Determinants of Economic Segregation and Spatial Distribution of Poverty*

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Abstract

Purpose - While many related prior studies have focused on the segregation by race and ethnicity, the academic interest in the separation of residence by income and social class is gradually increasing. This study aims to not only investigate spatial pattern of economic segregation and poverty rate in South Korea, but also shed light on what affect residential distribution of the poor.

Research design, data, and methodology - The unit of analysis is Si-Gun-Gu municipal level entities of South Korea. Most demographic, socioeconomic, and residential variables were derived from Korean Census Data in 2015. In order to examine spatial patterns of economic segregation and poverty rate in South Korea, a series of measurements and visualization was conducted through the Geo-Segregation Analyzer and ArcGIS programs. Determinants of economic segregation and local poverty rates were investigated by regression analyses using STATA.

Results - The spatial patterns of areas with high poverty rates were extremely clustered, while the distribution of areas with high economic segregation was relatively evenly distributed. Demographic, residential, and local factors appeared to affect whether the poor live in particular area or spread evenly.

Conclusions - The factors that raise the poverty rate result in lower level of economic segregation, while factors that reduce the poverty rate lead to severe level of economic segregation.

Keywords: Economic Segregation, Poverty, Spatial Distribution, Determinants.

JEL Classifications: J11, J15, J18.

1. Introduction

Poverty is a global social phenomenon of all ages and can never be completely eliminated even if any radical policy alternative is established and implemented. At the international level, poverty can be treated as a problem caused by the economic gap between developed and developing countries, but most countries today are making various efforts to address their own poverty. Especially in the Third World, when it is impossible to control unexpected events such as floods, droughts, diseases, and unemployment, people are much more likely to fall into the swamp of poverty(Senadjki, Mohd, Bahari, & Hamat, 2017). Many developing countries, however, have significant investment in social areas without consideration for the poor

and the vulnerable(Tambi, 2015). Therefore, it is a fairly challenging task for the government to prepare and effectively carry out the appropriate policy responses that the poor actually need. Since poverty basically results from the existence of the socioeconomic class, a correct grasp of the poverty strata of the country can be the cornerstone for the search for appropriate policy alternatives.

The poverty rate we generally use to look at the extent of poverty is widely used internationally as well as in individual countries. According to OECD, poverty rate can be defined as "the ratio of the number of people (in a given age group) whose income falls below the poverty line; taken as half the median household income of the total population" However, the ratio of the poor population to the entire population is bound to limit the analysis of the causes and consequences of poverty, especially at a micro level. In particular, a neighborhood where people communicate with each other is a key factor in determining people's lives and future(Sampson, 2008). Therefore, an approach based on spatial context is required to identify the characteristics of the residential patterns of economic minorities in small

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geographic units, such as neighborhoods. After all, measuring the separation of residence by income and economic class using segregation index and identifying the causes and consequences that have brought about various social phenomena provides an important clue to a society's response to poverty. In fact, many urban researchers have long been interested in the dynamics of residential segregation at the local level and the causal relationship with relevant variables(Charles, 2003).

Unlike Western urban studies, including the US, which focused much on spatial concentration of poverty-stricken areas, urban studies covering Asian cases did not pay much attention to identifying the spatial characteristics of poverty in terms of concentration of poverty and economic segregation. Above all, the fact that Asian countries have relatively short histories of economic wealth and still have a relatively homogeneous social structure may have contributed to the lack of social awareness and academic interest in the spatial concentration of poverty or economic segregation. In addition, Eastern scholars had fundamental limitations in drawing deep understanding and attention to American social phenomena based on historical processes, given that the concept of residential segregation is the result of extremely American racial segregation. It is also important for Asian countries, including Korea, to overlook the serious impact of the economic segregation on society as a whole, compared to the United States. While the problem of economic segregation was deeply involved in a series of extreme urban problems, such as crime, drugs, poverty, collapse of public education, and the financial meltdown in major metropolitan areas in the United States, Asian countries went through a rapid urbanization process but did not experience extreme American-style urban problems directly. However, recent rapid economic polarization and disparate social changes centering on major Asian cities are driving the study of the spatial characteristics of poverty to a situation that can no longer be neglected. In particular, Korea is experiencing a huge change in traditional social order and characteristics due to the rapid increase in the immigrant population, and the acceleration of economic polarization has also affected the geographic distribution of the population(Park, 2018).

The analysis and discussion of the measurement, cause and outcome of residential segregation needs to be confirmed in Asian cases, where residential segregation is slowly deepening, in order to overcome the limitations that have been mostly achieved only through Western empirical evidence. While many related prior studies have focused on the segregation by race and ethnicity, the academic interest in the separation of residence by income and social class is gradually increasing(Owens, 2018). Therefore, the purpose of this study is to measure the economic segregation and to analyze the determinants affecting the residential patterns of the poor based on the case of Korea, where the preceding study paid little attention. Therefore, this study could also

contribute to the generalization of the theory of residential segregation through the Korean case.

