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Research Paper

Change and stability in shopping tourist destination networks: The case of Seoul in Korea

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ABSTRACT

Despite the importance of shopping tourists in tourism destinations, the examination of the movements of this lucrative segment is insufficient. This study aims to analyze attractions networks in the Seoul Capital Area that are selected by shopping tourists, as well as to identify whether their attraction networks are stable or dynamic. Specifically, the centralities and the spatial structure of 28 attractions were identified to examine the features of the changing attraction networks. The Gini coefficients of centralities were measured to detect the inequality of link distribution. It was investigated whether networks follow a power law each year to detect the changes in destination networks. Finally, changing networks were visualized through link reduction modules featuring improved readability.

The results of this study are as follows: (1) this study reveals shopping tourists' attraction preference through centrality analysis. The attractions that shopping tourists visited encompass both shopping and non-shopping areas; (2) Sinchon/Hongik University and Namsan Hanok Village were identified as increasingly popular attractions for shopping tourists; (3) Gini coefficients of degree distribution for shopping tourists' attraction networks were higher over the three-year period compared with those of general tourists, indicating that the former choose tourist attractions in a homogeneous manner; and (4) Attraction networks followed the power law in 2013 but not in 2014 and 2015.

1. Introduction

Destinations depend on their primary and secondary attractions as a pull force motivating tourists to visit them (Benur & Bramwell, 2015). It is worth stressing that the marketing strategy of a destination should be comprehensive and cooperative, reflecting the relationship among tourist attractions (Fyall, Leask, & Garrod, 2001; Soteriades, 2012). Understanding tourists' paths connecting attractions and destination touch points promotes collaborative destination marketing (Stienmetz & Fesenmaier, 2015). In other words, the spatial linkages between attractions offer clues for joint marketing among tourist sites (Żemła, 2014). Attraction networks formed by tourist movements offer insights into the intertwined and ongoing endogenous changes in the relationship of attractions from the perspective of visitors. Furthermore, understanding traveler-activated networks could guide the redesign of urban tourism policy in terms of the diversity of tourist attraction attributes and spatial proximity. Thus, attraction network analysis will facilitate inter-destination cooperation.

Shopping tourists are a valuable segment for tourist destinations as a result of increased local revenues. Prior studies have shown that shopping tourists stay longer and spend more compared with general tourists (Choi, Heo, & Law, 2016). Jin, Moscardo, and Murphy (2017) recently presented the issue of shopping settings and destination preference. However, prior studies have lacked knowledge on shopping tourist attraction choices and their movement between destinations. Many prior studies have suggested that motivation plays a crucial role in tourists' movement patterns (Lau & McKercher, 2006). Shopping tourists engage in the attraction selection process while they are pushed by their desires and pulled by attractions. Attractions networks analysis helps to understand the current states of their attraction preference and increase the accuracy of tourism demand forecasts. Therefore, shopping tourists' network analysis could support destination management.

More importantly, it should be noted that destination networks are dynamic in nature (McKercher, 1999). Tourism involves the movement of tourists through time and space (Leung et al., 2012). Tourism destinations experience evolution and transformation beyond a static and fixed state as tourism environments and demand changes. Therefore, there is the need for in-depth understanding of destination network changes in a specific local context (Pavlovich, 2014). To cope with these demands and changes, it is imperative to examine and detect the

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spatial changes of tourist destinations and attraction preferences in the evolving destination networks. A network approach has the advantages of identifying in what way the structure of attractions develops, and how their relationship evolves over time.

This research addresses the following questions: (a) what are the attraction networks of shopping tourists? and (b) how do attraction networks change over time? The research objectives were as follows: (i) to identify attraction networks from the perspective of nodal centrality and linkages; (ii) to examine their degree of distribution by utilizing Gini coefficients; and (iii) to test the power law to detect changes in destination networks. To achieve these aims, attraction networks in the Seoul Capital Area, Korea, were analyzed. The area was chosen because many overseas travelers consider shopping to be an important reason for visiting Korea The literature on networks and shopping tourism was reviewed. Link reduced networks were visualized to distinguish the core from the periphery areas within attraction networks. Finally, theoretical and managerial implications are discussed based on the analysis.

2. Theoretical background

2.1. Shopping tourism

The designation ‘shopping tourists’ refers to tourists whose primary purpose and motivation for a trip is shopping (Choi et al., 2016). Shopping has become a principal motive for travel, and of increasing importance to destinations. For tourists, shopping is among the important tourism activities, affecting their satisfaction and revisit intentions (Heung & Cheng, 2000). However, tourist shopping activities have multidimensional aspects and a single-purpose shopping model is controversial (Shi, Wu, & Wang, 2015). Whether shopping tourists exhibit single- or multi-purpose behavior in terms of movement around destinations is highly contested. It is reasonable to consider that shopping tourists visit attractions with shopping malls and department stores. However, do they only visit commercial shopping districts? For example, Arentze, Oppewal, and Timmermans (2005) proposed a multipurpose shopping trip model in which they examine the relation between shopping trip purpose and destination choice. An appropriate combination of well-designed shopping facilities and diverse cultural activities might contribute to destination attractiveness for shopping tourists.

Although shopping tourists have garnered increased attention from researchers and destination marketers, empirical studies regarding shopping tourists' mobility have been scarce owing to the labor-intensive nature and time-consuming process. For example, Chang and Hsieh (2006) stated that the primary characteristic of shopping tourists in night markets in Taiwan tends to show a high level of mobility. Kemperman, Borgers, and Timmermans (2009) found that there are significant differences in movements of hedonic shopping tourists and utilitarian shopping tourists. Shopping tourists featuring hedonic motivation prefer walking around in the shopping area, whereas utilitarian shoppers prefer more efficient routes. In other words, hedonic shoppers are less sensitive to distance than utilitarian ones. In this context, it is necessary to understand the movement features and attraction choice of shopping tourists for successful destination management.

2.2. Network research in tourism

Network analysis has drawn great interest in recent years (Viren, Vogt, Kline, Rummel, & Tsao, 2015). In the tourism domain, the network analysis method has been applied to analyze the complexity of ties among tourism stakeholders, tourism research collaborations, and traveler activity networks (Fyall, Garrod, & Wang, 2012). Concerning the first research stream, Beritelli and Laesser (2011) conducted tourism organizational network analysis by examining power relationships in the interconnected networks of stakeholders in an Alpine tourist destination. Baggio, Scott, and Cooper (2010) demonstrated the positive impacts of stakeholder cohesion and adaptive capacity on information diffusion within Elba island networks. The second stream of network literature encompasses research collaboration. For example, Ye, Li, and Law (2013) evaluated introversive and extroversive collaboration features in the context of tourism and hospitality through network analysis.

The third stream of network literature explores the relationship to attractions formed by tourist flows. Attraction networks formed by tourist movements reveal the interconnected relationship among attractions. Network analysis can thus help to identify the most central and influencing attractions in the destination network (Del Chiappa & Baggio, 2015). Shih (2006)'s seminal study offered the overview of the structural characteristics of 16 tourism destinations in Taiwan based on the data obtained from the flow of 2142 tourists through network indicators. According to this study, the attractions in border positions that have more connections with adjacent nodes serve as an intermediary function between other places. Stienmetz and Fesenmaier (2015) estimated the value of Baltimore's attractions network in Maryland using data from the activated path of 1102 travelers. They found that the degree centrality of a place is a good predictor of its marginal economic impact on total trip expenditure. Leung et al. (2012) examined the changes of overseas tourist movement patterns based on 500 online trip diaries in Beijing over three periods (before, during, and post the Olympics) using content and network analyses. This study revealed how the Olympics influenced the networks in terms of an increasing number and an expanded area of visited places. In this way, previous studies on networks provide support to the notion that destinations must not be viewed as an independent entity but as interrelated within the network.

