Tourism Management Perspectives 33 (2020) 100617

Contents lists available at ScienceDirect

Tourism Management Perspectives

journal homepage: www.elsevier.com/locate/tmp

Measuring sustainable tourism attitude scale (SUS-TAS) in an Eastern island context

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ARTICLE INFO

Keywords:
Sustainable tourism
SUS-TAS
Cross-cultural validation
Measurement invariance

ABSTRACT

The concept of sustainability has been widely accepted in tourism to mitigate the detrimental effects of mass tourism. However, developing a valid scale and testing it in cross-cultural settings is critical in evaluating sustainable tourism outcomes. This study examines the validity of the Sustainable Tourism Attitude Scale (SUS-TAS) in an Eastern island context. We adopted competing models testing, cross-cultural validity examination, and multigroup confirmatory factor analyses. Data were collected from three archipelagoes in Taiwan. A seven correlated-factor model was identified as the best-fitting model. Cross-cultural validity demonstrates that SUS-TAS shares the same psychometric properties originally found in Choi and Sirakaya (2005), and multigroup confirmatory factor analyses support the concept that SUS-TAS has the same cognitive framework across the three groups. The findings suggest that SUS-TAS can be used to assess resident attitudes toward sustainable tourism in an Eastern island context. Implications for future research and managerial practice are discussed.

1. Introduction

Sustainable tourism development is crucial for island destinations (Prayag, Dookhony-Ramphul, & Maryeven, 2010). Islands, especially in coastal areas, have fragile environments that are threatened by major hazards related to the sociocultural, environmental, and fragile ecosystems resulting from tourism development, including large amounts of waste disposal, the destruction of coastal environments, the transformation from fishery to tourism, and the decline in traditional agricultural values and important landscapes and ecosystem functions. In addition to environmental destruction, these hazards can severely impact residents' cultural heritage and identity. In addition, unmanaged growth in traditional tourism in coastal areas poses unpredictable hazards to island destinations' economies, socioculture, and ecosystems. Although tourism contributes to the economy and the wellbeing of island communities by providing economic opportunities, tourism development in general has negative social and environmental impacts, including creating pollution, waste, and greenhouse gases (Legrand, Chen, & Sloan, 2013). Therefore, developing sustainable tourism in island destinations is imperative (Briguglio, Butler, & Harrison, 1996; Britton, 1982; García-Falcón & Medina-Muñoz, 1999; Twining-Ward & Butler, 2002).

Sustainable tourism indicators provide a useful tool for monitoring and managing tourism sustainably (Choi & Sirakaya, 2005, 2006). Understanding residents and other stakeholders, including tourists, tourism industry practitioners, and local governments, in terms of their views and priorities have become important subjects in sustainable tourism research (Prayag et al., 2010; Sirakaya-Turk & Gursoy, 2013; Theuns, 2002). Residents play an important role among all stakeholders. Nelson, Butler, and Wall (1993) note that residents' participation in decision-making is a key indicator of successful sustainable tourism. However, past research on sustainable tourism has not reached a consensus on the clear nature, target, idea, and applicability of the concept, thus hindering the transformation of traditional tourism into sustainable tourism (Bramwell & Lane, 1993; Butler, 1999; Harrison, 1996; Stabler, 1997; Wheeller, 1993). Research on finding and testing a measuring tool for sustainable tourism appears necessary not only to facilitate an understanding of sustainable tourism but also to enhance sustainable tourism development, especially at island destinations.

Choi and Sirakaya (2005) developed a Sustainable Tourism Attitude Scale (SUS-TAS), which is a new paradigm to implement sustainable tourism principles that focuses on the residents for tourism planning

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https://doi.org/10.1016/j.tmp.2019.100617
Received 19 December 2018; Received in revised form 28 November 2019; Accepted 2 December 2019

and management. SUS-TAS in not only a potential instrument for measuring community attitudes toward sustainable tourism development but also building the connection with existing theories, including social exchange theory. From a theoretical perspective, it is necessary to continually replicate the accurate data covariance matrix to refine an existing model to improve its model fit (Fornell & Larcker, 1981; Raykov & Marcoulides, 2001). Scale validation is the first step for testing and developing a theory (Hinkin, Tracey, & Enz, 1997). For scales validation, SUS-TAS has been tested in cross-cultural settings, including America (U.S.), Europe (Turkey), and Africa (Cape Verde) (Ribeiro, Pinto, Silva, & Woosnam, 2018; Sirakaya-Turk, Ekinci, & Kaya, 2008; Sirakaya-Turk & Gursoy, 2013; Yu, Chancellor, & Cole, 2009; Zhang, Cole, & Chancellor, 2014). Further examination of the higher-orders of SUS-TAS, however, was not consistent and the reason might be due to the difference in culture and stage of development (Ribeiro et al., 2018; Zhang et al., 2014). From a practical perspective, despite its usefulness and potentials, reliability and validity of SUS-TAS is warranted before it is applied to a new cross-cultural setting (Ribeiro et al., 2018; Sirakaya-Turk et al., 2008). Yet, SUS-TAS has not been tested in an Asian island context and this study aims to fill the gap.

Given the rich marine resources and historical and cultural remains of small islands, the Taiwanese government has implemented regulations to protect unique cultural and ecological resources. In 1989, the Island Building Regulations were promulgated in Taiwan to develop and promote the islands, maintain the natural environment, preserve cultural characteristics, and enhance island residents' wellbeing. However, without the support and active participation of the island residents, the development of sustainable tourism is ineffective (Andereck & Nyaupane, 2011; Nicholas, Thapa, & Ko, 2009). Further, developing tourism would bring about various changes, both positive and negative, in residents' lives (Milman & Pizam, 1988; Perdue, Long, & Allen, 1990) and requires regular assessment and monitoring using a valid measurement tool. Therefore, this study aims to examine the validity of the SUS-TAS using three tropical island archipelagoes of Taiwan as a study context: Penghu, Kinmen, and Matsu. The next section reviews the existing literature on the development and validation of a sustainable tourism attitude scale.

