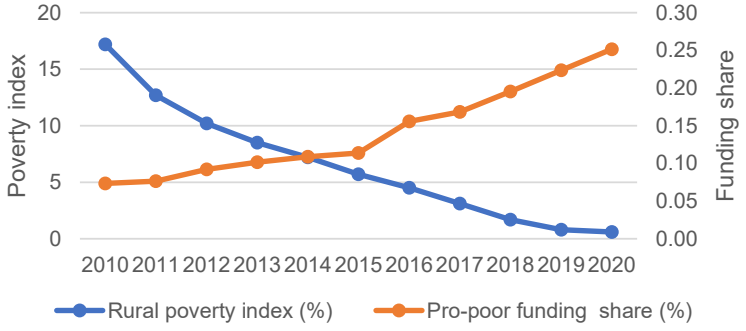
Figure 1.
Development trend of China's GDP growth rate from 2010 to 2020

efforts, a marked decline in the rural poverty rate was observed, dropping from 17.2% to zero. This decline, despite a slowdown in GDP growth, indicates the effectiveness of China's poverty reduction measures in rural areas. Nonetheless, accurately gauging the impact of poverty alleviation funds on rural poverty reduction and national economic growth from Figures 1 and 2 is challenging, necessitating further rigorous empirical validation.

The descriptive statistics for all variables are presented in Table 1. These statistics underscore significant variability among variables within China's provincial panel data, arising from both cross-sectional dimensions at the provincial level and temporal dimensions. For instance, the incidence rates of rural poverty span a broad range, from a mere 0.10% to a high of 49.2%. The highest rates of poverty rate typically occur in the western regions during the initial years of the dataset, reflecting the economic development levels of these provinces. Such variability across different variables lays a solid foundation for our subsequent empirical research.

3.4 Essential insights

Figure 3 depicts the rural poverty rate across various provinces for the years 2010 and 2016[2]. Excluding the municipalities of Beijing, Tianjin, and Shanghai, the data shows significant disparities in rural poverty rates among provinces in 2010, with an average rate of 21.0%. This implies that one in every five rural residents was impoverished, a rate that is notably



Source(s): Authors' own creation/work

Figure 2. Trends in China's poverty rate and proportion of poverty alleviation funds from 2010 to 2020

Variable	Observations	Mean	Standard error	Min. value	Max. value
Povindex (%)	308	8.18	9.08	0.10	49.20
Growth (%)	308	8.48	3.15	−5.00	17.20
Fpzjbz (%)	299	0.41	0.73	0.00	5.86
Fpzybz (%)	299	0.28	0.54	0.00	4.33
Fpdfbz (%)	308	0.13	0.20	0.00	1.53
Zbxclv (%)	308	65.06	26.23	12.70	167.78
Edurate (%)	308	15.88	3.20	3.60	22.22
Open (%)	308	20.36	19.54	0.76	115.66
Pop (in 10,000s)	308	4,711	2,902	300	12,601
Urban (%)	308	52.73	9.56	22.22	70.17
Transport (KM/Square KM)	0.85	0.49	0.05	2.23	0.85
Electricity (KWH)	1978.93	1476.54	20.00	6940.00	1978.93

