



Mobility Big Data-Based Movement Patterns and Inducement Factors Analysis^{*,**}

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Abstract

This study is intended to analyze the factors that make destinations attractive to leisure travelers, differentiating between weekdays and weekends, so as to identify their distinct characteristics. Prior to the analysis, data on leisure travel in Gyeongsangnam-do were extracted from movement location-based data and processed into origin-destination (O/D) data. These data were then analyzed using existing data to determine the current state of leisure travel by city and county. The analysis determined the centrality index of the region where leisure traffic patterns occur. Subsequently, the factors contributing to leisure traffic in Gyeongsangnam-do were analyzed. The analysis revealed differences in the factors influencing the population's behavior in Gyeongsangnam-do between weekdays and weekends. The hypothesis test examined the existence of a difference in the factors that influence leisure traffic. The number of traditional markets and art-related facilities was found to increase leisure traffic regardless of whether the traffic took place on weekdays or weekends, and the number of art-related facilities decreased leisure traffic. However, although it was not derived significantly, it was found that adding more convenient facilities would increase the population engaged in leisure traffic. Among the cultural and tourism characteristic factors, the number of traditional markets and restaurants was found to incentivize increased leisure traffic on weekdays. On the other hand, the factors that reduce leisure traffic were significantly derived from the number of detached houses among the housing characteristic factors, the number of sports-related facilities among the culture and tourism characteristic factors, and the number of art-related facilities. Among the culture and tourism characteristics, the number of traditional markets, accommodation facilities, and recreational facilities were found to be the factors that increased weekend leisure traffic. However, the one factor that reduced leisure traffic was the number of art-related facilities. This study is significant because it identifies the factors that attract leisure traffic and proposes facilities and plans for leisure activities in local hubs and urban areas.

Keywords Leisure Population, Big Data, Centrality Analysis, Inducement Factor

주제어 여가 통행인구, 빅데이터, 중심성 분석, 유인요인

I . Introduction

1. Background and Objectives

Recently, interest in various types of travel occurring in

cities is increasing. Since travel is the basis of various activities, efforts are required to identify travel patterns and travel inducement factors (Lee and Choi, 2020). Travels may be classified into commuting travels such as going to and coming back from workplaces and schools and business trips;

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and non-commuting travels without clear purposes. Most of the previous studies on travels were conducted to investigate the economic purposes thereof. Both commuting travels and leisure travels have the common feature that the travels are concentrated in a specific region, but the destinations of commuting travels are related mainly to work facilities and those of non-commuting travels are closely related to service and sales facilities and affected by variables related to daily living, such as infrastructure, culture, and tourism (Bhat, 2004; Krizek, 2003; Jung et al., 2016). Based on this discussion, it is necessary to pay attention to daily leisure travel, which is one type of non-commuting travels. Leisure activities in the past were stationary and passive, like simply taking rest and watching TV, but the current leisure activities are active and dynamic, such as leisure sports activities, travel, cultural activities, and participation in festivals (Kim et al., 2004). Various leisure activities performed within a city lead to the occurrence of non-commuting travels, changing urban functions and spatial structures (Jang and Lee, 2010; Park et al., 2016). However, most previous studies were limited to the technical description of the data collected from the household travel status survey or the passenger travel status survey or the analysis of daily routine activities of individuals. At present, there is a need for research on the inducement factors of leisure travels in consideration of the changes in the social conditions, including the increase of personal income, reduction of working hours, and development of mass media. According to the statistical data of the Gyeongnam Big Data Hub Platform, the registered population of Gyeongnam has been from about 3,380,000 in 2018 to about 3,370,000 in 2019, 3,350,000 in 2020, and 3,333,000 in 2021, but the de facto population was increased from about 2,900,000 in 2018 to 2,940,000 in 2019, 2,950,000 in 2020, and 2,940,000 in 2021 and then remained at the level. The floating population was increased from about 2,110,000 in 2018 to 2,160,000 in 2019, 2,280,000 in 2020, and 2,580,000 in 2021 (Lee et al., 2022).

Gyeongnam has many cities with various characteristics, including the major hub cities (East: Changwon; West: Jinju), their surrounding small and medium-sized cities and *guns*, and the satellite cities of Busan (Yangsan, Gimhae, etc.). Therefore, an analysis of the movement patterns in Gyeongnam could provide a strategy that is applicable to the cities in Korea. Hence, in the present study, we utilized

the individual mobile phone communication data, which can provide detailed and reliable information in the temporal and spatial range settings of the data, to derive the movement patterns of the leisure travel population and their frequent travel regions in Gyeongnam and analyze the inducement factors to the leisure travel population. The specific objectives of the present study are: 1) to investigate the leisure travel population status in Gyeongnam; 2) to derive the centrality regions according to the movement behavior and patterns of the leisure travel population in Gyeongnam; and 3) to analyze and characterize the inducement factors of the destinations incurring leisure travels during weekdays and weekend.

2. Research Scope and Methods

The spatial scope of the present study is 18 cities and *guns* and 305 *eups*, *myeons*, and *dongs* therein; the spatial units for the analysis were *eups*, *myeons*, and *dongs*, which are the minimum units for gathering traffic information at origins and destinations (Jung et al., 2016). The content range is the leisure travels that routinely occur in Gyeongnam. Lee (2020) and Min et al. (2021) defined non-commuting travel as the form of travel occurring in non-peak times for leisure activities, and described that the dictionary definition of a visit is an act of going to a certain person or place to see the person or place. Lee (2006) and Jang and Lee (2010) defined leisure travel as travel for activities performed in a nondaily space out of the routine life zone as well as various other purposes including sightseeing, vacation, sports, recreation, and hobby. Therefore, in this study, we defined leisure travel as all activities of moving to another area for sightseeing, rest, shopping, recreation, and the like. With regard to the temporal scope, previous studies related to travel were conducted for a period of one to five years, and few studies were performed for an analysis over a short period of time (Lee and Lee, 2022). Hence, in the present study, to analyze the routine travel except for the periods of holidays and vacation season, the temporal scope was determined as one week from March 18 to 24, 2019. With regard to the data used for the analysis, based on the positions obtained in an interval of 15 minutes from the SKT mobile base stations, users whose positions extracted from the data are the same for a certain residence time were considered as residents, and

the mobile phone living travel data including the origins and destinations was processed into origin-destination (OD) data and used for the analysis. In the present study, the visiting population data was used to derive the answers to the questions, “Where are the central areas of the leisure travel patterns in Gyeongnam?”, “What are the factors that determine the movement of the de facto population for leisure activities?”, and “Are the inducement factors different between weekdays and weekend?” With regard to the structure of the present article, Chapter 2 reviews the previous studies on leisure travels and purposed travels to discuss the factors to visiting of other areas and the inducement factors of de facto population. Chapter 3 presents the analytical procedures, including data collection, variable setup, and analytical processes. Chapter 4 describes the movement status for leisure travel in Gyeongnam based on the basic analysis, and describes the centrality regions based on the leisure travel population patterns. Subsequently, the same chapter analyzes the inducement factors of leisure travel during weekdays and weekend based on a regression analysis. Chapter 5 summarizes the results of this study and provides their significance.

II. Review of Previous Studies

1. Travel-related Studies

1) Leisure travel-related studies

Rho et al. (1994) defined leisure as activities performed by individuals to obtain rest, social accomplishments, and self-development, breaking free from their labor and household work. Similar concepts include tourism and recreation. Recreation, referring to activities or actions seeking for entertainment and pleasure, has a narrower meaning than leisure. On the other hand, tourism refers to activities or actions of moving to enjoy customs, cultural sites, landscape or the like, and thus is focused more on the destination than the current residence.