2. Literature review

2.1. Social exchange theory and The Sustainable Tourism Attitude Scale (SUS-TAS)

Social exchange theory (SET) a social-phychological theory, is particulary useful to understand the process of exchanging resources between individuals and groups and it has been used as an effective and comprehensive framework to analyze residents' attitudes toward sustainable tourism development (Ap, 1990; Choi & Murray, 2010; Hsu, Chen, & Yang, 2019; Lee, 2013; Ribeiro et al., 2018). SET is also the most common framework applied in resident attitudes research due to its explanatory power, as it can differentiate residents' perceived benefits and costs as an antecedent for future tourism development (Hadinejad, Moyle, Scott, Kralj, & Nunkoo, 2019).

Based on social exchange theory, residents' attitudes toward sustainable tourism are affected by the perceived benefits and costs from tourism (Poudel, Nyaupane, & Budruk, 2016). Tourism scholars have empirically tested that the residents tend to support tourism if the perceived benefits (positive impacts) are higher than the costs (negative impacts) (Ap, 1990; Choi & Murray, 2010; Choi & Sirakaya, 2005; Gursoy, Jurowski, & Uysal, 2002; Lee, 2013; Nunkoo & Ramkissoon, 2011).

The SUS-TAS was developed by integrating sustainability, the new environmental paradigm (NEP), social exchange theory (SET). The sustainable tourism paradigm is guided by the principle of balancing utilitarian paradigm and its consequences to the enviornment, the NEP revolves around conservation of resources and enhancement of the quality of life, and the SET focuses on the exchange between costs and benefits (Choi & Sirakaya, 2005). Tourism scholars (including Sirakaya and assoicates) further underscore the importance of the SET framework and analyzed the correlationship between the SUS-TAS dimensions on residents' intentions to support sustainable tourism development.

Choi and Sirakaya (2005) followed the seven steps of the scale-development process set forth in Churchill (1979): (1) Define measurement targets; (2) Collect measurement construct items; (3) Finalize scale items and scale types; (4) Purify measurements (assess reliability and validity); (5) Replicate the study; (6) Refine scale measurements using a new sample (using confirmatory factor analysis to reevaluate the reliability and validity of the scale); and (7) Develop norms (forming standards and norms for decision makers). Using steps 1 to 4, Choi and Sirakaya (2005) successfully developed the SUS-TAS in a North American context. Based on an explanatory factor analysis, seven constructs (44 items) were identified to measure SUS-TAS, which included (1) perceived social costs; (2) environmental sustainability; (3) long-term planning; (4) perceived economic benefits; (5) ensuring visitor satisfaction; (6) a community-centered economy; and (7) maximizing community participation. Subsequent researchers have taken the confirmation from steps 5–6 of the SUS-TAS, as described in Churchill (1979), to conduct a cross-cultural sample verification using data on Turkish residents (Sirakaya-Turk et al., 2008). Researchers have also performed validity verification and scale simplification using data from an American sample (Sirakaya-Turk & Gursoy, 2013; Yu et al., 2009; Zhang et al., 2014).

SUS-TAS has been further verified and widely used by subsequent researchers (Hung, Sirakaya-Turk, & Ingram, 2011; Kvasova, 2011; Prayag et al., 2010). More recently, Ribeiro et al. (2018) validated the SUS-TAS in an African island context. They examined and compared several versions of the SUS-TAS (i.e., one factor, second-order, 21-item, 27-item, 33-item, and 44-item models). Their results indicate that the original 44-item scale that includes seven dimensions has sound psychometric properties. The seven dimensions are further divided into two higher orders: perceived tourism impacts and expected tourism sustainability. However, the SUS-TAS has not been validated in the eastern island context, which differs in various aspects, including culture, nature, geography, and history. This study was conducted in Taiwan, an island state in the Asia Pacific.

The Asia Pacific region has become the world's second largest tourist-receiving region and listed as one of the fastest tourism growing region (UNWTO, 2018). The tourism industry has a great contribution toward Taiwan's economic growth, as it has exceeded the agriculture sector in terms of its contribution to GDP (Chen & Chiou-Wei, 2009). According to the UNWTO (2018) report, international tourist arrivals to Taiwan were 10.7 million in 2017. Tourism accounted for 4.44% (777 billion NTD) of GDP (Taiwan Tourism Bureau, 2018) and contributed 584,500 jobs in 2017 (WTTC, 2019), which is expected to grow by 10,000 every year and reach to 768,000 job by 2028 (National Development Committee, 2019; Taiwan Tourism Bureau, 2018; UNWTO, 2018). Given the growing trend in the Asia Pacific region, Taiwan's tourism industry needs to integrate cultural and natural resources, obtain broader participation from residents, and create the sustainable management of tourism (Taiwan Tourism Bureau, 2001).

This paper utilizes the cultural dimensions theory (Hofstede, 2014) to test and validate whether SUS-TAS developed in an individualist society holds true in a collectivist society. Based on Hofstede's conceptualization of the cultural dimensions of power distance, individualism, masculinity, uncertainty avoidance, and indulgence, significant differences could exist among different cultures in terms of residents' attitudes toward sustainable tourism. For example, compared with the United States, Taiwan is more concerned about social status, more collectivistic, less masculine, less tolerant of uncertainty, more likely to engage in long-term planning, and less likely to be indulgent (Hofstede, 2014). When compared with Turkey, Taiwan is less

concerned about social status, relatively more collectivistic, and equally masculine. Similarly, Taiwan has a higher tolerance for uncertainty and higher engagement in long-term planning and is equally indulgent (Hofstede, 2014). Smith (2004) speculated that when a scale is used cross-culturally, errors in scale responses are expected because of linguistic or cultural differences. Hinkin et al. (1997) recommended that the reliability and validity of new sample data should first be confirmed when a scale is used in a cross-cultural environment. The research clearly indicated that many studies' shortcomings were related to the cross-cultural inconsistency of the scale. Therefore, a scale's validity can be determined in a study if a series of strict testing procedures are followed (Choudhry, 1986; Hosany, Prayag, Deesilatham, Cauševic, & Odeh, 2014; Malhotra, Agarwal, & Peterson, 1996).