Source(s): Author's own creation/work

Table 1. Descriptive statistics of variables

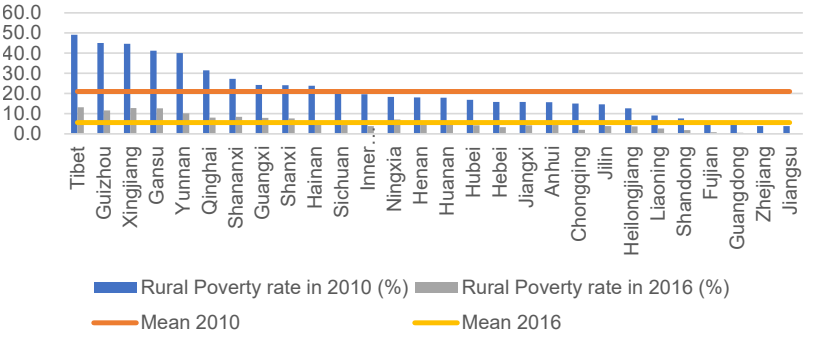


Figure 3.
Rural poverty rates across Chinese provinces

Source(s): Authors' own creation/work

high. The provinces with the highest poverty rates, exceeding 40%, were Tibet, Guizhou, Xinjiang, Gansu, and Yunnan, in that order. Conversely, the provinces with the lowest rates, under 10%, were Jiangsu, Zhejiang, Guangdong, Fujian, and Shandong. Observations indicate that the highest poverty rates are in the western regions, while the lowest are in the eastern coastal areas, suggesting a close relationship between rural poverty levels and the economic development status of the provinces.

Further analysis of Figure 3 indicates a marked decline in rural poverty across China's provinces by 2016. The rural poverty rate decreased to 5.6%, a reduction of 15.4% from the 2010 level. This significant decrease reflects the targeted strategies and achievements of China's central and local governments in addressing rural poverty and improving the living standards of rural residents in impoverished areas.

In 2016, the provinces with the highest rural poverty rates were Tibet, Xinjiang, Gansu, Guizhou, and Yunnan. Although these provinces remained the most affected by poverty, their rates have declined to below 14%. In contrast, the provinces with the lowest rates of rural poverty—Zhejiang, Jiangsu, Guangdong, Fujian, and Shandong—have demonstrated substantial progress, with some reporting rates below 1%. This near elimination of rural poverty in these regions highlights the ongoing, albeit uneven, progress in poverty alleviation efforts.

To facilitate a direct understanding of the disparities in poverty alleviation funding, economic growth, and capital formation among regions with high and low incidences of poverty, this study delineates provinces based on their 2010 poverty rates in relation to the national average. Provinces with poverty rates surpassing the average are designated as high-poverty areas. Under this classification, Tibet, Guizhou, Xinjiang, Gansu, Yunnan, Qinghai, Shaanxi, Guangxi, Shanxi, and Hainan are categorized as high-poverty regions, while the remaining provinces are considered low-poverty areas.

Figure 4 illustrates that, from 2010 to 2020, there has been a rise in the allocation of poverty alleviation funds as a percentage of GDP across all provinces, irrespective of their rural poverty levels. Additionally, it is apparent that provinces with higher incidences of rural poverty allocate a considerably larger proportion of their GDP to poverty alleviation funds compared to those with lower incidences. This gap has been increasingly widening since 2013.

Figure 5 indicates that akin to the proportion of poverty alleviation funds in GDP, the rate of capital formation in high-poverty regions significantly surpasses that in low-poverty areas. From 2010 to 2016, high-poverty areas experienced a steady increase in capital formation rate, from 72.0 to 83.3%. Conversely, the capital formation rate in low-poverty

areas remained relatively stable during this period. This suggests that high-poverty areas are still lagging in economic development and industrialization, necessitating intensive investment to promote further economic progress. On the other hand, low-poverty areas, with a more advanced degree of industrialization, do not require as much investment-driven development. Notably, post-2016, the capital formation rate has been declining in both high and low-poverty areas, although it remains consistently higher in high-poverty areas.

Figure 6 illustrates a general decline of varying degrees in the economic growth rates of both high-poverty and low-poverty regions from 2010 to 2020. Despite the exception of 2010, high-poverty regions have generally maintained higher economic growth rates than low-

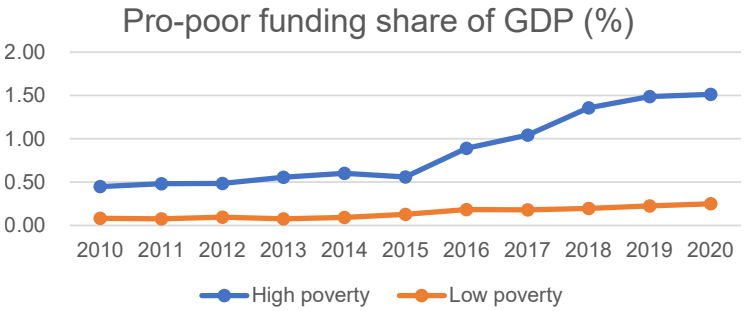


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Figure 4. Proportions of poverty alleviation funds in high-poverty and low-poverty regions from 2010 to 2016

