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The relationship between tourism development and multidimensional poverty reduction: A decoupling analysis

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Abstract
Despite the importance of tourism for poverty relief, limited studies have investigated the relationship between tourism development and multidimensional poverty reduction. The present work investigated the tourism–poverty nexus from the perspective of multidimensional poverty (including poverty related to economic, education, health care and social welfare dimensions) on the basis of a decoupling analysis in 74 national poverty-stricken counties of Southwest China over the period of 2007–2016. The results reveal the following regularities. First, a positive synchronisation relationship exists between tourism development and multidimensional poverty reduction. Second, the relationship between tourism development and multidimensional poverty reduction is unstable, and the poverty reduction effects of tourism have been shrinking over the past decade. Third, with the development of tourism, the poverty reduction in economic, health care and the social welfare dimensions have made achievements in general, whereas the poverty reduction of education demonstrated an opposite trend. The outcomes and implications of this study provide essential insights to the tourism–poverty nexus debate and offer directions for policies to alleviate poverty through tourism development.

Keywords Tourism development · Multidimensional poverty reduction · Decoupling analysis · China

1 Introduction

As an important sector in developing countries, tourism has been regarded as an effective means to reduce poverty (Ashley & Roe, 2002; Croes & Vanegas, 2008; Croes & Rivera, 2017; Comerio & Strozzi, 2019). Due to the significance of tourism to developing countries, the United Nations World Tourism Organisation (UNWTO) launched the Sustainable Tourism–Eliminating Poverty (ST-EP) programme in 2002, and promoted sustainable tourism as a tool of poverty reduction (UNWTO, 2002). The strength of tourism in fighting

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against poverty has also been highlighted in the sustainable development goals proposed by the United Nations in 2015.

Tourism–poverty nexus has caused wide concern over the past decades, and most attention have been paid on the poverty alleviation effect of tourism from the economic perspective (Medina-Muñoz et al., 2016; Scheyvens & Hughes, 2019; Ashley & Roe, 2002; Spenceley & Meyer, 2012). However, the concept of poverty is multifaceted, and it encompasses more than the economic dimension of poverty (Sen, 1999; Gough & McGregor, 2007). Amartya Sen (1999), the Nobel Prize laureate in economics, proposed a multidimensional poverty concept and suggested that the indicators of poverty include not only income aspects, but also education level, health care and living standards.

Enlightened by Sen's compelling concept of capability deprivation, many researchers and policymakers have begun to concentrate on multidimensional poverty and employed economic, social, cultural and institutional instruments to resolve the issue of poverty reduction since the late 1990s. In 2010, the Oxford Poverty and Human Development Initiative developed the Multidimensional Poverty Index (MPI) for poverty measurement (UNDP, 2010a, b). In comparison with the traditional assessment of income, MPI can reflect multiple attributes of poverty in terms of education level, health care and living standards (Alkire & Foster, 2011; Alkire & Santos, 2014); thus, it has been adopted as an international measure of poverty for developing countries by the United Nations Development Program (UNDP) (Alkire et al., 2017).

The past two decades have witnessed the increasing application of multidimensional poverty measurement in the areas of sociology, development and management. Meanwhile, this concept also captured the attention of researchers in the tourism field (Zhao & Ritchie, 2007; Jiang et al., 2011; Llorca-Rodríguez et al., 2017; Njoya & Seetaram, 2018). The International Trade Centre (2009) emphasised that tourism has a positive effect on poverty alleviation in terms of income, as well as education, infrastructure, institutions and gender equality. Jiang et al. (2011) used indicators of the Human Development Index (HDI) to evaluate poverty, which includes three indexes of longevity, knowledge and living standard. Llorca-Rodríguez et al. (2017) asserted that social, cultural, political, and environmental dimensions are also important indicators of poverty. Ma et al. (2019a, b) evaluated the poverty alleviation effect of ecotourism based on MPI.

The aforementioned studies indicate the trend of a comprehensive cognition of poverty. Under this background, insight into the relation between tourism and poverty alleviation must be gleaned based on the multidimensional poverty. In light of this, the present study builds the index system of a multidimensional poverty reduction (MPR), which incorporates four aspects of economy, education, health care and social welfare and uses a decoupling analysis to investigate the links between tourism development and MPR in 74 national poverty-stricken counties of Southwest China from 2007 to 2016.