2.2. Cross-cultural validity and measurement invariance of SUS-TAS

Scholars often use a competing model to test for a scale's best measuring model (Snepenger, King, Marshall, & Uysal, 2006). The competing model is regarded as the most powerful test for the proposed model because it can identify and test models with structural relationships under different assumptions (Hair, Anderson, Tatham, & Black, 1998). Noar (2003) suggested that confrontation tests on different models can collect even more details related to the scale, such as intercorrelations among the items and the scale's constructs, thus making the scale better fit for use, creating an alternative version of the scale, or possibly leading to further theory formation in certain areas. In Sirakaya-Turk et al. (2008), the relationships among the factors in the SUS-TAS were completely correlated, and the possibility of higher-order factors was implied in the scale. Therefore, Zhang et al. (2014) conducted a test on the second-order factors of the SUS-TAS. The test results did not converge to higher-order factors, thus indicating that the first-order multifactor correlated model was the best measurement model when performing a local confirmatory analysis using the SUS-TAS. When performing cross-cultural comparisons on the scale, different reliability indices should first be adjusted when considering the actual relationships among its various constructs (Malhotra et al., 1996).

Validity and reliability are vital assessment properties of measuring a scale. When a scale is both valid and reliable, it possesses excellent psychometric properties (Souza, Alexandre, & Guirardello, 2017). Psychometric properties are the elements that contribute to the statistical adequacy of a scale for its reliability and validity. Solano-Flores and Nelson-Barber (2001) suggested that social and cultural backgrounds shape individuals' values, thinking orientations, and interaction patterns, which influence the manners in which they interpret the assessment items in social science. Therefore, confirming the presence of similar psychometric results in a scale across cultures using data verification is important when testing for consistency (Malhotra et al., 1996). When a scale is cross-culturally valid, it is considered construct equivalent. Cross-cultural validity refers to the degree to which data collected by the same instrument are comparable across different cultures (Bredahl, 2001).

Cross-cultural validity can focus on an examination of functional, conceptual, instrumental, and metric equivalence. Functional equivalence examines whether a particular behavior or concept serves the same function in different cultures. Conceptual equivalence refers to whether the studied concept has a similar meaning across cultures. Instrument equivalence examines the scale items and response categories to determine whether they are interpreted similarly in different cultures. Metric equivalence examines whether the psychometric properties in the measurement scale have a similar pattern across cultures.

Only a few studies focused on using measuring tools to examine measurement invariance among different groups. Violations of measurement invariance can lead to errors and impact a study's validity. Therefore, a measuring tool must first be determined for use across all groups, and the measured constructs must be defined using the same meaning (Budruk, 2010; Sass, 2011; Vandenberg & Lance, 2000). Recently, sustainable tourism scholars began to consider residents' attitudes when examining measurement invariance across various groups and developed a scale with a stringent validity test based on corrections made to the test results collected (Poudel et al., 2016). This attempt is the first to test for validity in a Chinese version of the SUS-TAS using a sample of island residents for analysis. If variances in the economy, society, culture, and environment among various islands are to be considered, such as the development stages of the tourist area life cycle in Butler (1980), we must first confirm that residents of different islands have the same psychometric responses to the SUS-TAS. Therefore, examining the measurement invariance among residents of different islands is necessary to provide more stringent evidence for the validity of the scale. Measurement invariance refers to the extent to which the same cognitive framework is exhibited when different populations interpret or respond to a given measurement (Vandenberg & Lance, 2000). This paper examines the extent to which the same psychometric properties were shown in the latent variables to which the scale items belong when the populations are different (Little, 1997). Steenkamp and Baumgartner (1998) suggested that the levels of multigroup measurement invariance should be divided into configural invariance, metric invariance, intercept invariance, factor covariance, and error invariance.

Validation is necessary to develop a good quality measurement (Schmitt, Klimoski, Ferris, & Rowland, 1991). Taking stringent steps and performing examinations to verify scale validation will facilitate subsequent research expansion and establish a foundation for replication. The use of a standard measurement process enables comparisons and makes it feasible to test and develop theories (Clark & Watson, 1995; Garver & Mentzer, 1999; O'Leary-Kelly & Vokurka, 1998; Ping, 2004). A valid sustainable tourism attitude scale will not only help researchers test the theories related to sustainable tourism but also assist tourism industry and nongovernmental organization decision makers to accurately measure residents' attitudes toward sustainable tourism (Sirakaya-Turk et al., 2008).

To examine the validity and reliability of the SUS-TAS in cross-cultural settings, this study aims to (1) confirm the best measuring model of the shortened version of the SUS-TAS and identify the structure of the scale factors in an Asian island context, (2) test the cross-cultural validity of the shortened version of the SUS-TAS that ensures the same psychometric properties of the Asian island context, and (3) examine the measurement invariance of the shortened version of the SUS-TAS across each isolated island.

