

Article

Cultural heritage recognition and rural sustainability in China: Community capacity and tourism workforce participation as pathways to SDGs 8 and 11

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Abstract: Cultural heritage recognition is often expected to support rural development, but the mechanisms linking recognition with sustainability remain uncertain. This study examines the association between a tourism-resource-weighted cultural heritage recognition exposure index and rural sustainability in China, with tourism-supporting community capacity and tourism workforce participation evaluated as distinct pathways. The UNESCO Representative List of the Intangible Cultural Heritage of Humanity and the China Tourism Resilience Dataset were combined to form a balanced panel of 31 provincial-level regions from 2011 to 2020 (310 province-year observations). Composite indices were constructed from z-standardized indicators. Associations were estimated using pooled ordinary least squares with province-clustered standard errors, a 2000-resample cluster-bootstrap pathway decomposition, variance inflation factors, an unweighted heritage-count specification, municipality exclusion, alternative index scaling, and two-way fixed effects. The adjusted recognition-exposure-sustainability association was positive but not statistically significant. Recognition exposure was positively associated with tourism-supporting community capacity, and the indirect association through this pathway was significant (0.330; 95 % CI [0.114, 0.499]). The workforce-participation indirect association was small and nonsignificant (0.029; 95 % CI [-0.009, 0.079]), although workforce participation was strongly aligned with the SDG 8 composite. Because the exposure measure and outcomes are analytical provincial proxies with related components, the findings are interpreted as associations rather than causal mediation or direct measures of cultural vitality. Heritage policies should combine recognition with resident-serving infrastructure, community participation, local-enterprise support, employment-quality safeguards, and transparent monitoring of benefit distribution.

Keywords: intangible cultural heritage; recognition exposure; tourism resilience; workforce participation; community capacity; sustainable communities; cross-provincial analysis; China

1. Introduction

The Chinese government has implemented an extremely broad system for safeguarding intangible cultural heritage, and a sizable fraction of the safeguarded heritage is located in rural areas [1,2]. On the other hand, the heritage safeguarding efforts are becoming increasingly perceived not merely as cultural objectives but also as tools to stimulate sustainable economic development, since safeguarded cultural heritage may underpin tourism, investment, and livelihood improvement activities [1,2]. In parallel, there is an increasing emphasis on sustainable rural development through the Rural Revitalization Strategy and evaluation through indicators of economic, social, and environmental well-being [3,4]. This way, cultural heritage

safeguarding, tourism activities, and community development merge at the point of rural regions. The relevant frame of reference provided by the UN Sustainable Development Goals consists of SDG 8 (decent work and economic growth) and SDG 11 (sustainable communities and cultural heritage safeguarding) [5].

A wealth of literature exists both on heritage conservation and on tourism. However, these areas are often analysed individually instead of an integrated approach that considers how the heritage conservation can make a contribution to rural sustainability. A recent provincial study also suggests that ICCH and tourism development can follow a two-way process of reciprocal and coordinated relationships rather than a straightforward relationship [6]. In this regard, heritage tourism can be considered as a local development system that involves cultural resources, infrastructures, community engagement and employment opportunities in a temporal interaction [7,8]. Resilience in the context of tourism is also related to the capacity of tourism destinations and regional tourism systems to absorb shocks, adapt to changes and preserve the primary economic and social functions [9,10]. However, there is limited literature on the links between heritage recognition, community development, employment participation and the wider sustainability outcomes of rural areas [11,12].

International or national recognition can raise the profile and symbolic status of a cultural practice but did not necessarily lead to the sustainable enhancement of rural livelihoods. Its developmental value is related to the ability of local actors to transform cultural visibility into accessible services, market connections, organizational capacity, infrastructure, and participation that is for the benefit of residents and not just external investors. This separation is significant as a heritage site can have strong community capacity, seasonal jobs, unequal benefits, or a high reliance on tourism demand. Hence, the amount of identified heritage features cannot, however, be seen as an indicator of the sustainability of a rural area.

The proposed framework contains three analytically distinct stages. The first is cultural heritage recognition exposure, represented by the stock and diversity of formally recognized intangible heritage combined with provincial tourism-resource endowments. The second consists of two transmission pathways: Tourism-supporting community capacity and tourism workforce participation. Community capacity refers to the infrastructure and service conditions that enable heritage-related activity, while workforce participation describes the extent to which tourism and heritage-related economic activity involves the provincial labor force. The third stage comprises the Rural Sustainability Index and the SDG 8- and SDG 11-aligned composites. This staged framework does not assume that recognition is a sustainability outcome in itself; it examines whether recognition exposure is associated with sustainability through provincial capacity and workforce conditions.

Existing research establishes important links among cultural heritage, tourism, local livelihoods, resilience, and rural development. Nevertheless, three gaps remain. First, heritage recognition is commonly examined as a cultural or tourism asset, while less attention is given to the local capacities through which formal recognition may be converted into sustainable resident benefits. Second, community development capacity and employment-based engagement are frequently discussed as desirable outcomes but are rarely assessed simultaneously as theoretically distinct pathways. Third, provincial studies seldom align these pathways explicitly with SDG 8 and SDG

11 outcomes. These gaps require longitudinal data that connect heritage recognition, community capacity, workforce participation, and sustainability within a consistent province-year framework [13–15].

Accordingly, the principal research question is: Among Chinese provinces during 2011–2020, how is cultural heritage recognition exposure associated with rural sustainability, and to what extent are the observed associations transmitted through tourism-supporting community capacity and tourism workforce participation?

The study has four objectives: (1) to estimate the adjusted association between cultural heritage recognition exposure and rural sustainability; (2) to determine whether recognition exposure is associated with tourism-supporting community capacity and tourism workforce participation; (3) to assess the indirect associations operating through these two pathways; and (4) to examine whether tourism-supporting community capacity is more closely aligned with SDG 11 and tourism workforce participation with SDG 8.

2. Theoretical background and hypothesis development

2.1. Heritage recognition, cultural identity, and transmission

Consistent with the 2003 UNESCO Convention, intangible cultural heritage encompasses living practices, representations, knowledge, skills, meanings, and forms of transmission that communities recognize as part of their cultural identity and continually recreate in relation to their social and cultural environment [16]. Formal recognition can increase visibility, legitimacy, institutional attention, and opportunities for safeguarding, but recognition is not equivalent to cultural vitality, intergenerational transmission, community ownership, or effective safeguarding [2,6,8]. In this study, the heritage construct is therefore interpreted as a tourism-resource-weighted cultural heritage recognition exposure index. It is not a monetary valuation of culture and does not measure safeguarding quality or transmission directly.

