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Spatio-temporal patterns of rural poverty in China and targeted poverty alleviation strategies

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ABSTRACT

Poverty is a challenge facing all countries and the international community as a whole. Promoting development, narrowing the rural-urban gap, eliminating poverty and achieving common prosperity are all ideals that humanity constantly pursues. Despite the great achievements have been made in poverty alleviation over the past three decades, the extent of poverty in rural China is still high. It is both necessary and urgent to fully understand the root and status quo of China's poverty and establish a scientific poverty relief system. Based on high resolution poverty data, this study systematically examined the status quo and spatial distribution characteristics of poverty in rural China and its driving mechanism. The results showed that the distribution of the Chinese rural poor exhibits a distinct spatial agglomeration feature. Poverty is mainly concentrated in the remote deep rocky mountainous areas, border areas and minority areas of central and western China and gradually gathers towards the southwestern region. The "islanding effect" may well appear in China's poverty-stricken regions in the future. The proportion of poor people in the northwestern and southeastern regions of the Hu Huanyong line was 16.4% and 83.6%, respectively, indicating the uneven distribution of the rural poor. Furthermore, further investigations indicated that suffering from illness is the greatest contributor to current individual or transient poverty in rural China. The lack of natural endowments, poor geographic conditions and fragile ecological environment are the main driving forces behind persistent poverty. Ultimately, we proposed that China implement a scientific, differentiated, sustainable, targeted and problem-oriented poverty alleviation strategy that can lift the country's rural poor population out of poverty by 2020 as scheduled.

1. Introduction

Poverty remains a problem worldwide (Mani et al., 2013; Haushofer and Fehr, 2014; Zhang et al., 2015). Narrowing the rural-urban gap, eliminating extreme poverty and achieving common prosperity are all ideals that humanity constantly pursues (Bapna, 2012; Griggs et al., 2013; Imai and You, 2014; Tollefson, 2015). Poverty was originally considered as an economic phenomenon, a condition in which the income of individuals or families cannot meet the conditions of society to achieve the basic standard of living. Smith (1776) defined poverty as "the inability to purchase necessities required by nature or custom". In the early 20th century, poverty was defined as "earnings insufficient to obtain the minimum necessities for the maintenance of merely physical efficiency" (Rowntree, 1901). Townsend (1979) defined poverty as "the lack of the resources necessary to permit participation in the activities, customs and diets commonly approved by society". The World Bank (1981) also defined poverty as the lack of opportunity for some groups who do not have sufficient resources to purchase food, decent living conditions, and minimal participation in activities that are generally accepted by society. The definition of poverty was later simplified as the lack of the ability to achieve the minimum living standard (World Bank, 1990). Amartya Sen, a famous economist, defined poverty as "absolute deprivation in terms of a person's capabilities related to relative deprivation in terms of commodities, incomes and resources" (Sen, 1985, 1999).

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The World Development Report 2000/2001 pointed out that poverty is a multidimensional phenomenon that encompasses the lack of opportunities, lack of empowerment, lack of security, and malnutrition and poor health (World Bank, 2001). It is not difficult to find that with the deepening of research, poverty not only has the connotation of the shortage of economic factors but also includes missing out on opportunities, lack of access to or exclusion from social services and other social deprivation (Wagle, 2002; Park et al., 2002; Alkire and Foster, 2011; Alkire and Sumner, 2013; Bossert et al., 2013; Alkire and Santos, 2014; Alkire and Seth, 2015; Liu et al., 2016; Liu and Xu, 2016).

Many classic theories of poverty or antipoverty have been put forward from different perspectives. Development Economics is generally considered to have made an outstanding contribution to the theory of anti-poverty. Starting with the capital elements, it emphasizes that insufficient capital investment is the root of long-term poverty and advocates that large-scale investment can help to alleviate poverty. The representative theories include the Vicious Circle of Poverty (Nurkse, 1952), the Low-level Equilibrium Trap (Nelson, 1956), the Critical Effort (Leibenstein, 1957), the Circular and accumulative causation (Myrdal, 1957) and multidimensional poverty (Sen, 1999). New Institutional Economics links the poverty problem with the system or institutions, arguing that the system is a determinant of economic performance and that an effective system promotes economic growth, and vice versa. The classical theories on poverty in Institutional Economics are the Property Right Theory (Coase, 1937) and the Economic Growth Theory (North, 1955). Population is the object of anti-poverty efforts. Some researchers put forward the anti-poverty theory from the perspectives of the quality and quantity of the population, as in the theories of Dualistic Economics (Lewis, 1954), Malthusian Population Growth (Malthus and Layton, 1958) and Human Capital (Schultz, 1961). These relevant theories laid a solid foundation for decision making and subsequent studies on poverty. In recent years, the measurement of poverty has evolved from single element of income/consumption to multidimensional characteristics including income, education, health, nutrition, resources, environment and location (Alkire and Foster, 2011; Liu and Xu, 2016; Ferreira and Lugo, 2013; Alkire and Sumner, 2013; Alkire and Seth, 2015; Bader et al., 2016; Feeny and McDonald, 2016).