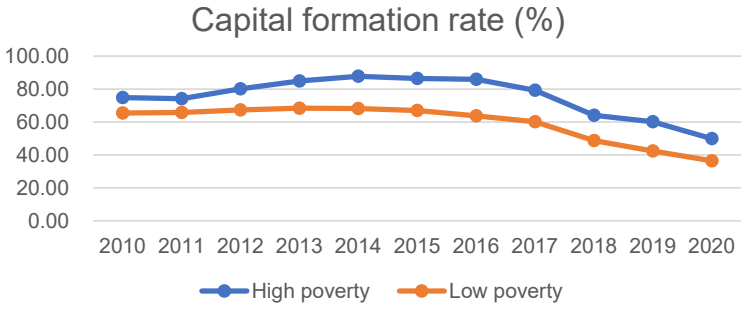

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Figure 5. Capital formation rates in high and low-poverty regions from 2010 to 2020

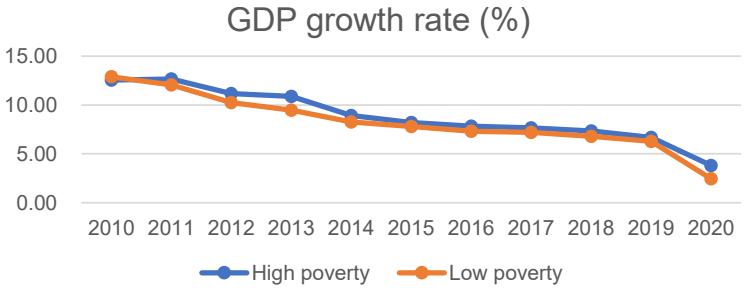

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Figure 6. Economic growth rates in high-poverty and low-poverty regions from 2010 to 2016

poverty regions, indicating a convergence in China's economic growth throughout this period.

The synthesis of the data reveals significant disparities in rural poverty rates among China's provinces. In 2010, provinces with the lowest rural poverty rates had nearly eradicated poverty, while those with the highest rates had rural poverty rates close to 50%. By 2020, after a decade of targeted poverty alleviation efforts, all provinces saw substantial reductions in rural poverty, with the highest rates in the top five provinces dropping below 2.0%.

Still, a comparison of data from 2010 and 2016 shows that the provinces with the highest rural poverty rates remained unchanged, and all five are located in the western region, while the provinces with the lowest rates are in the eastern coastal region. This suggests that regional economic development is a key strategy for poverty eradication.

When provinces are categorized based on their 2010 rural poverty rates into high and low incidence areas, it is evident that high-poverty provinces have higher proportions of poverty alleviation funds relative to GDP, higher capital formation rates, and higher economic growth rates than low-poverty provinces. This indicates that increased investment by the national government in high-poverty provinces is effective, as these regions are catching up economically with more developed provinces, showing a trend of absolute economic convergence among the provinces.

4. Empirical results and analysis

4.1 Empirical results

Table 2 presents the parameter estimates from Equation (1), focusing on the impact of poverty alleviation funds on economic growth. The first column contains only the pivotal explanatory variable, the proportion of poverty alleviation funds to GDP, which shows a positive coefficient, yet it does not pass the 10% significance threshold.