The analysis strategies for this are as follows: First, economic residential segregation will be measured at the level of cities and counties smaller than metropolitan areas and larger than neighborhood units, using dissimilarity index which is the most commonly used to measure residential segregation. Second, this study will visualize and explore the spatial distribution of the economic segregation and poverty rate of the municipal and county level of the Korean administrative districts through mapping technique of the geographic information system. Third, the present study will also identify the important influencing factors through regression analysis after establishing a causal model by dividing the determinant factors affecting economic segregation and poverty rate largely into demographic characteristics, residential characteristics and local characteristics.

2. A Brief Review of Prior Literature

Poverty is a typical socioeconomic phenomenon that can never be avoided in the course of human history development. There are many different characteristics of poverty, but the most striking feature can be explained in a spatial context. It is found in most countries that places where rich people reside and places where poor people live are mutually exclusive to each other in certain areas. It is very natural for people with similar socioeconomic status to tend to live together. Therefore, the existence of ghetto and slums, where the poor live together in any country, is easily identified. This spatial concentration of poverty has been a very important topic in social science research, especially in the United States, a representative country formed by the influx of immigrants, from the late 19th century to the 20th century. Especially, urban scholars such as Louis Wirth and Robert Park of Chicago School noted the negative effects of social disorganization in urban ecological characteristics as the core of traditional American urban research(Curley, 2005). The policy of segregating ethnic dwellings, which can be said to be the result of the historical legacy of the Black Slavery in institutional terms, was officially abolished in 1954. Although the degree of racial segregation has been steadily weakened, many parts of the United States still experience a high level of racial segregation(Massey & Tannen, 2015). In addition, various empirical studies have revealed the seriousness of the economic segregation, which represents the spatial concentration of poverty replacing the existing segregation of ethnic dwellings(Reardon & Bischoff, 2011; Quillian, 2012; Owens, 2018). This spatial concentration of poverty has eventually entrenched the economic separation and is still a subject of research that many urban researchers are interested in.

The traditional discussion of poverty concentration had

mainly focused on individual and behavioral perspectives. However, as urban poverty has become a serious issue in the United States since the 1960s, structural factors from socioeconomic aspects have been newly addressed as the causes of poverty concentration. In the 1970s, however, as individual-level variables were re-emerged, the poor who gathered in the central city of metropolitan area were considered socially isolated and pathologically underclass (Jencks & Mayer, 1989; Wilson, 1991). In this regard, the interest in urban inequality has finally come to note the impact of neighborhood poverty on the opportunities for the poor in the isolated areas. The two leading academic arguments that explain neighborhood poverty are first, the view that structural economic change leads to concentration of poverty, and second, the view that racial or economic segregation leads to concentration of poverty. Wilson (1991) argued that the spatial expansion of neighborhoods suffering from high levels of poverty resulted from deindustrialization and employment de-concentration, while Massey and his colleagues (1994) attributed to racial and economic segregation that increased the spatial expansion of poverty. In fact, with these two discussions, which are complementary rather than antagonistic, Jargowsky (1997) pointed out that the deepening of economic separation rather than ethnicity resulted in the mass production of high levels of poverty-stricken neighborhoods. Therefore, the spatial concentration of poverty and the economic segregation are very closely related as the fundamental causes of various urban problems.

Meanwhile, the related prior studies have addressed the causes and consequences of segregation from various perspectives. Many of the literature focuses on the fact that economic segregation is the cause of various negative social phenomena in the region. For example, Nechyba (1999) presented empirical evidence that separation of residence perpetuates income inequality. Cutler and Glaeser (1997) pointed out that the residential segregation affects the performance of black groups in education, employment and single parenthood. In other words, it was confirmed that black people in more segregated areas tended to experience worse consequences than same group members in relatively less segregated areas. Contrary to the discussion on the negative consequences of the segregation, Borjas (1995) highlighted the positive aspects of the segregation among the poor, affirming that the social capital of the group was created in areas where the separation of dwellings was intensified. Similarly, Patacchini and Zenou (2012) reconfirmed the positive aspects of residential segregation, demonstrating empirically that new immigrants with language barriers have the opportunity to get jobs much more easily thanks to the existence of communities with severe residential segregation.