3. Methodology

3.1. Instrument

The shorter version of the SUS-TAS suggested by Sirakaya-Turk and Gursoy (2013), which has seven constructs and 21 items, was used in this study. A five-point Likert scale was used for scoring. The Chinese version of the SUS-TAS was based on the back-translation process suggested by Bracken and Barona (1991), Geisinger (1994), and Van de Vijver and Leung (2000). The survey was translated into Chinese by two Chinese professors who are fluent in both Chinese and English. Next, semantic matching, discrepancy correction, and forward and backward translation matching were performed until all of the semantics were error-free, thus ensuring that the Chinese version was semantically consistent with the English version of the scale. Next, the Chinese version of the scale was given to two tourism scholars for examination, and ten Penghu residents were then asked to fill out the scale for pilot testing. The four-item scale of Intended Tourism Planning Involvement developed by Tosun (2006) was used to examine the nomological validity in the second part. The last part of the instrument included the six items of basic demographic information, including gender, age,

Table 1
Descriptive statistics for the three samples.

Demographics	Pescadores (n = 481)		Kinmen (n = 400)		Matsu (n = 384)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender						
Male	168	35.1	181	45.7	154	40.1
Female	311	64.9	215	54.3	230	59.9
Nonresponse	1		2		0	
Age						
20–29	63	13.2	115	28.8	7	1.8
30–39	132	27.7	129	32.3	116	30.4
40–49	204	42.9	64	16.0	191	50.0
50–59	65	13.7	67	16.8	64	16.8
≥60	12	2.5	18	4.5	4	1.0
Nonresponse	5		6		2	
Length of residence						
1–3 years	14	3.0	40	10.3	17	4.5
4–6 years	15	3.2	25	6.4	18	4.7
7–9 years	12	2.5	15	3.9	13	3.4
10–15 years	33	7.0	30	7.7	79	20.7
≥ 16 years	398	84.3	278	71.6	255	66.8
Nonresponse	9		12		2	
Education						
Sixth grade or less	8	1.7	2	0.5	14	3.7
Junior high school graduate	36	7.6	7	1.8	31	8.1
High school graduate	190	39.9	91	23.0	157	41.1
College or university graduate	179	37.6	246	62.1	156	40.8
Graduate degree or higher	63	13.2	50	12.6	24	6.3
Nonresponse	5		4		2	
Employment						
Tourism-related job	117	24.9	131	33.3	28	7.5
No tourism-related job	263	56.1	212	53.9	288	77.0
Homemaker	55	11.7	20	5.1	42	11.2
Students	12	2.6	13	3.3	1	0.3
Not currently employed	14	3.0	9	2.3	11	2.9
Retired	8	1.7	8	2.0	4	1.1
Nonresponse	12		7		10	
Income (NTD)						
Under $20,000	73	16.3	57	14.7	38	10.2
$20,001–40,000	191	42.7	182	46.8	151	40.4
$40,001–60,000	103	23.0	74	19.0	113	30.2
$60,001–80,000	57	12.8	45	11.6	47	12.6
$80,001–100,000	19	4.3	22	5.7	17	4.5
More than $100,001	4	0.9	9	2.3	8	2.1
Nonresponse	34		11		10	

residence duration, education level, income, and occupation. The questionnaire is attached in the Appendix.

3.2. Data collection and sampling

Data were collected from the residents of three island archipelagoes of Taiwan: Penghu, Kinmen, and Matsu. The Penghu (also referred to as The Pescadores of the West) archipelago is in the Taiwan Strait between Taiwan and mainland China. Ninety islands are scattered across the sea, each with a mature tourism industry and strong development potential. The primary feature of these islands is their world-class basalt geology and coastal environment. The islands contain basalt nature-reserve areas that are also some of the world's most beautiful coastal areas. These islands are filled with historical and cultural heritage sites, such as archeological remains, ancient battlefield remains, colonial bases, traditional folk architecture and historical temples, and ecological resources, including unique birds and marine ecology (Cheng, Wu, & Huang, 2013; Penghu County Government, 2015; Penghu NSA, 2015).

Kinmen is an archipelago near the southeastern part of mainland China. Kinmen's 12 islands are in the early stage of tourism development. Kinmen was under very strict military restrictions during the early Cold War era. After those restrictions were lifted in 1993, Kinmen began to use tourism as its economic development strategy. Because of the previous military barriers, Kinmen has preserved its entire historical and war heritage, and its primary tourism resources include its war remains and cultural assets. Kinmen National Park was established to protect the resources of the natural environment and preserve the important war culture and historical sites (Chen, Chen, & Lee, 2011; Kinmen County Government, 2015; Kinmen National Park, 2015).

Matsu is an archipelago near mainland China that is composed of 36 large and small islands. Similar to Kinmen, Matsu once had a battlefield mission and began tourism development after military restrictions were lifted. The Matsu National Scenic Area Administration was then established in 1999. Since that time, tourism has been jointly promoted by the local government with primary resources such as battlefield scenery, unique tunnels, natural resources including the coastal environment, and local ecological resources. Recently, glow-in-the-dark bioluminescent algae known as “blue tears” has become Matsu's featured attraction (Lienchiang County Government, 2015a; Matsu NSA, 2015).

Using the equation in Levy and Lemeshow (1999) and the Survey System (2015) for the calculation, the confidence level was set at 95%, and the confidence interval was set at 5%. The total population of the three archipelagoes from February 2015 demographics data was used in

the equation to calculate the sample size needed for the three archipelagoes: 383 for Penghu, 383 for Kinmen, and 373 for Matsu (Jincheng Township Household Registration Office, 2015; Lienchiang County Government, 2015b; Magong Household Registration Office, 2015). After calculating the required sample size, communities in the three archipelagoes with higher concentrations of tourism and businesses were selected to complete a questionnaire using the questionnaire distribution and collection method described in Boley and McGehee (2014) and the household survey method in Woosnam (2011) for studying residents' attitudes. Questionnaires were distributed via business and household visits to obtain information from residents who worked and who did not work in the tourism industry. After obtaining consent from the businesses/residents, questionnaires were left with the businesses or residents and collected later on the same day. To collect the calculated number of samples required, 500 questionnaires each were distributed to the Penghu, Kinmen, and Matsu archipelago, with 481, 400, and 384 questionnaires returned, respectively; the effective response rate was 96.2%, 80.0%, and 76.8%, respectively.