This study aims to make contributions to the existing literature in the following four ways. Firstly, this study fills the gap in the current literature by investigating the tourism-poverty nexus based on multidimensional poverty which include economic, education, health care and social welfare. To our knowledge, multidimensional poverty concept has rarely been used holistically in tourism poverty alleviation research, although the literature has emphasised that tourism has effect on the education (Manyara & Jones, 2007; Reeder & Brown, 2005; Snyman, 2012), health care (Ashley et al., 2001; Manwa & Manwa, 2014) and social welfare (Liu, 2013) in impoverished regions.

Secondly, different from previous research focusing on the relationship between poverty and tourism from the country/region level, this study investigates the tourism and MPR nexus from the county level. As the basic unit of China's administrative divisions, the

county has been the key target for poverty alleviation in the nation since 1986. In comparison with an examination using the administrative units of the country, province and city, the investigation of the poverty alleviation effect from the county level is more practical for the realisation of precision poverty alleviation (Wang et al., 2017a, b). Furthermore, different from past research that has investigated a single country/region, this study examines the tourism and MPR nexus using annual data from 74 national poor counties in China, which makes it possible to evaluate and compare the results across different areas.

Thirdly, *different from* studies that offer a snapshot of the link between tourism and poverty, this study covers a 10-year period from 2007 to 2016 and can provide a picture of how tourism-MPR nexus change over a long-term time.

Fourthly, this study introduces a decoupling analysis to examine the link between tourism and MPR. The concept of "decoupling" originated from the field of physics and can be used to accurately reflect the connection of two factors in different time intervals (Chen et al., 2016). This concept has been extensively used to examine the nexus of economic production and environment quality (Climent & Pardo, 2007; Mazzanti, 2008; Freitas & Kaneko, 2011), due to the advantages of reasonable criteria and uncomplicated calculation (Ma et al., 2019a, b).

The remainder of this paper is divided into four sections. Section 2 reviews poverty, tourism-poverty nexus and decoupling analysis. Section 3 conduct the decoupling analysis of tourism development and MPR. Section 4 analyses the temporal variation of the decoupling relationship between tourism development and MPR in the 74 national poverty counties during the period of 2007–2016. Section 5 contains the conclusions, implications, limitations and future work.

2 Literature review

2.1 Poverty

UNDP defined poverty in terms of "the denial of opportunities and choices most basic to human development–to lead a long, healthy, creative life and to enjoy a decent standard of living, freedom, dignity, selfesteem, and the respect of others." (UNDP, 1997). Poverty can be measured from an absolute or a relative way. Absolute poverty means the failure to meet basic subsistence or nutrition (UNESCO, 2019). Relative poverty refers a person whose living standards is below the poverty line in comparison with the rest of the population (Sabates, 2008).

Although poverty reduction has become an international concern, no consensus exists on the guidelines for measuring poverty. Medina-Muñoz et al. (2016) summarised four methods to measure poverty on the basis of related research on tourism and poverty between 1999 and July 2014. The first type of literature counted the numbers of residents, employees or households with incomes below the poverty line. The second strand of research used indexes, such as income, category of employment and occupation to differentiate poor residents or households. The third category of studies used the HDI or other poverty measurement indexes developed by the United Nations and other NGOs to assess poverty. The fourth classification of literature evaluated poverty on the basis of the perceptions of residents, practitioners, tourists and other stakeholders. Medina-Muñoz et al. (2016) highlighted that this perception-based method should be complimented by economic indicators and/or HDI due to the multidimensional nature of poverty.

Two regularities can be found through above analysis. Firstly, scholars have recognised the limitations of using a single income-based indicator for poverty measurement (Jamieson et al., 2004; Zhao & Ritchie, 2007; Scheyvens, 2012; Zeng & Ryan, 2012). Therefore, complicated indicators based on economic indexes have been applied in poverty evaluation to reduce poverty effectively. Secondly, multidimensional indexes, such as HDI and MPI, have been increasingly used in recent poverty research. HDI is composed of three indicators: life expectancy, education and per capita income. It was firstly used in the UNDP' Human Development Report in 1990. Jiang et al. (2011) adopted HDI in their research on tourism and poverty alleviation. Compared with HDI, MPI uses multidimensional indicators for the measurement of education, health and living standards. It has become an international measure of acute poverty in the Human Development Report of UNDP since 2010.

2.2 Tourism–poverty nexus

The tourism–poverty nexus has been extensively studied in the past decades. However, research results are inconsistent. Some scholars have suggested that tourism has a positive influence on the poor. Nevertheless, tourism development has also been criticised for its unfavourable influence on poverty reduction.