3. Measurement of centrality

Centrality measures node importance at the node level. Measuring node centrality involves several concepts, including degree, closeness, between-ness, and eigenvector centralities. The importance of nodes differs depending on the indicator. First, degree centrality refers to the centrality of a node in terms of the number of nodes to which a particular node directly connects (Tasci, Khalilzadeh, Pizam, & Wang, In press). Degree centrality is calculated as the number of direct ties that involve a given node. Second, eigenvector centrality considers the strength of ties and indirect ties among nodes, whereas degree centrality only considers the strength of direct ties (Shih, 2006). Third, between-ness centrality measures the extent to which a specific node lies between the other nodes in the set of nodes. In other words, between-ness centrality is determined by how many times actors play an intermediary role or broker. Fourth, closeness centrality is determined by the shortest path lengths linking actors (Shih, 2006). It indicates a node's closeness to all network members, contrary to degree centrality that measures only a node's connections to immediate neighbors.

4. Method

4.1. Research procedure and focus

Fig. 1 presents the research procedure employed in this study. In Step 1, this study targeted overseas tourists' movement data obtained from the International Visitor Survey. The International Visitor Survey is annually released by the Korea Tourism Knowledge and Information System (The Korea Tourism Knowledge and Information System, 2015). The secondary data is relatively credible in terms of the data collection process sponsored by the Korea Ministry of Culture, Sports, and Tourism. For example, more than 10,000 overseas tourists were chosen randomly by qualified interviewers every month at two main harbors (i.e. Incheon and Busan) and four major international airports (i.e. Incheon, Gimpo, Gimhae, and Jeju). Movement data were preprocessed using Microsoft Excel in Step 2, and then the network matrix was

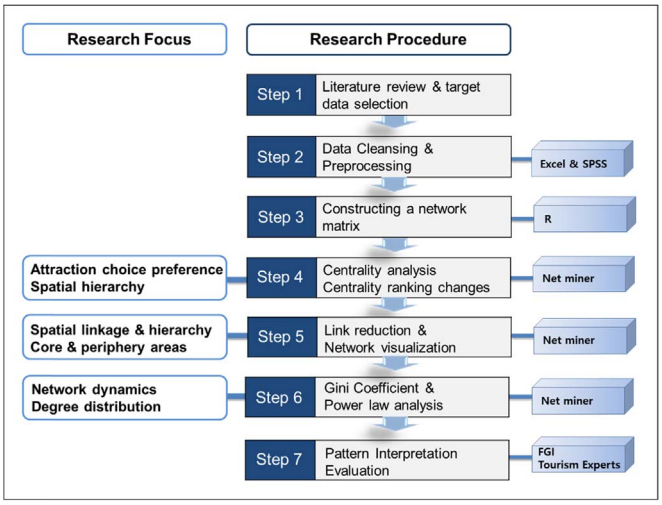

Fig. 1. Research procedures.

constructed as an adjacency matrix using R program in Step 3. In the network matrix, the nodes represent places and links that correspond to the flow of tourists. In Step 4, the centralities of attractions were analyzed using Netminer 4.0. In Step 5, the link reduced networks were visualized to configure the core and periphery (non-core) areas for shopping tourists. In Step 6, a power law test was conducted and Gini coefficients of centralities were measured to detect the inequality of link distribution. In Step 7, tourism experts comprised of the directors of tourism agencies, tourism consultants, as well as professors discussed the findings in focused group interviews. The current study used the secondary data, including media reports, for a context-sensitive approach to abductive interpretation in order to understand the background of the destination's changes. Thus, the process of network changes could be understood with context-sensitive information (Pavlovich, 2014).

In the present study, the research questions comprise of three parts (see Fig. 2). First, this study investigates what attraction networks have been formed in Korea by shopping tourists' movement. Second, it examines in what way destination networks remain stable in terms of the network structures. Since the changes in destination systems take time, there are some consistently influential nodes during the three-year period. Third, it explores how networks transform over years, particularly reflecting the changes of degree distributions and centralities.

4.2. Case study area

Twenty eight tourism attractions in the Seoul Capital Area as the study area. Seoul is the world's sixteenth largest city and a leading global city. It is a popular destination for shopping tourists. For example, the analysis report of the International Visitor Survey showed that many overseas tourists considered shopping among their most important reasons for visiting Korea (The Korea Tourism Knowledge and Information System, 2015). The 28 sites were selected as representative tourism spots from the International Visitor Survey through a discussion with tourism experts (see Table 1 and Fig. 3).

These attractions comprise not only shopping districts but also cultural, historical, and business sites located in Seoul, Incheon, and Gyeonggi-do, Korea. The 28 locations labeled from P1 to P20 are located around the inner and outer parts of the Seoul metropolitan area. The features of these important attractions are briefly summarized in Appendix A.

5. Findings and discussion

5.1. Demographic profiles of respondents

A shopping tourist is defined as a visitor whose main purpose for a trip is shopping and purchasing products (Choi et al., 2016). In consideration of the research scope and objective, we selected data from shopping tourists who identified shopping as their primary trip motivation from the International Visitor Survey. The demographic sample size was determined by the number of respondents who answered shopping in the survey question. The demographic profile of the respondents is shown in Table 2. The gender distribution of respondents shows that female tourists are a dominant gender group. The dominant age group of the respondents was 21–30 years, followed by 31–40 years. The dominant nationality group of the respondents was Japanese in 2013 and Chinese in 2014 and 2015. The major travel type of the respondents was free independent travelers in all three years.

5.2. Centralities of attractions of shopping tourists

Among the key issues in network analysis is estimating which nodes are central and have much power within the network (Bonacich, 1987). The concept of centrality measures the importance of a node in a network. Due to the complicated interconnected flows of tourists, most attractions recorded approximately zero in terms of between-ness centrality. Major attractions scored approximately one in terms of closeness centrality, indicating that nodes could easily extend to other nodes. In this context, the current study focused on the degree and eigenvector centralities of attractions in 2013, 2014, and 2015 (See Table 3). These centralities have the following characteristics: (1) in general, the attractions with a high level of degree centrality tended to exhibit a high level of eigenvector centrality. Accordingly, the ranking of the degree

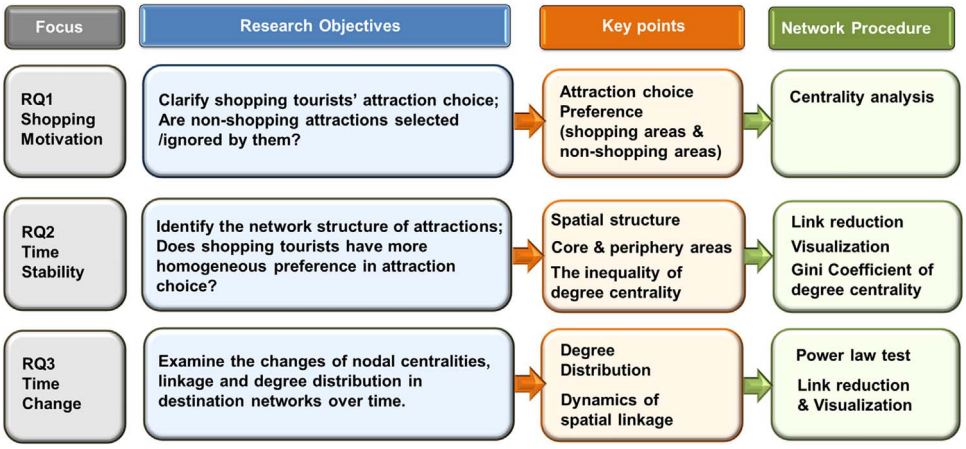

Fig. 2. Research goals and procedures.

Table 1
The sample of attractions in the Seoul Capital Area.

