

Associations between Space-Time Constraints and Spatial Patterns of Travels

Sanghoon Kang

Clemson University

ASSOCIATIONS BETWEEN SPACE-TIME CONSTRAINTS AND SPATIAL PATTERNS OF TRAVELS

ABSTRACT

The space-time constraint concept was originally developed by Hägerstrand (1970), the pioneer of time-geography, to explain the constraints associated with human daily travel in space and time. Based on his definitions of the space-time constraints (i.e., authority constraints, capability constraints, and coupling constraints), Shoval (2012) was modified the constraints concept for tourism research. This study examines the associations between these constraints and spatial patterns of travels. The results indicate that authority constraints (i.e., the purpose of travel) are significantly associated with the macro level (i.e., single destination travel and multi-destination travel), while the capability constraints (i.e., the length of travel) and coupling constraints (i.e., the composition of travel party) are significantly associated with the micro level (i.e., multi-destination travel patterns).

Keywords: authority constraints, capability constraints, coupling constraints, time-geography, spatial behavior, multi-destination travel

1. INTRODUCTION

According to Pearce (2011), tourist behavior can be best understood by incorporating a socio-psychological approach (i.e., the intention to travel) with a geographical approach (i.e., actualized travel behavior such as the spatial patterns of travels). While tourism behavior researchers have focused primarily on such social-psychology aspects (Cohen, Prayag, & Moital, 2014), the spatial and temporal aspects are currently seeing increased interest (e.g., Grinberger, Shoval, & McKercher, 2014). The limited amount of research in this area may be related to the lack of relevant data and techniques for analyzing tourists' spatial movement (Beeco, Huang, Hallo, Norman, McGehee, McGee, & Goetcheus, 2013; Gartner & Hunt, 1988, Lue, Crompton, & Fesenmaier, 1993).

However, recent advances in statistics and computer technologies have led to interesting approaches for increased understanding of tourists' spatial behavior (e.g., the spatial distribution of tourists and tourists' movement pattern research) with those efforts focusing on data collection methods using GPS and/or visualizing tourists' spatial movement patterns using GIS (e.g., Birenboim, Anton-Clavé, Russo, & Shoval, 2013; Chancellor & Cole, 2008; Edwards & Griffin, 2013; Grinberger et al., 2014; Hallo, Beeco, Goetcheus, McGee, McGehee, & Norman, 2012; McKercher, Shoval, Ng, & Birenboim, 2012; Shoval & Isaacson, 2007; Zheng, Huang, & Li, 2017) rather than applying spatial theories.

Tourists have to spend time moving from place to place, meaning they can be confronted with travel-related constraints that must be negotiated. However, tourism

researchers have been neglected studying spatial movement related constraints. Tourism researchers have traditionally applied the leisure constraint concept developed by Crawford and Godbey (1987) for examining perceived constraints related to the intention of tourists to participate in a particular tourism activity or in travel (i.e., whether to take a vacation trip) (e.g., Boo, Carruthers, & Busser, 2014; Hung & Petrick, 2010; Norman, 1995; Pennington-Gray & Kerstetter, 2002).

Several tourism researchers have reported empirical evidences regarding the limitations of applying the leisure constraints concept in explaining tourism constraints. Pennington-Gray and Kerstetter (2002), who empirically confirmed three types of leisure constraints in a tourism setting, reported that “respondents were fairly neutral in their response to the three dimensions” (p. 421), a result, according to them, perhaps suggesting “that we have not identified the true constraints to travel” (p. 421). Accordingly, they proposed that “in the future, we may want to use a constructivist approach to studying constraints in an effort to truly understand what, if anything, is constraining individuals from traveling” (Pennington-Gray & Kerstetter, 2002, p. 421). More recently, Boo and colleagues (2014) found that “although the findings relative to constraints and negotiation of event nonparticipants were consistent with the hierarchical leisure constraints model, the variance explained was only moderate” (p. 283). As these studies suggest, the leisure constraints concept has limitations in explaining tourism constraints.

Of tourism constraints research topics, examining constraints associated with tourists’ spatial behavior would be essentially important based on tourism’s inherently

geographical nature (Leiper, 1979). Cooper (1981, pp. 360-361) noted that “a time-space mechanic of constraints determines the pattern of search behavior.” Debbage (1991) found the relevance of space-time constraints concept in the context of intra-destination travel (i.e., within a destination) against socio-economic constraints. However, little research has examined constraints associated with the spatial patterns of travel. Based on the space-time constraints concept of time-geography developed by Hägerstrand (1970), this study examines the association between the space-time constraints and the spatial patterns of travels in the coastal areas of South Carolina, USA.

2. LITERATURE REVIEW

2.1 *Multi-Destination Travel*

Lue, Crompton, and Fesenmaier (1993) conceptualized tourists’ spatial patterns of pleasure trips, including the one single destination pattern and the four multi-destination patterns of the en-route pattern, the base camp pattern, the regional tour pattern, and the trip chaining pattern as seen in Fig. 1. Stewart and Vogt (1997), Chancellor (2012), and Popp and McCole (2016) conducted their research using this spatial pattern model of Lue et al. (1993). These patterns can be operationalized as follows: 1) single destination travel is a tourist traveling to a single destination (i.e., city, town, or community) and staying there the entire time; 2) en-route pattern involves a tourist visiting several destinations within a state which are en-route to and from a primary destination; 3) base camp is when a tourist stays at the primary destination throughout a vacation, using it as a “base camp” from which to visit destinations within a state; 4) the regional pattern is when a

tourist travels within a state, sequentially visiting a series of destinations in it; and 5) the trip chaining pattern involves a tourist visiting multiple destinations encompassing several states, traveling from one to another rather than having a single focal state.