In a previous study about the factors to the visitors' satisfaction, Kim (2004) performed a regression analysis and reported that cultural experience is a factor. Holden and Norland (2005) performed an analysis of the variables influencing leisure travel by using the land use characteristics and demographic characteristics related to residence as

explanatory variables, and reported that private garden, residential density, and the like affect leisure travel. Seo and Boo (2007), Oh and Lee (2007), and Lee et al. (2017) reported that direct factors to the visitors' satisfaction include parking lots, amenities, restrooms, comfort, convenience, local specialties, number of rest areas, number of cultural facilities, and number of traditional markets. Yang and Shin (2008) reported that the key places that are visited by visitors include historical centers, cultural organizations (museums, etc.), shopping malls, and urban parks of the cities. Shim (2014) pointed out that accommodation facilities are also becoming a very important factor. Lee and Lee (2012) found that the factors to the visitors' satisfaction and intention of action include the impression of a city together with the accessibility (transportation accessibility, transportation system, etc.), urban environment (urban parks, squares, etc.), sociocultural factors (museum, etc.), and symbolism (tourists' points, cultural assets, etc.).

In a study about the factors to leisure travel, Kim (1990) reported that the factors are classified into leisure object property factors, psychological factors, leisure environmental factors, and socioeconomic factors: the leisure object property factors include accessibility, resource management, surrounding environment, and capacity; the psychological factors include attitude, learning, personality, life stage, and motivation; the leisure environmental factors include society, culture, economy, politics, ecology, and technological factors; and the socioeconomic factors include vehicle ownership, gender, income, educational level, residential area, occupation, and age of the travelers. The study showed that the direct factors to leisure demand are the psychological factors and socioeconomic factors, while the direct factors to leisure supply are the leisure object property factors and leisure environmental factors. Sung et al. (2008) analyzed the impact of the selected transportation means on the location and type of leisure facilities and reported that public transportation is used more when the walking accessibility is better and that long-distance movement occurs more frequently depending on the accessibility to public transportation in the origins than in the destinations. Kim and Bae (2012) conducted a survey about the temporal and spatial movement ranges and reported that short-distance movements occur more for daily hobbies/entertainment and eating-out and long-distance movements occur more for rest,

nature experiences, and *leports* (leisure sports) activities. Jang (2016) classified the factors to leisure travel into the physical spaces and the external features related to individuals' internal attributes, wherein the spatial factors among the external features include the transportation and the land use characteristics of the origins and destinations. Park et al. (2016) mentioned the departure area, means of travel, residence-nonresidence complexity, monthly household income, housing type, density of commercial facilities as the factors to the leisure travel distance and time on weekdays. Lee and Choi (2019) indicated that the factors to the leisure travel distance and time on weekdays include the household properties (number of preschool children, multiplex/multi-household house, detached house, etc.) and the location and travel properties (region of origin, initial transportation means, accessibility to subway station, etc.).

2) Purposed travel-related studies

Lee (1998) analyzed the commuting distance determinants of the residents in Seoul with the type of house ownership, educational level, and occupational characteristics, and the like as the variables, and reported that long-distance commuters are those who own their own houses, those who are highly educated, and those working in the fields of administration, management, and specialized jobs. Choo (2012) comparatively analyzed the travel data for weekdays and weekend, and found that the factors to weekend travel include the gender, income, occupation, number of preschool children, and vehicle ownership. Kim et al. (2013) reported that rural residents tend to move urban areas through public transportation to utilize public services during the weekend, while urban residents tend to visit rural areas to experience farm villages and rustic life during the weekend. Han and Lee (2015) reported that the key destination inducement factors of the aged people in the Seoul metropolitan sphere include the number of companies hiring the aged, the number of traditional markets, and the number of parks. Jeon et al. (2019) separately analyzed the factors to the commuting travel movement time in urban areas and rural areas, and reported that the factors in urban areas include the travel means, full-time job, residence in apartments, residence in townhouses, and income and that the factors in rural areas include public transportation, full-time job, and residence in detached houses. Yun and Choi

(2020) derived the floating population patterns in the Seoul Metropolitan Area affected by the COVID-19 pandemic through a network analysis. The analytical results showed that the floating population was high in the entire Seoul region before the first wave of the pandemic but the internal connectivity was weakened after the first wave and thus the population inflow from areas far away from the urban areas was reduced.

2. Studies Related to Social Network Analysis

A study related to social network analysis showed that networks formed by interactions between the members are maintained and reproduced through a continuous process, and the characteristics of a previously formed network affect the new network behavior (Park, 2009). In addition, it has been suggested that a macroscopic social structure may be explained through the description of relational phenomena, and particularly, an analysis between administrative 'dongs' presented density, traffic volume (intensity), and network centrality (connectivity) as the information about exchange between two regions (Kim, 2003). Social network analyses have been employed to explain the decision-making structures of companies or social structures based on the data about the internal movement of information and relationships between social members, and the application of these analyses has been extended to the explanation of local space formation processes and cities (Lee and Kim, 2006; Koo, 2008). Network analysis is an analytical method for systematically explaining the potential connection patterns between spatial components mapping them with lines and dots. A network analysis study regarding leisure mobility within cities explained the relationships between the origins and destinations of leisure visiting population within a city space by means of nodes and links (Lee and Kim, 2006), wherein the nodes refer to the origins and destinations and the links refer to the number of exchanges between the origins and destinations or the number of times of visits between administrative 'dongs.' Lee et al. (2022) analyzed the centrality, closeness centrality, and eigenvector centrality to distinguish the sphere of employed population out of a province ('do') the sphere within a province, and performed a coherence analysis to investigate the network structure and density. The analytical results showed that

the employed population flowing in from a province and the employed population within a province exhibited differences in community formation. In addition, a network refers to connectivity between regions, and a basic method of network analysis is sociography. A sociogram has the advantage of visualizing the relationships between regions by means of dots and lines so that the overall structure of a social network may be understood at a glance. However, when the connectivity between regions is complicated, the structural characteristics included in the network are difficult to measure. To overcome this limitation, an analytical method has been proposed to measure the structural characteristics of network focusing on the centrality. A network analysis related to leisure travel has demonstrated the usefulness of the method, presenting the need for further analysis and research on leisure travel (Choi, 2015). Therefore, the present study was conducted to analyze the leisure travel patterns through a network analysis, thereby deriving the centrality and identify the destinations for leisure activities.

3. Differences of Present Study

Most of the previous studies simply showed that the occurrence of leisure travel affects the residential area characteristics. Since leisure travel, incorporating tourism and recreation, is considered as a destination-centered activity, most of the previous studies on the destination characteristics were focused on the travel by the aged. In addition, the statistical data on the population movement in Korea has been focused on some locations only, it has been difficult to analyze the leisure travel status and patterns in the entire Gyeongnam region. Therefore, the first difference of the present study is that due to the lack of previous studies on the factors of the leisure travel destinations that induce movement to other regions, we derived the patterns of leisure travel and the inducement factors of destinations. Second, previous studies were conducted by using the population movement statistics in Korea to identify the leisure travel factors, but the travel data has low accuracy because the data is dependent on where the measurement devices are placed and when the measurement is performed. Therefore, in this study, we analyzed the inducement factors of destinations that induce leisure travel during the weekdays

and weekend by using the reliable life service data based on the LTE signal data, which provide the information about the actual movement paths.