2.2. Rural sustainability in the Chinese context

Rural sustainability refers to the capacity of rural communities and regional systems to maintain viable livelihoods, accessible services, social continuity, cultural vitality, adaptive resilience, and responsible resource use over time. In China, the concept is closely connected with rural revitalization but is not limited to economic growth; it also includes service accessibility, structural transformation, resilience to shocks, and the ability of residents to participate in and benefit from development [3,4,12]. In this article, regional level refers to provincial-level administrative units rather than formally identified spatial clusters. Population density is a relevant contextual factor because it can influence service accessibility, infrastructure provision, labor-market concentration, and tourism demand. A harmonized annual continuous density series was unavailable in the merged panel. Excluding the four centrally administered municipalities therefore serves only as a limited sensitivity check for exceptionally dense and urbanized units and does not identify an independent population-density coefficient.

2.3. Tourism-supporting community capacity and tourism workforce participation

Community development is conceptually broader than tourism infrastructure. Tourism infrastructure primarily comprises visitor-facing facilities and transport or service systems that support tourism activity, whereas community development also includes resident-oriented public services, local organizations, participation in decision making, social capital, enterprise capacity, and benefit-sharing arrangements. The broader interpretation is consistent with the Community Capitals Framework, which treats local development as an interaction among cultural, human, social, political, financial, built, and natural resources [17]. The sustainable-livelihoods perspective similarly emphasizes access to combinations of human, social, natural, physical, and financial resources rather than treating income or employment quantity as sufficient evidence of sustainability [18]. Because the available provincial indicators emphasize travel agencies, hotels, road density, and tertiary-sector structure, the mediator used here is interpreted narrowly as tourism-supporting community capacity. Tourism workforce participation is defined as tourism-sector labor participation and economic involvement, not the psychological construct of work engagement measured through vigor, dedication, and absorption [11,15].

2.4. Hypothesis development

The proposed framework treats cultural heritage recognition exposure as an antecedent whose association with sustainability may be transmitted through two analytically distinct pathways. Tourism-supporting community capacity represents the infrastructure and service conditions through which cultural visibility may be converted into broader resident benefits. Tourism workforce participation represents the extent to which tourism-related activity involves the provincial workforce. The hypotheses corresponding to **Figure 1** are:

H1: Cultural heritage recognition exposure is positively associated with rural sustainability.

H2: Cultural heritage recognition exposure is positively associated with tourism-supporting community capacity.

H3: Cultural heritage recognition exposure is positively associated with tourism workforce participation.

H4a: Tourism-supporting community capacity is positively associated with rural sustainability after recognition exposure and the controls are considered.

H4b: Tourism-supporting community capacity carries a positive indirect association between recognition exposure and rural sustainability.

H5a: Tourism workforce participation is positively associated with rural sustainability after recognition exposure and the controls are considered.

H5b: Tourism workforce participation carries a positive indirect association between recognition exposure and rural sustainability.

H6a: Tourism-supporting community capacity is positively associated with the SDG 11-aligned composite.

H6b: Tourism workforce participation is positively associated with the SDG 8-aligned composite.

3. Materials and methods

3.1. Research design

This paper employs a secondary-data analysis using authentic and publicly accessible datasets rather than artificial or hypothetical observations. The unit of analysis is the province-year. The term regional refers to the 31 provincial-level administrative units observed annually from 2011 to 2020, producing a balanced panel of 310 observations; it does not imply that formal spatial clusters have been estimated. The models link a tourism-resource-weighted cultural heritage recognition exposure index with tourism resilience, tourism-supporting community capacity, tourism workforce participation, and sustainability indicators. Fiscal scale, per-urban-resident consumption, education, and tourism-resource density are included as observed controls. A harmonized annual population-density series was not available in the merged panel; therefore, the study does not report an unsupported continuous density coefficient. Exclusion of the four centrally administered municipalities is used as a limited sensitivity check for whether the principal pattern is driven by exceptionally dense and highly urbanized administrative units.

3.2. Data sources

Use of two public datasets. The first is the UNESCO Representative List of the Intangible Cultural Heritage of Humanity (dataset ich001) available at data.unesco.org. Inscribed elements, inscribed year, safeguarding category, and country are entered in the list, which is filtered to China with 45 entries. The principal analysis integrates the national recognition stock and the national category diversity of the elements in the panel with the provincial shares of tourism resources to create a provincial tourism-resource-weighted recognition exposure index, because the source list does not contain a harmonized field on province-year location for each element used in the panel. This index is not a valuation of cultural identity or transmission, nor is it a proxy measure of either cultural community ownership or safeguarding of quality. Robustness is an unweighted cumulative heritage count. The second source is the China Tourism Resilience Dataset from Mendeley Data (identifier 9cbhzt2bg2), which is a panel data from province-year level covering tourism resilience, tourism economy, employment, infrastructure and regional sustainability indicators. Provides the dependent, pathway, control and SDG aligned variables. The role of each source is indicated in **Table 1**.

Table 1. Dataset sources and variable alignment with the manuscript title.

Dataset	Public source	Type / context	Role and title alignment
UNESCO ICH List (ich001)	data.unesco.org/explorer/dataset/ich001	Cross-sectional listing; filtered to China (45 elements)	Tourism-resource-weighted cultural heritage recognition exposure — independent variable.
China Tourism Resilience Dataset	data.mendeley.com/datasets/9cbhzt2bg2	Province-year panel, 2011–2020; 31 regions	Tourism resilience, tourism-supporting community capacity, tourism workforce participation, and SDG-aligned composites.

Both datasets are publicly available and non-synthetic. All variables are measured from the two sources above.

3.3. Variable construction

Composite indices are built from z-standardized indicators so that components share a common scale before averaging. **Table 2** defines every variable and its measurement strategy. The Rural Sustainability Index is an analytical provincial composite of tourism resilience, tourism-supporting community capacity, tertiary-sector structure, and innovation-and-transformation resilience. Cultural heritage recognition exposure combines cumulative Chinese UNESCO inscriptions and category diversity with provincial tourism-resource shares and is entered as a log intensity term. Tourism-supporting community capacity represents a narrow infrastructure-and-service dimension, while tourism workforce participation captures tourism-sector labor participation and workforce involvement.

Table 2. Variable definitions and measurement strategy.

Variable	Role	Definition and measurement
Rural Sustainability Index	Dependent	Mean of standardized tourism resilience, tourism-supporting community capacity, tertiary-sector share, and the innovation-and-transformation resilience sub-dimension. Because community-capacity components also appear in the pathway analysis, the RSI is treated as an analytical composite and exact pathway magnitudes are interpreted cautiously.
Cultural heritage recognition exposure	Independent	Log intensity term combining cumulative Chinese UNESCO ICH stock and category diversity with annual provincial tourism-resource shares. It is an analytical exposure proxy, not a monetary valuation or direct measure of identity, transmission, or safeguarding quality. An unweighted cumulative count is used in robustness checks.
Tourism-supporting community capacity	Mediator	Mean of standardized travel-agency count, star-rated hotels, road density, and tertiary-sector share; represents tourism-supporting infrastructure and service capacity rather than comprehensive community development.
Tourism workforce participation	Mediator	Mean of standardized tourism employment, tourism employment intensity, and tourism-industry share; represents workforce participation rather than psychological work engagement.
SDG 8-aligned composite	Outcome	Mean of standardized domestic tourism revenue, tourism employment, employment intensity, and the resistance-and-recovery sub-dimension; an analytical SDG 8-aligned composite rather than an official UN score.
SDG 11-aligned composite	Outcome	Mean of standardized recognition exposure, tourism-supporting community capacity, and the adaptation-and-adjustment sub-dimension; an analytical SDG 11-aligned composite rather than an official UN score.
Controls	Control	Log fiscal expenditure, log per-urban-resident consumption, log university students per 10,000 population, and tourism-resource density.