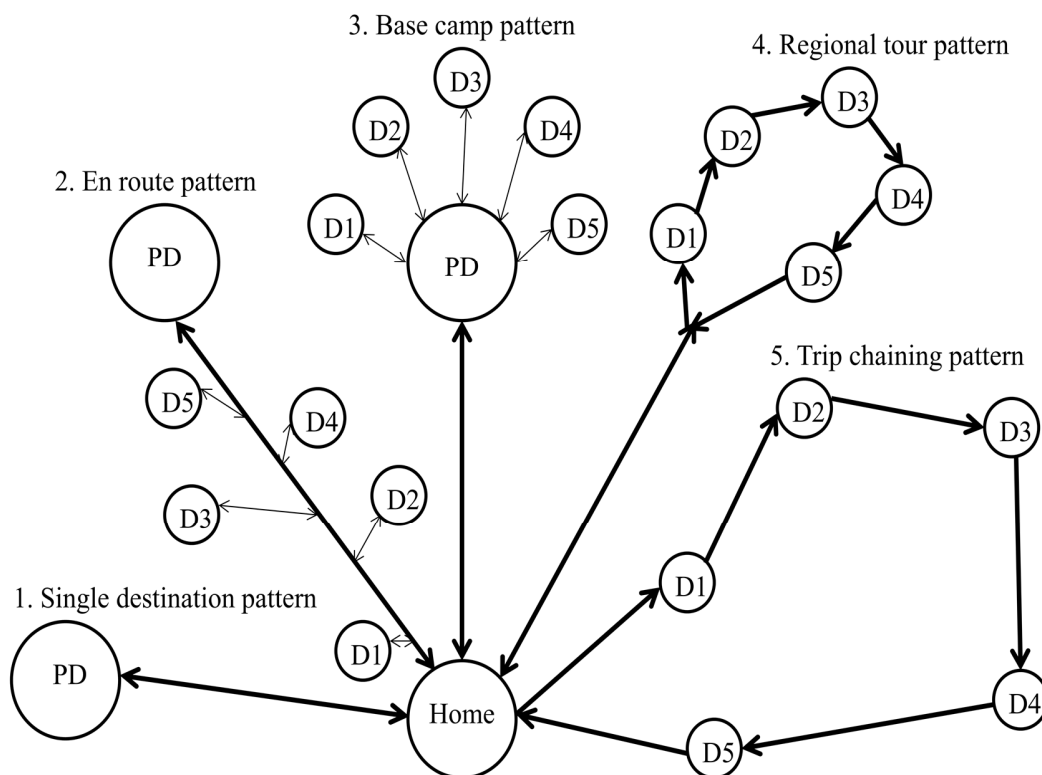


Fig. 1. Spatial patterns of travels (adapted from Lue, Crompton, & Fesenmaier, 1993)
 Note. PD represents a primary destination; D represents a destination.

Since previous research conducted by Stewart and Vogt (1997), Chancellor (2012), and Popp and McCole (2016) reported that tourists tend to visit multi-destinations during a trip, considering this travel perspective can provide better insights for understanding tourists' actual spatial behavior during travel. Previous tourism research on tourist spatial behavior has primarily focused on the single destination or the within a

destination patterns (e.g., McKercher & Lau, 2008; McKercher et al., 2012; Shoval & Isaacson, 2007). Difficulties in data collection such as tourists having trouble recalling the sequential destinations visited and analyzing the movement data are some of the challenges associated with conducting multi-destination travel research.

While many tourists develop plans before their trips, these plans can be changed and/or adjusted to address unexpected constraints occurring while traveling (Hwang & Fesenmaier, 2011; Kah & Lee, 2014; Stewart & Vogt, 1999). Such changes may be more significant or extensive for multi-destination travelers than for single-destination tourists. The extent of the difficulty in coping with those challenges may determine the level of tourism satisfaction. For this reason, understanding multi-destination travelers' actual constraints during their trips is important for increasing understanding of travel behavior.

2.2 Constraint Research in Tourism

The leisure constraint concept (Crawford & Godbey, 1987; Crawford, Jackson, & Godbey, 1991) has primarily been applied in examining tourism constraints for participating in tourism activities or pleasure travel (e.g., Boo et al., 2014; Daniels, Rodgers, & Wiggins, 2005; Fleischer & Pizam, 2002; Hinch & Jackson, 2000; Hudson & Gilbert, 2000; Hung & Petrick, 2010; Norman, 1995; Nyaupane & Andereck, 2008; Nyaupane, Morais, & Graefe, 2004; Pennington-Gray & Kerstetter, 2002). According to Crawford and Godbey (1987), leisure constraints are classified into three categories: intrapersonal, interpersonal, and structural constraints. Intrapersonal constraints are the individual psychological states that interact with leisure preferences, while interpersonal

constraints are the result of the relationship between an individual's characteristics, and structural constraints are intervening factors between leisure preferences and participation such as financial resources, season, and climate.