As mentioned in the previous chapter, this paper however aims to shed light upon the forces driving economic segregation in South Korea. Thus, it is necessary to discuss the causes that led to the economic segregation rather than to discuss the consequences of the separation of dwellings. The theoretical discussion that had the most influence on the reasons for choosing a residence is modeling the residential location decision(Schirmer et al., 2014). Basically, according to this model, each household chooses its own residence to maximize its utility. Thus, the factors influencing these utility will determine the choice of residence and, ultimately, the level of residential segregation. In general, properties that lead to residential selection include the physical characteristics of housing itself, the status of ownership(rented or owned), and the characteristics of its neighborhood. Particularly, the characteristics of the surrounding areas have a wide variety of contexts, typically including social-demographic composition, school, creme, topology, and air quality. Meanwhile, Borjas (1994) pointed out that socioeconomic characteristics, such as income and education level, have great limitations in explaining the residential segregation. Rather, he argued that the formation of social capital that emerges from the existence of the ethenic spillover could affect the level of separation of residence. In summing up the factors of the impact of the residential segregation presented by these prior studies, the determinants of the economic residential segregation that this study seeks to analyze could be largely categorized into demographics, residential features and regional characteristics. Figure 1 below shows an analytical framework that indicates that these three contexts affect economic segregation and poverty rates.
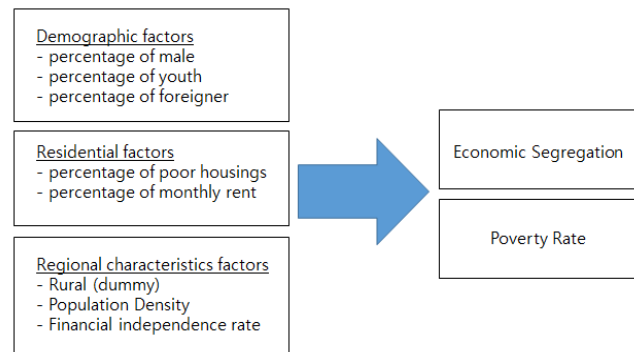
Source: Author's own edited.

Figure 1: A Framework of Causal Mechanisms

3. Methodology

3.1. Measuring residential segregation

In order to measure the residential segregation for the poor, it is necessary to define the poor, which uses statistics on the number of people receiving National Basic Livelihood Security. Unlike the US Census data, Korea's statistical data do not make public by measuring the official

poverty rate at the city and provincial levels. Therefore, it is required to use proxy variables to measure the local poverty rate, so the number of beneficiaries of the National Basic Livelihood Security Act is the most realistic data that can be collected, even if it means the number of groups subject to public assistance. The variable for analyzing the residential patterns of the poor is the number of poor people represented by the number of basic livelihood security recipients in each region. It is very critical to choose the appropriate geographic unit to examine the spatial pattern of poverty and residential segregation. This study aims to analyse residential patterns of the poor in Si-Gun-Gu(urban and rural units) that are most commonly used in the country's geographical analysis unit research in Korea. Si(city), Gun(county), and Gu(district) are 3 parts of municipal-level divisions in Korea. Particularly, Gun is less densely populated than a Si or Gu, and more rural in character than either of the other two divisions. The ratio of the population of the poor can be measured simply by using the ratio of basic livelihood security recipients at the Si-Gun-Gu level. However, to measure the level of segregation for the poor at Si-Gun-Gu level, data from more micro unit should be needed. To examine whether the population distribution of the poor across subgroups is geographically evenly distributed or concentrated in a particular area, this study will use basic livelihood security recipients data at the sub-municipal level(Eup-Myeon-Dong).

The proportion of poor people living in a particular area and the degree of separation of the poor are clearly distinct from each other. Even in areas with a high proportion of the poor, they can be spatially dispersed. Some areas with low poverty rate might also experience highly concentrated spatial pattern in particular sub-areas. So simply from the proportion of the poor, it might not be possible to examine how much this economic minority lives apart from the mainstream population. After all, it is required to pay attention to the implications of measuring the economic segregation that are distinct from the simple proportion of the poor.

Many prior studies have presented various indicators so far, since the measurement of the economic segregation has been quite complex and difficult to pin down. Basically, the concept of segregation shows how different one population group (mainly a minority) from another population group (mainly a mainstream) in a particular unit area. Residential segregation refers to spatial separation of population groups, usually expressed by spatial distribution of minority populations, but also to limits the interaction between groups that are mutually exclusive (Wong, 2003), Thus, various measurement criteria have been presented by prior studies showing differences in residential patterns between groups. Typically, Massey and Denton(1988) have presented five key dimensions: evenness, exposure, clustering, centralization, and concentration, and a number of related studies made extensive use of these factors(Reardon & O'Sullivan, 2004). The present study focuses on the evenness and utilizes the

index of dissimilarity which is the most widely used measure of segregation(Allen et al., 2015). This index is also called the Duncan Segregation Index, which was initially designed as the best measure of occupational segregation. The following is a simple expression of the traditional dissimilarity index.

$$D = \frac{1}{2} \sum_{i=1}^{n} |x_i - y_i|$$

n is the number of units(Eup-Myeon-Dong), x_i means the ratio of the population of group x living in area i to the total population of the group x living in the whole region (including the region i). In the same manner, y_i means the ratio of the population of group y living in area i to the total population of the group y living in the whole region (including the region i). Thus, this particular index in this research essentially utilizes the ratio of the population in sub-geographical units(Eup-Myeon-Dong) to the number of people in the entire region(Si-Gun-Gu) for two exclusive groups. In theory, if there is no residential resegregation between groups, the index has a value of zero, whereas if the residential segregation is completely realized, the index has a maximum value of 1. The value of the index can be interpreted as a percentage of minority groups that must move their dwellings to realize the even distribution of their dwellings between groups within the region.