The standardized components are used for two reasons. First, it helps to avoid the dominance of indicators with large monetary or population units as indicators that are expressed as proportions or index scores. Second, it allows the resulting composites to be read as relative positions of the provinces within the observed sample. A positive standardized value means the province-year is above the average (sample mean) for the associated construct; a negative value means the province-year is below the average (sample mean) for the associated construct. These resulting composites should not be assumed to represent absolute thresholds of sustainability or official scores given by the United Nations SDG. They are analytical indices that have been created to represent corresponding dimensions in a uniform way over the provinces and years.

Construct boundaries were defined conceptually before index formation. Tourism infrastructure refers to visitor-facing facilities and accessibility, whereas

comprehensive community development would additionally include resident services, organizations, participation, social capital, enterprise capacity, and benefit sharing. Because the available indicators are travel-agency count, star-rated hotels, road density, and tertiary-sector share, the measured pathway is consistently named tourism-supporting community capacity. Tourism workforce participation is restricted to labor-market participation and economic involvement in tourism and does not represent psychological work engagement. The recognition-exposure index likewise measures analytical exposure to formal recognition in a tourism-resource context rather than cultural identity or safeguarding effectiveness.

The pathway models are interpreted as exploratory associational decompositions of provincial composite indicators rather than as tests among fully independent latent constructs. Some measures contain conceptually related structural, service, employment, or heritage components; this shared-component structure can increase correlations and coefficient magnitudes. The manuscript therefore reports the high correlations transparently, avoids causal mediation language, and emphasizes confidence-interval direction and robustness across alternative scaling, an unweighted heritage count, municipality exclusion, and two-way fixed effects. These checks improve interpretive transparency but do not eliminate the measurement limitation, which is stated explicitly in the Discussion.

3.4. Empirical strategy

The empirical strategy tests the hypotheses in a sequence of related models. Model 1 estimates the total adjusted association between cultural heritage recognition exposure and rural sustainability (H1). Models 2 and 3 estimate the associations between recognition exposure and the two proposed pathways (H2 and H3). Model 4 includes recognition exposure, tourism-supporting community capacity, and tourism workforce participation simultaneously to evaluate the pathway-to-outcome associations and the remaining direct association (H4a and H5a). Models 5a and 5b assess the SDG-aligned relationships (H6a and H6b). The primary estimator is pooled ordinary least squares with province-clustered standard errors and the full control vector. Clustered standard errors allow for heteroskedasticity and serial dependence among repeated observations from the same province.

Pooled OLS is used as the principal estimator because the cumulative recognition-exposure measure changes slowly over time and contains substantial cross-provincial variation. Province fixed effects absorb time-invariant provincial characteristics and identify the recognition coefficient mainly from within-province changes; for a slow-moving cumulative measure, that specification is conservative. Two-way province and year fixed effects are therefore reported as a robustness check rather than as the sole estimator. The substantive question is whether province-years with higher recognition exposure also display higher tourism-supporting community capacity, tourism workforce participation, and rural sustainability after the observed controls are considered. All coefficients are interpreted as conditional associations, not causal effects.

The bootstrap analysis is an associational pathway decomposition rather than evidence of a causal mechanism. Path a is the association between recognition

exposure and a proposed pathway variable. Path *b* is the association between that pathway and rural sustainability conditional on recognition exposure and the controls. Their product, $akbk$, is the estimated indirect association. The total association is denoted *c*, while *c*-prime is the recognition-exposure coefficient after the pathway variables are included. Provinces, rather than individual province-years, are resampled in 2000 bootstrap replications so that the panel structure is retained. An indirect association is classified as statistically supported when its 95 % percentile confidence interval excludes zero. H4b and H5b are assessed only from these bootstrap intervals; the term pathway decomposition is used to avoid implying causal mediation between fully independent constructs.

Four sensitivity checks assess whether the community-capacity pattern depends on a single measurement or estimator choice: An unweighted cumulative heritage count, a min-max version of the Rural Sustainability Index, exclusion of the four centrally administered municipalities, and a specification with province and year fixed effects. The municipality exclusion provides a limited check that the result is not driven only by China's densest and most urbanized provincial-level units, but it does not estimate a continuous population-density effect. The fixed-effects estimate is treated as a conservative robustness check. All approaches preserve the non-causal interpretation.

The Rural Sustainability Index for province *i* in year *t* is the mean of its standardized components, as in Equation (1).

$$RSI_{it} = (zRES + zCD + zTER + zINN)/4 \quad (1)$$

The baseline association is estimated as in Equation (2), where *X* is heritage intensity, *W* is the control vector, and the error term is clustered by province.

$$RSI_{it} = (\beta_0 + \beta_1 X_{it} + \gamma W_{it} + \varepsilon_{it}) \quad (2)$$

For pathway variable *k*, the path-*a* association is estimated in Equation (3), where *M* denotes tourism-supporting community capacity or tourism workforce participation.

$$M_{kit} = (\alpha_0 + \alpha_k X_{it} + \delta W_{it} + \mu_{it}) \quad (3)$$

The full outcome model is shown in Equation (4). The *b* coefficients represent pathway-to-outcome associations, and *c*-prime is the remaining direct recognition-exposure association after both pathway variables are included.

$$RSI_{it} = (\theta_0 + c'X_{it} + b1CC_{it} + b2WP_{it} + \eta W_{it} + v_{it}) \quad (4)$$

Figure 1 summarizes the hypothesized relationships among cultural heritage recognition exposure, tourism-supporting community capacity, tourism workforce participation, SDG 8, SDG 11, and rural sustainability. H1 represents the total recognition-sustainability association; H2–H3 represent the path-*a* relationships; H4a and H5a represent pathway-to-outcome relationships; H4b and H5b represent the indirect associations; and H6a–H6b represent the SDG-aligned relationships.