Tourism constraint researchers (e.g., Nyaupane & Andereck, 2008; Hung & Petrick, 2010) have repeatedly confirmed structural constraint factors (i.e., time, money, and environment) as major tourism constraints and, thus, have continued to advance tourism constraint research by incorporating sub-categories. For example, Nyaupane and Andereck (2008) extended the leisure constraint model by adding three sub-dimensions (i.e., time, costs, and place attribute) of structural constraints, arguing that place-based constraints factors (i.e., traffic, weather condition, and proximity) may not be critical constraints that prevent people from traveling to a particular destination. Hung and Petrick (2010) found that constraints consisted of four factors (i.e., intrapersonal constraints, interpersonal constraints, structural constraints, and not an opinion) in regard to taking a cruise vacation. They claimed differences in constraints between leisure and tourism (i.e., cruise vacation) settings.

While “theories and concepts developed in leisure studies can be used to aid understanding of tourist behavior” (Carr, 2002, p. 981), previous studies (e.g., Hung & Petrick, 2010) revealed differences in constraints between leisure and tourism settings. Cooper (1981, p. 360) had also noted distinct nature of tourist compared to other consumers: “Firstly, the tourist has a very limited time in which to complete his exploration. Secondly, the tourist is almost a behavioural caste and thus needs special

consideration.” Thus, tourism scholars need to continually develop theories and concepts specifically related to tourism.

This study is one attempt to do so as it applies the space-time constraint concept of time-geography rather than depending on the leisure constraint concept for better understanding constraints in the context of tourists’ spatial behavior. Because tourism is inherently a geographical phenomenon, which includes physical movement to and from places (Leiper, 1979; Smith, 2010), the space-time constraints concept may demonstrate new insights to understanding tourists’ spatial behavior. This effort is responding to Xiao, Jafari, Cloke, and Tribe (2012), who indicated that:

Tourism has increasingly differentiated itself from its sisters’ field of recreation and leisure studies and hospitality, as well as departed from its parents’ (traditional social sciences) disciples To date, tourism studies have been moving on with a strong intellectual legacy, and have been developing a character or identity of its own (Xiao et al., 2012, p. 373).

2.3 Space-Time Constraints

Geographers (e.g., Schwanen & Kwan, 2008) have conducted constraints research associated with human daily travel and everyday life by applying the space-time constraint concept of time-geography developed by Hägerstrand (1970). These constraints focus on barriers associated with human spatial movement in both space and time (Couclelis, 2009). To cope with these constraints effectively, individuals need to understand the inherent spatial and temporal aspects of their lives. Since the time-

geography concept provides a framework for understanding human existence in time and space, the time-geographical constraint concept is applicable for examining the spatial behavior of tourists. Like daily travel, tourist travel occurs within limited time and space resources, specifically the length of stay and the territorial space (i.e., the tourism destination). For this reason, the space-time constraint concept of time-geography may provide insights that improve our understanding of the tourism constraints associated with the spatial behavior of tourists.

According to Hägerstrand (1970), the space-time constraints of individual daily travel and activities include authority constraints, capability constraints, and coupling constraints. According to his definitions:

[Authority constraints reflect that] the world is filled with a device which we may call the “control area” or “domain.” These words are essentially spatial. However, I would suggest that the concept of a domain be redefined to refer to a time-space entity within which things and events are under the control of a given individual or a given group (Hägerstrand, 1970, p. 16).

Capability constraints are those which limit the activities of the individual because of his biological construction and/or the tools he can command.

Some have a predominant time orientation and two circumstances are of overwhelming importance in this connection: the necessity of sleeping a

minimum number of hours at regular intervals and the necessity of eating, also with a rather high degree of regularity (Hägerstrand, 1970, p. 12).

Coupling constraints define where, when, and for how long, the individual has to join other individuals, tools, and materials in order to produce, consume, and transact (Hägerstrand, 1970, p. 14).

In tourism research, time-geography can be applied to examine “a complex connection between time, space and tourist mobility” (Zillinger, 2007, p. 79). It focuses on the movement and interaction of tourists in time and space and, thus, can provide a relevant theoretical and methodological framework for examining tourism and leisure-related mobility (Hall, 2012). Past tourism research has primarily focused on the visualization of tourists’ movement patterns in time and space rather than on comprehending the fundamental reasons formulating those patterns (Shoval, 2012), some of which may include constraints. Thus, Hägerstrand (1970)’s space-time constraint concept may provide insight into the spatial behavior (i.e., movement patterns) of tourists.

Little research has focused on understanding tourism constraints associated with tourists’ multi-destination travel, even though the definition of tourism traditionally includes the idea of spatial movement to and from places (Leiper, 1979). While the concept of space-time constraints was originally developed by Hägerstrand (1970) to understand human daily activities and travels in space and time, this study applies that constraint concept to improve the understanding of tourists’ spatial behavior. To do so,

this study proposes six hypotheses to test Shoval's (2012) definition of the space-time constraints concept of time-geography in the context of spatial patterns of travel including both single and multi-destination trips.

Shoval (2012) defined the authority constraints, capability constraints, and coupling constraints focused on tourism implications. Authority constraints in tourism research can be defined as the purpose of travel because the:

Purpose of visit has a direct impact on the spectrum of possibilities available to the tourist; tourists who travel for business or to visit friends and relatives will be less likely to visit tourist sites than tourists who travel for the specific purpose of touring and sightseeing (Shoval, 2012, p. 177).