In the sample from the Penghu archipelago, the majority of the sample (56.1%) was engaged in non-tourism occupations. In the Kinmen archipelago sample, slightly more than half (53.9%) of the residents were engaged in non-tourism occupations. In the Matsu archipelago sample, more than three-quarters (77.0%) of the residents were engaged in non-tourism occupations. A detailed distribution of the sample for each island is shown in Table 1.

3.3. Data analysis

AMOS 18 was used to perform a confirmatory factor analysis (CFA) of the data from the short Chinese version of the SUS-TAS. Before conducting a CFA, a normal distribution test was performed to confirm that the results were consistent. As suggested by Kline (2005), if the absolute value of the skew index was smaller than 3 and the absolute value of the kurtosis index was smaller than 10, the data would be defined as exhibiting a normal distribution, and thus, the maximum likelihood was used for the estimation. First, a competing model analysis was performed to determine the optimal factor structure. To understand the optimal factor structure of the Chinese SUS-TAS scale, data collected in the Penghu archipelago were used for analysis and examination in the competing model proposed in this study. After obtaining the optimal factor structure using the competition model, convergent validity, composite reliability, and discriminant validity were subsequently tested. In addition, nomological validity was tested using correlation analysis to determine whether a significant correlation existed between the factors in the Chinese version of the SUS-TAS and the factors on the Intended Tourism Planning Involvement scale, based on a previous study (Zhang et al., 2014).

When examining the measurement invariance among various groups, multigroup confirmatory factor analysis (MGCFA) was conducted (Cheung & Rensvold, 2002). Data collected from the three archipelagoes were analyzed using a nested model comparison. The best measuring model without restriction was used as the benchmark model. If the model comparison did not achieve a significant level of loading invariance, intercept invariance, factor covariance, and others, the model was the same as the baseline model, thus indicating that it possessed measurement invariance. The following identification standards were used by Cheung and Rensvold (2002): $\Delta TLI \leq 0.02$ and $\Delta CFI \leq 0.01$. Little (1997) suggested using $TLI > 0.90$ and $\Delta TLI < 0.05$ as the standards. Vandenberg and Lance (2000) suggested that invariance exists when ΔCFI is ≤ 0.01. When ΔCFI is between 0.01 and 0.02, variance among different groups should be considered; when ΔCFI is > 0.02, invariance is not supported. When intercept invariance is not supported, a test for partial intercept invariance is suggested to be performed (Vandenberg & Lance, 2000). If partial intercept invariance is supported, a nested model comparison could be performed again, followed by a comparison of factor covariance and error invariance.

4. Results

4.1. Testing measurement model

Three models of various factors were proposed to calculate and compare the various factors to find the best measurement model for them in the Chinese version of the SUS-TAS (Noar, 2003). The results of the goodness-of-fit of the seven first-order uncorrelated-factor model were as follows: $\chi 2/df = 6.293$, GFI = 0.773, AGFI = 0.723, CFI = 0.761, TLI = 0.735, RMR = 0.120, SRMR = 0.2232, and RMSEA = 0.105. Although the goodness-of-fit indices of this seven first-order uncorrelated-factor model were closer to the identification standards than in the single-factor model, they still have not yet reached an acceptable standard. Therefore, the seven uncorrelated-factor model was not supported, indicating that the seven factors in sustainable tourism are not entirely uncorrelated.

The results of the goodness-of-fit of the seven correlated first-order factor model were as follows: $\chi 2/df = 2.072$, GFI = 0.937, AGFI = 0.913, CFI = 0.957, TLI = 0.946, RMR = 0.026, SRMR = 0.045, and RMSEA = 0.047. All of the goodness-of-fit indices reached the identification standards. Therefore, this seven correlated first-order factor model was supported, meaning that correlations among the seven factors in sustainable tourism exist and that the model could be used as the measurement model for the SUS-TAS.

The results of the goodness-of-fit indices of one second-order factor model were as follows: $\chi 2/df = 2.717$, GFI = 0.912, AGFI = 0.888, CFI = 0.925, TLI = 0.914, RMR = 0.055, SRMR = 0.828, and RMSEA = 0.060, among which, $\chi 2/df$, GFI, CFI, and TLI reached the identification standards but AGFI, SRMR, and RMSEA did not. When compared with the seven first-order factor model, goodness-of-fit was still better in the seven first-order factor model. In addition, the correlations among the factors in the seven-factor model were not completely significant. Therefore, the seven factors in the SUS-TAS could not form higher-order factors. When using the competition model to compare with the identification standards, this study found the best identification standards in the seven correlated-factor model, indicating that this model is the best measurement model. The identification standards of the three competing models are shown in Table 2.

4.2. Psychometrics of the Chinese version of SUS-TAS

4.2.1. Convergent validity and composite reliability

The judgment standards for convergent validity are based on the average factor loading of all of the observed variables > 0.07 (Hair et al., 1998) and a t-value that is significant (Anderson & Gerbing,

Table 2
Results of competing models of the Chinese version of SUS-TAS.

Model	X^2/df	GFI	AGFI	CFI	TLI	RMR	SRMR	RMSEA
Uncorrelated factors	6.293	0.773	0.723	0.761	0.735	0.120	0.2232	0.105
Correlated factors	2.072	0.937	0.913	0.957	0.946	0.026	0.0451	0.047
Hierarchical	2.717	0.912	0.888	0.925	0.914	0.055	0.828	0.060
Cutting criteria	1–5	> 0.9	> 0.9	> 0.9	> 0.9	< 0.08	< 0.08	< 0.08

Table 3
CFA summaries of the Chinese version of SUS-TAS.