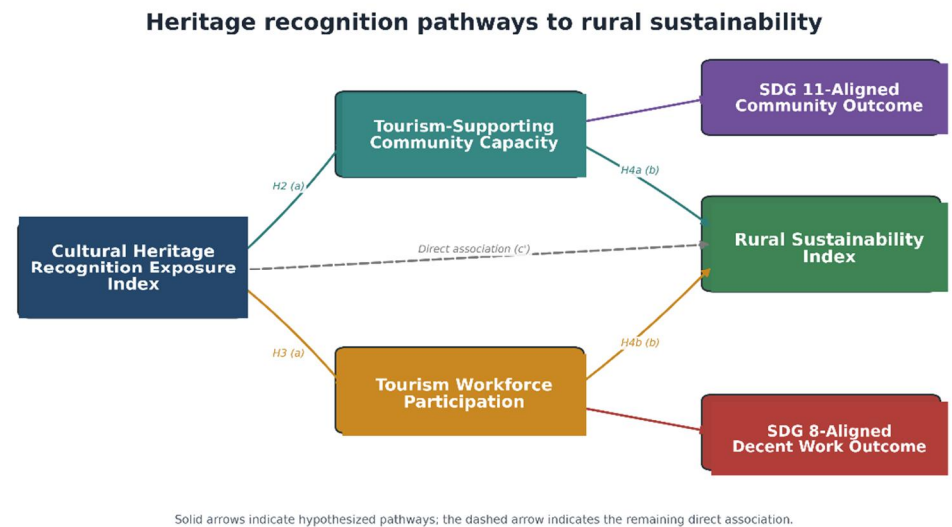


Figure 1. Conceptual framework and hypotheses linking cultural heritage recognition exposure, tourism-supporting community capacity, tourism workforce participation, SDG 8, SDG 11, and rural sustainability.

3.5. Data processing

The data-processing sequence is shown in **Figure 2**. First, UNESCO records were filtered to China and aggregated by inscription year to form cumulative stock and category-diversity measures. Second, tourism indicators were cleaned, converted to numeric format, and harmonized across the resilience sub-dimensions. Third, the cumulative national recognition stock and diversity measures were combined with provincial tourism-resource shares to construct a province-year recognition-exposure proxy, which was then merged with the tourism-resilience panel. Finally, all index components were standardized and combined according to **Table 2**. The weighted measure represents comparative exposure to formal recognition in a tourism-resource context; it is not a monetary valuation and does not directly measure identity, transmission, community ownership, or safeguarding quality. The unweighted cumulative count is retained as a robustness specification.

3.6. Ethical statement

This study used publicly available secondary datasets and did not involve direct interaction with human participants. Formal ethical approval was therefore not required.

4. Results

4.1. Descriptive profile

Table 3 provides descriptive statistics for the 310 province-year observations. Composite variables were standardized, so their sample means are close to zero. Recognition exposure and the SDG-aligned composites show substantial cross-provincial variation. These values do not establish spatial clustering or an independent population-density effect. In this article, regional variation means differences among provincial-level administrative units. A harmonized annual density variable was

unavailable; however, the robustness analysis excludes Beijing, Shanghai, Tianjin, and Chongqing as a limited check that the principal community-capacity pattern is not driven only by exceptionally dense and highly urbanized units. This check cannot be interpreted as an estimate of the effect of population density itself.

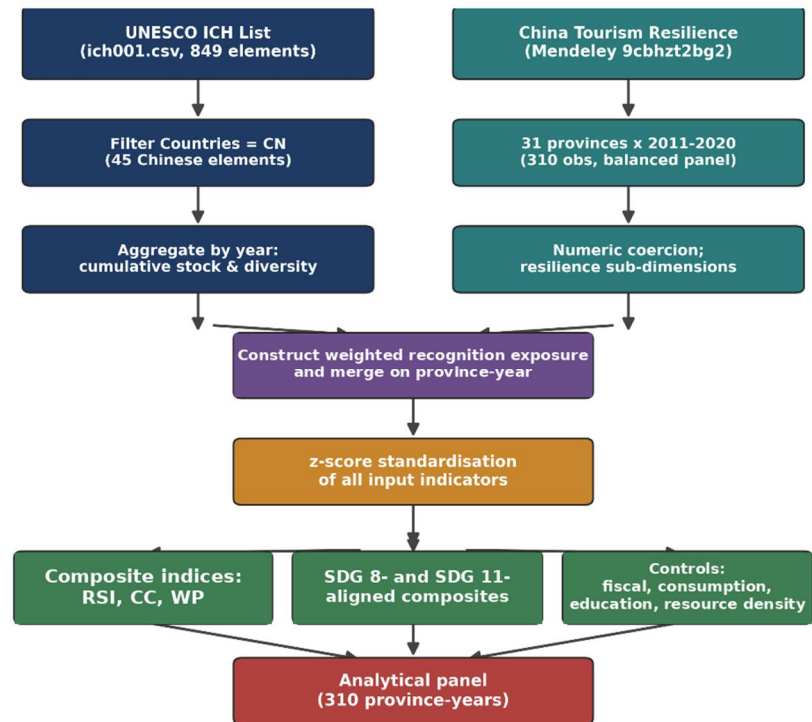


Figure 2. Data-processing and recognition-exposure-index construction workflow.

Table 3. Descriptive statistics ($N = 310$ province-years).

Variable	Mean	SD	Min	Median	Max
Rural Sustainability Index	0.000	0.873	-1.308	-0.209	3.333
Cultural heritage recognition exposure	2.984	1.104	0.000	3.020	5.385
Tourism-supporting community capacity	0.000	0.724	-1.389	-0.154	2.119
Tourism workforce participation	0.000	0.639	-1.098	-0.139	3.609
SDG 8-aligned composite	0.000	0.775	-1.229	-0.187	2.705
SDG 11-aligned composite	0.000	0.873	-1.416	-0.176	2.149
Tourism resilience	0.227	0.113	0.062	0.197	0.619
Log fiscal expenditure	8.339	0.614	6.561	8.404	9.766
Log per-urban-resident consumption	9.917	0.298	9.250	9.923	10.785
Log education	5.248	0.283	4.394	5.255	6.026
Tourism resource density	0.003	0.004	0.000	0.002	0.021

Figure 3 presents the cross-provincial ranking of mean cultural heritage recognition exposure during 2011–2020. The figure describes variation among provinces and is not interpreted as evidence of spatial autocorrelation or geographic clustering.

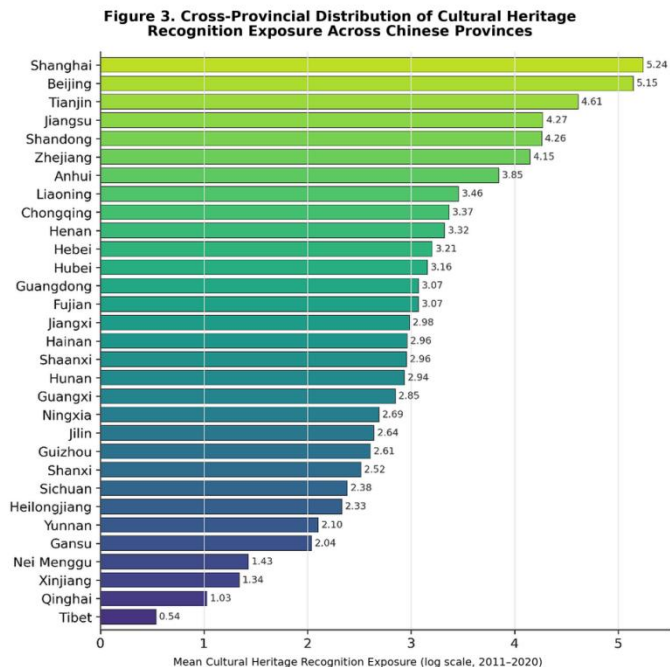


Figure 3. Cross-provincial distribution of mean cultural heritage recognition exposure, 2011–2020.