Thus, an association between authority constraints and the spatial patterns of tourists' trips is expected. As a result, two hypotheses, H1 and H2, were developed:

H1: There is a significant association between authority constraints and the spatial patterns of travel (i.e., single destination travel, multi-destination travel).

H2: There is a significant association between authority constraints and multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, trip chaining pattern).

Capability constraints can be defined as the length of a visit because "in the case of tourists the stay in the destination varies and therefore the length of visit is a constraining factor that changes the spectrum of opportunities for the tourists" (Shoval,

2012, p. 177). In addition, according to Fennell (1996, p. 814), “when time is short, space is conserved.” Thus, this study expects that the spatial patterns of trips may differ depending on the length of visit. Accordingly, two hypotheses, H3 and H4, were proposed:

H3: There is a significant association between capability constraints and the spatial patterns of travel (i.e., single destination travel, multi-destination travel).

H4: There is a significant association between capability constraints and the multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, trip chaining pattern).

Coupling constraints can be defined as the composition of the travel party since “the spatial activity of individual tourists and the geographic range of their activities in a destination will be completely different from that of organized groups, as they are personally responsible for selecting the particular tourist sites to be visited” (Shoval, 2012, p. 177). Cooper (1981) showed life cycle can discriminate differences in spatial behavior. Shaw and Williams (1997) found that children in a travel party influence its spatial and temporal behavior. Thus, the spatial patterns of travel may differ depending on the nature of the travel party, resulting in the two hypotheses, H5 and H6, below:

H5: There is a significant association between coupling constraints and the spatial patterns of travel (i.e., single destination travel, multi-destination travel).

H6: There is a significant association between coupling constraints and the multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, trip chaining pattern).

3. METHODS

3.1 Data Collection

The population for this study included U.S. domestic tourists who visited at least one of the selected South Carolina coastal areas of McClellanville, the Isle of Palms, Charleston, Beaufort, and Hilton Head Island (see Fig. 2). Researchers from a U.S. southeastern university traveled to these areas to obtain email addresses from randomly selected tourists on randomly selected days and at a randomly selected times of day during October 2014. The tourists who voluntarily agreed to participate in this e-mail survey typed their email addresses into a tablet computer such as an iPad or wrote them on the designated sheet. One week after the intercept, an email invitation was sent to these tourists. A modified Dillman (2000) technique was applied to increase the response rate, and an incentive, a \$100 gift card, was provided to one randomly selected participant from those who had completed the entire survey. An online survey website, Qualtrics.com, was used for this self-administered online survey. The total valid number of survey responses was 362 (856 effective invites, a 42.3% response rate). Of these 362 responses, 357 respondents fully completed the survey. Of these 357 responses, 31 respondents' data were intentionally deleted due to such reasons as they were international tourists and/or their length of stay was more than a year. Business travelers' data were also excluded

from the data analysis. As a result, a total of 299 respondents were considered as the data set for conducting the hypothesis tests.