4. Hypotheses Establishment

Leisure travel is movement by individuals for resting, shopping, and recreation. Travel for leisure activities is expected to be affected by the local characteristics of the destinations rather than the characteristics of the origins. Therefore, the questions of the present study are “Do the residence, culture and tourism, and living infrastructure characteristics increase leisure travel in the movement of the de facto population in Gyeongnam?” and “Is there a difference in the inducement factors of leisure travel between weekdays and weekend?” The null hypotheses established for these questions are that “The residence, culture and tourism, and living infrastructure characteristics do not increase leisure travel in the movement of the de facto population in Gyeongnam” and that “The inducement factors of leisure travel during weekdays and weekend are the same.” <Figure 1> illustrates the detailed hypotheses with respect to the variables of the individual characteristics, and the contents are described below.

- 1) H_0 : The residence characteristic factor does not affect the leisure travel in the movement of the de facto population in Gyeongnam.
- H_1 : The residence characteristic factor affects the leisure travel in the movement of the de facto population in Gyeongnam.
- 2) H_0 : The culture and tourism characteristic factor does not affect the leisure travel in the movement of the de facto population in Gyeongnam.

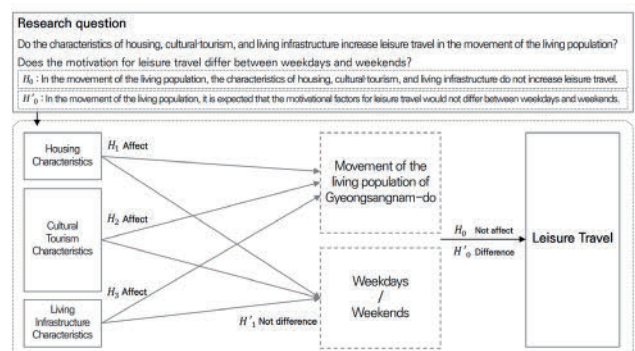


Figure 1. Establishing research questions and hypotheses

H_1 : The culture and tourism characteristic factor affects the leisure travel in the movement of the de facto population in Gyeongnam.

3) H_0 : The living infrastructure characteristic factor does not affect the leisure travel in the movement of the de facto population in Gyeongnam.

H_1 : The living infrastructure characteristic factor affects the leisure travel in the movement of the de facto population in Gyeongnam.

4) H'_0 : The inducement factors of leisure travel by the de facto population in Gyeongnam during weekdays and weekend are the same.

H'_1 : The inducement factors of leisure travel by the de facto population in Gyeongnam are difference between weekdays and weekend. (Figure 1)

III. Analytical Framework

1. Analytical Data

In the present study, 25,576,840 pieces of mobile living travel big data provided by SKT based on the base station relay were processed into O/D matrices, including 93,025 O/D matrices for the inside of Gyeongnam and 983,752 O/D matrices for the outside of Gyeongnam. However, due to the absence of data representing the movement from Gyeongnam to the outside, only the data for the inside of Gyeongnam was used. In addition, leisure travel was considered as nondaily activities for recreation, tourism, rest, and refreshment (Lee, 2006). The mobility data inside Gyeongnam was processed, except for the movement within the users' current residential regions, and the data in 64,921 O/D matrices representing the leisure activity population moving from the current residential regions (eup, myeon, dong) to other administrative regions was used for the analysis. The data of only the population moving to other administrative regions was used for the following reasons. First, the mobile living travel big data provided by SKT considers the movements within the same eup, myeon, and dong as the movements by the residential population, and thus the data for the same eup, myeon, and dong was excluded from the analysis. Second, the analysis was initially conducted by including the movements within the same si and gun, but the number of movements in specific regions was found to

be too many. Therefore, the data was excluded from the analysis lest the reliability of the analytical results should be lowered. The mobile living travel big data includes the records of the mobile phone communication signals from the SKT users received by the individual relays each hour, and thus this is floating population data allowing for analysis of incoming regions and accurate numbers of communications. From an analytical point of view, the floating population may also be defined as active population in the sense that the data provides information about the population present in a specific region in a specific time zone (Lee et al., 2017).

The SKT mobile life population data is established for different time windows by classifying the mobile phone users according to the day of the week, gender, and age group. The data includes the information about not only the positions at each time window but also the users' residential areas, providing residential population, workplace population, and visiting population data. The residential population data is obtained by estimating the workplace and the actual residential area based on the positions of the mobile phone users during the night. The actual residential areas of users are estimated by generating weights based on the mobile phone received in the same places between 11 p.m. and 4 a.m. for 15 days or more in the past one month and the results of the Population and Housing Census.¹ Based on this, the use patterns are differentiated according to the purpose. SKT defines the user patterns according to the purpose as follows. The residential population is defined as the population currently present in the vicinity of the residential areas, considering that those whose outflowing area and inflowing area are the same are present in the vicinity of the residential areas. The workplace population is defined as the population currently in the workplace areas, considering that those whose inflowing area and daytime residence area are the same are present in the vicinity of the workplaces. The visiting population, which is the net inflow population except for the daytime residential local population and the night time residential local population, refers to the population flowing in from other administrative regions besides the workplace areas and residential areas (Lee et al. 2022). As shown in <Figure 2>, the data used in the present study is the visiting population in different hours. and the data was established so that the user position in different hours may

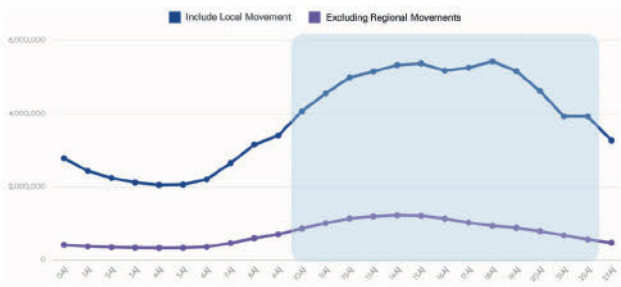


Figure 2. Current status of visitor population in Gyeongsangnam-do

be indicated as the one and only place without redundancy, although it may be redundant within 24 hours. (Figure 2)

Centrality is a numerical value representing how central a region is in an entire network. Measurement of centrality means quantification of how important a location occupied by a region is in consideration of the network structure. Measures of centrality are degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality, and the degree centrality and closeness centrality are divided into in-degree centrality and out-degree centrality depending on the network direction.

The degree centrality is an indicator for measuring the magnitude of a direct influence on a neighboring region. More linked regions mean a higher degree centrality as well as a larger magnitude of direct influence. In Equation 1, Z_{ij} means a direct link from i to j , and N means the total number of nodes in the network. A region with a higher degree centrality may be understood as a region that has good accessibility and that can play the role of a nodal region.

$$C_D(i) = \sum_{j=1}^n Z_{ij}(i) \tag{1}$$

The betweenness centrality is a concept for measuring how much a certain region plays the role of an intermediate region or a mediating region in constructing a network with other regions. In Equation 2, g_{jk} means the number of cases of the shortest paths between two points (i and j), and $g_{jk}(i)$ means the number of times of passing point i between two points $ik(j \neq k)$. A region with a higher betweenness centrality has better capacity to communicate and control regions, and thus its dependency on other regions is also higher.

$$C_B(i) = \sum_{j < k} g_{jk}(i) / g_{jk} \tag{2}$$

The closeness centrality represents how close a certain node is to another node, and the distance between two nodes is the essential concept. Since the centrality is measured by calculating the distances of not only the directly linked nodes but also the directly linked nodes, the closeness centrality allows to measure the centrality in consideration of the overall relationships of the whole network. Closeness centrality is understood as the capacity to spread the population or resources of the region to the entire network. In Equation 3, $d(i,j)$ represents the shortest path from node i to node j , and N represents the total number of nodes in the network. A region with a higher closeness centrality is understood as close if the frequency of leisure travel between regions is high, while it is understood as distant if the frequency of leisure travel between regions is low.

$$C_i = (N-1) \left[\sum_{j=1}^N d(i,j) \right]^{-1} \tag{3}$$

A 1-mode network was used to construct a square matrix. To analyze the regions exhibiting leisure travel patterns, the in-degree centrality index, betweenness centrality index, and out-closeness centrality index were used.