4.2. Correlation and preliminary evidence

Table 4 provides descriptive, preliminary evidence about the direction and relative strength of the bivariate relationships; it is not used independently to accept or reject hypotheses and does not establish causality. Cultural heritage recognition exposure is positively correlated with rural sustainability ($r = 0.70$), tourism-supporting community capacity ($r = 0.77$), tourism workforce participation ($r = 0.28$), SDG 8 ($r = 0.58$), and SDG 11 ($r = 0.83$). Community capacity has the strongest bivariate relationship with the Rural Sustainability Index ($r = 0.87$), whereas workforce participation is most strongly correlated with SDG 8 ($r = 0.81$).

Table 4. Correlation matrix of core constructs.

	RSI	RE	CC	WP	SDG 8	SDG 11
RSI	1.00					
RE	0.70	1.00				
CC	0.87	0.77	1.00			
WP	0.45	0.28	0.48	1.00		
SDG 8	0.71	0.58	0.83	0.81	1.00	
SDG 11	0.87	0.83	0.97	0.47	0.83	1.00

Note: RSI = Rural Sustainability Index; RE = cultural heritage recognition exposure; CC = tourism-supporting community capacity; WP = tourism workforce participation.

The pattern is consistent with the proposed distinction between a tourism-supporting community-capacity pathway and a workforce-participation pathway. However, correlations involving community capacity, SDG 11, and the Rural Sustainability Index are high because the analytical composites contain conceptually related structural and service dimensions. **Table 4** is therefore interpreted as a descriptive map of related provincial indicators. **Table 5** provides conditional regression evidence and **Table 6** provides cluster-bootstrap indirect-association intervals.

The high correlations do not imply that the constructs are interchangeable, nor do they demonstrate causal pathways. Variance inflation factors and alternative specifications are used to evaluate coefficient stability, but the exact magnitudes should still be interpreted cautiously because of shared-component structure and the provincial level of measurement. The SDG 8- and SDG 11-aligned composites are analytical indicators rather than official United Nations scores.

4.3. Regression and hypothesis-test results

Table 5 tests the direct and component-path hypotheses. In Model 1, the adjusted recognition-exposure-sustainability coefficient is positive but not statistically significant ($\beta = 0.095$, $p > 0.10$); therefore, H1 is not supported. Model 2 shows a positive association between recognition exposure and tourism-supporting community capacity ($\beta = 0.373$, $p < 0.01$), supporting H2. Model 3 reports a positive but nonsignificant association with tourism workforce participation ($\beta = 0.180$, $p > 0.10$), so H3 is not supported. In Model 4, tourism-supporting community capacity is positively associated with rural sustainability ($\beta = 0.861$, $p < 0.01$), supporting H4a, whereas tourism workforce participation is not significant ($\beta = 0.046$, $p > 0.10$), so H5a is not supported. The recognition-exposure coefficient becomes negative after the strongly related community-capacity variable is entered ($\beta = -0.235$, $p < 0.01$). This sign change is consistent with suppression or inconsistent decomposition and should not be interpreted as evidence that heritage recognition harms sustainability.

Table 5. Regression results (pooled OLS, province-clustered standard errors in parentheses).

Variable	M1: RSI	M2: CC	M3: WP	M4: RSI full
Cultural heritage recognition exposure	0.095 (0.137)	0.373*** (0.103)	0.180 (0.131)	-0.235*** (0.089)
Tourism-supporting community capacity				0.861*** (0.139)
Tourism workforce participation				0.046 (0.050)
Log fiscal expenditure	0.174* (0.097)	0.495*** (0.094)	0.181 (0.180)	-0.261*** (0.075)
Log per-urban-resident consumption	1.255*** (0.268)	0.432** (0.220)	0.859*** (0.323)	0.843*** (0.171)
Log education	-0.392 (0.239)	-0.731*** (0.208)	-0.463* (0.273)	0.259* (0.157)
Tourism resource density	109.790** (53.422)	20.981 (37.223)	-41.159 (46.444)	93.615*** (23.707)
Observations	310	310	310	310
R-squared	0.844	0.836	0.233	0.933

Figure 4 visualizes the bivariate relationship between cultural heritage recognition exposure and rural sustainability, with point shading representing tourism-supporting community capacity.

RSI = Rural Sustainability Index; CC = tourism-supporting community capacity; WP = tourism workforce participation. Coefficients are conditional associations. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

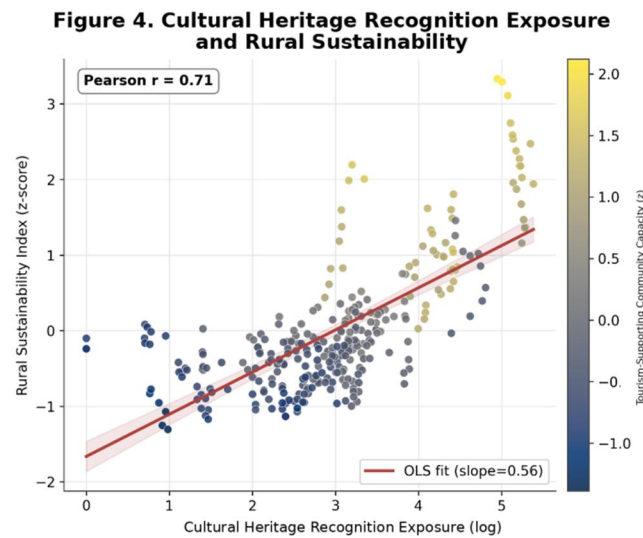


Figure 4. Bivariate relationship between cultural heritage recognition exposure and rural sustainability (point shading indicates tourism-supporting community capacity).

4.4. Tourism-supporting community-capacity pathway

Table 6 evaluates the indirect-association hypotheses using province-clustered bootstrap confidence intervals. The indirect association through tourism-supporting community capacity is positive and statistically supported ($a \times b = 0.330$; 95 % CI [0.114, 0.499]), so H4b is supported within the reported composite-index specification. Because the total adjusted association in Model 1 is nonsignificant, the direct coefficient changes sign in Model 4, and the constructs contain conceptually related components, this pattern is described as an associational pathway decomposition with possible suppression rather than proof of a causal mechanism. **Figure 5** displays the path-a, path-b, direct, and indirect estimates for transparent comparison.