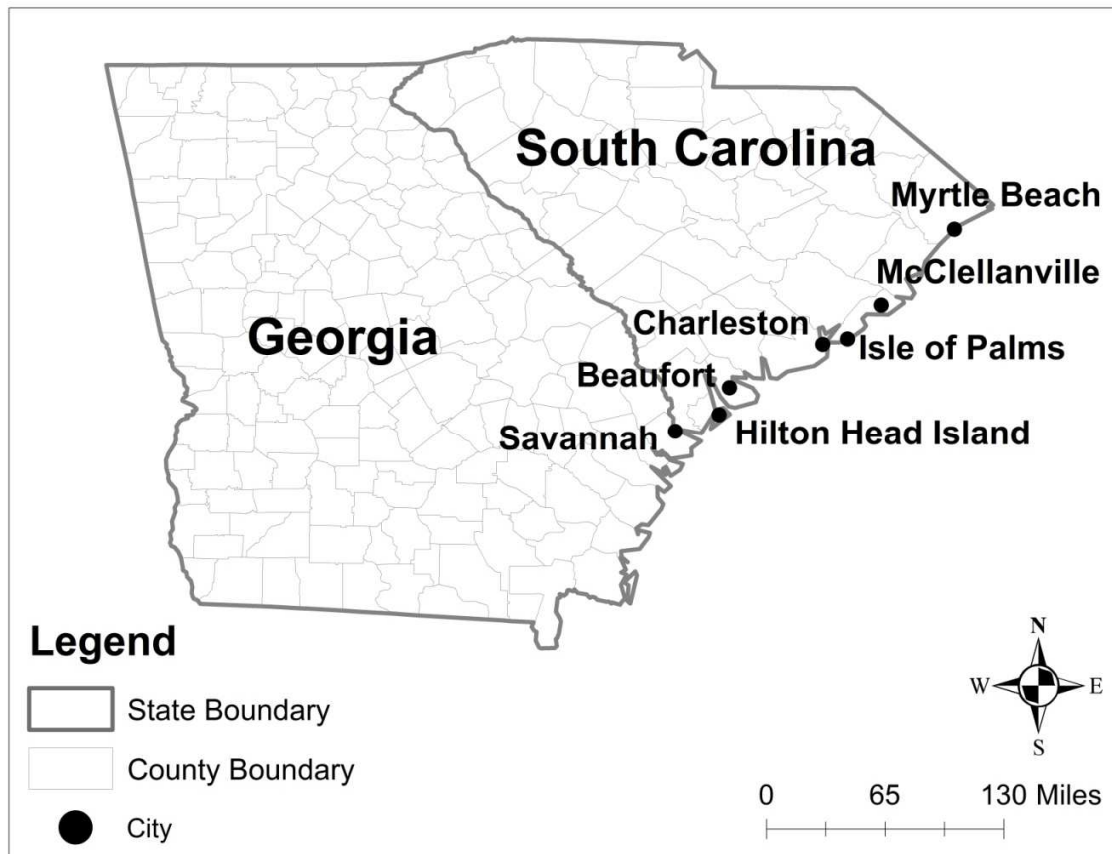


Fig. 2. Major coastal tourism destinations in the state of South Carolina, USA.

3.2 Measurement

Space-time constraints were measured using the definitions proposed by Shoval (2012). Authority constraints (i.e., the purpose of travel) were measured by the question, “What was the main purpose of this most recent trip?” Respondents answered with one of the eleven options --Vacation, Business, Visit friends and relatives, Attend a special

event, Go to the beach, Go boating, Go fishing, Eat out, Visit a second home/cottage/condo, Visit attraction(s), or Other (Please specify). This study assumed that vacation tourists may be more likely to visit tourism destinations than non-vacation tourists who may have a specific purpose for their trip. As a result, this study dichotomized the eleven options into two categories, vacation and non-vacation.

Capability constraints were assessed by the question, “For this most recent trip, how many nights did you stay at this location?” Respondents answered one of two options, either Day trip/no overnight, or I stayed ____nights (fill in box with # of nights). Based on these responses, the capability constraints consisted of two categories, day trip and overnight trip. According to Shoal (2012, p. 177), “the length of visit is a constraining factor that changes the spectrum of opportunities for the tourists.” This study dichotomized capability constraints into day trip/no overnight and overnight.

Based on Shoal (2012), this study assumed that the geographical range of tourist travel patterns may vary based on the composition of the travel party to reflect the individual members’ wants. The influence of children can be importantly considered (Rapoport & Rapoport, 1975). Specifically, tourists who had children perceived more structural constraints than retired and living alone tourists (Pennington-Gray & Kerstetter, 2002). Thus, coupling constraints were measured by a question, “How many people, including yourself, were in your group, on this most recent trip to the South Carolina coast?” Respondents provided specific information regarding the composition of their family group by providing the appropriate numbers of “Adults (indicate # in box): _____” and “Children – under 18 (indicate # in box): _____.”

The spatial patterns of travel, which include both single destination and multi-destination travel, were measured as a categorical variable with the question, “How would you best describe the travel pattern of your most recent trip?” Respondents responded to one of the five travel pattern options: “Traveled to a primary destination, and stayed there the entire time,” “Visited several destinations within the state, en route to and from a primary destination,” “Stayed at the primary destination throughout the vacation, and used it as a ‘base camp’ from which to visit destinations within the state,” “Traveled within the state and sequentially visited a series of destinations in the state,” or “Visited multiple destinations encompassing several states, and traveled from one to another, rather than having a single focal state.” These travel pattern descriptions were adapted from Lue et al. (1993).

3.3 Analysis

The Chi-square (χ^2) tests were used to test for statistically significant associations between the two nominal variables. Chi-square analysis needs to meet the criterion that no expected frequency is less than 1 and no more than 20% of the expected frequencies are less than five (Sirkin, 2006). However, when a table violates the criterion, the table was modified by combining the regional tour pattern and the trip chaining pattern categories into the regional tour pattern (including trip chaining pattern) to meet the criteria needed to validly conduct the Chi-square test.

When the χ^2 test was significant, strength of the association between variables was examined using phi (ϕ) or Cramer’s V , depending on the size of a table. Specifically,

ϕ was used for a two-by-two table, while Cramer's V was used for a table larger than two-by-two (Frankfort-Nachmias & Leon-Guerrero, 2011). Statistical Package for the Social Sciences (SPSS) 18.0 was used to conduct the analyses.

4. RESULTS

4.1 *Space-Time Constraints*

4.1.1 *Authority Constraints*

Of the 299 respondents, 46.2% reported vacation as the main purpose of their most recent trip to the South Carolina coast. The respondents reporting attending a special event, visiting attraction(s), and visiting friends and relatives were 16.1%, 12.0%, and 11.7%, respectively (see Table 1).

Table 1

The main purpose of most recent trip to the South Carolina coast.

Purpose	Frequency	Percent (%)
Vacation	138	46.2
Attending a special event	48	16.1
Visit attraction	36	12.0
Visit friends & relatives	35	11.7
Go to the beach	14	4.7
Visit second home/cottage/condo	9	3.0
Other	9	3.0
Eat out	5	1.7
Go fishing	3	1.0
Go boating	2	0.7
Total	299	100.0

4.1.2 *Capability Constraints*

Of the 299 respondents, 76.6% were overnight tourists, and 23.4% were day trip/no overnight tourists (see Table 2).

Table 2

Number of nights respondents stayed during their most recent trip to the South Carolina coast.