Label	Place	Label	Place	Label	Place
P1	Palaces	P2	Memorial Halls	P3	Insa-dong
P4	Namsan N Seoul Tower	P5	Myeong-dong	P6	Namdaemun Market
P7	COEX	P8	Dongdaemun Market	P9	Itaewon
P10	Lotte World	P11	Yeouido/63 Building	P12	Hangang River/Ferry
P13	Cheonggyecheon	P14	Sinchon/Hongik University	P15	DMC/World Cup Stadium
P16	Namsan Hanok Village	P17	Bukchon/Samcheong-dong	P18	Cheongdam-dong/Apgujeong-dong
P19	Garosu-gil Street	P20	China Town	P21	Songdo
P22	Ganghwa	P23	Yeongjongdo	P24	Everland/Caribbean Bay
P25	Suwon Hwaseong Fortress	P26	Imjingak Nuri Peace Park	P27	Korean Folk Village
P28	Seoul Land				

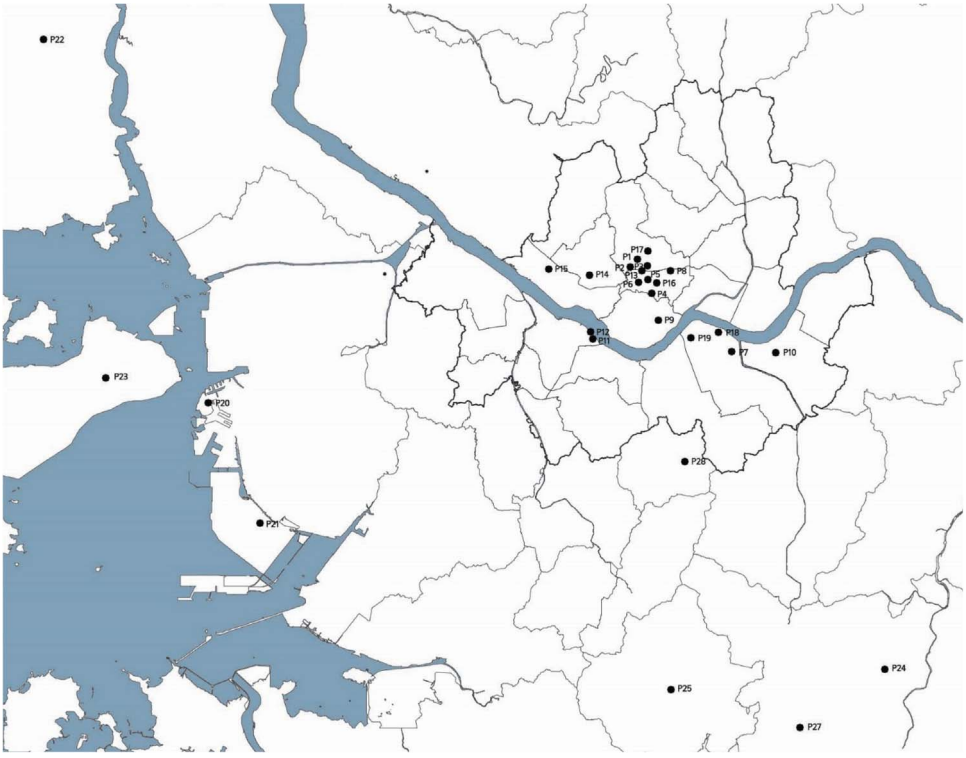

Fig. 3. Locations of attractions in Seoul Capital Area.

centrality generally coincided with that of the eigenvector centrality in attraction networks; (2) P1 (Palace) and P5 (Myeong-dong) were the top levels of degree and eigenvector centralities for the three year period; (3) moreover, both P8 (Dongdaemun Market) and P6 (Namdaemun Market) recorded middle level of degree and eigenvector centralities, even though their rankings follow a decreasing trend; (4) a few rising popular attractions included P4 (Namsan/N Seoul Tower), P14 (Sinchon/Hongik University), and P16 (Namsan Hanok Village), with increasing rankings of the degree and eigenvector centralities over the three-year period.

Fig. 4 illustrates the overall ranking changes of degree centrality. The rankings of the degree centrality of P14 (Sinchon/Hongik University) and P16 (Namsan Hanok Village) improved during this period. The reason of these attractions' rising popularity is partly because of their close location to the city's central tourism zone and changes in shopping tourists' preference. It could be also interpreted that these tourist attractions have a thematic compatibility with shopping tourists. However, shopping tourists might need complementarity between shopping activity and non-shopping activity. In this way, the rising popularity of diversified attractions could provide opportunity for international tourists' to be introduced to undiscovered areas in the future.

5.3. Spatial structure of Seoul tourism attractions: link reduction analysis

The link reduction module helps to improve understanding of a network structure by progressively removing the links in the network. Through the procedure, a link was removed if its weight was smaller than the specified threshold value. For example, the link reduced network of top 5% was constructed by the top 5% of high number of links. Link reduction of 5%, 10%, 20%, and 30% was conducted for the entire network using Netminer 4.0. The link reduction module has the following advantages: The spatial structure of place nodes is clearer through link reduction. The module enhances the readability of visualized networks when removing links and helps to differentiate networks formed by strong ties with those formed by weak ties. This module helps to differentiate tourism attractions in the core area from those in peripheral areas of the attractions network.

Table 4 illustrates that P1 (Palaces) and P5 (Myeong-dong) were included in the top 5% of the most visited attraction networks every year. P2 (Memorial Hall), P3 (Insa-dong), P4 (Namsan N Seoul Tower), P6 (Namdaemun Market), and P8 (Dongdaemun Market) were included within the top 10% of the most visited attraction network. The spatial distribution of these attractions showed a high concentration located in the central part of the city. P7 (COEX), P11 (63 Building), P12

Table 2
Demographic features of the respondents.

Criteria		2013	2014	2015
Gender	Male	252 (22.9)	191 (20.4)	202 (22.3)
	Female	847 (77.1)	747 (79.6)	703 (77.7)
Travel type	Free independent travelers	642 (58.4)	585 (62.3)	545 (60.2)
	Group travel	280 (25.5)	220 (23.4)	258 (28.5)
	Airtel	177 (16.1)	133 (14.2)	102 (11.2)
Nationality	China	176 (16.0)	297 (31.7)	365 (40.3)
	Japan	525 (47.7)	254 (27.1)	138 (15.2)
	Hong Kong	88 (8)	109 (11.6)	123 (13.6)
	Thailand	101 (9.1)	115 (12.3)	77 (8.5)
	Taiwan	71 (6.5)	84 (9.0)	70 (7.7)
	Singapore	21 (1.9)	16 (1.7)	24 (2.7)
	Malaysia	29 (2.6)	28 (3.0)	17 (1.9)
	Russia	27 (2.5)	15 (1.6)	17 (1.9)
	Middle East	15 (1.4)	3 (0.3)	8 (0.9)
	Australia	4 (0.4)	3 (0.3)	4 (0.4)
	United States	13 (1.2)	3 (0.3)	4 (0.4)
	Canada	7 (0.6)	4 (0.4)	2 (0.2)
	United Kingdom	3 (0.3)	1 (0.1)	2 (0.2)
	Others	19 (1.8)	6 (0.6)	54 (6)
Age	19–20	47 (4.3)	55 (5.9)	54 (6.0)
	21–30	359 (32.7)	402 (42.9)	405 (44.8)
	31–40	327 (29.7)	287 (30.5)	274 (30.3)
	41–50	198 (18.0)	120 (12.8)	97 (10.7)
	51–60	126 (11.5)	59 (6.3)	56 (6.2)
	Over 60	42 (3.8)	15 (1.6)	19 (2.1)

(Hangang River), P18 (Apgujeong-dong), which are located in the southern area, and P15 (World Cup Stadium) showed less importance for shopping tourists.

Based on the results of the link reduction analysis displayed in Table 4, the spatial structure of attractions in the Seoul Capital Area for shopping tourists was identified (see Fig. 5). It is important to examine the relative importance and relations of places in the spatial structure because destination marketing requires a comprehensive approach beyond the perspective of an individual tourism product (Nguyen & Pearce, 2015). Tier 1, Tier 2, and Tier 3 comprise attractions that are included consistently within the top 5%, 10%, and 20% of networks respectively. Although the reputation and cumulative tourism resources of attractions result in path dependency and preferential attachment in networks, the spatial structure is not fixed and does not have a predetermined order; in other words, it is possible for a secondary attraction to become a primary attraction in the future when the centralities of some attractions increase (Botti, Peypoch, & Solonandrasana, 2008).