2. Selection of Variable and Sources of Data

The purpose of the present study is to investigate the movement status and movement patterns of leisure travel in Gyeongnam and to measure the centrality indexes of the regions showing the patterns to analyze the inducement factors of leisure travel. The spatial units of the analysis were 305 eups, myeons, and dongs in Gyeongnam, and the temporal scope of the analytical variables were limited to 2019. The dependent variable was the leisure travel inflow obtained by processing the base station relay-based mobile living travel data provided by SKT. Only the inflow was used, because movement to a destination, which is a region that is not the residential area, occurs in leisure travel.

The descriptions of the variables used in the present study and the sources of data are summarized in <Table 1> with reference to the variables used in previous studies. The data sources are the National Spatial Data Infrastructure Portal, the Public Data Portal, and the Gyeongnam Big Data Hub Platform.

With regard independent variables, the push-pull theory

Table 1. Variable definition

Division	Variable	Definition	Source	
Variable	Number of visitors	The number of visitors from the departure area to the arrival area	SKT-Provided Mobile Living Travel Data	
Indept. variable	Housing characteristics	Apartment	Number of apartments by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	National Spatial Information Portal
		Town house	Number of town houses by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Multi-family housing	Number of multi-family houses by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Detached house	Number of general detached house by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	Public Data Portal
		Multi-family detached house	Number of multi-family detached houses by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Detached house with business	Number of detached houses with business by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Traditional market	Number of traditional markets by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
Indept. variable	Cultural tourism characteristics	Restaurant	Number of restaurants by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	Public Data Portal
		Accommodation facility	Number of accommodation facilities by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	Gyeongnam Big Data Hub Platform
		Recreational facilities	Number of recreational facilities by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Cultural facilities	Number of cultural facilities (movie theaters, etc.) by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Sports facilities	Number of sports facilities (golf course + swimming pool, etc.) by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		Art related facility	Number of art related facilities (museums and art museums, etc.) by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	
		City bus stop	Number of city bus stops by Eup-Myeon-Dong in Gyeongsangnam-do in 2019	Public Data Portal
Living infrastructure characteristic	Amenities facility	Number of amenities facility by Eup-Myeon-Dong in Gyeongsangnam-do in 2019		
	Gas station	Number of gas stations by Eup-Myeon-Dong in Gyeongsangnam-do in 2019		
	Park	Number of park (neighborhood park + children's park + small park + sports park + cemetery park + cultural park + waterside park + historical park) by Eup-Myeon-Dong in Gyeongsangnam-do in 2019		
	Parking lot	Number of parking lot by Eup-Myeon-Dong in Gyeongsangnam-do in 2019		

of Lee. E. S. (1966) presents population migration factors such as factors related to origin, factors related to destination, intervening obstacles, and personal factors. Reviewing the push-pull theory and other relevant previous studies, and to improve the destination inducement factor of leisure travel, which is more focused on the destination characteristics than on origin characteristics, we finally chose the resi-

dential characteristics, culture and tourism characteristics, and living infrastructure characteristics of the destinations as the variables affecting leisure travel. Among the residential characteristics, we chose, as variables, the number of apartments, the number of town houses, the number of general detached houses, the number of multi-family houses, and the number of detached houses with business in

each eup, myeon, and dong. Among the living infrastructure characteristics, we chose the number of city bus stops, the number of amenities facilities, the number of gas stations, the number of parks, and the number of parking lots in the minimum units of eup, myeon, and dong. Among the culture and tourism characteristics, we chose the number of traditional markets, the number of restaurants, the number of accommodation facilities, the number of recreational facilities, the number of culture facilities, the number of sports facilities, and the number of art-related facilities. (Table 1)

3. Analytical Procedures

In the present study, we investigated the leisure travel status in Gyeongnam and analyzed the centrality and inducement factors. Before the analysis, from the mobile living travel data, we extracted the leisure travel data about the movements in Gyeongnam, processed the data into OD data, and investigated the leisure travel status in each eup, myeon, and dong based on the established data. Next, we investigated the leisure travel patterns in each eup, myeon, and dong and derived the centrality indexes of the regions exhibiting the travel patterns. After deriving the centrality indexes, we analyzed the inducement factors of the leisure travel in Gyeongnam by the analytical procedures shown in <Figure 3>.

First, in the analysis of the leisure travel in Gyeongnam, the O/D data processed as a 308-by-308 matrix was visualized as a flow diagram to analyze the 'si-si,' 'si-gun,' 'gun-si,' and 'gun-gun' travel patterns in each eup, myeon, and dong. Second, the in-degree centrality, betweenness centrality, and closeness centrality of the movement regions were analyzed to find out the top 10 regions with frequent travels for leisure activities. Third, the population traveling for leisure activities in Gyeongnam was divided into weekdays and weekend, and a multiple regression model was employed to derive the inducement factors of the destinations. Before constructing a regression model, we put in a total of 18 explanatory variables reviewed in the previous studies, including housing characteristics, culture and tourism characteristics, and living infrastructure characteristics. The network centrality analysis was performed using Net-miner 4.0 software program, and the multiple regression analysis was performed using SPSS 27 software program.

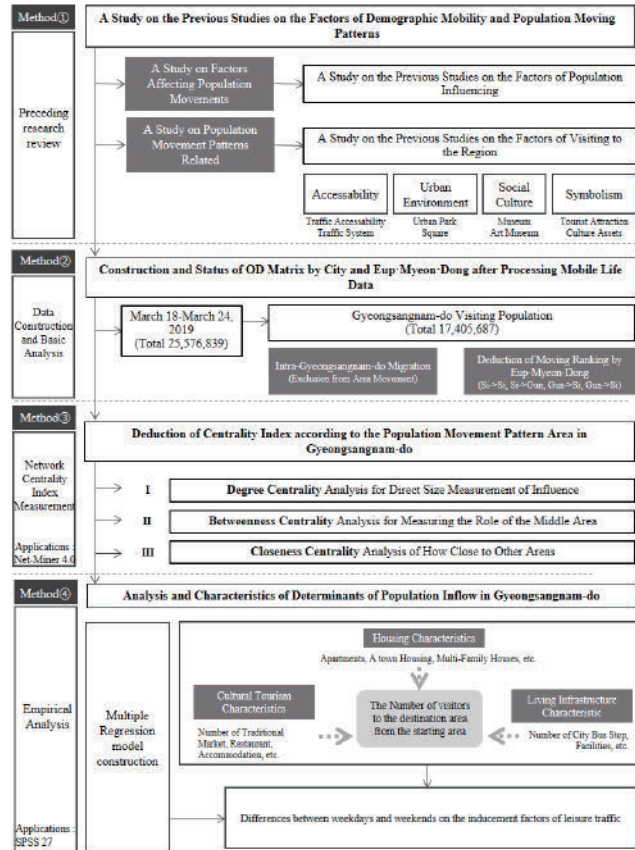


Figure 3. Analysis preceding

IV. Results of Analysis

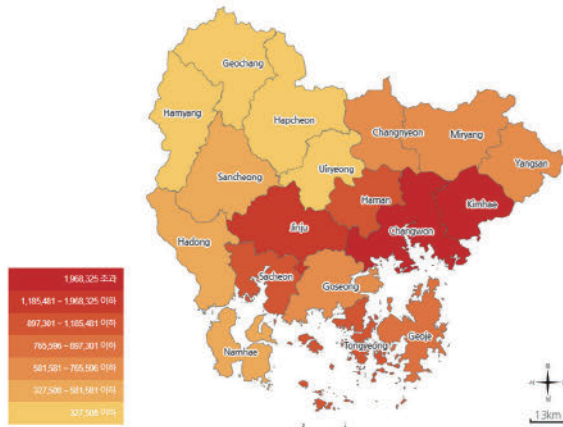
1. Leisure Travel Movement Status in Gyeongnam