The most representative criticism of the traditional index, first introduced, is the limitation of not taking into account the spatial characteristics represented by the so-called "checkerboard problem" originally proposed by White(1983). This problem can be attributed to the negligence of the overall combination of the upper-level regions surrounding by only considering each separate or isolated unit area from the other regions. There are a number of different indicators that have been devised by scholars to overcome limitations due to lack of spatial consideration of the Duncan Segregation Index. This study uses Wong's index(1993), which partially modifies the traditional index in a spatial context. An index using the spatial weighted matrix developed by Wong was developed to complement the weaknesses of the boundary modified index of Morrill (1991), which considered only whether or not boundary sharing was possible in the weighted matrix. Wong (1993) points out that although Morill's revised dissimilarity index is the easiest way to handle spatial information, the intensity of interactions among adjacent areas may depend on a variable called length of boundaries shared by regions. In other words, longer boundaries make it easier for groups to communicate and interact as they cross borders. Based on this spatial context, the new revised Wong index, $D_{(w)}$ formula is as follows.

$$D_{(w)} = D - \frac{1}{2} \sum_i \sum_j w_{ij} |Z_i - Z_j|$$

where D is the traditional Duncan index and Z_i and Z_j mean the proportion of minorities living in the local units i and j, and the weighting matrix on the right, w_{ij} which is the most important part of the $D_{(w)}$ index, means the ratio of the length of the shared boundaries of regions i and j to the length of the entire boundary. Thus, in order to solve a problem that is overestimated by not taking into account the interaction between neighboring groups in the traditional index, Wong index can be calibrated to the level of potential interaction in the formula. The use of this index not only takes into account a variable called the length of a common boundary as an important spatial factor in influencing group interactions, but also allows the handling of boundaries with an irregular shape to give the benefit of measuring more realistic and accurate patterns of interactions(Wong, 1993).

3.2. Model Specification

The unit of analysis of this study, aimed at analysing the determinants of the separation of the poor, is the municipal and provincial districts with the level of the basic administrative units. In Korea, city and county districts have much more homogeneous characteristics than the provincial and provincial administrative units, which are commonly used in research using geographic units. In other words, it is assumed that the residential distribution of the poor in a particular region is determined by specific demographic combinations, environmental factors, and other regional characteristics. It was also assumed that local poverty rates are affected by these factors. By setting up a regression model for these two dependent variables, it would be possible to identify what are the factors that affect the economic segregation and the rate of poverty, and how they are different. The two regression models are expressed numerically as follows:

i) $S_i = \alpha_1 + \alpha_2 M_i + \alpha_3 Y_i + \alpha_4 FO_i + \alpha_5 PH_i$
$\quad + \alpha_6 MR_i + \alpha_7 R_i + \alpha_8 D_i + \alpha_9 I_i + u_i$

ii) $P_i = \beta_1 + \beta_2 M_i + \beta_3 Y_i + \beta_4 FO_i + \beta_5 PH_i$
$\quad + \beta_6 MR_i + \beta_7 R_i + \beta_8 D_i + \beta_9 I_i + v_i$

The dependent variables, S_i and P_i represent economic segregation and poverty rate of area i, respectively. The distribution of dwellings for the poor, measured by the dissimilarity index and the ratio of basic livelihood security recipients, may depend on demographic characteristics, residential features, and other regional contexts. M_i is the percentage of male, Y_i is the percentage of people between the ages of 13 and 18, FO_i is the percentage of foreign residents, PH_i is the percentage of poor housings, MR_i is the percentage of monthly rental housings, R_i is rural area(dummy variable), D_i is population density, I_i is financial independence rate, u_i and v_i are disturbance terms.

Technically, the number of poor and non-poverty populations was entered for the upper and lower level geographical units in the geographic information system(GIS) data, and a series of measurements was performed through the Geo-Segregation Analyzer program(version 1.2). In addition, a regression analysis was conducted through the STATA(version 13) program to identify determinants of economic segregation and local poverty.