	(1) Growth	(2) Growth	(3) Growth	(4) Povindex	(5) Povindex	(6) Povindex
fpzjbz	0.218	0.411**	0.382**	−7.367***	−7.094***	−7.797***
	(0.194)	(0.165)	(0.156)	(1.780)	(1.511)	(1.516)
zbxclv		0.00516	0.00530		−0.0761**	−0.0731**
		(0.00819)	(0.00850)		(0.0362)	(0.0345)
edu		−0.105	−0.100		−0.198	−0.108
		(0.0680)	(0.0688)		(0.189)	(0.167)
pop		0.140**	0.114		0.568**	0.0710
		(0.0588)	(0.0692)		(0.262)	(0.273)
urban			−0.0307			−0.196
			(0.0471)			(0.197)
open			−0.00480			−0.226***
			(0.0143)			(0.0795)
growth				−0.0316	−0.167	−0.209
				(0.254)	(0.239)	(0.250)
Provincial Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Annual Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.858	0.866	0.866	0.823	0.846	0.866
N	299	299	299	299	299	299

Note(s): The figures in the parentheses represent robust standard errors. ***, **, and * signify significance at the 1, 5, and 10% levels respectively
Source(s): Author's own creation/work

Table 2.
The growth and poverty reduction effects of poverty alleviation funds

Building upon the initial column, the second column introduces additional control variables: the capital formation rate, the proportion of educational expenditure to fiscal outlay, and the total population. The results indicate that neither the capital formation rate nor the educational spending proportion significantly affects economic growth. Contrary to economic theory, which suggests a positive effect of both physical and human capital investment on economic growth, the negative coefficient associated with education seems counterintuitive. A possible explanation is that the dependent variable is the economic growth rate of the previous year, reflecting short-term economic dynamics. Short-term investments in human capital might detract from physical capital input and consumption, thereby hindering short-term economic growth. Nonetheless, in the long run, human capital investment is expected to have a positive effect on economic growth. The positive impact of the total population suggests that regions with higher population density tend to have stronger economic vitality. After factoring in the three variables—capital formation rate, education, and total population—the influence of poverty alleviation funds on economic growth becomes significantly positive. The third column further includes urbanization rate and openness as explanatory variables for economic growth, yet their impacts are not significant. Upon accounting for all control variables, the effect of poverty alleviation fund proportion on economic growth decreases in magnitude but remains significant at the 5% level.

Columns 4 to 6 delineate the effects of the proportion of poverty alleviation funds on the rural poverty rate. Column 4, controlling solely for the economic growth rate, reveals that poverty alleviation funds negatively impact the rural poverty rate, with statistical significance at the 1% level. The economic growth rate also appears to influence the poverty rate negatively, though it does not reach the 10% significance threshold.

Expanding upon Column 4, Column 5 introduces additional variables: capital formation rate, education, and total population. Both capital formation and education negatively influence the poverty rate, although education does not achieve statistical significance. The total population significantly contributes to reducing the poverty rate.

Column 6 incorporates urbanization rate and openness as further variables. The urbanization rate negatively affects the rural poverty rate but is not statistically significant, while openness demonstrates a substantial negative impact, indicating that regions with higher openness tend to have lower poverty rates.

Adjusting of all variables, the impact of the proportion of poverty alleviation funds on the poverty rate remains negative and significant at the 1% level. The parameter estimates from Columns 4 to 6 collectively underscore the significant poverty-reducing effects of China's poverty alleviation funds, especially when considering the influence of the economic growth rate.

Drawing upon the parameter estimations presented in Table 2, we can infer fiscal poverty alleviation funds positively influence China's economic growth and significantly reduce the rural poverty rate. This indicates that poverty alleviation funds play a crucial role in both reducing poverty and promoting economic growth in the long run.

Specifically, the data in column 3 suggest that for every one-percentage increase in the proportion of poverty alleviation funds in GDP, there is an associated increase of 38.2% in the economic growth rate. Our dataset from 2010 to 2020 shows that China's allocation of poverty alleviation funds increased by 0.18%, contributing to a 6.8% increase in the economic growth rate. During this period, China's economic growth rate reached 93.3%, with poverty alleviation funds accounting for a 7.3% contribution to this growth.