China was once the developing country with the largest rural poor population in the world. China's poverty problem has attracted broad attention from academics at home and abroad because of the various types and complex causes of poverty and the arduous task of antipoverty (Du et al., 2005; Zhang and Wan, 2006; Ravallion and Chen, 2007; Montalvo and Ravallion, 2010; Glauben et al., 2012; Yu, 2013; Li et al., 2015; Ward, 2016; Lo et al., 2016). Most published studies focused on the poverty line (Chen et al., 2013), the types of poverty (Jalan and Ravallion, 2000; Chen and Ravallion, 2007; Duclos et al., 2010; Glauben et al., 2012; Ward, 2016), the causes of poverty (Jalan and Ravallion, 2000; Glauben et al., 2012; Wu et al., 2015), anti-poverty targets (Park et al., 2002; Gao et al., 2015; Li et al., 2016), vulnerability to poverty (McCulloch and Calandrino, 2003; Ward, 2016; Cao et al., 2016), multi-dimensional poverty measurement (Wang and Alkire, 2009; Yu, 2013; Alkier et al., 2015; Liu and Xu, 2016), and the poverty alleviation effect of socioeconomic development (Ravallion, 2001; Ravallion and Chen, 2007; Montalvo and Ravallion, 2010; Barrett and Carter, 2013; Lü, 2015). These studies provide a useful reference for guiding the formulation of anti-poverty strategy and policy, thus effectively promoting China's poverty reduction. However, China still has a large rural poor population. We scarcely know how this population is distributed or the main causes of poverty. In other words, the status quo of poverty and the mechanisms through which poverty arises and perpetuates itself in China are poorly understood. Thus, it is important to understand the spatial characteristics of the current remaining rural poor population in China and to investigate the leading causes of poverty. Fully understanding the status quo and causes of poverty and establishing a scientific anti-poverty system are prerequisites for narrowing the rural-urban gap and eradicating poverty altogether (Zhang and Wan, 2006; Glauben et al., 2012). The main aim of this study was first to explore the status quo and driving mechanism of poverty in rural China, and then corresponding oriented-problem poverty reduction strategies were proposed. These findings will provide a scientific basis for further guiding the formulation and implementation of China's targeted poverty alleviation strategy in the future.

2. Data and methods

2.1. Data sources

This study makes full use of the poverty headcount ratio or poverty figures in China at different spatial scales. The poverty headcount ratio data for China's 14 contiguous poor areas with particular difficulties for 2006, 2012 and 2014 are collected from the Poverty Monitoring Report of Rural China (2000–2015), the Yearbook of China's Poverty Alleviation and Development (2010–2015) and the China Rural Statistical Yearbook (1985–2014). The provincial poverty data for 1978 and 2014 are derived from a previous study (Li et al., 2007) and the 2015 Yearbook of China's Poverty Alleviation and Development. The county rural poor population data are obtained from the State Council Leading Group Office of Poverty Alleviation and Development (http://cpadis.cpad.gov.cn/cpad/).

2.2. Spatial autocorrelation analysis

Exploratory spatial data analysis (ESDA) is a set of techniques aimed at describing and visualizing spatial distributions, detecting patterns of global and local spatial associations and suggesting spatial regimes or other forms of spatial heterogeneity (Anselin and Bera, 1998). These methods provide measures of global and local spatial autocorrelation.

2.2.1. Global spatial autocorrelations

The global spatial autocorrelation statistical method was used to measure the correlations among neighbouring observations and to find the patterns and levels of spatial clustering among neighbouring districts. Moran's I statistic is the most commonly applied measure of global spatial autocorrelation and is given as follows (Cliff and Ord, 1981):

$$I = \left(\frac{n}{S}\right)\left[\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i-\bar{x})\,(x_j-\bar{x})}{\sum_{i=1}^{n}\sum_{j=1}^{n}(x_i-\bar{x})^2}\right] \quad (1)$$

where n is the number of the county-level unit, x_i and x_j are the variable values in counties i and j, $\bar{x}$ is the average of x, and w_{ij} is the element of a binary spatial weights matrix W such that $w_{ij} = 1$ if counties i and j share a border and zero otherwise. S is a scaling factor equal to the sum of all of the elements of W.

Vales of I larger than the expected value E[I] = -1/(n-1) indicate positive spatial autocorrelation and vice versa. According to the Z value {Z(I) = [I-E(I)]/[VAR(I)1/2]}, a significance test can be performed for the null hypothesis H_0; if H_0 is true, $Z(I)$ follows the normal distribution. Assuming α is the significance level, values