Table 6. Associational pathway decomposition using a province-clustered bootstrap with 2000 resamples.

Mediator	Path a	Path b	Indirect	95 % CI	Status
Tourism-supporting community capacity (SDG 11-aligned)	0.373	0.883	0.330	[0.11, 0.50]	Significant
Tourism workforce participation (SDG 8-aligned)	0.180	0.160	0.029	[-0.01, 0.08]	Not sig.

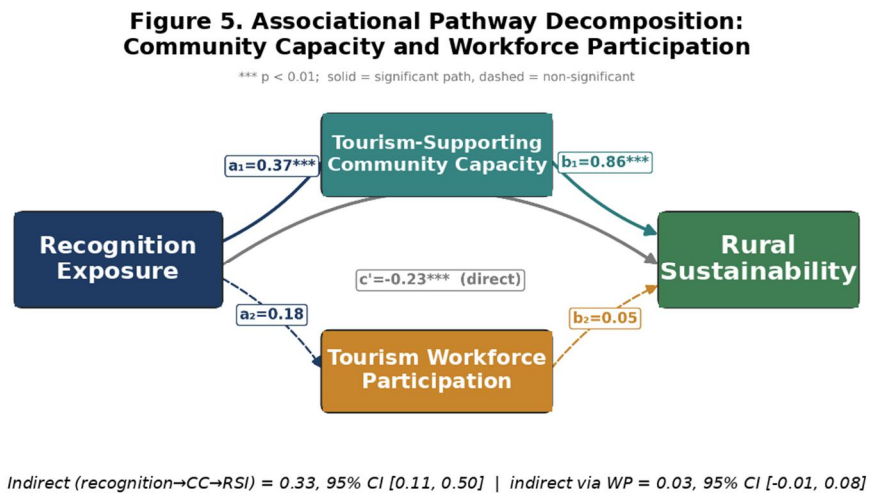


Figure 5. Estimated direct and indirect associations through tourism-supporting community capacity and tourism workforce participation.

4.5. Tourism workforce participation pathway

Tourism workforce participation does not significantly carry the recognition-exposure-sustainability association (indirect association = 0.029; 95 % CI [-0.009, 0.079]), so H5b is not supported. Its correlation with the SDG 8-aligned composite is strong in **Table 4** ($r = 0.81$), and its conditional coefficient in Model 5a is also positive and significant ($\beta = 0.691$, $p < 0.01$). These results support H6b at the SDG 8 level but do not establish a significant workforce-participation pathway to the composite Rural Sustainability Index. Workforce participation therefore appears more closely aligned with the economic and decent-work dimension than with the multidimensional sustainability composite [5,19,20].

The pathway results also clarify why the recognition-exposure coefficient changes after the pathway variables are introduced. Recognition exposure is positively associated with tourism-supporting community capacity, and community capacity is strongly associated with the Rural Sustainability Index. Conditioning on this highly related composite changes the direct coefficient from a small positive estimate to a negative estimate. This pattern should not be read as evidence that recognition is detrimental to sustainability. It may reflect suppression, shared variance among composite indicators, and unmeasured province characteristics. The supported conclusion is limited to a positive indirect association in the reported specification.

From a substantive point of view, the positive indirect association supports a capacity-conversion interpretation. Public interest, visitors, investment, and organizational activity associated with recognition become developmentally relevant when they coincide with local roads, accommodation, services, market access, and institutional cooperation. The measured community-capacity construct is therefore a tourism-supporting infrastructure-and-service setting rather than a comprehensive measure of social capital or participatory governance. This interpretation is consistent with research on community support, tourism-system development, and resident participation in sustainable rural tourism [12,21,22–24].

The nonsignificant indirect association through tourism workforce participation is nevertheless informative as a boundary condition. Tourism labor participation is

strongly associated with SDG 8, but it does not carry the broader recognition-exposure-sustainability association as consistently as tourism-supporting community capacity. Tourism jobs may be more sensitive to seasonality, demand shifts, and external shocks, and the available indicators measure participation quantity and intensity rather than job quality, security, wages, worker voice, or social protection.

Therefore, an increase in tourism jobs does not necessarily correspond to an equivalent improvement in multidimensional rural sustainability. The findings support differentiated policy frameworks: Tourism-supporting community capacity is the more consistent pathway in the reported provincial composites, while employment policies are needed to strengthen the SDG 8 contribution. Employment stability, local access, skills development, and sustainable-livelihood contributions should be considered alongside job numbers when evaluating heritage-tourism programs.

Table 7 consolidates the hypothesis decisions. It distinguishes the unsupported adjusted total association (H1) from the supported community-capacity component paths (H2, H4a, and H4b), the unsupported employment-mediated pathway (H3, H5a, and H5b), and the supported SDG-specific alignments (H6a and H6b).

Table 7. Summary of hypothesis-test results.

Hypothesis	Statistical evidence	Decision	Interpretation
H1	Model 1: $\beta = 0.095, p > 0.10$	Not supported	No significant adjusted total heritage-sustainability association.
H2	Model 2: $\beta = 0.373, p < 0.01$	Supported	Recognition exposure is positively associated with tourism-supporting community capacity.
H3	Model 3: $\beta = 0.180, p > 0.10$	Not supported	No significant association with tourism workforce participation.
H4a	Model 4: $\beta = 0.861, p < 0.01$	Supported	Tourism-supporting community capacity is positively associated with rural sustainability.
H4b	Indirect = 0.330; 95% CI [0.114, 0.499]	Supported	The community-capacity indirect association excludes zero.
H5a	Model 4: $\beta = 0.046, p > 0.10$	Not supported	Tourism workforce participation is not significant in the full RSI model.
H5b	Indirect = 0.029; 95% CI [-0.009, 0.079]	Not supported	The workforce indirect interval includes zero.
H6a	Model 5b: CD $\beta = 0.762, p < 0.01$	Supported	Tourism-supporting community capacity is positively aligned with SDG 11.
H6b	Model 5a: EE $\beta = 0.691, p < 0.01$	Supported	Tourism workforce participation is positively aligned with SDG 8.

4.6. Robustness checks

Four sensitivity checks were used to assess whether the community-capacity pattern depended on a single measurement or estimator choice. First, a log cumulative heritage count without tourism-resource weighting was used as an alternative recognition measure. Second, a min-max version of the Rural Sustainability Index was estimated. Third, the four centrally administered municipalities were excluded. Fourth, a two-way fixed-effects specification controlled for time-invariant provincial characteristics and common annual shocks. The municipality-exclusion result provides limited evidence that the community-capacity pattern is not solely driven by the densest and most urbanized provincial-level units; it does not identify a continuous

population-density effect. **Table 8** reports the SDG-aligned models and the fixed-effects check.