	Frequency	Percent (%)
I stayed ___ nights	229	76.6
Day trip/no overnight	70	23.4
Total	299	100.0

4.1.3 Coupling Constraints

Of the 291 respondents, 66.7% respondents traveled without children, while 33.3% respondents traveled with their children on their most recent trip to the South Carolina coast (see Table 3).

Table 3

Composition of travel party on the most recent trip to the South Carolina coast.

	Frequency	Percent (%)
With children	97	33.3
Without children	194	66.7
	291	100.0

4.2 Spatial Patterns of Travel

Of the 299 respondents, 55.5% indicated single destination travel for their most recent trip to the South Carolina coast, with the remaining 44.5% traveling to multiple destinations. Of these 44.5% respondents, 49.6% selected the base camp pattern, followed by the en-route pattern (26.3%), the trip chaining pattern (18.8%) and the regional tour pattern (5.3%). This finding demonstrates an interesting distinction compared with previous studies (e.g., Chancellor, 2012; Popp & McCole, 2016; Stewart & Vogt, 1997). While only 5% of the respondents visiting the South Carolina coastal region selected the regional tour pattern for their multi-destination travel, 28.9% and 50.0% respondents selected this tour pattern in Missouri and Michigan states,

respectively (see Table 4). This finding suggests that tourists' multi-destination travel pattern could be associated with the spatial structure of a tourism region.

Table 4

Comparison of current study with similar previous work.

	This study (2015), South Carolina, USA	Stewart & Vogt, (1997), Missouri, USA	Chancellor (2012), North Carolina, USA	Popp & McCole, (2016), Michigan USA
Single destination travel	55.5%	30.1%	69.9%	3.4%
Multi-destination travel	44.5%	69.9%	30.1% ^a	96.6%
Total	100.0%	100.0%	100.0%	100.0%
En-route pattern	26.3%	41.5%		31.0%
Base camp pattern	49.6%	18.5%		8.3%
Regional tour pattern	5.3%	28.9%		50.0%
Trip chaining pattern	18.8%	11.1%		10.7%
Total	100.0%	100.0%		100.0%

^aEn-route, regional tour, or trip-chaining pattern

4.3 Hypotheses Test

4.3.1 Authority Constraints and Spatial Patterns of Travel

The Chi-square test reveals that authority constraints (i.e., the purpose of travel) were significantly associated with the spatial patterns of travel, $\chi^2(1, N = 299) = 10.102$, Sig. = 0.001, $p < 0.01$ (see Table 5). Thus, H1 was supported. The ϕ of -0.184 shows a weak association between authority constraints and spatial patterns of travel (i.e., single destination travel and multi-destination travel).

Vacation respondents were more likely to be involved in multi-destination travel (54.3%) than single destination travel (45.7%). In contrast, non-vacation respondents were more likely to be single destination travelers (64.0%) than multi-destination ones (36.0%).

Table 5
Authority constraints and the spatial patterns of travel.

	Authority constraints (i.e., The purpose of travel)		Total
	Vacation	Non-vacation	
Single destination travel	63 (45.7%)	103 (64.0%)	166 (55.5%)
Multi-destination travel	75 (54.3%)	58 (36.0%)	133 (44.5%)
Total	138 (100.0%)	161 (100.0%)	299 (100.0%)

$\chi^2 = 10.102$, $df = 1$, Sig. = 0.001, $p < 0.01$; $\phi = -0.184$, Sig. = 0.001, $p < 0.01$.

4.3.2 Authority Constraints and Multi-Destination Travel Patterns

The Chi-square test shows that authority constraints were not significantly associated with multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, and trip chaining pattern), $\chi^2(2, N = 133) = 6.007$, Sig. = 0.050, $p > 0.05$. Thus, H2 was not supported.

Table 6

Authority constraints and multi-destination travel patterns.

	Authority constraints (i.e., The purpose of travel)		Total
	Vacation	Non vacation	
En-route pattern	14 (18.7%)	21 (36.2%)	35 (26.3%)
Base camp pattern	39 (52.0%)	27 (46.6%)	66 (49.6%)
Regional tour pattern (including trip chaining pattern)	22 (29.3%)	10 (17.2%)	32 (24.1%)
Total	75 (100.0%)	58 (100.0%)	133 (100.0%)

 $\chi^2 = 6.007$, $df = 2$, $Sig. = 0.050$, $p > 0.05$.

4.3.3 Capability Constraints and Spatial Patterns of Travel

There was no significant association between the capability constraints (i.e., the length of travel such as day trip and overnights) and spatial patterns of travel (i.e., single destination travel and multi-destination travel), $\chi^2 (1, N = 299) = 2.845$, $Sig. = 0.092$, $p > 0.05$ (see Table 7). As a result, H3 was not supported.

Table 7

Capability constraints and the spatial patterns of travel.

	Capability constraints (i.e., The length of travel)		Total
	Day trip / No overnight	Overnights	
Single destination travel	45 (64.3%)	121 (52.8%)	166 (55.5%)
Multi-destination travel	25 (35.7%)	108 (47.2%)	133 (44.5%)
Total	70 (100.0%)	229 (100.0%)	299 (100.0%)

 $\chi^2 = 2.845$, $df = 1$, $Sig. = 0.092$, $p > 0.05$.