Many studies have used different indexes, empirical methods and datasets and found a positive link between tourism and poverty relief in rural areas of China (Bowden, 2005), Tanzania (Anderson, 2015), Zimbabwe (Mutana et al., 2013) and the protected regions in Costa Rica (Ferraro & Hanauer, 2014). Recently, Njoya and Seetaram (2018) confirmed that tourism has a favourable influence on poverty reduction in Kenya, especially in urban areas. Within the context of Central America, Vanegas et al. (2015) identified the linkage between tourism development and poverty reduction in Costa Rica and Nicaragua, and found that the contributions of tourism on poverty alleviation were higher than that of agricultural development.

Nonetheless, some research has failed to verify the positive influence of tourism on poverty relief. Mbaiwa (2005) concluded that tourism has no long lasting effect for reducing poverty in the Okavango region of Botswana. Muchapondwa and Stage (2013) denied that tourism has substantially benefits for the poor compared with other industries in Botswana, Namibia and South Africa. Antonakakis et al. (2019) challenged the role of tourism in poverty alleviation. Similar negative findings have also been found in East Africa (Blake, 2008), Ghana (Holden et al., 2011), Malawi (Gartner & Cukier, 2012), Madagascar (Rakotondramaro & Andriamasy, 2016) and the Dominican Republic (Oviedo-García et al., 2019).

In addition, some researchers have indicated that the tourism–poverty link is determined by contextual attributes, such as time period, tourism type and economic level. Sharpley and Naidoo (2010) found that tourism is not sustainable for poverty alleviation, despite the short-term economic benefits it may offer for the poor in Mauritius. Deller (2010) examined the effects of tourism and recreation on poverty in the United States, and suggested that the not every recreational activity reduces poverty rates. Kim et al. (2016) stipulated mixed outcomes in terms of the influence of tourism on poverty in 69 developing countries. The results indicated that only the least developed countries benefited from tourism poverty reduction. Winters et al. (2013) stated that the tourism–poverty nexus should be considered with the macro-environment, the specific institutions of the destination and the pattern of tourism.

The index of income has been used to measure poverty in most of the above discussions on tourism–poverty nexus. In recent years, with the increasing use of the MPI, the relationship between tourism and multidimensional poverty has also gained attention. Wang et al. (2017a, b) and Ma et al. (2019a, b) focused on MPI and constructed economic as well as social indicators to measure poverty. Wang et al. (2020) investigated the impacts of tourism on poverty alleviation from the perspective of multidimensional poverty. The above research provides useful implications for the investigation of tourism–MPR nexus in this research.

2.3 Decoupling analysis

The concept of decoupling was originated from the physics field. Carter (1966) first used this term to examine the nexus between economic growth and energy consumption. In 2002, the Organisation for Economic Cooperation and Development (OECD) investigated the relation between environment damage and economic growth based on decoupling analysis. Since then, decoupling analysis has been increasingly popular and widely used to test the relationship between resource and economic activity in the fields of environment, consumption, pollution, energy and transportation.

The decoupling analysis utilised by OECD (2002) has the weakness of unstable fluctuation of decoupling elasticity (Zhao et al., 2016). Tapio (2005) improved the approach and proposed the Tapio decoupling index. In comparison with the OECD method, the classification of the Tapio's decoupling analysis is more precise; it can more accurately illuminate the time change of the relationship between two indicators (Chen et al., 2016; Ma et al., 2019a, b) and has become a mainstream approach in decoupling analysis.

Owning to the advantages of decoupling analysis, Chen et al. (2016) investigated the influence of economic growth on rural poverty using the Tapio decoupling analysis. In the tourism field, Tang et al. (2014) studied the link of tourism and CO2 emission based on decoupling method. The decoupling relationship of tourism and multidimensional poverty has also been researched in Wuling Mountain, China (Wang et al., 2020). On the basis of the above studies, the present work uses Tapio's decoupling analysis to investigate the relationship between tourism development and MPR.

3 Methodology

3.1 Research area

Seventy-four national-level poverty-stricken counties in Southwest China were selected as study areas for three reasons. Firstly, the Southwest region of China (including Yunnan, Sichuan and Guizhou Province, Chongqing City and the Tibet Autonomous Region) is widely distributed with concentrated contiguous poverty areas due to natural environment and historical reasons. There are 173 national poor counties in the Southwest region and they account for nearly 30% of the total number (592) in China.

Secondly, the Southwest region is rich in natural and cultural resources and thus has favourable conditions for tourism development. With the increasing attention from the government and investors and the high participation of residents, tourism has become an important means to reduce poverty in the past decade.