4. Findings

One of the main goals of this study is to explore how the poor are spatially distributed through the indicators of local poverty rates and economic segregation. The top 20 areas and the bottom 20 areas for two indices were summarized below in Table 1 and Table 2 as measured by the dissimilarity index and percentage of the national livelihood security recipients. First of all, Table 1 shows that the top 20 cities and counties with higher poverty rates tend to be concentrated in rural areas. The areas with the highest proportion of the poor are listed as Jeonbuk-Kimje of North Jeolla Province, followed by Busan-Dong, Busan-Yeongdo, Jeonbuk-Jeongeup, and Daegu-Nam. Among the top 20 regions, as many as 12 are in the Jeolla provinces, indicating the highest poverty rate. However, some municipalities in metropolitan cities were also included, especially those in Busan where the poverty rate was severe. On the other hand, the bottom 20 cities and counties in the country show that most of areas with low poverty rates are concentrated in urban areas. The lowest percentage of the poor was Yongin-Suji of Gyeonggi Province, followed by Suwon-Yeongtong, Yongin-Kiheung, Changwon-Sungsan in South Gyeongsang Province, and Seocho in Seoul. Fourteen of the 20 lowest-income areas appeared in the Seoul metropolitan area, confirming that areas with low poverty rates were clustered.

Table 2 shows the top and bottom 20 rankings based on the results of measuring the dissimilarity index for the poor. First of all, it can be seen that most of districts included in the top 20 list of segregated poor neighborhoods are concentrated in urban areas. The areas with the highest residential segregation for the poor were identified as Gyeonggi Province's Seongnam-Bundang, followed by Seoul's Gangnam, Incheon's Yeonsu, Seoul's Gangseo and South Chungcheong Province' Gyeryong. The level of economic segregation in these upper-tier regions seems to be significantly high compared to the level of segregation in major countries measured with the same actual metrics. In Seongnam-Bundang, the value of the dissimilarity Index reaches 0.52, which is similar to the average(0.55) of the level of black-and-white racial segregation in the major US metropolitan areas. In terms of overall regional distribution, out of the top 20 regions, the metropolitan area appeared to be as many as 12 areas, confirming the spatial concentration of the high-poverty area.

On the other hand, the bottom 20 list of economic segregation tends to be mostly concentrated in rural areas. Busan-Jung was the only city to be ranked in the bottom 20 with a low level of economic segregation nationwide. The areas with the lowest level of separation of the poor were Jeungpyeong of Chungbuk Province, followed by Gangwon-Yanggu, Gangwon-Cheorwon, Gyeongnam-Changnyeong, and Chungnam-Yesan. Unlike the previous rankings, however, the districts in the bottom 20 ranking for economic segregation were relatively evenly distributed in rural areas across the country. Overall, the ratio of the poor was relatively high in rural areas, but the level of segregation for the poor was low. Whereas in urban areas, the proportion of the population of the poor was relatively low, but the level of economic segregation was very high. The discrepancy between the upper regions with a higher proportion of the poor and those with higher economic segregation can be seen as empirical evidence to confirm that higher poverty rates and greater separation of economic settlements are separate concepts.

Table 1: List of Top & Bottom 20 Cities and Counties by Poverty Rate

Top 20 Si-Gun-Gu			Bottom 20 Si-Gun-Gu		
Rank	Si-gun-gu	%	Rank	Si-gun-gu	%
1	Jeonbuk Kimje	8.87	1	Yongin Suji	0.33
2	Busan Dong	8.46	2	Suwon Yeongtong	0.73
3	Busan Yeongdo	7.51	3	Yongin Kiheung	0.82
4	Jeonbuk Jeongeup	7.33	4	Changwon Seongsan	0.94
5	Daegu Nam	7.06	5	Seoul Seocho	1.01
6	Gyeongbuk Yeongyang	7.04	6	Yongin Cheoin	1.04
7	Jeonnam Jindo	6.96	7	Gyeongnam Geoje	1.16
8	Jeonbuk Namwon	6.89	8	Gyeonggi Hwaseong	1.20
9	Gwangju Dong	6.52	9	Anyang Dongan	1.24
10	Jeonnam Jangheung	6.23	10	Gyeonggi Uiwang	1.26
11	Jeonbuk Imsil	6.14	11	Seoul Songpa	1.30
12	Busan Jung	6.11	12	Goyang Ilsanseo	1.32
13	Gyeongbuk Yeongduk	6.06	13	Seongnam Bundang	1.33
14	Jeonbuk Jangsu	6.06	14	Gyeonggi Gwacheon	1.33
15	Jeonnam Youngkwang	6.02	15	Chungnam Gyeryong	1.36
16	Busan Seo	5.93	16	Ulsan Buk	1.46
17	Jeonnam Goheung	5.89	17	Ulsan Dong	1.47
18	Jeonbuk Buan	5.85	18	Suwon Kwonsun	1.47
19	Daejeon Dong	5.80	19	Daejeon Yuseong	1.48
20	Jeonnam Bosung	5.74	20	Gyeonggi Gwangju	1.51