Considering the strength of connections, the attractions included in Tier 1, 2, and 3 could indicate the reprehensive preference structure of shopping tourists' attractions. More importantly, the findings show that these attractions represent both shopping (brown font) and non-shopping area (blue font). The diversity of attraction attributes indicate that shopping tourists not only participate in shopping activities but also visit places for cultural uniqueness and entertainment. For example, the analysis shows that shopping tourists visit the landmarks of Seoul (Palace and N Seoul Tower), and concurrently enjoy entertaining experiences (Lotte World) and local distinctiveness (Hanok Village).

Figs. 6–8 display attraction networks from 2013 to 2015. The strong or weak spatial linkages among attractions are differentiated by black, blue, and orange color lines designating the range of the top 5%, 10%, and 20% of networks each year respectively. The pictures show the geographical disparity in the popularity of attractions. Despite temporal changes of connectivity during the study period, tourist activity remains primarily focused on the key attractions in the central zone of northern Seoul. Most key attractions are located in northern Seoul, whereas others located in the southern part are designated as non-core areas, with few exceptions.

Moreover, it should be noted that the spatial linkage of P14 (Sinchon/Hongik University) became strong in the relationship of other nodes during the study period, indicating that this area displays an increasing importance for shopping tourists. The rising popularity of

Table 3
Degree and eigenvector centralities in 2013, 2014, and 2015.

Place labels	2013 degree centrality	2014 degree centrality	2015 degree centrality	2013 eigenvector centrality	2014 eigenvector centrality	2015 eigenvector centrality
P1	254.74 (3)[a]	180.11 (3)	205 (4)	1 (3)	1 (3)	1 (4)
P2	121.81 (7)	68.44 (9)	115.33 (9)	0.44 (7)	0.35 (8)	0.52 (9)
P3	254.74 (3)	68.59 (8)	205 (4)	1 (3)	0.34 (9)	1 (4)
P4[b]	**106.15 (8)**	**180.11 (3)**	**205 (4)**	**0.37 (8)**	**1 (3)**	**1 (4)**
P5	254.74 (3)	180.11 (3)	205 (4)	1 (3)	1 (3)	1 (4)
P6	254.74 (3)	89.96 (7)	112.63(10)	1 (3)	0.49 (7)	0.51 (10)
P7	70.48 (11)	40.26 (12)	33.74 (14)	0.25 (11)	0.19 (12)	0.14 (14)
P8	152.56 (6)	102.78 (6)	119.33 (8)	0.55 (6)	0.54 (6)	0.55 (8)
P9	77.89 (10)	54.78 (10)	55.93 (11)	0.27 (10)	0.27 (10)	0.24 (11)
P10	86.89 (9)	33.52 (14)	205 (4)	0.3 (9)	0.16 (14)	1 (4)
P11	39.19 (15)	19.48 (17)	18.11 (18)	0.13 (15)	0.09 (17)	0.07 (18)
P12	37.44 (17)	23.04 (16)	28.04 (16)	0.12 (17)	0.11 (16)	0.11 (16)
P13	47.48 (13)	180.11 (3)	35.11 (13)	0.15 (13)	1 (3)	0.15 (13)
P14	**63.11 (12)**	**52 (11)**	**205 (4)**	**0.21 (12)**	**0.25 (11)**	**1 (4)**
P15	14.44 (24)	6.7 (19)	7.48 (21)	0.04 (25)	0.03 (19)	0.03 (23)
P16	**44.67 (14)**	**38.52 (13)**	**205 (4)**	**0.14 (14)**	**0.19 (13)**	**1 (4)**
P17	24.04 (18)	26.48 (15)	37.78 (12)	0.08 (18)	0.13 (15)	0.16 (12)
P18	22.41 (20)	15.48 (18)	20.96 (17)	0.07 (20)	0.07 (18)	0.08 (17)
P19	23.33 (19)	180.11 (3)	14.74 (19)	0.08 (19)	1 (3)	0.06 (19)
P20	12.52 (25)	2.81 (24.5)	7.22 (22)	0.04 (24)	0.01 (25)	0.03 (21)
P21	7 (26)	3.96 (21)	0.33 (28)	0.02 (26)	0.02 (21)	0 (28)
P22	3.19 (28)	1.74 (27)	1.52 (27)	0.01 (28)	0.01 (27)	0.01 (27)
P23	18.26 (22)	2.81 (24.5)	6.07 (24)	0.06 (22)	0.01 (24)	0.03 (22)
P24	37.96 (16)	3.37 (23)	29.26 (15)	0.12 (16)	0.02 (22)	0.13 (15)
P25	254.74 (3)	5.56 (20)	12.7 (20)	1 (3)	0.03 (20)	0.05 (20)
P26	19.11 (21)	2.37 (26)	6.04 (25)	0.06 (21)	0.01 (26)	0.02 (24)
P27	17.56 (23)	3.48 (22)	6.41 (23)	0.05 (23)	0.02(23)	0.02 (25)
P28	5.7 (27)	0.7 (28)	2.48 (26)	0.02 (27)	0 (28)	0.01 (26)

[a] ( ) = ranking.
[b] Bold = attractions with improved rankings.

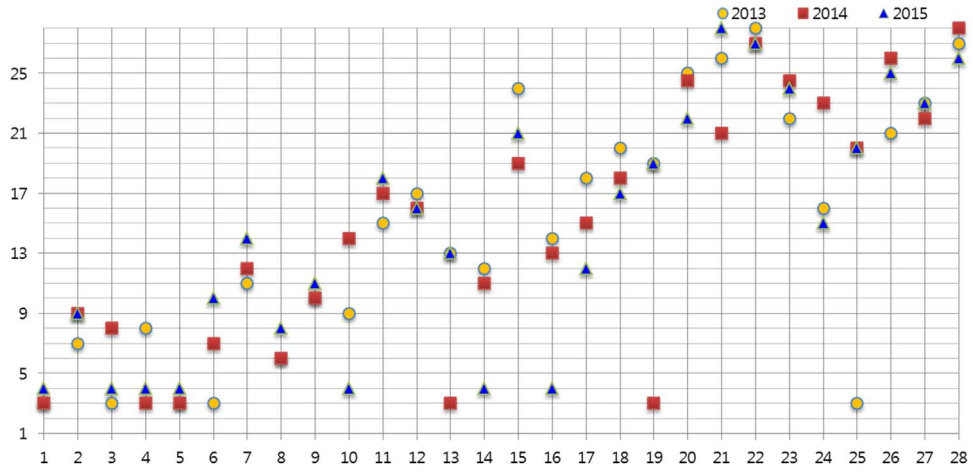

Fig. 4. Ranking changes of degree centrality.

this attraction could be interpreted by the characteristics of both the attraction and the shopping tourists. The popularity of Sinchon/Hongik University is supported by news reports stating that international tourists recently prefer to visit this area because of the young cultural atmosphere on the streets and an increasing number of accommodation facilities at Hongik University (Yoon, 2016). The opening of the airport railroad has improved the transportation environment and has attracted a number of international tourists to this site in recent years. Furthermore, overseas shopping tourists in Korea are known to spend more shopping while saving on accommodation expenses compared with general tourists (Hyundai Research Institute, 2016). The accommodation prices in this area are less expensive compared to hotels in central Seoul. In this vein, the evolving networks reflect a change in tourists' attraction preferences.

5.4. Stable or dynamic destination networks

5.4.1. Gini coefficients: the inequality of link distribution

Gini coefficient of network analysis has been used to detect the unequal distribution of link connectedness. To determine the diversified or polarized choices of shopping tourists, the distribution of the degree centrality has been examined utilizing Netminer 4.0 for the Gini coefficient. The concept of the Gini coefficient was originally designed to measure wealth distribution of people in a society and has been applied to measure inequality among the values of a frequency distribution. Table 5 shows the rudimentary data of the degree distribution, serving as the base of calculation of Gini coefficients. For example, 5% of the place nodes occupy 21.9% of the sum of connected links formed by tourist flows in 2013 in the shopping tourist network.