Thirdly, given the importance of tourism to local development, and the availability of research data, 74 national poverty-stricken counties with complete statistics of tourism and poverty status from 2007 to 2016 were selected as research areas. In 2016, 72 out of the 74 poor counties had tourism receipts that accounted for over 5% of the GDP, thereby indicating the significance of the tourism industry for economic and social development in these impoverished counties.

3.2 Index system and data source

Owning to the wide recognition of the global MPI proposed by the UNDP, many scholars have used the dimensions and indicators of the global MPI to investigate multidimensional poverty at the national and provincial levels in China (Alkire & Fang, 2019; Shen & Peng, 2019). The MPR dimensions in this research is constructed on the basis of the global MPI, and the peculiarities of the poverty at the county level in China are also concerned. First, we use the dimensions of health and education in the MPI to evaluate MPR. These dimensions are consistent with the poverty reduction goals of "two no worries and three guarantees (The basic living needs of rural poor populations are met, and people have access to compulsory education, basic medical services, and housing)" set by the Chinese government. Second, living standard is not included in the dimensions of MPR due to the lack of statistics data. Third, in view of the importance of social welfare to poverty reduction in China (Yang et al., 2017), the dimension of social welfare has been added to the MPR evaluation index. Fourth, given the influence of income poverty on MPR in China, the traditional economic measure of poverty has been incorporated in the dimensions of MPR. In summary, the MPR index system used in this study includes four dimensions: economic, education, health, and social welfare.

As to the global MPI indicators, the UNDP assesses poverty at the individual level and conducts detailed surveys on ten indicators: nutrition, child mortality, years of schooling, school attendance, fuel, water, sanitation, housing, electricity and assets. However, in China, statistics on the ten global MPI indicators at the county level are limited. Therefore, the global MPI indicators are not used in this study. We select eight MPR indicators on the basis of China poverty literature and take the data availability into consideration. The references of the indicators are listed in Table 1. First, per capita GDP, per capita financial revenue and the per capita net income of rural residents denote the dimension of economic. Second, two indicators (that is, the number of students enrolled in middle schools per 10,000 persons and the number of students enrolled in primary schools per 10,000 persons) measure the poverty reduction of the education. Then, the number of hospital beds per 10,000 persons reflects the poverty reduction of health care. Finally, two indicators (that is, the number of social welfare institutions per 10,000 persons and number of beds in social welfare institutions per 10,000 persons) are used to account for poverty reduction of social welfare.

We use the number of tourists and tourism receipts to measure tourism development according to tourism literature (Table 2). The annual data of the two indicators of tourism development were obtained from the Statistical Yearbook (2008–2017) of Yunnan, Sichuan, Guizhou and Chongqing, the National Economic and Social Development Statistics Bulletin and the government work report of the 74 counties over the period of 2008–2017. The data on the poverty reduction of the economic (in consumer price index 2010), education, health care and social welfare were collected from the China County Statistical Yearbook (2008–2017).

Table 1 Dimensions and indicators of MPR

Dimension	Indicator	Description	Reference
Poverty reduction of the economic	Per capita GDP	GDP divided by the total population at the end of the year	Llorca-Rodríguez et al. (2017)
	Per capita financial revenue	Financial revenue divided by the total population at the end of the year	Yuan et al. (2014)
	Per capita net income of rural residents	Net income divided by the rural population at the end of the year	Ding (2014); Yuan et al. (2014)
Poverty reduction of education	Number of students enrolled in middle schools per 10,000 persons	Percentage of students enrolled in middle schools	Battiston et al. (2013)
	Number of students enrolled in primary schools per 10,000 persons	Percentage of students enrolled in primary schools	Battiston et al. (2013)
Poverty reduction of health care	Number of hospital beds per 10,000 persons	Number of hospital beds divided by the total population at the end of the year	Wang et al. (2017c)
Poverty reduction of social welfare	Number of social welfare institutions per 10,000 persons	Number of social welfare institutions divided by the total population at the end of the year	Yang et al. (2017)
	Number of beds in social welfare institutions per 10,000 persons	Number of beds in social welfare institutions divided by the total population at the end of the year	Yang et al. (2017)

Table 2 Indicators of tourism development

	Indicator	Description	Reference
Tourism development	Number of tourists	Domestic and inbound tourist arrivals	Riddington et al. (2010); Llorca-Rodríguez et al. (2017)
	Tourism receipts	Domestic and inbound tourism receipts	Sharpley (2002); Oh (2005); Kim et al. (2016)

3.3 Determination of indicator weight

The indicator weights of tourism development and MPR were calculated using the weighted entropy approach. This approach, which was proposed by Guiasu (1971), is the information measurement that provided both by the objective probabilities and objective or subjective weights. Owning to the context-dependent advantage of weighted entropy, and concerning the differences of MPR and tourism development between the 74 national poverty-stricken counties of Southwest China, the indicator weights of MPR and tourism development were determined using weighted entropy.