Moreover, estimations in column 6 indicate that each one-percentage-point increase in the ratio of poverty alleviation funds in GDP leads to a 7.8% decrease in the rural poverty rate. Over the sample period, the increase of 0.18% in poverty alleviation funds correlates with a

1.4% decrease in the rural poverty rate, which fell from 17.2% in 2010 to 0.6% in 2020—a total reduction of 16.6%, with poverty alleviation funds contributing 8.4% to this decline.

In essence, the impact of poverty alleviation funds on rural poverty reduction encompasses two distinct facets: a direct diminution of poverty levels and an indirect alleviation through the stimulation of economic growth.

4.2 Mitigating potential endogeneity concerns

The central explanatory variable in our analysis is the proportion of governmental poverty alleviation funds. These funds, predominantly disbursed by central government fiscal allocations and significantly influenced by national policy directives, theoretically reduce the likelihood of significant endogeneity issues within our primary explanatory variable. Nonetheless, with the recent increase in local governmental fiscal contributions to poverty alleviation, which may be influenced by the economic growth of provinces, there is a potential for reverse causality. This is particularly true in areas with high rural poverty rates, where local governments may increase funding for poverty alleviation. To address these potential endogeneity concerns, we have employed lagged proportions of poverty alleviation funds from one term and three terms prior as instrumental variables for re-estimating the parameters. The outcomes of this re-estimation are systematically outlined in Table 3.

Table 3's estimations indicate that using lagged explanatory variables as instrumental variables uncovers a positive effect of poverty alleviation funds on economic growth. Despite this, neither the one-term nor the three-term lagged variables reach statistical significance. In contrast, the poverty reduction impact of these funds proves to be highly significant, irrespective of the lagged term.

Further analysis of Table 3, after addressing endogeneity concerns, reveals that investments in physical capital and increased openness positively influence the reduction of

	(1) Growth	(2) Growth	(3) Povindex	(4) Povindex
L.fpzjbz	0.303		−6.807***	
	(0.192)		(1.433)	
L3.fpzjbz		0.629		−6.976***
		(0.387)		(2.077)
zbxclv	0.0067	0.0098	−0.066**	0.060**
	(0.0091)	(0.0105)	(0.033)	(0.023)
edurate	−0.113	−0.133	−0.256	−0.248
	(0.0747)	(0.0788)	(0.206)	(0.178)
pop	0.128*	0.0635	0.114	0.247
	(0.0707)	(0.101)	(0.304)	(0.357)
urban	−0.0474	−0.0301	−0.223	−0.141
	(0.0475)	(0.0452)	(0.148)	(0.107)
open	−0.009	0.010	−0.161*	−0.0417
	(0.014)	(0.016)	(0.092)	(0.120)
growth			0.0965	0.135
			(0.242)	(0.166)
Provincial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
R^2	0.858	0.791	0.846	0.808
N	271	215	271	215

Note(s): L. and L3. Respectively represent a lag of 1 term or a lag of 3 terms; the values in the parentheses are robust standard errors, ***, **, and * respectively denote significance levels of 1, 5, and 10%
Source(s): Author's own creation/work

Table 3. Growth and poverty reduction effects of poverty alleviation funds considering endogeneity

rural poverty. These results have profound policy implications, indicating that amplifying physical capital investments in rural areas and elevating their level of openness can significantly advance efforts to eradicate poverty. Appropriately directed fiscal funds towards physical investments, such as bolstering infrastructure in impoverished rural communities, are shown to have a positive impact.

To address the potential endogeneity of lagged variables when employed as instrumental variables, we have identified novel instrumental variables to refine our causal inference. We specifically utilize the interaction term between the count of national poverty-stricken counties per province in 1994 and a time trend as the instrumental variable for fiscal poverty alleviation funds. The premise is that while historical fiscal policies for poverty alleviation influence the current distribution of such funds, they are not directly associated with the current economic landscape, thereby meeting the criteria for relevance and exogeneity required of instrumental variables.