The leisure travel population in Gyeongnam, except for the movements within the same eup, myeon, and dong, was 17,405,687, and the highest number was 4,302,337 (24.72%) in Changwon-si, followed by 2,043,623 (11.74%) in Gimhae-si, 1,968,325 (11.31%) in Jinju-si, 1,022,221 (6.81%) in Sacheon-si, and 1,022,221 (5.87%) in Haman-gun (Table 2). Despite being a gun region, Haman-gun showed a large inflow of leisure travel probably because it is adjacent to Chanwon-si, which showed the highest inflow of leisure travel. The inflow of the leisure travel was little in Namhae-gun as 412,537 (2.37%), Euiryeong-gun as 327,508 (1.88%), Hapcheon-gun as 273,371 (1.57%), Hamyang-gun as 240,687 (1.38%), and Geochang-gun as 176,420 (1.01%). Geochang-gun showed the least inflow of leisure travel, probably because it is geographically farthest from the urban areas in Gyeongnam. The analytical results showed that the

Table 2. Visiting population inflow present condition

Rank	Region	Inflow number	Ratio (%)
1	Changwon-si	4,302,337	24.72
2	Kimhae-si	2,043,623	11.74
3	Jinju-si	1,968,325	11.31
4	Sacheon-si	1,185,481	6.81
5	Haman-gun	1,022,221	5.87
...
14	Namhae-gun	412,537	2.37
15	Uiryeong-gun	327,508	1.88
16	Hapcheon-gun	273,371	1.57
17	Hamyang-gun	240,687	1.38
18	Geochang-gun	176,420	1.01
Total		17,405,687	100

Map



Source: SKT offer visiting population data

leisure travel occurs more in the geographically central regions, and it occurs less in the peripheral regions. (Table 2)

2. Leisure Travel Patterns

The patterns of the 17,405,687 leisure travels, except for the movements within each region, were classified into 'si ⇒ si', 'si ⇒ gun', 'gun ⇒ si' and 'gun ⇒ gun' travel patterns, and the rank of each pattern was analyzed (Table 2). The rank of the 'si ⇒ si' movement was the highest, followed by the 'si ⇒ gun', 'gun ⇒ si' and 'gun ⇒ gun' travels (Table 3). The 'si ⇒ si' movement pattern accounted for 54.7% of all movements. Specifically, the movement from Dong-eup, Euichang-gu, Changwon-si to Jinyeong-eup, Gimhae-si was the most frequent (74,982), followed by the movement from Jinyeong-eup, Gimhae-si to Dong-eup,

Euichang-gu, Changwon-si; and the movement from Jangyu-sam-dong, Gimhae-si to Jungang-dong, Seonsan-gu, Changwon-si.

Among the 'si ⇒ gun' movements, the movement was frequent between Changwon-si and Haman-gun. Specifically, the movement was most frequent from Naeseo-eup, Masanhoewon-gu, Changwon-si to Chilwon-eup, Haman-gun (80,626), followed by the movement from Naeseo-eup, Masanhoewon-gu, Changwon-si to Gaya-eup, Haman-gun, and the movement from Naeseo-eup, Masanhoewon-gu, Changwon-si to Chilseo-eup, Haman-gun. Like the 'si ⇒ gun' movement, the 'gun ⇒ si' movement was most frequent between Haman-gun and Changwon-si. Specifically, the movement was most frequent from Chilwon-eup, Haman-gun to Naeseo-eup, Masanhoewon-gu, Changwon-si (134,521), followed by the movement from Chilwon-eup, Haman-gun to Seokjeon-dong, Masanhoewon-gu, Changwon-si, and the movement from Chilwon-eup, Haman-gun to Odong-dong, Masanhappo-gu, Changwon-si. The 'gun ⇒ gun' movement was found to be frequent in Changnyeong-gun, Haman-gun, Hamyang-gun, Geochang-gun, and Uiryeong-gun. Specifically, the movement was most frequent from Namji-eup, Changnyeong-gun to Chilseo-myeon, Haman-gun (26,065), followed by the movement from Chilseo-myeon, Haman-gun to Namji-eup, Changnyeong-gun, and the movement from Aneui-myeon, Hamyang-gun to Geochang-eup, Geochang-gun.

The analysis of the leisure travel patterns between si and gun showed that the 'si ⇒ si' movement is most frequent and the 'gun ⇒ gun' movement is least frequent. This indicates that people move to another administrative region in pursuit of public services and leisure activities better than those in their residential areas. Therefore, in this study, we analyzed factors that induced leisure travel in Gyeongnam. (Table 3)

3. Centrality Analysis

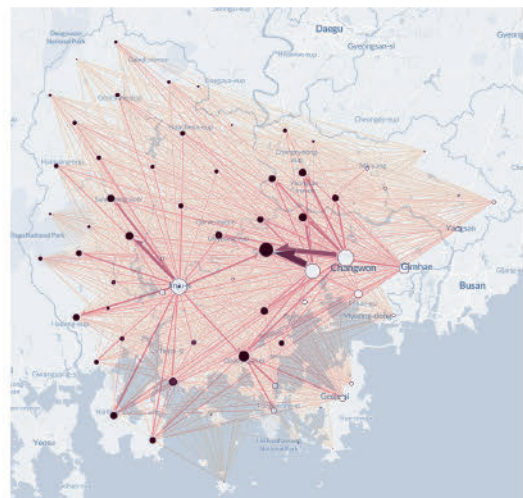
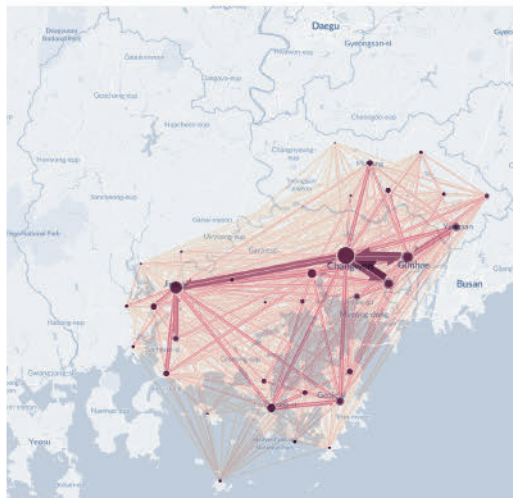
As a premise of the analysis of the inducement factors to leisure travels in Gyeongnam, we analyzed the centrality through a network analysis for understanding the flow of leisure travel in Gyeongnam (Table 4).