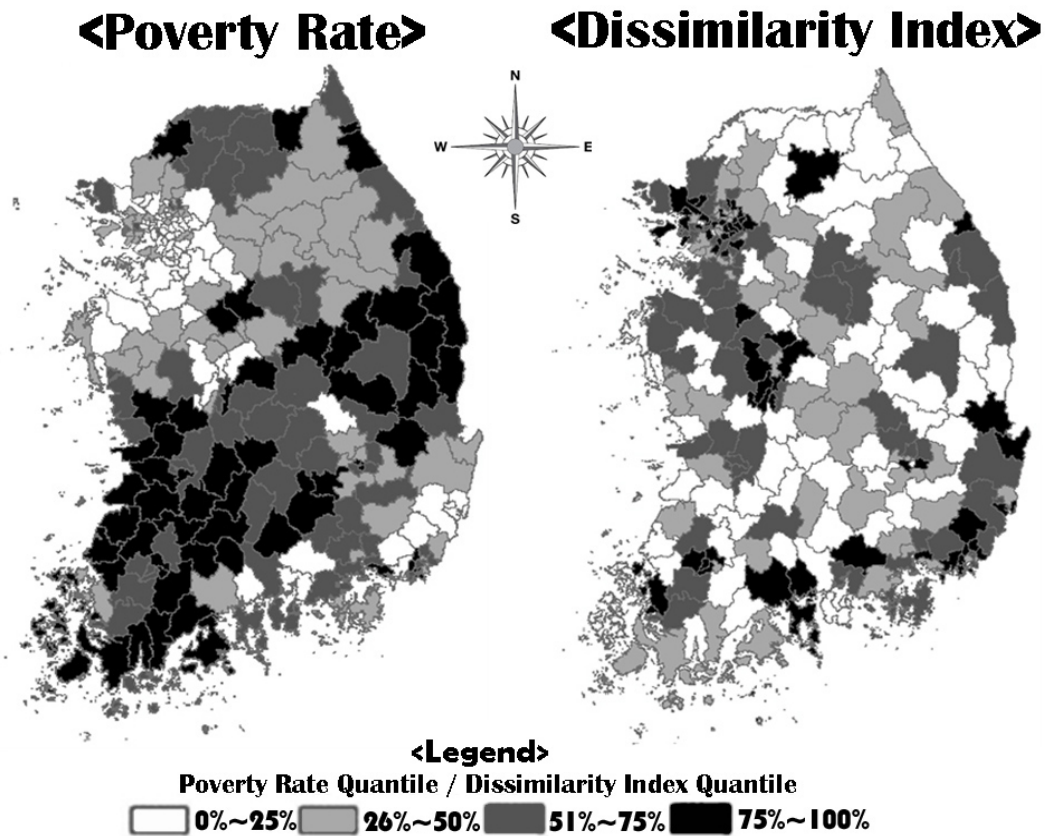Source: 2015 Basic Livelihood Recipients Statistics (Mistry of Health and Welfare)

Table 2: List of Top & Bottom 20 Cities and Counties by Economic Segregation

Top 20 Si-gun-gu			Bottom 20 Si-Gun-Gu		
Rank	Si-gun-gu	$D(w)$	Rank	Si-gun-gu	$D(w)$
1	Seongnam Bundang	0.5201	1	Chungbuk Jeungpyeong	0.0041
2	Seoul Gangnam	0.4962	2	Gangwon Yanggu	0.0236
3	Incheon Yeonsu	0.4488	3	Gangwon Cheorwon	0.0322
4	Seoul Gangseo	0.4469	4	Gyeongnam Changnyeong	0.0329
5	Chungnam Gyeryong	0.4178	5	Chungnam Yesan	0.0334
6	Daegu Dalseo	0.3913	6	Gangwon Hoengseong	0.0347
7	Busan Haeundae	0.3854	7	Jeonbuk Jangsu	0.0351
8	Seoul Seocho	0.3612	8	Busan Jung	0.0396
9	Busan Buk	0.3558	9	Chungnam Taean	0.0409
10	Seoul Songpa	0.3378	10	Gyeongbuk Yeongyang	0.0443
11	Busan Sasang	0.3272	11	Chungnam Nonsan	0.0448
12	Sejong	0.3241	12	Jeonnam Gurye	0.0455
13	Goyang Ilsanseo	0.3233	13	Chungbuk Jincheon	0.0459
14	Anyang Dongan	0.3198	14	Gyeongnam Namhae	0.0459
15	Gyeonggi Guri	0.319	15	Gyeongbuk Cheongdo	0.046
16	Bucheon Wonmi	0.318	16	Jeonbuk Imsil	0.047
17	Gyeonggi Gunpo	0.3146	17	Chungnam Seocheon	0.0473
18	Gyeongnam Geoje	0.3138	18	Jeonbuk Jinan	0.0476
19	Incheon Jung	0.3083	19	Jeonbuk Buan	0.0493
20	Cheonan Seobuk	0.3074	20	Chungbuk Boeun	0.0521