Table 4 illustrates the two-stage least squares (2SLS) estimation outcomes of our instrumental variable analysis. Consistent with our previous findings, the impact of poverty alleviation funds on economic growth remains statistically insignificant; however, these funds significantly diminish the prevalence of poverty. Further in Table 4, we report diagnostics affirming the efficacy of our instrumental variable. Notably, both the Wald *F*-statistic and the LM statistic exceed the threshold of 10 in the first stage, suggesting the absence of issues related to weak instruments or a lack of instrument identification strength. This reinforces the validity of our chosen instrumental variable.

4.3 Robustness check

Previously, we utilized the ratio of fiscal poverty alleviation funds to GDP as the key explanatory variable. In this section, for robustness testing, we re-estimated the impact of poverty alleviation funds on economic growth and poverty incidence using the logarithm of the amount of fiscal poverty alleviation funds as the key explanatory variable. Table 5 presents the results of OLS and 2SLS estimations. The OLS estimation results indicate that

	(1) Growth	(2) Poverty
fpzjbz	0.114	−4.244***
	(0.221)	(1.395)
zbxclv	0.008	−0.192*
	(0.012)	(0.120)
edurate	−0.147	−2.035*
	(0.139)	(1.080)
pop	0.163	2.195
	(0.143)	(2.102)
urban	−0.022	−0.564
	(0.049)	(0.430)
open	0.004	−0.794**
	(0.038)	(0.309)
First stage test statistics		
rk Wald *F*-statistic	15.5	15.5
rk LM statistic	15.8	15.8
Observations	299	299
Number of prov	28	28

Note(s): Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own creation/work

Table 4.
The effect of fiscal poverty alleviation funds on income growth and poverty reduction based on instrumental variable estimation

Variables	(1) OLS Growth	(2) OLS Povindex	(3) 2SLS Growth	(4) 2SLS Povindex
lnfpzj	0.486***	−2.005***	0.768	−4.616**
	(0.184)	(0.754)	(2.175)	(2.030)
zbxclv	0.00496	−0.0512**	0.00552	−0.138
	(0.00767)	(0.0224)	(0.00953)	(0.0967)
edurate	−0.100*	−0.474**	−0.114	1.667
	(0.0591)	(0.190)	(0.108)	(1.407)
pop	0.0989*	0.518***	0.105	−0.364
	(0.0584)	(0.179)	(0.0657)	(0.832)
urban	−0.0528	−0.0295	−0.0633	1.610
	(0.0458)	(0.145)	(0.0943)	(1.076)
open	−0.0111	−0.0955*	−0.0111	−0.0953
	(0.0149)	(0.0559)	(0.0145)	(0.207)
First stage test statistics				
rk Wald *F*-statistic			15.5	15.5
rk LM statistic			15.8	15.8
Observations	299	299	299	299
Number of prov	28	28	28	28

Note(s): Robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own creation/work

Table 5. Robustness test based on logarithmic fiscal poverty alleviation funds

the logarithm of fiscal poverty alleviation funds significantly affects both growth and poverty alleviation. The 2SLS estimation results, however, suggest that fiscal poverty alleviation funds have a significant negative effect only on the poverty incidence, while their impact on economic growth is positive but not statistically significant. The empirical findings in Table 5 are consistent in direction with the earlier estimations that used the ratio of poverty alleviation expenditure to GDP as the key explanatory variable.

4.4 Mechanisms

Previous theoretical analyses have pointed out that a significant portion of China's poverty alleviation funds is dedicated to the infrastructure construction in impoverished areas, and extensive literature has demonstrated that infrastructure development aids in promoting economic growth and reducing the incidence of poverty. Here, we will examine whether fiscal poverty alleviation funds foster the development of local infrastructure. We gauge the transportation and electricity infrastructure of various regions by road density and the logarithm of per capita electricity consumption, respectively. Table 6 presents the results based on Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) estimations. It is evident that fiscal poverty alleviation funds exert a significant positive influence on per capita electricity consumption, and this finding is consistent across both OLS and 2SLS estimations. While the impact of fiscal poverty alleviation funds on road infrastructure is positive, the coefficient from the 2SLS estimation does not meet the criteria for statistical significance.