The degree centrality index was highest in Changwon-si,

Table 3. Visiting population movement pattern

Rank	Si ⇒ Si (Total inflow : 9,524,172)	Si ⇒ Gun (Total inflow : 3,964,923)
1	Dong-eup, Uichang-gu, Changwon-si ⇒ Jin Yeong-eup, Kimhae-si (74,982)	Naeseo-eup, Masanhoewon-gu, Changwon-si ⇒ Chilwon-eup, Haman-gun (80,626)
2	Jin Yeong-eup, Kimhae-si ⇒ Dong-eup, Uichang-gu, Changwon-si (74,798)	Naeseo-eup, Masanhoewon-gu, Changwon-si ⇒ Gaya-eup, Haman-gun (23,050)
3	Jangyu 3-dong, Kimhae-si ⇒ Jungang-dong, Seongsan-gu, Changwon-si (46,535)	Naeseo-eup, Masanhoewon-gu, Changwon-si ⇒ Chilseo-eup, Haman-gun (22,632)
4	Daesan-myeon, Uichang-gu, Changwon-si ⇒ Jin Yeong-eup, Kimhae-si (36,083)	Naeseo-eup, Masanhoewon-gu, Changwon-si ⇒ Sanin-myeon, Haman-gun (19,286)
5	Jin Yeong-eup, Kimhae-si ⇒ Jungang-dong, Seongsan-gu, Changwon-si (34,516)	Gwangdo-myeon, Tongyeong-si ⇒ Goseong-eup, Goseong-gun (18,055)

Flow Map



Rank	Gun ⇒ Si (Total inflow : 3,054,816)	Gun ⇒ Gun (Total inflow : 861,776)
1	Chilwon-eup, Haman-gun ⇒ Naeseo-eup, Masanhoewon-gu, Changwon-si (134,521)	Namji-eup, Changnyeong-gun ⇒ Chilseo-eup, Haman-gun (26,065)
2	Chilwon-eup, Haman-gun ⇒ Seokjeon-dong, Masanhoewon-gu, Changwon-si (45,420)	Chilseo-eup, Haman-gun ⇒ Namji-eup, Changnyeong-gun (18,263)
3	Chilwon-eup, Haman-gun ⇒ Odong-dong, Masanhappo-gu, Changwon-si (42,045)	An-uimyeon, Hamyang-gun ⇒ Geochang-eup, Geochang-gun (14,116)
4	Gaya-eup, Haman-gun ⇒ Naeseo-eup, Masanhoewon-gu, Changwon-si (24,934)	Geochang-eup, Geochang-gun ⇒ An-uimyeon, Hamyang-gun (10,701)
5	Gaya-eup, Haman-gun ⇒ Seokjeon-dong, Masanhoewon-gu, Changwon-si (23,582)	Uiryong-eup, Uiryong-gun ⇒ Gunbuk-myeon, Haman-gun (9,873)

Flow Map

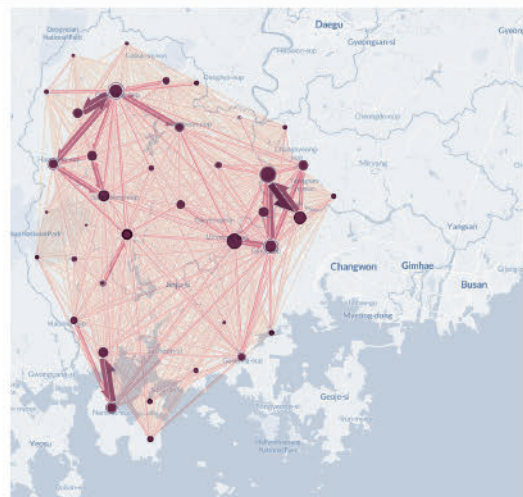
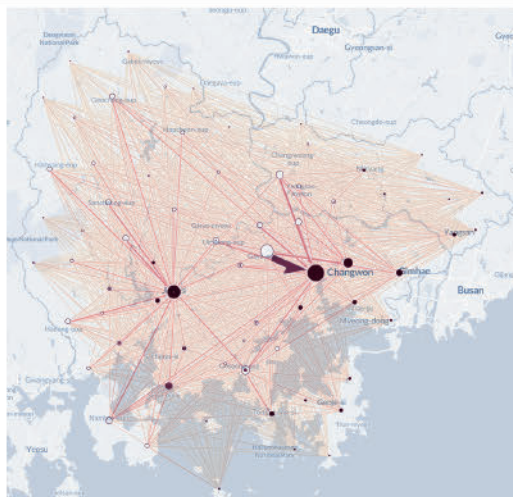
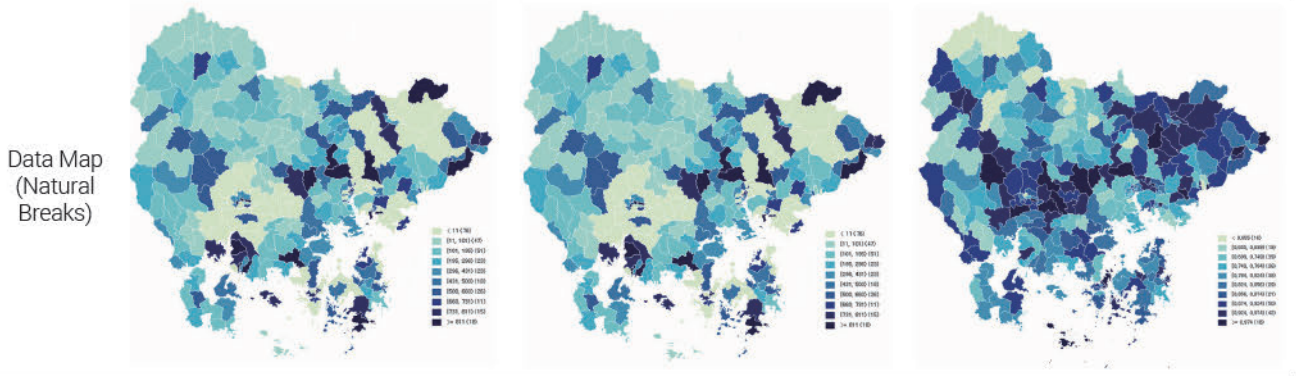


Table 4. Results of centrality analysis of visitor population

Rank	Region	Degree centrality	Region	Betweenness centrality	Region	Closeness centrality
1	Odong-dong, Masanhappo-gu, Changwon-si	19,137.21	Naeseo-eup, Masanhoewon-gu, Changwon-si	0.001906	Dong-eup, Uichang-gu, Changwon-si	0.993464
2	Seokjeon-dong, Masanhoewon-gu, Changwon-si	14,880.07	Jin Yeong-eup, Kimhae-si	0.001872	Naeseo-eup, Masanhoewon-gu, Changwon-si	0.993464
3	Jungang-dong, Seongsan-gu, Changwon-si	11,809.18	Buk-myeon, Uichang-gu, Changwon-si	0.001837	Jin Yeong-eup, Kimhae-si	0.993464
4	Jungang-dong, Yangsan-si	8,126.21	Jungang-dong, Seongsan-gu, Changwon-si	0.001835	Gunbuk-myeon, Haman-gun	0.993464
5	Hadae-dong, Jinju-si	6,355.74	Seokjeon-dong, Masanhoewon-gu, Changwon-si	0.001820	Buk-myeon, Uichang-gu, Changwon-si	0.987013
6	Bukbu-dong, Kimhae-si	6,015.82	Cheonjeon-dong, Jinju-si	0.001814	Jungang-dong, Seongsan-gu, Changwon-si	0.987013
7	Sangnam-dong, Seongsan-gu, Changwon-si	5,369.41	Palryong-dong, Uichang-gu, Changwon-si	0.001814	Seokjeon-dong, Masanhoewon-gu, Changwon-si	0.987013
8	Seongbuk-dong, Jinju-si	5,346.41	Jangyu 1-dong, Kimhae-si	0.001798	Danseong-myeon, Sancheong-gun	0.987013
9	Idong, Jinhae-gu, Changwon-si	5,114.44	Gaho-dong, Jinju-si	0.001781	Palryong-dong, Uichang-gu, Changwon-si	0.983819
10	Sangdae-dong, Jinju-si	4,948.32	Seongbuk-dong, Jinju-si	0.001763	Jangyu 1-dong, Kimhae-si	0.983819