Source: 2015 Basic Livelihood Recipients Statistics (Mistry of Health and Welfare)

In this study, 252 cities and counties nationwide were examined through a map to visualize the spatial concentration of poverty based on the results of measurements of poverty rate and dissimilarity index for the poor. Figure 2 displays the spatial variation in the order in which the ratio of basic livelihood security recipients and the dissimilarity index are high. A map of the poverty rate on the left shows that the poverty rate in rural areas in the Jeolla provinces and North Gyeongsang Province is relatively high compared to other regions. However, several districts in Busan and other municipalities in some metropolitan areas also showed high poverty rates. On the other hand, the quantile map of economic segregation on the right shows that the top 25 percent regions tend to be evenly distributed across the country. In spite of the relatively equal distribution, many districts with higher levels of economic segregation are still located across the Seoul metropolitan area, the central Yeongnam area centered in Busan and Ulsan, and some metropolitan areas in Daejeon and Gwangju. Conversely, most rural areas tended to have low levels of residential segregation for the poor.

In order to analyze the determinants of the poverty rate and the residential segregation of the poor, this study performed a regression analysis. The summary statistics for all independent and dependent variables used in the regression model are shown in Table 3. The dependent variable, dissimilarity index, appears to enjoy quite large scale across the entire Si-Gun-Gu districts, with a maximum value of 0.52, while the minimum value is only 0.0014. The poverty rate also varies significantly across geographic observations, so the minimum is 0.33 and the maximum value is 8.87. Meanwhile, among the demographic factors, the elderly population ratio was found to have a fairly high correlation with the youth population ratio, which had to be omitted from the regression model due to the problem of multicollinearity. In addition, the dissimilarity index variable is used in regression analysis by reducing the decimal unit of the regression coefficient value and intentionally multiplying it by 100 for convenience of analysis and changing it to the same scale as the percentage.

<Legend>
Poverty Rate Quantile / Dissimilarity Index Quantile
0%~25%   26%~50%   51%~75%   75%~100%

Source: 2015 Basic Livelihood Recipients Statistics (Mistry of Health and Welfare)

Figure 2: Spatial Pattern of Poverty Rate and Economic Segregation in South Korea

Table 3: Summary of descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Dependent Variables					
Dissimilarity Index	252	0.17	0.09	0.0014	0.52
Poverty Rate	252	3.65	1.54	0.33	8.87
Demographic Factors					
Percentage of Male	255	50.12	1.27	47.52	56.66
Percentage of Old People	252	17.51	7.76	5.39	36.59
Percentage of Youth	252	12.53	2.90	5.86	20.52
Percentage of Foreigners	252	3.30	2.47	0.6	18.77
Residential Factors					
Percentage of Poor Housings	252	9.69	8.71	0.5	51.01
Percentage of Monthly Rent	252	19.68	8.06	1.57	39.94
Regional Characteristics Factors					
Rural(Gun Dummy)	252	0.31	0.47	0	1
Population Density	252	4126	6208.1	20.2	27840.8
Financial Independence rate	252	27.76	14.57	7.4	66.2

Source: 2015 Basic Livelihood Recipients Statistics (Mistry of Health and Welfare), 2015 Census Population and Housing Census

Table 4: OLS Regression Models for Economic Segregation and Poverty Rate

Variable	Segregation Model Dissimilarity Index(Dw)		Poverty Model Poverty Rate	
	Coefficient(SE)	β	Coefficient(SE)	β
Male(%)	-1.06(0.38)**	-0.14	-0.18(0.05)**	-0.15
Youth(%)	1.04(0.22)**	0.32	-0.19(0.03)**	-0.35
Foreign Residents(%)	-0.35(0.19)*	-0.09	0.05(0.03)*	-0.08
Poor Housing(%)	-0.15(0.06)**	-0.14	-0.01(0.01)	-0.05
Monthly Rental Housing(%)	0.04(0.09)	0.03	0.02(0.01)*	0.12
Gun(Dummy)	-4.11(1.60)**	-0.20	-0.53(0.23)**	-0.16
Population Density	0.0003(0.0001)**	0.20	-0.0003(0.00001)**	-0.28
Financial Independence(%)	0.15(0.04)**	0.24	-0.06(0.01)**	-0.58
$Adj\ R^2$	0.4931		0.6112	
F	31.52		50.33	
N	252		252	