4.5 The impact of central and local governmental poverty alleviation funds

It has been established that poverty alleviation funds stem from two primary channels: the central government's specialized fiscal allocations and the local governments' financial contributions. To delineate the distinct growth and poverty mitigation effects attributable to each source, separate analyses were conducted to assess their respective influences on economic growth and the rural poverty rate. The findings from these analyses are detailed in Table 7.

	(1) OLS Electricity	(2) OLS Road	(3) 2SLS Electricity	(4) 2SLS Road
fpzjbz	0.120***	0.044***	0.199**	0.213
	(0.016)	(0.011)	(0.109)	(0.139)
zbxclv	0.000	0.000	0.001	−0.000
	(0.001)	(0.000)	(0.001)	(0.001)
edurate	−0.001	0.006*	−0.006	0.016*
	(0.005)	(0.003)	(0.009)	(0.009)
pop	−0.004	0.004	0.001	−0.007
	(0.003)	(0.003)	(0.008)	(0.010)
urban	−0.002	0.001	−0.001	−0.001
	(0.004)	(0.002)	(0.003)	(0.004)
open	0.000	0.001	0.002	−0.002
	(0.001)	(0.001)	(0.002)	(0.003)
Provincial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
First stage test statistics				
rk Wald *F*-statistic			15.5	15.5
rk LM statistic			15.8	15.8
Observations	299	299	299	299
Number of prov	28	28	28	28

Note(s): Robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own creation/work

Table 6.
The impact of fiscal poverty alleviation funds on the development of electricity and road infrastructure

	(1) Growth	(2) Growth	(3) Povindex	(4) Povindex
fpzybz	0.527**		−10.40***	
	(0.205)		(2.020)	
fpdfbz		1.188*		−24.40***
		(0.678)		(3.126)
zbxclv	0.00590	0.00370	−0.0839**	−0.0389
	(0.00846)	(0.00881)	(0.0341)	(0.0399)
edurate	−0.0990	−0.113	−0.150	−0.0962
	(0.0681)	(0.0720)	(0.182)	(0.151)
pop	0.112	0.109	0.131	0.0611
	(0.0683)	(0.0717)	(0.291)	(0.260)
urban	−0.0306	−0.0295	−0.195	−0.197
	(0.0470)	(0.0478)	(0.201)	(0.200)
open	−0.00426	−0.0107	−0.233**	−0.171**
	(0.0144)	(0.0153)	(0.0858)	(0.0750)
growth1			−0.225	−0.252
			(0.263)	(0.242)
Provincial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
R^2	0.866	0.868	0.855	0.865
N	299	308	299	308

Note(s): The numbers in parentheses represent robust standard errors. ***, **, and * respectively indicate significance levels of 1, 5, and 10%
Source(s): Author's own creation/work

Table 7.
The growth and poverty reduction effects of local and central governmental poverty alleviation funds

Our initial analysis indicates that poverty alleviation funds from the central government positively affect economic growth, passing the significance test at the 5% level. The growth effect of local government poverty alleviation funds, albeit positive, merely meets the 10% significance threshold. Both central and local governmental poverty alleviation funds significantly reduce the rural poverty rate, with the impact of local funds being numerically more substantial. Table 7's estimations demonstrate that central government funds contribute to both economic growth and poverty reduction. Local government funds, however, show a stronger effect on poverty reduction and a comparatively weaker influence on economic growth. Relative to central government funds, local funds have a more pronounced effect on poverty alleviation. Additionally, Table 4's findings continue to underscore the active role of physical capital investment and openness in lowering rural poverty rates, even when distinguishing between central and local governmental poverty alleviation funds.