The calculation process is as follows:

Step 1: Normalisation indicator values.

$$X'_{ij} = \frac{X_{ij} - Min(X_{ij})}{Max(X_{ij}) - Min(X_{ij})} \tag{1}$$

where X_{ij} and X'_{ij} are the initial values and standardized values of the indicators, respectively, m is the number of studied counties, and n is the number of indicators.

Step 2: Calculating the proportion P_{ij} of the county i under the indicator j.

$$P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^{m} X'_{ij}} \tag{2}$$

Step 3: Calculating the weighted entropy.

$$E_j = -k \sum_{i=1}^{m} \omega_{ij} P_{ij} \ln P_{ij} \tag{3}$$

where E_j is the weighted entropy of the indicator. k equals to the $1/\ln(m)$. Then, X'_{ij} was divided into four levels: 0–0.25, 0.25–0.5, 0.5–0.75 and 0.75–1, and ω_{ij} is the ratio of the number of poor counties in each level to the total number of poor counties.

Step 4: Calculating the indicator weight W_j.

$$W_j = (1 - E_j) / \left(n - \sum_{j=1}^{n} E_j \right) \tag{4}$$

3.4 Decoupling analysis of tourism development and MPR

According to Tapio (2005), the decoupling index between tourism development and MPR can be calculated as follows:

$$D_{Y-1}^{Y} = \frac{\Delta M_{Y-1}^{Y}}{\Delta T_{Y-1}^{Y}} \tag{5}$$

where D_{Y-1}^{Y} is the decoupling index between tourism development and MPR from year $Y-1$ to year Y and ΔM_{Y-1}^{Y} and ΔT_{Y-1}^{Y} are the change percentages of MPR and tourism development from year $Y-1$ to year Y, respectively; these values can be calculated as follows:

$$\Delta M_{Y-1}^{Y} = \frac{M^{Y} - M^{Y-1}}{M^{Y-1}} \tag{6}$$

$$\Delta T_{Y-1}^{Y} = \frac{T^{Y} - T^{Y-1}}{T^{Y-1}} \tag{7}$$

Next, on the basis of Tapio's decoupling index and elasticity values (Tapio, 2005), the decoupling status between tourism development and MPR can be divided into eight categories: expansive negative decoupling, expansive coupling, weak decoupling, strong decoupling, strong negative decoupling, weak negative decoupling, recessive coupling, and recessive decoupling. Similarly, the decoupling index between tourism development and the four dimensions of poverty reduction can also be calculated and classified.

4 Results

4.1 Overall level of tourism development and MPR

Firstly, the tourism development in the 74 counties has demonstrated a rising trend from 2007 to 2016 (Fig. 1). The growth rates of the number of tourists and tourism receipts have been accelerating especially since 2013 (Fig. 1), which shows the increasing significance of tourism development in these poverty-stricken areas.