Factor	Factor loading	CR	AVE
Item description			
Perceived social costs		0.84	0.64
I often feel irritated because of tourism in my community.	0.73		
Tourists in my community disrupt my quality of life.	0.89		
My community is overcrowded because of TD.	0.78		
Perceived economic benefits		0.83	0.62
I believe that tourism is a strong economic contributor to the community.	0.77		
Tourism diversifies the local economy.	0.79		
I believe that tourism is good for our community's economy.	0.81		
Environmental sustainability		0.79	0.56
Tourism must protect the environment.	0.73		
Proper TD requires that wildlife and natural habitats be protected at all times.	0.81		
Community resources must be protected now and for the future.	0.69		
Maximizing community participation		0.82	0.60
Community residents should have opportunities to be involved in TDM.	0.79		
The tourism industry must embrace the values of community residents.	0.82		
Community residents should be given more opportunities to invest in TD.	0.71		
Long-term planning		0.76	0.51
I believe that successful management of tourism requires advanced planning.	0.71		
TD plans should be continuously improved.	0.67		
TI must plan for the future.	0.76		
Community-centered economy		0.80	0.57
I think TB should hire at least one-half of their employees from within my community.	0.73		
Community residents should receive a fair share of benefits from tourism.	0.75		
The TI should obtain at least one-half of their goods and services from within the community.	0.78		
Ensuring visitor satisfaction		0.75	0.51
TB must monitor visitor satisfaction.	0.75		
TI must ensure good-quality tourism experiences for visitors.	0.80		
Community attractiveness is a core element of ecological “appeal” for visitors.	0.56		

Note: TD = tourism development; TB = tourism business; TI = tourism industry; TDM = tourism decision making.

1988). The analysis reveals that the factor loading of all of the observed variables was between 0.56 and 0.89, indicating that the scale tested was confirmed to be in line with the standards of convergent validity. The equation provided by Fornell and Larcker (1981) was used to calculate composite reliability (CR). The calculated CR value of each construct was between 0.75 and 0.84, in line with the standard of > 0.60 (Bagozzi & Yi, 1988). The results are shown in Table 3.

4.2.2. Discriminant validity

For discriminant validity, average variances extracted (AVE) was calculated based on the equation published by Fornell and Larcker (1981). To possess discriminant validity, AVE must be greater than the square root of the intercorrelations among the factors. The calculated AVE value of all of the constructs was greater than the square root of the intercorrelations, indicating that the scale had discriminant validity. The results are shown in Table 4.

4.2.3. Nomological validity

Nomological validity means that the interrelationships among the scale and the other constructs are in line with either the theories or previous studies (Bagozzi, 1980; Hair, Black, Babin, & Anderson, 2010; Peter, 1981; Steenkamp & van Trijp, 1991; Venkatraman, 1989). In Zhang et al. (2014), intercorrelations have been found between the factors of sustainable tourism attitude and participation intention in tourism planning when Intended Tourism Planning Involvement (ITPI) was used in the SUS-TAS to predict validity. Therefore, this study used the correlations between the SUS-TAS and ITPI to examine nomological validity. Except for the fact that the intercorrelation between the construct of perceived social costs and ITPI was not significant, all of the other intercorrelations among the constructs were significant, thus indicating that the SUS-TAS had nomological validity and that no significant intercorrelation exists between the factor of perceived social costs in the island environment and residents' ITPI. The results are shown in Table 5.

Table 4
Means, standard deviations, linear correlations, and average variances extracted.

	M	SD	1	2	3	4	5	6	7
1. Perceived social costs	2.85	0.82	0.64[a]						
2. Perceived economic benefits	4.00	0.66	−0.430***	0.62[a]					
3. Environmental sustainability	4.55	0.56	0.072	0.23***	0.56[a]				
4. Maximizing community participation	4.22	0.62	0.053	0.17**	0.58***	0.60[a]			
5. Long-term planning	4.38	0.56	0.011	0.26***	0.61***	0.67***	0.51[a]		
6. Community-centered economy	4.02	0.68	0.110	0.07	0.37***	0.62***	0.58***	0.57[a]	
7. Ensuring visitor satisfaction	4.27	0.57	−0.20***	0.38***	0.47***	0.55***	0.70***	0.55***	0.51[a]

Note: a = Average Variances Extracted (AVE).

Table 5
Correlations of Chinese version of SUS-TAS and intended tourism planning involvement.

	Intended tourism planning involvement
1. Perceived social costs	0.051
2. Perceived economic benefits	0.126**
3. Environmental sustainability	0.329**
4. Maximizing community participation	0.564**
5. Long-term planning	0.518**
6. Community-centered economy	0.488**
7. Ensuring visitor satisfaction	0.472**

** $p < .01$.

4.3. Measurement invariance of Chinese version of SUS-TAS across three islands

A nested model was used in the measurement invariance analysis (Steenkamp & Baumgartner, 1998). The levels used in the analysis include configural invariance, metric invariance, intercept invariance, factor covariance, and error invariance. In the nested model, metric invariance was built on top of configural invariance; intercept invariance was built on top of configural and metric invariances; covariance was built on top of configural, metric, and intercept invariances; and error invariance had to be built on top of not only configural, metric, and intercept invariances but also covariance. The results of the MGCFA analysis of the three islands were as follows: ΔTLI = 0.000, −0.004, and 0.004; ΔCFI = −0.003, −0.008, and −0.002. When compared with the suggested standards in Cheung and Rensvold (2002), Little (1997), and Vandenberg and Lance (2000), these results indicated that the invariance of the Chinese version of the SUS-TAS across the three islands exhibited configural invariance, metric invariance, intercept invariance, and factor covariance. The results are shown in Table 6.