Yangsan-si, Jinju-si, and Gimhae-si. Specifically, Odong-dong, Masanhappo-gu, Changwon-si showed the highest leisure travel inflow (19,137.21), thereby exhibiting a strong in-degree centrality. The degree centrality index was next highest in the order of Seokjeon-dong, Masanhoewon-gun, Changwon-si (14,880.07) and Jungang-dong, Seonsan-gun, Changwon-si (11,809.18). The regions with a high degree centrality index have good regional accessibility from other areas and frequent leisure travels, and they may be consid-

ered as having higher potentials than other regions.

The betweenness centrality was highest in Changwon-si, Gimhae-si, and Jinju-si. Specifically, the betweenness centrality was highest in Naeseo-eup, Masanhoewon-gun, Changwon-si (0.001906), followed by Jinyeong-eup, Gimhae-si (0.001872) and Buk-myeon, Euichang-gu, Changwon-si (0.001837). The regions with a high betweenness centrality may be considered as playing the role of structurally and geographically intermediate regions, having the high

possibility that the leisure travel frequency may be increased in the future.

The closeness centrality index was highest in Changwon-si, Gimhae-si, and Haman-gun. Specifically, the closeness centrality was highest in Dong-eup, Euichang-gu, Changwon-si; Naeseo-eup, Masanhoewon-gu, Changwon-si; Jinyeong-eup, Gimhae-si, Gunbuk-myeon, Haman-gun (0.993464); and Buk-myeon, Euichang-gu, Changwon-si (0.987013). Compared to other regions, the regions with a high closeness centrality are convenient regions where the movement time to travel to another region in Gyeongnam is short.

<Table 4> shows the results of the centrality analysis for each eup, myeon, and dong depending on the leisure travel. The degree centrality index was found to be high mostly in the east Gyeongnam, including Changwon-si, Yangsan-si, Jinju-si, and Gimhae-si. The betweenness centrality was high in Changwon-si, Gimhae-si, and Jinju-si. The closeness centrality was high in Changwon-si, Gimhae-si, and Haman-gun. (Table 4)

4. Results of Inducement Factor Analysis

The hypothesis testing with the questions, “Do the residential, culture and tourism, and living infrastructure characteristics increase the leisure travel by the de facto population in Gyeongnam?” and “Are the inducement factors of leisure travel different between weekdays and weekend?”, rejected the null hypotheses with a significance of 0.05 or less. The results showed that the residential, culture and tourism, and living infrastructure characteristics increase the leisure travel by the de facto population in Gyeongnam, and the inducement factors of leisure travel are different between weekdays and weekend. Accordingly, to derive the inducement factors to the leisure travel pattern by the characteristics, we established the dependent variables to be the number of leisure travels flowing into Gyeongnam, the number of inflowing leisure travels during the weekdays, and the number of inflowing leisure travels during the weekend, and the independent variables to be the inducement factors to leisure activities, based on the relevant theory and previous study. A multiple regression analysis was performed with the variables, and the results are described below. The explanatory power of the entire leisure travel

model was 58.6%, and its Durbin-Watson was 1.958, which was close to 2. Therefore, the model was considered as suitable for a multiple regression analysis. The explanatory power of the weekday leisure travel model was 22.1%, and its Durbin-Watson was 2.227, which was close to 2. The explanatory power of the weekend leisure travel model was 21.4%, and its Durbin-Watson was 2.237, which was close to 2. Therefore, the models were considered as suitable for a multiple regression analysis (Table 5).

The testing of the hypothesis that the residential characteristics do not affect the leisure travel in the movement of the de facto population in Gyeongnam showed a significant result, indicating that the number of detached houses reduces the leisure travel in the movement of the de facto population in Gyeongnam. This may be because the regions where general detached houses are concentrated are far away from the urban areas in the case of ‘si’ regions where commercial facilities and recreational facilities are concentrated or they have deteriorated infrastructure facilities or inferior environments in the case of ‘gun’ regions. Next, the testing of the hypothesis that the culture and tourism characteristics do not affect the leisure travel showed a significant result, indicating that the number of traditional markets and the number of accommodation facilities increase the leisure travel in the de facto population in Gyeongnam. Since leisure travel is often carried out as a day trip or with a plan for staying for the night, movement is often induced to the destinations where there are many accommodation facilities. Finally, the testing of the hypothesis that the living infrastructure characteristics do not affect the leisure travel showed a significant result, indicating that the number of bus stops and the number of amenities facilities increase the leisure travel in the de facto population in Gyeongnam. This suggests that those who live in regions where the infrastructure is inferior tend to carry out leisure travels to other regions where the transportation accessibility and the quality of amenities facilities are high, in order to utilize public services.

The testing of the hypothesis that the inducement factors of leisure travel by the de facto population in Gyeongnam are not different between weekdays and weekend showed a significant result, indicating that the inducement factors to leisure travel are difference between weekdays and weekend. The significant factors commonly found during both week-

Table 5. Analysis of determinants of visitor population in Gyeongsangnam-do

Division		Dependent variable								
		Number of visitors			Number of weekdays visitors			Number of weekend visitors		
		B	β	t	B	β	t	B	β	t
Constant		126473.46	-	2.575**	168941.96	-	3.715***	81421.79	-	3.679***
Housing characteristics (N=308)	Apartment	8.876	0.075	0.922	.717	0.009	0.080	-0.602	-0.016	-0.139
	Town house	323.63	0.084	1.378	-203.55	-0.078	-0.936	-65.48	-0.052	-0.735
	Multi-family housing	-88.11	-0.105	-1.118	96.37	0.171	1.321	57.607	0.110	1.622
	Detached house	-162.96	-0.193	-3.972***	-78.16	-0.137	-2.057**	-25.395	-0.092	-1.374
	Multi-family detached house	283.57	0.237	0.839	248.998	0.330	1.562	-147.37	-0.307	-0.789
	Detached house with business	282.93	0.009	0.128	-283.02	-0.135	-1.382	-164.76	-0.111	-1.220
Cultural tourism characteristics (N=308)	Traditional market	250743.11	0.378	7.337***	63470.65	0.142	2.005**	29618.28	0.137	1.923*
	Restaurant	-148.18	-0.055	-0.355	603.25	0.242	2.173**	260.09	0.294	1.384
	Accommodation facility	7168.29	0.204	3.090**	-2593.66	-0.109	-1.207	1275.30	0.163	1.654*
	Recreational facilities	29233.85	0.186	2.292**	31565.32	0.379	0.978	12389.45	0.296	3.082**
	Cultural facilities	53038.07	0.395	1.505	-14532.93	-0.161	-0.445	-5148.98	-0.117	-0.324
	Sports facilities	15.57	0.001	0.005	-5287.35	-0.404	-1.959*	-1831.93	-0.289	-1.395
	Art related facility	27560.36	0.026	0.475	-95786.53	-0.134	-1.783*	-46890.06	-0.135	-1.793*
living infrastructure characteristic (N=308)	City bus stop	1548.58	0.096	1.920*	641.22	0.059	0.859	391.59	0.074	1.077
	Amenities facility	98887.52	0.110	2.469**	18872.74	0.031	0.509	25781.79	0.088	1.429
	Gas station	3441.58	0.026	0.508	1250.74	0.014	0.200	-77.50	-0.002	-0.025
	Park	-7928.23	-0.086	-1.346	4380.57	0.070	0.803	2777.67	0.092	1.046
	Parking lot	2048.40	0.027	0.580	-1845.13	-0.036	-0.564	-1571.52	-0.064	-0.988
F(p)		22.490***			4.504***			4.320***		
Adj R^2 (%)		0.586(58.6%)			0.221(22.1%)			0.214(21.4%)		
Durbin-Watson		1.958			2.227			2.237		