Table 8. SDG-oriented models (Models 5a and 5b) and two-way fixed-effects robustness check.

Variable	M5a: SDG 8	M5b: SDG 11	Two-way FE
Recognition exposure	0.282***	0.116***	-0.065
Tourism-supporting community capacity		0.762***	1.002***
Tourism workforce participation	0.691***		0.011
Controls	Yes	Yes	Yes
Fixed effects	None	None	Province + Year
Observations	310	310	310
R-squared	0.916	0.979	0.879

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. CC = tourism-supporting community capacity; WP = tourism workforce participation. The fixed-effects column is a conservative check; the community-capacity pathway remains significant.

The robustness checks increase confidence in the direction of the tourism-supporting community-capacity association without removing the limitations of observational analysis. Persistence under alternative index scaling suggests that the result is not solely an artifact of z-standardization. The unweighted heritage-count specification indicates that the pathway is not wholly dependent on tourism-resource weighting, and excluding the municipalities reduces the possibility that exceptionally dense administrative units disproportionately drive the pattern. The two-way fixed-effects model further accounts for stable provincial differences and annual shocks shared across China.

The continued significance of tourism-supporting community capacity in the conservative fixed-effects model is informative because it is identified from changes within provinces after common annual shocks are removed. The weaker recognition-exposure coefficient under fixed effects is expected because cumulative recognition changes slowly. This difference reinforces the need to interpret the pooled coefficient as a cross-provincial association rather than as a causal effect of receiving a new inscription.

All variance inflation factors remain below the conventional severe-multicollinearity threshold of 10, with a maximum of 7.48 for recognition exposure. This diagnostic does not eliminate the conceptual overlap among provincial composite indicators. Accordingly, the consistency of the community-capacity direction across the main, alternative, municipality-exclusion, and fixed-effects models is more informative than the exact magnitude of any single coefficient.

4.7. Cross-provincial and temporal distribution

Figure 6 visualizes the correlation structure reported in **Table 4**. **Figure 7a** shows the cumulative national heritage-recognition stock from 2011 to 2020, while **Figure 7b** shows annual mean standardized values for rural sustainability, tourism-

supporting community capacity, and tourism workforce participation. The 2020 decline in workforce participation is consistent with the tourism-employment shock associated with the COVID-19 period [9,25]. These temporal plots are descriptive and are not interpreted as causal trend tests or evidence of spatial clustering.

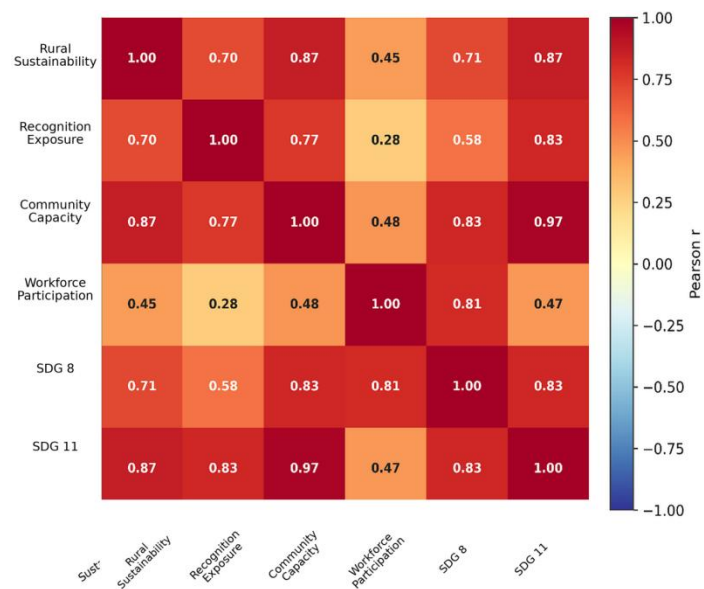


Figure 6. Correlation matrix of core constructs displayed as a heatmap.

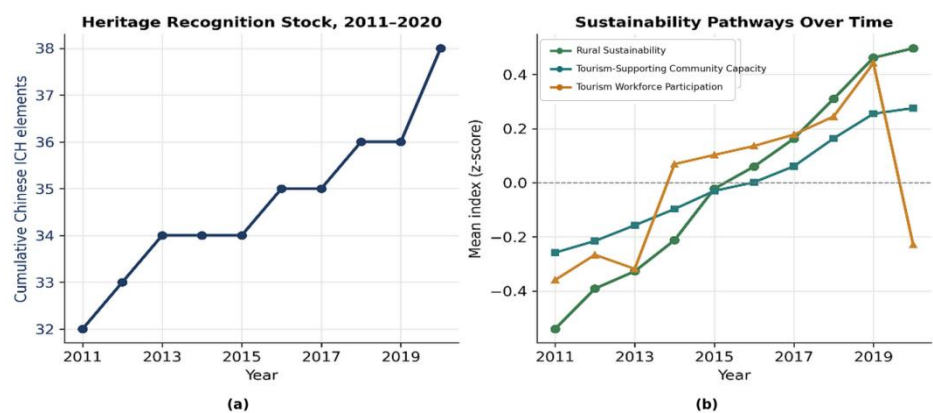


Figure 7. Temporal trends in heritage recognition and rural-sustainability pathways, 2011–2020: **(a)** cumulative Chinese UNESCO intangible cultural heritage recognition stock; **(b)** annual mean standardized values of rural sustainability, tourism-supporting community capacity, and tourism workforce participation.

5. Discussion

5.1. Interpretation of the principal findings

The results support a qualified recognition-exposure and community-capacity interpretation of rural sustainability. The adjusted total association between cultural heritage recognition exposure and rural sustainability is not statistically significant, but recognition exposure is positively associated with tourism-supporting community capacity, and the indirect association through that pathway excludes zero. By contrast, the tourism workforce participation pathway to the composite Rural Sustainability

Index is not supported. The findings do not show that recognition automatically produces sustainability; they indicate that higher recognition exposure corresponds with sustainability primarily where tourism-supporting community capacity is also present. Because the provincial composites contain related components, this conclusion concerns pathway alignment and not causal mediation among fully independent constructs.

5.2. Theoretical implications and novelty

The main innovation is that formal heritage recognition exposure, two unique conversion pathways, a compound sustainability outcome, and SDG-aligned outcomes have been incorporated into the framework of a single longitudinal province-year. The framework does not consider heritage designation as a adequate intervention in development, but rather as recognition and the local capacity required to convert the visibility of the heritage into resident providing benefit. It also isolates community capacity to support tourism and participation in tourism workforce and demonstrates that both avenues play different empirical roles as the former has stronger links with the multidimensional sustainability outcome and SDG 11, and the latter with SDG 8. The study methodologically integrates two publicly available datasets, province-clustered inference, bootstrap indirect-association decomposition, an unweighted recognition-count check, municipality exclusion and fixed-effects sensitivity analysis [7,10,11,15].