5. Discussion

A competing model was used to compare and obtain an understanding of the intercorrelations among the constructs to find the best measuring model. Based on the goodness-of-fit result comparison, the seven correlated-factor model was confirmed as the best measurement model. However, the intercorrelation among the seven factors was not completely correlated, and thus, a higher-order measurement model could not be formed, which is consistent with Zhang et al. (2014). In that study, both the intercorrelation between perceived social costs and maximizing community participation and the intercorrelation between perceived economic benefits and maximizing community participation were not significant. In this study, among the 21 intercorrelations among the seven factors, 16 were significantly correlated and five were nonsignificant. Among the nonsignificant intercorrelations, four were intercorrelated with the factor of perceived social costs, indicating less intercorrelation between the factor of perceived social costs and other factors in residents' attitudes toward sustainable tourism in an island environment. In Sirakaya-Turk et al. (2008), the seven factors were found to be completely correlated, thus implying that the intercorrelations among the factors in residents' attitudes toward sustainable tourism vary from region to region and thus that the results would vary. This study adopted Noar's (2003) competing model to compare and find the measuring model that best fits Taiwan's island environment. An appropriate scale version could further enhance theory formation to fit a specific region.

To ensure construct equivalent across cultures, as suggested in Malhotra et al. (1996), this study focused on equivalence in function, concept, tool, and measurement. This study adopted the same measurement tool as in the original scale to preserve consistency with respect to the tool, that is, the SUS-TAS developed by Choi and Sirakaya (2005). In addition, a short version scale proposed by Sirakaya-Turk and Gursoy (2013) was used for cross-cultural verification. When translating the scale into Chinese, back-translation was used to ensure semantic consistency across cultures. After semantic consistency was achieved, expert review, and resident feedback were used to ensure consistency in function and concept. With a special emphasis on metric equivalence, Malhotra et al. (1996) further divided metric equivalence into calibration equivalence, translational/linguistic equivalence, and scalar/metric equivalence. Calibration equivalence refers to whether units of measurement are the same in different cultures. A five-point Likert scale was used in both this study and for the original scale. Translational/linguistic equivalence refers to whether the translated scale is easily understood by questionnaire respondents in different cultures, as confirmed in this study by using back-translation. Scalar/metric equivalence refers to whether the psychometric properties of different cultures on the scale exhibit the same structure, as confirmed by using CFA in this study. Convergent validity, discriminant validity, and composite validity in the Chinese version of the SUS-TAS were all confirmed to be in line with the standards, thus indicating metric equivalence in the Chinese version of the SUS-TAS. The metric equivalence shows the same psychometric structures in different culture samples. Thus, the Chinese version of the SUS-TAS is proven to have the same factor structure and same psychometric properties as the original SUS-TAS, and metric equivalence is confirmed. As confirmed in this process, cross-cultural consistency exists in the island resident samples of the Chinese SUS-TAS; that is, the Chinese version of the SUS-TAS is capable of measuring the same concept as the SUS-TAS developed by Choi and Sirakaya (2005), making future comparison of sustainable tourism research in various regions feasible and beneficial for further extensions of sustainable tourism theories. In this study, a short version of the SUS-TAS was used for confirmation. Among past studies, both Yu et al. (2009) and Zhang et al. (2014) were devoted to working on scale simplification. A simplified scale is more convenient for practical use. Therefore, an effective short version of the Chinese version of the SUS-TAS will enhance both the effective execution of regional research and the future use of practical tools. In addition to using an effective scale, this study also used the construct of ITPI in Zhang et al. (2014) to further examine nomological validity. The results showed that six of the seven factors were in line with the study conducted by Zhang et al. (2014), whereas no significant relationship was observed between the factors of perceived social costs and ITPI. Sirakaya-Turk and Gursoy (2013) used sustainable tourism attitude factors to predict pro-sustainability. No significant correlation is found between the factors of perceived social costs and economic support, consistent with the results of past studies. Gursoy et al. (2002) and Gursoy and Rutherford (2004) explained that such results are related to

Table 6
MGCFA results across the Penghu, Kinmen, and Matsu Archipelagoes.

Model	χ2	df	TLI	CFI	ΔTLI	ΔCFI	Δ
M1 Configural invariance	1103.29	504	0.934	0.947			
M2 Metric invariance	1165.01	532	0.934	0.944	0.000	−0.003	M2-M1
M3 Scalar invariance	1296.77	574	0.930	0.936	−0.004	−0.008	M3-M2
M4 Factor covariance invariance	1379.98	630	0.934	0.934	0.004	−0.002	M4-M3

the economic situations of the region in which the study was conducted. Therefore, the correlations among sustainable tourism attitudes and related factors, such as tourism intention and support for sustainable tourism intention, must be further verified.

In the past, few researchers performed group comparisons to confirm whether revisions were needed to scale items (Poudel et al., 2016). As the test results of the Chinese version of the SUS-TAS indicate, we confirmed that configural invariance existed among the residents in the three archipelagoes of Penghu, Kinmen, and Matsu; that is, the same number of factors and the same factor patterns were observed among the various groups, indicating the same factor structure. Therefore, each construct item of the Chinese version of the SUS-TAS can reflect the latent construct among the residents of various archipelagoes. In addition, loading equivalence indicates that the scale has the same meaning to the residents of the three archipelagoes in terms of metrics, which indicates that the mean comparison of all of the individual items is meaningful. Then, intercept equivalence indicates that the initial sustainable tourism attitudes of the residents in the three archipelagoes have the same meaning, and thus, a comparison of the construct mean and the latent mean is feasible. Factor covariance refers to the invariance of the measurement model for the three archipelagoes; that is, the best measurement model of the three archipelagoes is the seven correlated-factor model (Steenkamp & Baumgartner, 1998). This study examined the measurement invariance of different groups using empirical data to confirm that the Chinese SUS-TAS among residents of different archipelagoes was capable of measuring the same meaning, thereby avoiding possible scale error but enhancing validity in subsequent studies (Budruk, 2010; Sass, 2011; Vandenberg & Lance, 2000).