***p<0.01, **p<0.05, *p<0.1

days and weekend were the number of traditional markets and the number of art-related facilities: the number of traditional markets increase the leisure travel population during both weekdays and weekend, while the number of art-related facilities reduce the leisure travel. Although not significant, the number of amenities facilities increase the inflow of the leisure travel population.

The inducement factors that significantly increase the leisure travel during the weekdays are the number of traditional markets and the number of restaurants, and the significantly decreasing factors are the number of detached houses among the residential characteristics and the num-

ber of sports facilities and the number of art-related facilities among the culture and tourism characteristics. These results suggest that people tend to visit traditional markets or enjoy various meals and meetings at restaurants during the weekdays. It was also found that among the culture and tourism characteristics, facilities related to food culture play a major role. On the other hand, the results showed that leisure travel is relatively low in regions where there are many detached houses, because the accessibility to commercial areas or cultural facilities is low and nearby commercial facilities or cultural facilities are few in the regions. In addition, it was found that the number of sports facilities and the num-

ber of art-related facilities are significant factors that decrease the leisure travel during the weekdays. This may be because most of the sports and art-related activities are concentrated at the weekend and thus the use of the facilities is low during the weekdays.

The inducement factors that increase the leisure travel during the weekend are the number of traditional markets, the number of accommodation facilities, and the number of recreational facilities among the culture and tourism characteristics, and the decreasing factors are the number of art-related facilities. These factors affect the choice of the destinations by people who seek for more diverse activities during the weekend. Traditional markets, where people experience local features and cultures and consume local foods, are visited by visitors even during the weekend, although the number of visitors is less than during the weekdays. In addition, accommodation facilities and recreational facilities are considered as factors that are necessary to the people who pursue rest and leisure activities during the weekend. On the other hand, art-related facilities are used more frequently during the weekend than during the weekdays. (Table 5)

V. Conclusions

The results of the analysis of the leisure travel movements in Gyeongnam are summarized as below. In Gyeongnam, the total leisure travels, except for the leisure travels within the same eup, myeon, and dong, were the most in Changwon-si, followed by Gimhae-si, Jinju-si, Sacheon-si, and Haman-gun. Therefore, the leisure travel was more frequent in the central regions, and less frequent in the peripheral regions. The analysis of the travel patterns, classified into 'si \Rightarrow si', 'si \Rightarrow gun', 'gun \Rightarrow si' and 'gun \Rightarrow gun' travel patterns, showed that the proportion of the 'si \Rightarrow si' travel pattern was the highest. Particularly, the movement was most frequent from Dong-eup, Euichang-gu, Changwon-si to Jinyeong-eup, Gimhae-si. The centrality analysis by a network analysis showed that the degree centrality was highest in the order of Changwon-si, Yangsan-si, Jinju-si, and Gimhae-si, which exhibited strong connectivity with other regions. The betweenness centrality was highest in Changwon-si, Gimhae-si, and Jinju-si, and the closeness centrality was highest in Changwon-si, Gimhae-si, and Haman-gun.

Comprehensively considering these results, it is suggested that the leisure travel in Gyeongnam is more active in the regions located in the center, and the regions that are found to have a high centrality through a network analysis are regions with high connectivity with other regions and with potentials for future increase of leisure travel.

Based on these results, we performed a multiple regression analysis to identify the inducement factors among the residential characteristics, culture and tourism characteristics, and living infrastructure characteristics of the destinations and analyzed the difference of the inducement factors between weekdays and weekend. The following conclusions were obtained from the present study.

First, the leisure travel by the de facto population in Gyeongnam is decreased in the regions where there are many detached houses. This suggests that while commercial facilities and recreational facilities are concentrated in urban areas, facilities related to leisure activities are insufficient or dispersed in the vicinity of residential areas, thereby limiting leisure activities. Therefore, introducing more facilities into regions that are close to an urban area or regions where facilities related to leisure activities are concentrated is necessary to induce population moving for a leisure purpose.

Second, the leisure travel by the de facto population in Gyeongnam is decreased in the regions where there are many traditional markets and accommodation facilities. This indicates that people tend to move from other regions to the regions for a day trip or with a plan for staying for the night, because the regions are attractive destinations for leisure activities and they have many accommodation facilities. Considering this result, it is important to appropriately combine recreation-related facilities of key regions with traditional markets of historical features to form an environment where various activities can be enjoyed.

Third, the leisure travel by the de facto population in Gyeongnam is decreased in the regions where there are many bus stops and amenities facilities. This suggests that the de facto population in regions where the infrastructure is inferior tend to move to other regions where the transportation accessibility and the quality of amenities facilities are high, in order to utilize public services. Therefore, rather than providing public services differently for urban regions and gun regions, the services need to be appropriately provided so that the residents can routinely enjoy leisure activi-

ties and public services.

Based on the results described above, to reflect the characteristics of the leisure travel population, it is necessary to establish facilities for hobbies and cultural and recreational activities in local hub regions and urban areas rather than in residential areas. Although the leisure travel is induced to regions where there are many accommodation facilities, it is necessary for municipal governments to renovate and manage abandoned houses in each region rather than indiscreetly constructing accommodation facilities. Accordingly, travel programs such as Gyeongnam-type one month living program or other programs suitable for each si, gun, eup, myeon, and dong may be developed so that people who visit other administrative regions in Gyeongnam for leisure travel may obtain various experiences while living in Gyeongnam. In additions, plans may be prepared to support the visitors with lodging expenses or experience program fees. The significance of the present study is that the inducement factors to leisure travel were identified to derive the facilities and plans necessary for the leisure activities in local hub regions and urban areas.

The present study was focused on the characteristics of destinations and the variables presented by previous studies to identify the inducement factors to leisure travel. Since the subject of analysis was limited to Gyeongnam, the generalization of the research results may be limited. Another limitation of the present study is that the specific local characteristics and cultural elements of Gyeongnam may make it difficult to compare the results with other regions or find differences from other regions. Furthermore, the present study is limited because the short-term data was used for the analysis and thus the long-term variability or trend such as season, vacation period, and events could have not been perfectly captured. Future studies on the inducement factors to leisure travel may need to be conducted to perform a detailed analysis of the control variables such as the population, employment, and transportation.

Note 1. Geovision Big Data (<http://b2b.tworld.co.kr>).

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