The Lorenz curve graph represents the cumulative distribution of connected links. For example, the percentage of nodes is plotted on the x-axis, and the percentage of the sum of weighted links of nodes is plotted on the y-axis. When its curve converges towards the 45° straight line, it is called the perfect equality line. In contrast, perfect unequal distribution occurs in which only one node contains all the variable values.

The Gini coefficient is equal to the area marked A divided by the sum of the areas marked A and B. The Gini coefficient could be calculated by A / (A + B) in the Lorenz curve graph. Gini coefficients are bounded between 0 and 1. A value of 0 means perfect equality, whereas a value of 1 indicates perfect inequality. The closer the value to zero results in the lower level of inequality. Following Shuai (2015), in Eq. (1), L(x) represents the Lorenz curve, and the Gini calculation can be expressed in Eq. (1):

$$\text{Gini coefficients} = 1 - 2\int_0^1 L(x)dx \tag{1}$$

As presented in Fig. 9, Gini coefficients of shopping tourists' networks were relatively stable, recording 0.519 in 2013, 0.569 in 2014, and 0.547 in 2015. The Gini coefficients of the general tourist network were 0.432 in 2013, 0.267 in 2014, and 0.482 in 2015. These results show that the Gini coefficients of shopping tourists are higher than that of general tourists each year. The higher Gini coefficients of shopping tourists indicate that their inequality of degree distribution is high compared with general tourists. A higher Gini coefficient reveals that degree centrality is more unevenly distributed. The results imply that shopping tourists have more homogeneous preferences in attraction choice compared with general tourists. In other words, shopping tourists' attraction choices are more concentrated in a few nodes compared with those of general tourists.

5.4.2. Power law of attractions network

The power law distribution indicates a phenomenon that a small minority of nodes have a large number of links, whereas nodes with only a few links are abundant (Clauset, Shalizi, & Newman, 2009). It can be expressed by Eq. (2), where X is the number of connections (degree centralities) and Y is the constant exponent parameter of the number of connected lines. Power law relations are ubiquitous in a complex network, and many types of social networks follow a power law distribution regardless of the level of analysis of actors as

Table 4
Results of the link reduction analysis (2013–2015 data).

Thresholds	Place nodes in 2013	Place nodes in 2014	Place nodes in 2015
Top 5%	**P1**[a], P2, P3, **P5**, P6, P8, P25	**P1**, P4, **P5**, P6, P8, P13, P19	**P1**, P3, P4, **P5**, P10, P14, P16
Top 10%	P1, **P2, P3, P4**, P5, **P6, P8,** P9, P10, P25	P1, **P2, P3, P4,** P5, **P6, P8**, P9, P13, P19	P1, **P2, P3, P4,** P5, **P6, P8,** P10, P14, P16
Top 20%	P1, P2, P3, P4, P5, P6, P7, P8, **P9, P10**, P11, **P13 P14, P16**, P24, P25	P1, P2, P3, P4, P5, P6, P7, P8, **P9, P10, P13, P14, P16**, P19	P1, P2, P3, P4, P5, P6, P8, **P9, P10, P13, P14, P16**, P17
Top 30%	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P16, P17, P19, P24, P25	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P16, P17, P19	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P14, P16, P18, P17, P24

[a] Bold = nodes those are included consistently within the threshold of link reduction.

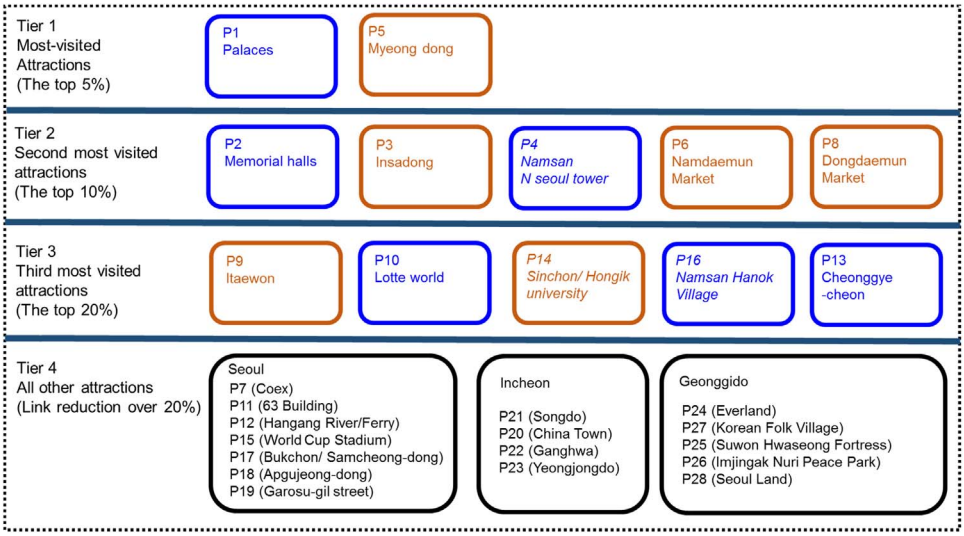

Fig. 5. Spatial structure based on link reduction analysis. Brown font denotes attractions in shopping districts. Blue font denotes attractions in a non-shopping area (i.e. landmarks, cultural districts, and an entertainment park). Italic font denotes attractions with an increasing ranking of centralities from 2013 to 2015. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

individuals, institutions, and countries (Newman, 2006). Power laws are often considered the signatures of structure related to preferential attachment; new nodes prefer to attach to the more connected nodes. In a scale-free network which follows a power law, the preferential attachment is related to the trend of a rich-get-richer phenomenon among nodes (Newman, 2006). Baggio et al. (2010) introduced the concept of power-law distributions in the tourism domain but has not yet been empirically tested in the tourism domain:

$$P(x) \sim x^{-\alpha} \quad (2)$$

Clauset et al. (2009) suggested using maximum-likelihood approaches and goodness-of-fit test for a power law. Netminer software generates 2500 synthetic datasets and calculates the goodness-of-fit between the data and the power law by comparing Kolmogorov-Smirnov statistics. If the resulting p-value is greater than 0.1, the power law is a plausible hypothesis for the data; otherwise, it is rejected. In general, if the p-value is higher than 0.1 and α is between 2 and 3, the observed data distribution is assumed to follow a power law (Clauset et al., 2009). In this study, an attraction network follows a power law in 2013; however, this finding is not constant with other years. Accordingly, the results might indicate certain changes in degree distribution of attraction networks over time. It also implies the phenomenon that only a few nodes feature prominent decrease in tourist movement.