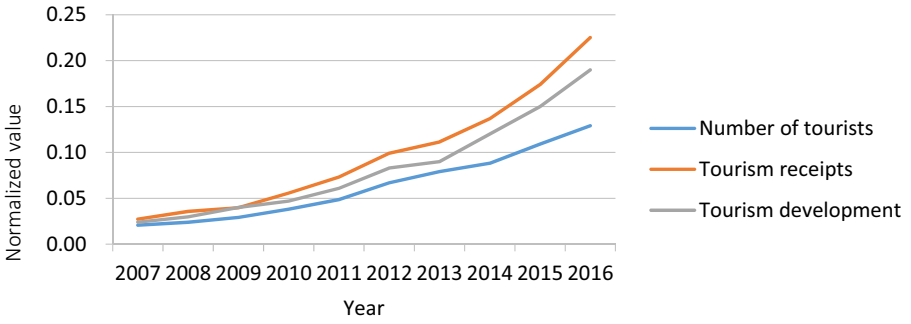

Fig. 1 Values of tourism development, number of tourists and tourism receipts

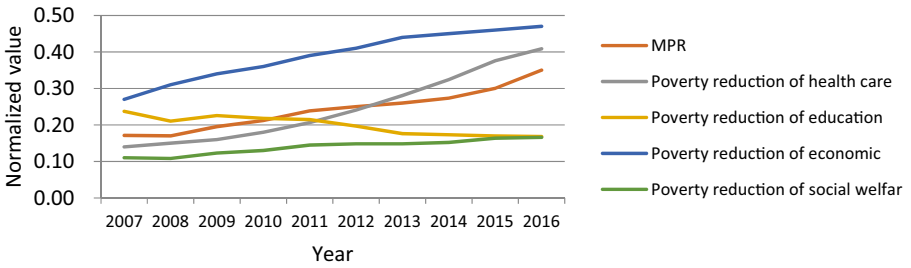

Fig. 2 Values of MPR and the four dimensions of poverty reduction

Table 3 Number of poor counties with tourism receipts accounting for more than 5% of the GDP

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number	37	37	49	55	59	60	67	70	72	72
Percentage (%)	52.11	52.86	66.22	75.34	80.82	81.08	90.54	94.59	97.3	97.3

Secondly, the time variation of MPR in the 74 counties has shown a gradual increase since 2007 (Fig. 2). However, the poverty reduction indicators of economic, educational, health care and social welfare have indicated different trends and rates. Among the four indicators, the poverty reduction of the economic has made the most significant progress in the past decade, followed by that of the health care. By contrast, the poverty reduction of social welfare has been rising at a very slow rate, and the growth of this indicator has been stagnant since 2012. In addition, the poverty reduction of education has shown a completely different tendency from the other three indicators in the past decade. Generally, the overall value of this indicator has been declining since 2010.

Thirdly, Fig. 2 shows the difference between MPR and economic poverty reduction. It can be seen that since 2007, economic poverty is better than multidimensional poverty. Although the MPR has gradually improved due to the improvement of economic poverty, the social dimension of education and poverty reduction in 74 poor counties is very slow, which has affected the MPR to a certain extent. Therefore, the multidimensional analysis of poverty is more comprehensive and objective than the study of poverty from a single economic perspective.

4.2 Decoupling analysis of tourism development and MPR

With regard to the classification of the decoupling relationship between tourism development and MPR in the 74 counties, the types of decoupling relationship are diverse in 2007, among which weak decoupling (27) accounts for the highest proportion, followed by strong decoupling (16), strong negative decoupling (15) and expansive negative decoupling (9). In 2016, weak decoupling (57) accounted for the majority among the various categories of decoupling relationships, followed by strong decoupling (7). The time variation of the decoupling relationship between tourism development and MPR clearly indicates that the efforts of MPR has achieved remarkable progress in the 74 poverty-stricken counties over the past decade, with the increasing proportion of tourism receipts in GDP (Table 3). In

other words, a positive synchronicity between tourism development and MPR has been observed from 2007 to 2016.

The type of decoupling relationship between tourism development and MPR has been dominated by weak decoupling, and the proportion of weak decoupling has been increasing over time, from 27 (36.49%) in 2007 to 57 (77.03%) in 2016. This tendency indicates that with the development of tourism, the poverty condition of the 74 impoverished counties has been gradually alleviated, although the degree of improvement is lower than the speed of tourism development.

The weak decoupling relationship between tourism development and MPR can be explained by tourism multiplier effect and trickle-down thesis. First, the proportion of tourism revenue in GDP in the 74 impoverished counties has been increasing in recent years (Table 3). In 2016, there were 72 counties (97.3%) where tourism revenue accounted for more than 5% of GDP. As can be seen, tourism has become the pillar industry in these impoverished counties. Due to the obvious tourism multiplier effect (Mitchell & Ashley, 2010), tourism has driven the development of related industries in poor counties, including restaurants, catering, entertainment, shopping, transportation, post and telecommunications, and makes significant contribution to the local economic growth. Second, tourism industry generates tourism tax and fiscal revenues in poor counties. Through distribution and redistribution of tourism incomes, tourism revenues has been invested in the fields of social welfare, medical care, health, education, transportation, telecommunications in poor counties, and enable the alleviation of multidimensional poverty in these impoverished counties (Zhao & Ritchie, 2007). Third, tourism industry is labor-intensive and provides valuable job opportunities for less skilled poor individuals, and thus benefits the poor in areas with high level of poverty (Scheyvens, 2007; Croes & Vanegas, 2008). In additional to employment chances, the benefit created from tourism development also trickle down to the poor through other channels such as social welfare, health services and family networks (Zeng et al., 2005). Therefore, tourism is regarded as an effective means to lift local poor out of multidimensional poverty in the 74 impoverished counties.