The results build on heritage-led development literature, in defining the existence of community capacity to support tourism as a conversion condition, as opposed to believing that symbolic recognition is directly economically or socially valuable. The key heritage variable is directly considered to be a weighted tourism-resource recognition exposure proxy rather than culture per se or a financial value. Recognition can generate visibility and institutional attention, but these resources to become developmentally relevant require mobilization by local services, accessibility, organizations, and enterprise networks. This interpretation promotes coupling-coordination and institutional perspectives of sustainable heritage tourism as well as bringing out the proxy nature of the measurement explicit [7,10,11,22].

5.3. Practical implications for heritage and tourism management

To heritage managers and tourism organizations, the findings imply that designation must be preceded by a local capacity assessment. The following are practical priorities such as visitor and transport management, resident-oriented services, supporting local enterprises, cultural-transmission activities, skills development, resident consultation, and a means of monitoring who benefits the tourism. Assessment of workforce initiatives must be based not on the number of jobs created but on stability, the ability to access them by the local population, chances to advance, training, and against seasonal or external shocks. Such actions reinforce SDG 11 and SDG 8 trajectories without the assumption that exposure of recognition or even the level of employment is enough [5,11,26].

The practical contribution is thus a series of choices as opposed to a statement that designation is inevitably resulting in sustainability: Acknowledge and protect

heritage; evaluate local institutional and service capacity; recognize infrastructure and involvement cleavage; create locally obtainable and decent jobs; and oversee resilience, cultural continuity and distribution of gains. In cases where community capacity is weak, surging visitor demand without governance and service preparations can only increase pressure and no long-term benefits will be achieved.

5.4. Public policy and cross-provincial implications

The implications of SDG 11 results are that policy of cultural heritage and sustainable-community should be carried out as a coordinated policy as opposed to being applied as individual domains. The protection plans must bridge resident involvement, civic services, cultural transference, long-term upkeep, and open-ended sharing of advantages. The presentation, commercialization and allocation of heritage-tourism benefits should involve community organizations to ensure that the cultural practices do not lose their connection with communities in which they are upheld. This type of coordination minimizes chances of having investment build up tourism facilities without enriching the local capacity.

The SDG 8 results also indicate that the quantity of jobs is an impartial policy goal. The SDG 8-aligned composite has a strongly associated TWFP tourism workforce participation, which is not statistically significantly related to the Rural Sustainability Index. Evaluating policies must therefore consider job security, job training, social protection, clear remuneration, the safety in the workplace, employee voice and development of low value seasonal workers to management, entrepreneurship and specialized cultural services [26–28].

There is also the need to have policy differentiation within regions at the provincial level. The degree of heritage-recognition, access to the market, infrastructure, fiscal ability, governance structures, and susceptibility to tourism shocks differ among provinces. The concept of regional differentiation used in this paper thus refers to interprovincial dispersion, instead of officially determined spatial clusters. More marginalised rural regions might need government funding, human capital creation, collaborative business structures and their resident-based services prior to livelihood being backed by recognition. More developed destinations might need more intense measures against congestion, over-commercialization, degradation of culture and environmental pressure [29].

5.5. Transferability and boundary conditions

The framework proposed can be generalized outside of China, but the mechanisms are not universal. The most likely similar pathways are where formal acknowledgment enhances visibility of the masses, subnational authorities have an opportunity to invest in local services, communities have significant involvement in protection and cultural or tourism sectors offer a sustainable livelihood. The weaker the relationships can be where a governance is very central, the local fiscal capacity is weak, the community rights are curtailed, the external firms are taking benefits, or the familiar practices are not much related to the tourism markets. The framework should then be applied comparatively to treat it as a set of testable relationships and apply

locally valid measures of safeguarding quality, community capacity, workforce inclusion, rurality and institutional autonomy.

5.6. Limitations and future research

A number of limitations characterize the confines of conclusions. The provincial indicators display general temporal and cross-provincial trends but fail to identify those benefiting at the community level, whether the resident population participates in decision making, the viability of cultural practices, and also the distribution of benefits in employment. The assessment in future must thus be a combination of provincial indicators and site, project, household, interview, and survey evidence with respect to participation, cultural transmission, social capital, employment quality, and share of benefits [30–32].

A multilevel design would as well aid in separating the relationship of recognition and ex ante tourism benefits and local governance capacity. County-, village-, household-, and heritage-project data might be connected to the province-level panel in order to find out whether the trends found here are mirrored in the local counties and whether the benefits related to heritage are shared equally among residents. Before claims can be made concerning the concentration, dispersion or spatial dependence, it would be necessary to conduct a spatial analysis with explicit geographic weights.

Special care is needed when it comes to five measurement limitations. To begin with, the workforce (participation) in tourism is quantified by tourism employment, employment intensity and tourism-industry share, which does not depict psychological labour involvement. Second, the heritage variable is an exposure index of cultural heritage recognition (weighted by tourism-related resources); it is not monetary valuation, but it is not a direct measure of identity, its intergenerational transmission, community ownership, or quality protection. The cumulative number of cases, without weighting, eliminates, although it does not eliminate, this restriction. Third, community capacity that supports tourism primarily absorbs travel agencies, hotels, road density and tertiary-sector structure as opposed to the entire institutional, participatory, and social-capital aspect of community development. Fourth, related indicators show up across the analytical composites, giving high correlations and indirect-association magnitudes may in part be the manifestation of shared-component structure; the findings are thus understood to be the alignment of pathways of exploration but not of causation. Fifth, an annual population-density harmonized variable was not available. The omission of the four municipalities gives a partial sensitivity test, yet the research is incapable of separating an autonomous continuous density effect. These restrictions support the associative, provincial-level explanation of the findings.

6. Conclusion

This paper tackled four goals on the cultural heritage recognition exposure, rural sustainability, two suggested paths, and how they align with the SDGs in China. To start with, adjusted total recognition-exposure-sustainability association was positive but not statistically significant. Secondly, recognition exposure was also positively related to the capacity of community to support tourism, but not with the participation

of tourism in the workforce. Third, the statistically significant indirect association between the community and capacity was observed in the reported specification of composite-index, but the indirect association between the workforce and participation was not. Fourth, the community capacity that facilitates tourism was better aligned to SDG 11 and tourism as a workforce had a strong association with SDG 8. These results signify that exposure to formal recognition is not enough to guarantee sustainable rural results. They are associative, but not causal and have to be viewed through the prism of weighted heritage proxy, shared-component structure, provincial aggregation and missing continuous population-density control. In practice, heritage policy ought to relate recognition with resident-serving infrastructure, participatory protection, local-enterprise assistance, decent and resilient jobs, cultural-transmission initiatives, and open-book accounting on the distribution of benefits. Further multilevel, comparative studies need to confirm how these relationships hold true down the line with province-specific heritage sites, outcome measures independent, and with explicit measures of rurality and population-density.

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