5.4.3. Network correlations and properties

Pearson correlations were computed to examine whether the network matrices were related for each year. The correlation coefficients among the three network matrices for overseas shopping tourists were tested through the Quadratic Assignment Procedure (QAP). QAP is a random network simulation that generates a large number of random networks satisfying the number and density of the currently observed networks and then compares their structural characteristics with other networks. The results indicate that the three networks studied in this project are significantly related to each other. The correlation coefficient between 2013 network and 2014 network was 0.424 ($p < 0.01$). The correlation coefficient between 2013 and 2014 was 0.466

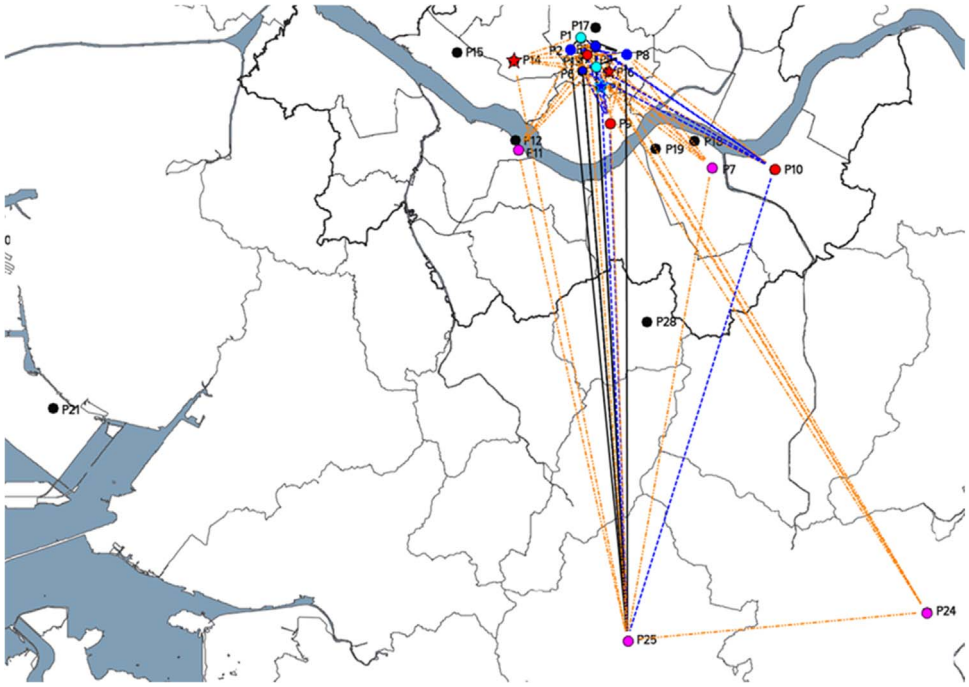

Fig. 6. Visualization of networks in 2013.

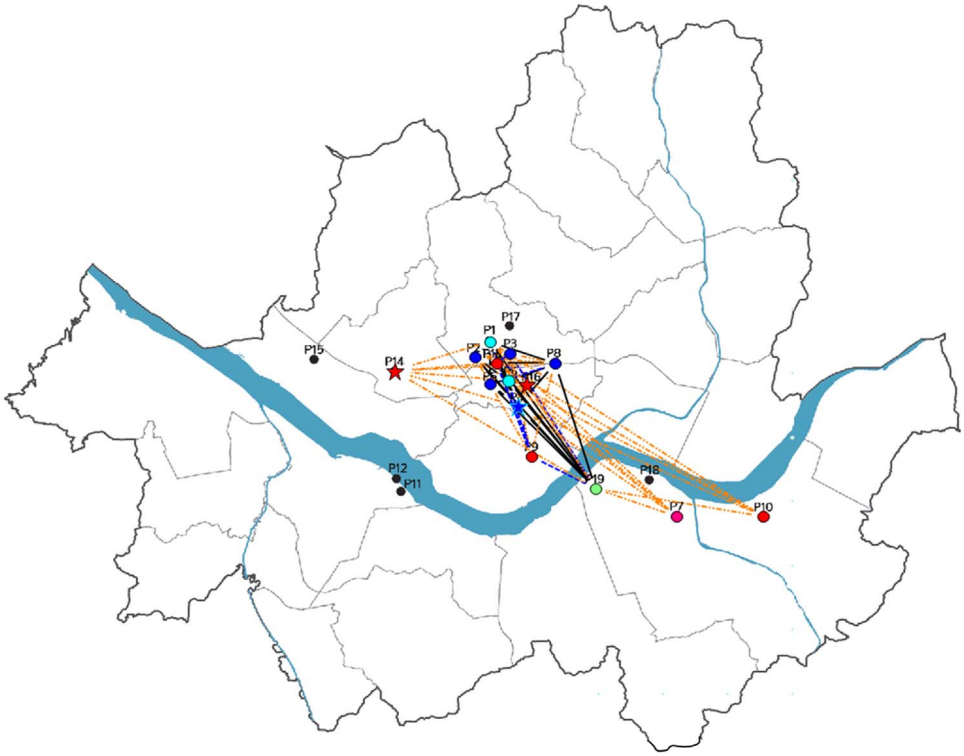

Fig. 7. Visualization of networks in 2014.

($p < 0.01$), and the correlation coefficient between 2013 and 2015 was 0.533 ($p < 0.01$). These measures indicate that the attraction networks have a similar core-periphery structure over the three-year period. In addition, the number of links was recorded as 778 in 2013, 678 in 2014, and 714 in 2015. Density is measured by comparing the number of links of the current network with the total number of links that may be created at the network level. Density was 0.992 in 2013 and 0.86 in 2014 and 0.907 in 2015.

6. Conclusion

Focusing on tourist motivation, movement, and time, this exploratory study examined the features of shopping tourists' attraction networks, and whether their attraction networks were static or

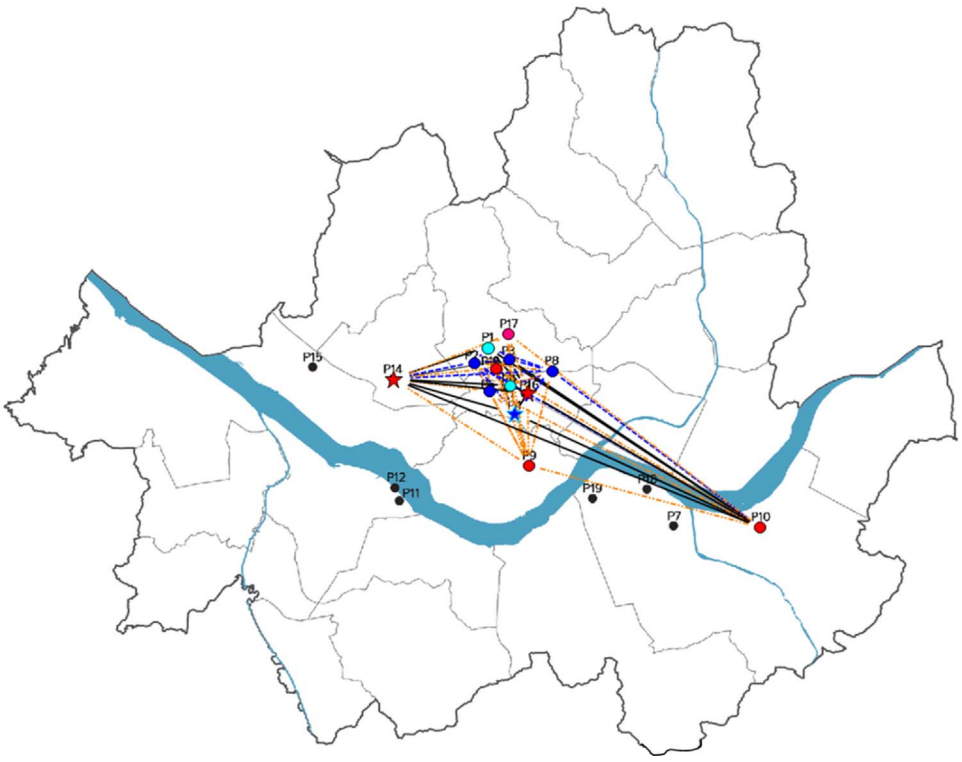

Fig. 8. Visualization of networks in 2015. The color of links denotes strong or weak spatial linkages; Black (the top 5%) > Blue (the top 10%) > Orange (the top 20%). The color of nodes denotes the tier of most-visited regions (Highlighted blue > Blue > Red). Nodes in star shapes denote attractions with a rising ranking of centralities. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 5
Distribution of degree centralities.