5.1. Management implications

After a series of test procedures, the Chinese SUS-TAS is indeed confirmed as an effective tool that can assist government organizations, practitioners, and other stakeholders involved in sustainable tourism in island destinations. Tourism scholars agree that the tourism paradigm has already shifted from traditional tourism to sustainable tourism and indicate that the sustainable growth of the future tourism industry will be a challenge and resident participation is indispensable. Residents play a critical role in achieving the goal of sustainable tourism. Therefore, understanding their attitudes is necessary. Using the Chinese version of the SUS-TAS to measure residents' attitude toward sustainable tourism, this study provides a more robust tool to understand residents' attitudes in a broader cultural setting. The survey results show that residents' attitudes toward the factors of sustainable tourism in the three archipelagoes were all positive, thus indicating that the residents of those archipelagoes are in favor of promoting sustainable tourism. We recommend that destination management organizations constantly monitor residents' attitudes toward tourism development to maximize tourism benefits to residents and avoid their resentments of tourism.

In 1993, the Executive Yuan Outlying Islands Construction Steering Committee that was responsible for developing the three archipelagoes' tourism was handed over to the Economic and Technological Construction Council by the Taiwanese Ministry of the Interior. The committee oversaw the actual implementation of the construction work in the islands from 1990 to 1993 and invited scholars and experts to hold a conference on the development of sustainable islands. The conference agreed that the future development of the islands should be promoted toward sustainable development and a more holistic and systematic approach to planning and development should be adopted by embracing more natural and culturally sensitive development. This study provides an important measurement tool for the council to evaluate progress toward sustainable tourism (Choi & Sirakaya, 2005) and engage residents and other stakeholders in the tourism planning process.

6. Conclusions

Because empirical measurements of the scale constructs were included in the scale development, an overall understanding of sustainable tourism was further enhanced (Woosnam & Norman, 2010). As Churchill (1979) noted, scale development is a key factor in the evolution of knowledge ontology. The scale-development process proposed by Churchill (1979) is regarded as the gold standard in tourism research (Boley, Nickerson, & Bosak, 2011; Woosnam & Norman, 2010). Based on the scale-development process in Churchill (1979) and the recommendations of other scholars, this study performed a series of stringent confirmatory processes on the Chinese version of the SUS-TAS. This study's primary contribution is to establish an effective Chinese SUS-TAS for residents of Taiwan's archipelagoes. From this study, the following conclusions are made. By using the competing model analysis, the seven correlated-factor model is confirmed to be the best measurement model for the Chinese version of the SUS-TAS used in Taiwan's archipelagoes. By using CFA, the Chinese version of the SUS-TAS is confirmed to have cross-cultural equivalence. The factor structures are the same in both the Taiwan archipelago environment and the original scale with construct equivalence. By using MGCFA, the Chinese version of the SUS-TAS is confirmed to have measurement invariance for residents of the Penghu, Kinmen, and Matsu archipelagoes. Validation is a necessary condition for developing a good quality measurement tool (Schmitt et al., 1991). Taking stringent steps and performing tests to confirm the scale's effectiveness can help subsequent research expansion and establish a foundation for replication. This study contributes to the sustainable tourism literature by empirically confirming the validation of the Chinese version of the SUS-TAS. In addition to being used to conduct subsequent local studies, the Chinese version of the SUS-TAS could be used to compare regions involved in past studies, thereby enhancing the understanding of the knowledge ontology of sustainable tourism. Moreover, this study's confirmatory process can be used as a reference for related future studies.

6.1. Research limitations and future research recommendations

Although this study has striven to be strict and vigorous in its design, study process, and data collection, it still inevitably contains several research limitations that are presented as reference for future research directions. First, based on stakeholder theory, the stakeholders in sustainable tourism are the residents, tourism operators, and government officials. The target of this study was the residents; therefore, only their perspectives were provided. However, according to the theories of sustainable tourism, tourism development should be the product of mutual cooperation by the three aforementioned stakeholders. Therefore, this study suggests future surveys of tourism operators and government officials. Second, this study only surveyed Taiwan's island residents. To determine whether this study's conclusion can be generalized to other Asia-Pacific islands, new samples need to be tested. We suggest surveying similar islands in the Asia-Pacific region, such as Okinawa in Japan and Jeju Island in Korea. Finally, this study collected cross-sectional data that could not provide an understanding of the long-term change in residents' attitudes toward and levels of support for sustainable tourism. Therefore, we suggest that future studies collect longitudinal data to obtain an understanding of the changing situations in island residents' attitudes toward sustainable tourism.

Author Contribution Statement

Hsu, Chen, and Nyaupane conceptualized the idea, developed the theory. Hsu, Chen, and Lin performed the computations. Chen supported Hsu for data acquisition and supervised the entire process from conceptualization to publication. Hsu, Nyaupane, and Lin revised and edited the draft. All authors discussed the results and contributed to the final manuscript.

Acknowledgements

This work was supported by National Taiwan Normal University (NTNU) within the framework of the Higher Education Sprout Project by the Ministry of Education (MOE) in Taiwan (Grant No. 108J1A3203) and the fourth author was supported by the Ministry of Science and Technology (MOST 107-2410-H-153-021) in Taiwan. The authors would like to thank the Editor and all the referees for all the constructive, useful, and insightful suggestions and comments.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tmp.2019.100617.

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