4.3 Decoupling analysis of tourism development and poverty reduction of economic

The types of decoupling relationship between tourism development and poverty reduction of the economic in the 74 poverty-stricken counties mainly consists of weak decoupling, expansive negative decoupling and expansive coupling. This finding indicates a high degree of synchronisation between tourism development and poverty reduction of the economic.

For the time change of the decoupling relationship between tourism development and poverty reduction of the economic, weak decoupling has been increasing, whereas the proportions of expansive negative decoupling and strong decoupling have declined since 2007. Poor counties developed tourism rapidly in the past decade, and economic poverty was improved simultaneously. Further analysis reveals that the poverty reduction of the economic was developing at a rate no lower than tourism development in many poverty-stricken counties before 2011. However, the speed of tourism development has surpassed the poverty alleviation of the economic in more than 40 counties after 2011. In 2016, such counties reached 58 (78.38%). This outcome demonstrates that the high synchronisation relationship between economic poverty improvement and tourism development has been weakening from the long-term trend.

Then, we compared the decoupling relationship between tourism development and economic poverty and the decoupling relationship between tourism development and MPR, and found that there are certain differences in the research results. In the decoupling relationship between tourism development and economic poverty, expansive negative decoupling, expansive coupling, and weak decoupling account for a relatively high proportion. It demonstrates that since 2007, tourism development and economic poverty improvement in most poor counties (87.54%) have maintained simultaneous growth. In contrast, the proportion of simultaneous improvements in tourism development and MPR is lower. This difference illustrates the importance and necessity of studying the decoupling relationship between tourism and poverty from a multidimensional perspective.

4.4 Decoupling analysis of tourism development and poverty reduction of education

Two main types of decoupling relationship exist between tourism development and poverty reduction of education, namely, strong and weak decoupling. Between 2007 and 2012, the number of poverty-stricken counties with strong decoupling type increased from 35 (47.3%) in 2007 to 55 (74.32%) in 2012; this number decreased slightly since 2013 and declined to 44 (59.46%) in 2016. By contrast, the number of poor counties belonging to the weak decoupling type showed a slow upward tendency from 2013.

The temporal variation of the decoupling relationship between tourism development and poverty reduction of education shows that although the tourism development of the 74 poverty-stricken counties has been continuously accelerating, the poverty reduction of education is unsatisfactory. In other words, such poverty reduction has been seriously lagging behind tourism development. However, this unsynchronised relationship between the two variables has improved slightly, with the slow increase of weak decoupling type since 2013.

4.5 Decoupling analysis of tourism development and poverty reduction of health care

With respect to the proportion of decoupling relation between tourism development and poverty reduction of health care, the 74 poverty-stricken counties classified as having weak decoupling, expansive negative decoupling and expansive decoupling gradually increased from 51.35 to 82.43% during 2007–2011. From 2012 to 2016, the number of poor counties belonging to these three types of decoupling relationships exceeded 70% in most years from 2012.

On the basis of the preceding analysis, most impoverished counties show a high degree of consistency between tourism development and poverty reduction of health care. With regard to the level of improvement, the speed of tourism development exceeds the rate of poverty reduction of health care in most of the 74 poor counties.

4.6 Decoupling analysis of tourism development and poverty reduction of social welfare

The decoupling relationship between tourism development and poverty reduction of the social welfare in the 74 poverty-stricken counties mainly includes three types: weak

decoupling, strong decoupling and expansion negative decoupling. Although the proportions of various types of decoupling relationship fluctuated during 2007–2016, the number of poverty-stricken counties belonging to the types of weak decoupling, expansive negative decoupling and expansive decoupling exceeded that of the strong decoupling type in the past decade.

The preceding analysis shows that the relationship between tourism development and poverty reduction of social welfare has been polarised in the 74 poverty-stricken counties. On the one hand, a simultaneous development occurred between tourism and poverty reduction of social welfare in two-thirds of the 74 poor counties. On the other hand, although tourism in approximately 30% of the poor counties developed, the poverty condition of social welfare worsened.

5 Conclusions and implications

5.1 Conclusions

With the increasing attention on multidimensional poverty from scholars and policymakers, rethinking the tourism–poverty nexus from the perspective of multidimensional poverty (including poverty related to economic, education, health care and social welfare) is crucial. By using a decoupling analysis, this paper investigated the nexus between tourism development and MPA. The findings of this paper contribute to the tourism–poverty relationship debate and provide essential policy insights to alleviate poverty through tourism industry in developing countries.