4.3.4 Capability Constraints and Multi-Destination Travel Patterns

The Chi-square test indicates that there was a significant association between capability constraints (i.e., the length of travel such as day trip and overnights) and the multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, and trip chaining pattern), $\chi^2 (2, N = 133) = 15.753$, Sig. = 0.000, $p < 0.001$ (see Table 8). Thus, H4 was supported. The Cramer's V of 0.344 (Sig. = 0.000, $p < 0.001$) reveals a moderate association between capability constraints and the multi-destination travel patterns.

The day trip respondents who did not spend the night were more likely to use an en-route pattern (56.0%) for their multi-destination travel, followed by the regional tour pattern (including trip chaining pattern) and base camp pattern, 24.0% and 20.0%, respectively. In contrast, 56.5% of the overnights respondents preferred the base camp pattern for their multi-destination travel to the South Carolina coast, followed by the regional tour pattern (including trip chaining pattern) and en-route pattern at 24.1% and 19.4%, respectively.

Table 8
Capability constraints and multi-destination travel patterns.

	Capability constraints (i.e., The length of travel)		Total
	Day trip / No overnight	Overnights	
En-route pattern	14 (56.0%)	21 (19.4%)	35 (26.3%)
Base camp pattern	5 (20.0%)	61 (56.5%)	66 (49.6%)
Regional tour pattern (including trip chaining pattern)	6 (24.0%)	26 (24.1%)	32 (24.1%)
Total	25 (100.0%)	108 (100.0%)	133 (100.0%)

$\chi^2 = 15.753$, $df = 2$, Sig. = 0.000, $p < 0.001$; Cramer's $V = 0.344$, Sig. = 0.000, $p < 0.001$.

4.3.5 Coupling Constraints and Spatial Patterns of Travel

The Chi-square test reveals no statistically significant association between coupling constraints (i.e., the composition of the travel party) and the spatial patterns of travel (i.e., single destination travel and multi-destination travel), $\chi^2(1, N = 291) = 0.699$, Sig. = 0.403, $p > 0.05$ (see Table 9). Thus, H5 was not supported.

Table 9

Coupling constraints (i.e., the composition of travel party) and the spatial patterns of travel.

	Coupling constraints (i.e., the composition of travel party)		Total
	With children	Without children	
Single destination travel	58 (59.8%)	106 (54.6%)	164 (56.4%)
Multi-destination travel	39 (40.2%)	88 (45.4%)	127 (43.6%)
Total	97 (100.0%)	194 (100.0%)	291 (100.0)

$\chi^2 = 0.699$, df = 1, Sig. = 0.403, $p > 0.05$.

4.3.6 Coupling Constraints and Multi-Destination Travel Patterns

A Chi-square test reveals a significant association between the coupling constraints and multi-destination travel patterns, $\chi^2(2, N = 127) = 11.941$, Sig. = 0.003, $p < 0.01$ (see Table 10). As a result, H6 was supported. Cramer's V was 0.307 (Sig. = 0.003, $p < 0.01$), indicating a moderate association between coupling constraints and the multi-destination travel patterns.

Of the 39 respondents who traveled with children, 71.8% used the base camp pattern. The en-route pattern and regional tour pattern (including trip chaining pattern) were used by 15.4% and 12.8%, respectively. In contrast, 88 respondents (out of 127) traveled without children. An interesting finding was that those respondents who traveled without children did not depend on a particular travel pattern during their most recent trip to the South Carolina coast as the base camp

pattern (38.6%), the en-route pattern (30.7%), the regional tour pattern (including trip chaining pattern) (30.7%) scored similarly.

Table 10
Coupling constraints and multi-destination travel patterns.

	Coupling constraints (i.e., The composition of travel party)		Total
	With children	Without children	
En-route pattern	6 (15.4%)	27 (30.7%)	33 (26.0%)
Base camp pattern	28 (71.8%)	34 (38.6%)	62 (48.8%)
Regional tour pattern (including trip chaining pattern)	5 (12.8%)	27 (30.7%)	32 (25.2%)
Total	39 (100.0%)	88 (100.0%)	127 (100.0%)

$\chi^2 = 11.941$, $df = 2$, $Sig. = 0.003$, $p < 0.01$; Cramer's $V = 0.307$, $Sig. = 0.003$, $p < 0.01$.

5. CONCLUSION

5.1 Discussion

This study found that the spatial patterns of travel are likely differentiated by the spatial structure of the tourism destination region. Compared with Stewart and Vogt (1997) and Popp and McCole (2016), who reported 29% and 50%, respectively, only 5% of the multi-destination travelers in this study responded that they used the regional tour pattern. Interestingly, 20% used the trip chaining pattern. This finding shows that while the amount of leisure time available for travel is an essential component of the tourism experience, tourists' spatial movement patterns could be related to the spatial structure of a tourism region. For example, one of the major tourism destinations in the US southeastern coastal area is Savannah in the state of Georgia; however, the geographical distance between Savannah and several popular tourism destinations in the state of South Carolina such as Hilton Head Island and Charleston is close (see Fig. 2). For

instance, it takes less than an hour to drive from Savannah to Hilton Head Island, even though the two tourism destinations are located in different states, meaning Georgia and South Carolina, respectively. In contrast, tourists would spend at least four hours driving from Hilton Head Island to Myrtle Beach, while these two destinations are located in the same state (i.e., South Carolina). Thus, if these destinations (i.e., Savannah, Hilton Head Island, and Myrtle Beach) provide similar tourism environments, a more time- and cost-effective approach for maximizing tourism experiences would be traveling between Hilton Head Island and Savannah, rather than traveling to the destinations (i.e., Hilton Head Island and Myrtle Beach) within the state. As a result, the trip chaining pattern could be the preferred travel pattern over the regional tour pattern for tourists visiting the South Carolina coastal region. This finding suggests the need for more research regarding spatial patterns of travels, especially multi-destination travel research, to make the most efficient use of tourism destinations between/among regions.