5. Conclusions and policy implications

This paper primarily examines the characteristics of rural poverty rates across different provinces, comparing the disparities in the use of poverty alleviation funds, capital formation rates, and economic development between provinces with high and low poverty prevalence. Leveraging significant poverty-related data gathered from all Chinese provinces over a decade (2010–2020), a two-way fixed effects model was utilized to empirically test the impact of poverty alleviation funds on economic growth and the rural poverty rate. The conclusions are as follows:

Firstly, based on a two-way fixed-effects model using provincial panel data, we discern that poverty alleviation funds have both growth and poverty-reducing effects. During the period from 2010 to 2020, the economic growth attributable to poverty alleviation fund expenditures amounted to 6.8% , contributing 7.3% to the overall economic growth. The direct effect of poverty alleviation funds on poverty reduction is also evident; within the sample period, these funds led to a direct reduction in the poverty rate by 1.4%, accounting for 8.4% of the total poverty reduction. This suggests that poverty alleviation funds have generally been effective, yielding both direct poverty-reducing effects and indirect growth effects.

Secondly, the poverty alleviation funds' impact on poverty reduction exhibits considerable heterogeneity. Upon dividing the funds according to their source into central and local government allocations, it becomes apparent that the central governmental funds have both a growth effect and a poverty reduction effect. In contrast, the local governmental funds demonstrate a more significant effect on poverty reduction, with a relatively weaker influence on economic growth. The comparison reveals that the poverty reduction effect of local government funds is markedly higher than that of the central government, suggesting that local funds may be more prioritized toward poverty reduction, while central funds focus on both poverty reduction and promoting local economic growth.

Overall, the empirical evidence corroborates the significant strides made in China's poverty reduction efforts over the years. Additionally, it underscores the critical function that poverty alleviation funds serve in driving economic growth and mitigating poverty. Of course, we also have to acknowledge a limitation in the empirical research of this paper, which is that we are unable to separate the share of poverty alleviation funds used for fixed asset investment in the capital stock, as we do not have the relevant exact data. Of course, since the formation of fixed capital already includes a portion of poverty alleviation funds, this means that the impact of poverty alleviation funds on growth and poverty reduction discussed in this paper may be underestimated.

Beyond the role of poverty alleviation funds in reducing poverty, our research reveals that substantial investments in physical capital and increased openness significantly reduce the poverty rate. This leads to several policy implications:

To begin with, our analysis reveals that central governmental funds not only contribute to poverty reduction but also foster economic growth, while local governmental funds have a pronounced effect on poverty mitigation with a relatively weaker influence on growth. The poverty reduction effect of local funds is significantly more pronounced than that of central funds. As enduring economic growth is the primary strategy for poverty reduction, central governmental funds offer both immediate and long-term benefits—addressing both the symptoms and the root causes of poverty. Conversely, local funds primarily provide short-term relief. Thus, a strategic combination of central and local governmental funds is crucial to formulating a comprehensive approach that tackles both the immediate and fundamental aspects of poverty.

Furthermore, our study identifies that investments in physical capital have a positive influence on reducing rural poverty, indicating that fiscal funds should be more intensively channeled into impoverished rural regions. The principal cause of poverty in these areas is often the lack of developed infrastructure and minimal external connections, resulting in economic seclusion and a barrier to the spillover effects of broader economic progress. Enhancing infrastructure in these rural regions is another vital strategy to promote economic growth and alleviate poverty. Additionally, promoting openness, whether through increased inter-provincial trade or expanded international commerce, is also a key strategy for lowering the poverty rate.

Finally, under the policy of targeted poverty alleviation, China has truly utilized poverty alleviation funds for the development of impoverished areas and the improvement of the lives of poor families, thereby ultimately achieving dual effects of economic growth and poverty reduction. This holds significant implications for other developing countries as well. Specifically, firstly, the essence of poverty alleviation policy lies in precision. Only by accurately identifying impoverished areas and the poor population, and implementing targeted poverty alleviation measures, can the efficiency and effectiveness of the use of poverty alleviation funds be enhanced. Secondly, promoting economic growth can effectively reduce poverty, providing an important policy direction for other developing countries. Thirdly, improving the infrastructure and public service levels in impoverished areas is an important mechanism for promoting economic development and reducing the incidence of poverty in these regions.

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