	2013				2014				2015			
	Shopping tourists		General tourists		Shopping tourists		General tourists		Shopping tourists		General tourists	
	Upper (%)	Lower (%)	Upper (%)	Lower (%)	Upper (%)	Lower (%)	Upper (%)	Lower (%)	Upper (%)	Lower (%)	Upper (%)	Lower (%)
1%	10.9	0.0	8.4	0.0	6.6	0.0	6.79	0.0	9.7	0.0	8.6	0.0
5%	21.9	0.0	16.9	0.0	24.9	0.5	13.5	0.0	19.4	0.0	17.2	0.0
10%	32.8	0.1	25.4	0.1	37.3	1.4	20.3	1.6	29.2	0.0	25.8	0.1
15%	54.7	0.6	42.4	0.9	46.5	2.6	33.9	4.9	48.6	0.2	43.0	0.6
20%	61.2	1.2	49.8	1.6	53.8	4.1	40.2	6.6	58.4	0.4	51.6	1.0
25%	71.0	2.6	60.9	3.0	60.0	5.9	48.7	10.1	73.8	1.0	66.8	2.0
30%	74.8	3.3	65.5	3.9	65.1	8.0	52.7	12.2	79.2	1.4	71.9	2.6
35%	81.2	5.1	73.8	6.3	69.5	10.3	60.2	16.8	87.2	2.3	0.36	4.1
40%	83.9	6.1	77.3	7.9	73.6	13.0	63.9	19.1	89.0	3.0	83.1	5.3
45%	87.8	8.8	83.2	11.7	77.4	15.8	70.5	23.8	92.3	4.9	88.3	8.0
50%	89.5	10.4	85.9	14.0	81.0	19.0	73.4	26.5	93.7	6.2	90.4	9.5

dynamic. This study offers insights on shopping tourists' attraction networks in five areas.

6.1. The attraction preference of shopping tourists

The shopping tourists' attractions network revealed that attractions they visited were not limited to shopping districts. For example, P1 (Palace), P2 (Memorial Hall), and P4 (Namsan N Seoul Tower) were included in the top 10% of networks over the three-year period. In other words, shopping tourists who consider shopping as the main trip motivation also visited landmarks and attractions where they could experience destination uniqueness. This finding indicates that shopping tourists tend to engage in multi-attraction trips in order to satisfy various tourism demands, which may not be achieved in shopping districts. The results of this study are supported by research findings that shopping tourists have recently become interested in participating in non-shopping activities, such as going to theme parks and visiting heritage sites (Hyundai Research Institute, 2016). Accordingly, a combination of multi-attractions is necessary to better satisfy shopping tourists' preferences. Thus destinations could achieve greater competitiveness through integrative diversification of shopping tourism products. Moreover, the Gini coefficient of the degree distribution for shopping tourists' networks was found to be higher than that of general tourists over the three-year period. These results indicate that the attraction networks of shopping tourists have a more homogeneous degree of distribution compared with that of general tourists. This finding confirms that shopping motivation could serve as a market segmentation characteristic with respect to their attraction choice diversity.

6.2. Cultural and political impacts on networks

The results reflect the uniqueness of international tourists' attraction choice in Korea. A majority of shopping tourists were Asian travelers; many Korean TV dramas have resulted in increased tourists from China, Japan, and other Asian nations. It seems that some attractions have gained popularity with shopping tourists due to the popularity of Korean dramas. For example, Namsan N Seoul Tower has become a rising attraction with an increasing degree centrality after the release of the drama *My Love* from Star. Furthermore, future changes in destination networks should be interpreted in tandem with the impact of politics. For example, China's tourism administration ordered travel agents to halt sales of travel packages to South Korea by opposing the

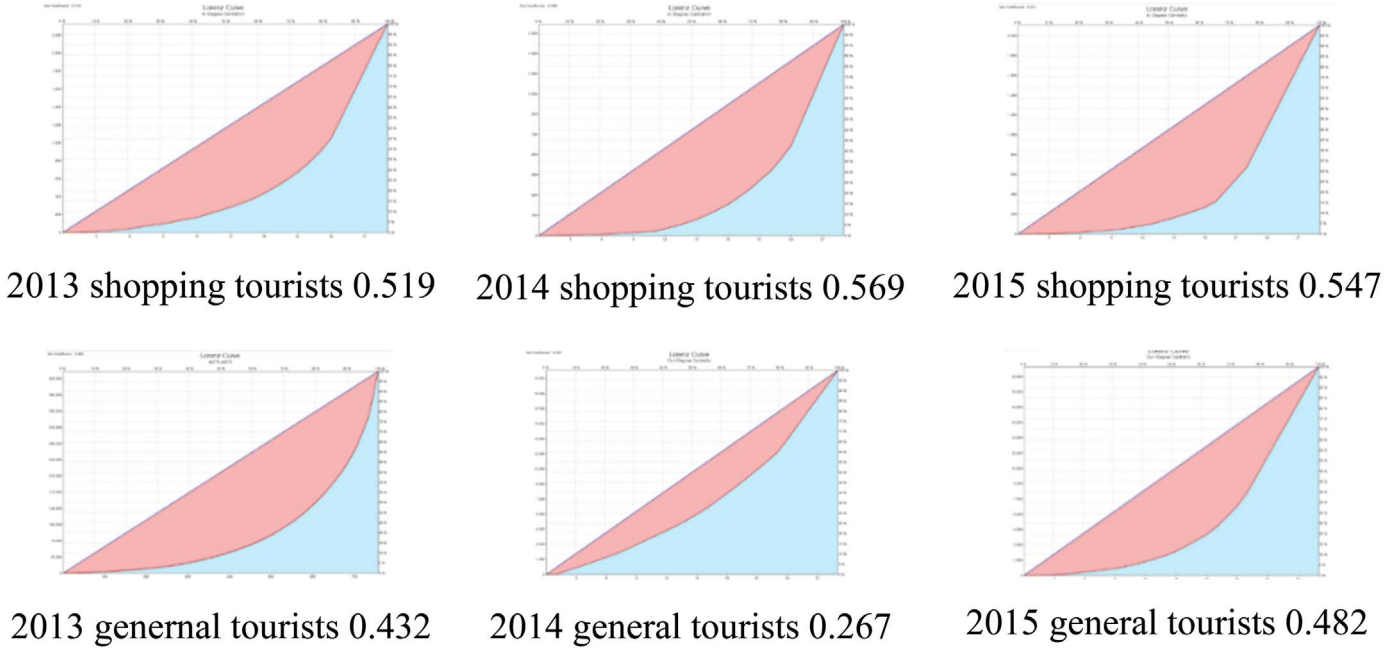

Fig. 9. Lorenz curve of degree centrality.

deployment of a US missile defense system in South Korea in 2017 (Jung, 2017). These travel restrictions decreased South Korea's tourism revenues, which heavily depend on Chinese tourists. Although the present study does not cover the data in 2016 and 2017, another study could examine how destination networks change under the influence of external social and political impacts.

6.3. The spatial structure of attractions

As the meaning of centrality is linked directly to importance and power, nodes with a higher level of centrality have been considered as the core spots in the spatial structure of attractions. The results demonstrate that there are differences between core and peripheral nodes in tourist activated networks. The centrality analysis results show that P1 (Palaces) and P5 (Myeong-dong) recorded the highest score of degree and eigenvector centrality compared with the other attractions over the three-year period. These places act as anchors that are revisited in the city. Accordingly, these two attractions could be classified as key attractions from the perspective of shopping tourists. Moreover, P2 (Memorial Hall), P3 (Insa-dong), P4 (Namsan N Seoul Tower), P6 (Namdaemun Market), and P8 (Dongdaemun Market) were consistently included in central locations within the top 10% of networks for the three consecutive years studied. These attractions are in the northern part of Seoul and could be considered as core areas for shopping tourists.

6.4. The strength of weak ties

Network changes occur in the process of creation and dissolution among the nodal connections (Koka, Madhavan, & Prescott, 2006). Strengthening or weakening nodal links may significantly change destination networks (Teichert & Schöntag, 2010). By examining the network pattern of the tourism destination over three years, changes related to the strengths of nodal links was observed in attractions such as Sinchon/Hongik University. Granovetter (1973) asserted that examining weak ties is important because weak connections provide a chance for non-redundant information in human relationship networks. The importance of weak ties is thus significant in attraction networks because they may serve as a tourism demand-side indicators and signal a future opportunity for extending the area of the city considered as attractive in urban tourism. Pavlovich (2014) provided empirical evidence that the transformation of destination emerges from connectivity of multiple peripheral nodes.