Firstly, our findings show that a synchronisation relationship exists between tourism development and MPR. In other words, both tourism development and MPR in the poverty-stricken counties have shown a positive growth trend since 2007. Such findings are consistent with the results obtained by Bowden (2005), Mitchell and Ashley (2006), Mutana et al. (2013), Ferraro and Hanauer (2014), Vanegas et al. (2015), Anderson (2015), Croes and Vanegas, (2008), Njoya and Seetaram (2018) and Folarin and Adeniyi (2020). These above studies also found the positive linkage between tourism development and poverty reduction in Kenya, Costa Rica, Nicaragua, Zimbabwe and other developing countries. However, it should be noted that the relationship between tourism development and MPR identified using a decoupling analysis is synchronous, not causal. Further analysis is needed to determine whether there is a causal relationship between the two variables.

Secondly, the relationship between tourism development and MPR has become increasingly weakly decoupled. In other words, the poverty alleviation effect of tourism has been shrinking over the past decade. The reason may be that the level of economic development has affected the MPR effects of tourism (Kim et al., 2016; Croes, 2014). Kim et al. (2016) suggested the moderating effect of economic level in alleviating poverty through tourism in developing countries. Croes (2014) found that the poverty reduction effect of tourism decreases as the country's income per capita increases. Therefore, developing countries and regions should pay attention to the short-term and long-term effects of poverty alleviation when implementing tourism poverty alleviation policies.

Thirdly, obvious differences occur among the four dimensions of tourism development and MPR in terms of the decoupling relationship. In general, the poverty reduction of the economic has made the most obvious achievements, followed by that of the health care and social welfare. Nevertheless, the poverty reduction of education has demonstrated the

opposite trend. Tourism development has not achieved the improvement of local basic and secondary education conditions. This finding differs from the discovery of Reeder and Brown (2005) and Snyman (2012), which supported the positive influence of tourism development on education condition. This difference reflects that in different developing countries, the trickle-down effects of tourism in the fields of economic, health care, social welfare and education are different. Thus, developing countries should make reasonable distribution of tourism income based on poverty problems that need to be solved urgently.

5.2 Implications

This work has the following essential implications for policy formulation. Firstly, given the complex and multidimensional nature of poverty, policymakers should realize that the benefit of tourism to impoverished countries is beyond the scope of economic development. In other words, in addition to the direct benefit of tourism's contribution on GDP, the indirect influence from tourism development to education, health care and social welfare should also be considered. Accordingly, a better understanding of tourism' contribution on poverty reduction may be gained in poor countries with a high dependence on tourism.

Secondly, the weights determined by the context-dependent weighted entropy indicate that the economic dimension has the largest weight for MPR, followed by the poverty reduction of education, social welfare and health care. Weight sequences reveal that economic poverty reduction has been the most important concern for poor counties. By contrast, poverty alleviation of the other dimensions of public facilities, especially in the health care dimension, is not as significant as that for the economic dimension. These findings can shed light on the efforts made for the poverty alleviation in developing countries.

Thirdly, the decoupling relationship between tourism development and MPR has changed over time, and the speed of MPR has been lagging behind that of tourism development. The level of economic development may be an important factor affecting the relationship between these two variables. Therefore, with the gradual improvement of poverty in developing countries, how to use tourism to achieve long-term poverty reduction is worthy of special attention.

5.3 Limitations and future work

There are several limitations to this study. Firstly, we only include limited indexes to denote the economic, education, health care and social welfare dimensions of MPR due to data unavailability; other indicators that may measure MPR, such as human capital development (Fowowe & Shuaibu, 2014; Folarin & Adeniyi, 2020), transport (Medina-Muñoz et al., 2016), sanitation facilities and safe drinking water (Sen, 1999), are suggested to be used in future study of tourism–MPR nexus.

Secondly, despite the advantages of Tapio's decoupling analysis, it has two limitations. On the one hand, the theoretical foundation of the Tapio's eight categories used in this research needs to be strengthened. On the other hand, the decoupling status may be affected by the research time duration (Xue, 2012). We calculated the decoupling relationship between tourism development and MPR on year-on-year basis. In the future, with the availability of long time series data, it is necessary to conduct a comparative study on the decoupling relationship of tourism-MPR based on the long-term research period.

Thirdly, although this paper investigates the tourism-MPR nexus based on decoupling analysis, the causal relationship between the two factors and the degree of mutual influence

has not been studied. In the future, the causality test can be conducted in a more in-depth study of the relationship between the two factors.

Fourthly, this work focuses on the research areas of southwest counties in China, and the conclusions might not be generalisable to other areas. In the future, the investigation of tourism-MPR nexus in other developing countries needs to be further conducted.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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