More importantly, this study reveals that tourists' spatial behavior was significantly associated with their travel related constraints (i.e., space-time constraints). Specifically, authority constraints (i.e., the purpose of travel) were significantly associated with spatial patterns of travel (i.e., single destination travel and multi-destination travel), while capability constraints (i.e., the length of travel) and coupling constraints (i.e., the composition of travel party) were significantly associated with the multi-destination travel patterns (i.e., en-route pattern, base camp pattern, regional tour pattern, and trip chaining pattern) (see Table 11).

Table 11

Associations between space-time constraints and spatial patterns of travel.

	Space-time constraints		
	Authority constraints	Capability constraints	Coupling constraints
Spatial patterns of travel	√		
Multi-destination travel patterns		√	√

Note. √ indicates a statistically significant association.

A result from this study indicates that traveling with children could constrain multi-destination travel patterns. For example, tourists who traveled with children heavily used the base camp pattern (71.8%), while tourists who traveled without children similarly used three patterns: the base camp (38.6%), the en-route (30.7%), and the regional tour patterns (including the trip chaining pattern) (30.7%). This finding supports Thornton et al. (1997), who found the presence or absence of children as well as the age of the youngest child affected the activities of groups. Pennington-Gray and Kerstetter (2002) also revealed that tourists with children had more structural constraints than retired and living alone tourists. This study confirms children could be considered as coupling constraint associated with tourists' multi-destination travel patterns.

5.2 Limitations and Future Research

Since the data for this study was collected in the rural coastal areas of South Carolina, the findings presented here might be limited in tourism areas with similar spatial structure, tourism systems, and resources. Seasonality should also be addressed since it could impact the supply and demand sides of the tourism system in a tourism region (Koenig-Lewis & Bischoff, 2005). For example, tourists' spatial movement patterns during the fall might be different from the spring, summer, and winter seasons. A recent study conducted by McKercher, Shoval, Park, and

Kahani (2015) asserted that the influence of the weather was probably limited to urban destinations. However, the influence of the weather might be an important consideration for tourists who would participate in outdoor tourism activities or visit natural resource based tourism environments.

While spatial patterns of travel were operationally defined based on Lue et al. (1993), spatial scale and structure should be carefully considered before conducting tourist' spatial behavior research. Specifically, when a study is interested in tourists' spatial behavior between/among destinations (i.e., city, community, or town) within a region (i.e., state) or multiple regions (i.e., states), Lue et al.'s model (1993) should be reasonably considered. Stewart and Vogt (1997), Chancellor (2012), and Popp and McCole (2016) have already successfully applied the model of Lue et al. (1993) to examine the spatial patterns of travel. However, if a study focuses on tourists' spatial behavior within a destination, Lew and McKercher's model (2006) should be considered, because tourists' spatial behavior within a destination is complex (McKercher & Lau, 2008).

Regarding data collection methods, Global Positioning System (GPS) devices could be considered for collecting tourists' space-time data such as where a tourist stopped and how long he/she stayed at one place (Fennell, 1996). Some tourism researchers (e.g., De Cantis, Ferrante, Kahani, & Shoval, 2016; Hallo, Beeco, Goetcheus, McGee, McGehee, & Norman, 2012; McKercher et al., 2012; Zheng et al., 2017) have successfully used GPS devices in their tourist behavior research. However, this study focused on overall spatial patterns of travel in a larger spatial scale, providing statements to describe the spatial patterns, rather than collecting specific information related to tourists' spatial and temporal behavior within a destination. To minimize recall bias, email invitations asking for respondents to complete web-based questionnaires were

sent out one week after intercepting the tourists. Thus, based on the purpose of this study, the approach used in this piece would be acceptable, especially considering a larger spatial scale.

A decision whether to use GPS devices for collecting tourists' spatial and temporal behavior data might also depend on 1) the spatial scale of the spatial patterns of travel (i.e., within a destination or between/among destinations); 2) the spatial structure of a tourism region; or/and 3) the degree of specificity of tourists' spatial and temporal behavior information. Nevertheless, a new approach for collecting tourists' spatial and temporal data should be recommended. An example would be employing both GPS and web-based questionnaire using smartphones to obtain tourists' behavioral data during a trip, which include both socio-psychological and geographical characteristics.

While this study demonstrated statistically significant associations between the space-time constraints and the spatial patterns of travels, future research should be conducted on how tourists negotiate these space-time constraints by using information and communication technologies (ICTs) such as smartphones during a trip. While Schwanen and Kwan (2008) examined the relationship between the Internet, mobile phone and space-time constraints, little tourism research has conducted to verify the role of smartphones in negotiating the space-time constraints during a trip. Using smartphones might empower tourists to efficiently cope/negotiate with unexpected constraints by obtaining new information during a trip. Thus, future research would examine the role of information searches using smartphones in relation to negotiating the space-time constraints during tourists' multi-destination travel because each new place requires a new search for information such as maps, sights to see, and things to do.

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