6.5. Power-law distributions

Baggio et al. (2010) argued that many types of tourism-related networks have a degree distribution that follows a power law. Our results show that the attractions network in 2013 follows a power law distribution, but not in 2014 and 2015. This indicates that the degree distribution of attraction networks has changed over time. It is important to examine whether spatial networks follow a power law, as the latter is often associated with the transitional state between a chaotic and an organized condition in statistical physics (Baggio et al., 2010). The fitting or unfitting of a power law signals a phase of destination development and growth. It is acknowledged that the growth mechanism of networks covers balanced node addition, pairwise connection, and preferential attachment (Andersson, Hellervik, & Lindgren, 2005). The results of this study indicate changes in the trend of preferential attachment (a rich-get-richer phenomenon) among attraction choices of overseas tourists. These could be interpreted as showing that attractions with a middle level of degree centrality were developed during the study period.

7. Theoretical and practical implications

7.1. Theoretical implications

First, this work enriches our understanding of destination management. While there have been prior studies examining the destination transformation of tourism organizations, limited research has examined the changes of attraction networks from a consumer-centric perspective. This research extends Pavlovich (2014), which asserted that destinations could be transformed through the tie changes of non-central nodes. Moreover, the present findings contribute to the multi-destination trip literature by validating the claim of multi-attraction trip patterns from overseas tourists in Korea.

Secondly, this work contributes to the theoretical development of shopping tourists' consumer behavior with respect to their attraction choice. Jin et al. (2017) presented the importance of tourism settings of shopping tourists. They recognized that shopping tourists prefer visiting tax-free stores, department stores, and large discount stores. However, shopping tourists' choice of specific attractions has received little attention. This study reveals shopping tourists' attraction choice and preference through centralities analysis and visualization. Moreover, this work sheds light on the homogenous aspect of shopping tourists' attraction choice using the Gini coefficient. In this way, this study extends Lee, Guillet, Law, and Leung (2012), which showed that tourism motivation influences destination and attraction preference.

Third, the present study extends the network literature in the tourism domain. Both power-law and degree distributions have recently received growing interests in the tourism domain (Koo, Lau, & Dwyer, 2017; Lau, Koo, & Dwyer, 2017; Yang, In press). This work extends Baggio et al. (2010), which introduced the concept of a power law in examining the distribution of networks. Furthermore, the present study conducted the link reductions module for simplifying the network structure. Although centralities analysis is effective in understanding the relative importance and power of each node at the nodal level, link reduction module results reveal how nodes are included or excluded as well as connected within the range of a network at the network level. Through link reduction, a visualized network distinguishes weak ties from strong ties among nodes.

7.2. Managerial implications

This attractions network analysis has a managerial significance for inter-destination cooperation and balanced regional development. Strategic destination management requires collaborative destination marketing (Wang & Xiang, 2007). Attraction network analysis offers insights for tourism stakeholders to form partnerships for successful development of the destination. Visitors' multi-destination travel behavior indicates that having a neighboring attraction with a high level of degree centrality might pose collaborative opportunities for other attractions (Żemła, 2014). Thus, the local government should conduct joint marketing among attractions by increasing strong connections with hot spots (Yang, In press). In this way, destination management could be improved by understanding connections among attractions.

Furthermore, the results demonstrated that most key attractions with a high value of centrality are in the northern part of Seoul. For decreasing regional disparity in tourism development, local authorities could consider the spatial linkages between attractions in the periphery area and the key attractions that have a potential to influence regional growth. For example, tourism authorities in charge of P10 (Lotte World) and P19 (Garosu-Gil Street) in the southern area could offer better transportation information by considering links with influential attractions (i.e. P1, P3, P4, P5, P14, and P16) in the northern part of the city (Ahn, Kim, & Lee, 2016). In this way, the results could help to improve the effectiveness of tourism development through an increased understanding of foreign shopping tourists' attraction preference and tourism demands (Supak, Brothers, Bohnenstiehl, & Devine, 2015).

Thus destination marketers could develop thematic and spatial synergies among tourism attractions by understanding the attraction network analysis.

Moreover, understanding shopping tourists' network is important for tourism agencies and operators to detect the trends of popular sites and cope with the current demands of shopping tourists. Tourism agencies could develop new travel products and customized packages tailored to shopping tourists' actual needs. In other words, tourism practitioners could develop intra-destination tourism products by considering both tourist movement patterns and geographical aspects. According to the results, few attractions indicate a growing importance in the spatial structure of Seoul. For example, the importance of Namsan Hanok Village has increased amid the change of centrality. This attraction is a tourism setting where visitors experience Korean cultural uniqueness. In this way, a travel agency could increase advertising effectiveness and improve sales by combining traditionally popular locations and those rising in popularity. Thus, it is suggested that, for start-up companies, this information on travel patterns could be useful.

7.3. Limitation

Although the study attempts to explore the dynamic relationships among tourism attractions, it has limitations. For example, the sample size might influence the results of power-law tests. In addition, this study does not reflect the direction of tourism flows. Accordingly, a further study could examine the detailed movement behavior of tourists by using GPS movement data. Moreover, this study does not cover the impact of the democratic features on attraction choice. The different movement patterns between free independent travelers and group tourists were not examined in the present study. Future studies must be conducted to clarify these issues. Furthermore, the information about tourism movement should be accessible to all tourism stakeholders in a smart tourism destination because a smart tourism destination can be regarded to be a knowledge-based network (Del Chiappa & Baggio, 2015). Accordingly, a future study could investigate how to manage the destination network in the context of a smart destination.

Acknowledgments

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Appendix A. Explanation of selected attractions in Seoul

Link reduction	Names (label)	Pictures	Attributes	Characters	Function & Proximity
The top 5%	Myeong-dong (P5)		Shopping	Brand name shops and department stores line the streets. The special tourist zone in Seoul.	Anchor spots. Gates to the city.
	Palaces (P1)		Non-shopping	The heritage sites. It is known for a drama shooting place of *The moon embracing the Sun.*	Anchor spots. Centers of the city.
The top 10%	Memorial Halls (P2)		Non-shopping	The heritage districts.	Thematic synergy with shopping areas.
	Namdaemun Market (P6)		Shopping	It is the largest traditional market in Korea. It functions as a wholesale market.	Diversification of shopping tourism products.
	Insa-dong (P3)		Shopping	The galleries and traditional restaurants, teahouses are the heartbeat of Insa-dong. Precious and traditional goods are on displayed.	Diversification of shopping tourism products
	Namsan N Seoul Tower (P4)		Non-shopping (a rising attraction)	The landmark of Seoul. It is known for a drama shooting place of *My Love from Star.*	Thematic and spatial synergy with shopping areas.
	Dongdaemun Market (P8)		Shopping	The large discount store and shopping mall are located in Dongdaemun Market.	Shopping tourism product concentration.
The top 20%	Cheonggyecheon (P13)		Non-Shopping	The remodeled stream has beautiful bridges. It is close to Palace, and Insa-dong street, allowing visitors to easily visit major sites after a stroll.	Bridge functions. Close proximity to major tourist attractions.
	Namsan Hanok Village (P16)		Non-shopping (a rising attraction)	This village has restored traditional Korean houses, gardens, a pavilion, and a time capsule plaza.	Thematic synergy with modernized shopping facilities.

Sinchon/ Hongik University (P14)		Shopping (a rising attraction)	Unique fashion shops, live cafés, clubs, and art markets are located with its youthful ambiance in an underground culture.	Diversification of tourism products. The middle level of spatial proximity with central areas.
Itaewon (P9)		Shopping	It is a multicultural place with World Food Streets.	Culinary tourism. The middle level of proximity to major tourist attractions.
Lotte World (P10)		Non-shopping	A modernized entertainment park. It is located in the Southern part of Seoul.	Induction spots in the Southern area.

Source: Group discussions and secondary information on attractions retrieved from [http://korean.visitseoul.net/attractions].

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