Source: Author's own edited

The following Table 4 shows the OLS regression results for the poverty rate and the residential segregation of the poor. First of all, the segregation model showed that all 3 variables related to demographic factor were statistically significant. The ratio of male and foreign residents were negatively significant, so the level of economic segregation appears to decrease as the percentages of male and foreign residents increase. However, the ratio of the teenage population was positively significant, which led to an increase of economic segregation as the ratio of the young population increases. The ratio of poor housing in relation to the residential factor appears to be negatively significant, so the higher the proportion of poor housing, the lower the level of economic segregation. On the other hand, the percentage of monthly rent failed to produce statistical significance and meaningful results. All three variables classified as regional characteristic factors showed statistically significant results, with different directions for their effects. The coefficient of dummy variable for rural areas is negative and statistically significant, which explains that economic segregation is likely to be lower in the rural areas. On the other hand, both population density and financial independence rate are positively significant, so the higher the population density and financial autonomy, the higher the economic segregation. This series of results suggests that the younger population is entering, the more densely populated and the more financially able the region is, the more likely it is to separate the living quarters of the economically minority group. It also shows that the higher the proportion of foreigners' population and poor housing, the more diverse the poor's choice of residence will result in lower levels of economic segregation.

The results of the second regression model, which makes poverty rates a dependent variable, show that all three demographic factors-related variables are statistically significant, but there are some differences in the direction in

which they affect them. The percentage of male is statistically significant in the positive direction, which suggests that increasing male ratio leads to a decrease in the poverty rate. Although the coefficient is also statistically significant, the direction of the coefficient for youth ratio is shown to be negative, and the poverty rate is found to decrease as the proportion of the young population increases. The last demographic variable, the percentage of foreign residents is also statistically significant and the coefficient is minus sign indicating that higher ratio of foreign residents results in higher poverty rate.

In the case of residential factor, it was found that, unlike the results from segregation model, poor housing does not significantly affect the poverty rate. However, percentage of monthly rent is statistically significant in positive direction, so the higher the monthly rent rate, the higher the poverty rate. Lastly, among the variables related to regional characteristics factor, the rural dummy variable was shown to be as negative as the segregation model, indicating a low poverty rate in rural areas. However, population density and financial independence appear to be negatively significant as opposed to the segregation model, so the higher the population density and financial autonomy, the lower the poverty rate. The regression analysis results of the poverty rate model show that increasing the young population, increasing density, and increasing financial autonomy can naturally lower the poverty rate. On the contrary, the increasing proportion of foreigners' population and monthly housing was an important factor in raising the poverty rate. Both regression models had adjusted R^2 of 0.49 and 0.61 respectively, indicating that the model had a fairly explanatory power and that the VIF(variance inflating factor) value was less than 3, indicating that there was no problem with multicollinearity.

5. Conclusion and Policy Implication

Asia is the largest and most densely populated continent on earth and has experienced rapid economic growth over the past half century. According to the World Bank's 2018 report, about 40 percent of the 783 million poor people living below the $1.9 daily poverty line live in Asia. Given that Asia is a region where both extreme poverty and high economic growth coexist, the way countries cope with poverty is an interesting subject of social science. Korea was once the poorest country in the world, experiencing a terrible war, but it successfully led remarkable economic growth since the 1960s, eventually becoming the leading country in the world economy in the late 20th century. However, the problems of economic polarization and poverty in the course of the nation's growth were inevitable social phenomena, and various policy efforts were made to cope with them. Nevertheless, the diagnosis of the problem and

the search for alternatives considering the spatial context of poverty have not been done properly. The reason is also due to a lack of understanding and interest in the segregation from which there has long been academic and policy interests in the West. Therefore, just measuring economic segregation and poverty rates at the level of cities in Korea and looking at their spatial patterns can provide a substantial amount of policy implications.

The spatial pattern analysis of poverty rate and economic segregation in micro-geographical units, the purpose of the first study, was achieved through exploratory spatial data analysis techniques. According to the analysis of spatial patterns of poverty, the poverty rate in rural areas in the southern regions, such as Jeolla Province and North Gyeongsang Province, was relatively high, and among the metropolitan areas, the high rate of poverty in some districts of the Busan was confirmed. In the case of economic segregation, many urban districts in the metropolitan area of Seoul, Busan, Ulsan, Daejeon and Gwangju appear to be severe. Overall, the spatial patterns of areas with high poverty rates were extremely clustered, while the distribution of areas with high economic segregation was relatively evenly distributed.

Along with the exploratory analysis of the spatial data on residential segregation and poverty rates, This study attempted to identify the determinants that affect the economic segregation, which can be called the second purpose of the study. The results of the regression analysis indicated that demographic factors, residential factors and local factors all affect whether the poor live in a particular area or spread evenly. While high fiscal independence, high youth population ratio and high population density are likely to deepen the economic segregation, high percentage of foreign residents and high poor housing ratio appeared to weaken the economic segregation. On the other hand, poverty rate tends to decrease as population density, youth population ratio, and financial independence rate increase. On the contrary, high percentage of foreign residents and monthly rent housings appeared to be leading to high poverty rate. These results suggest that the factors causing higher local poverty rates or severe economic segregation are quite similar, but the effects are very contradictory. In other words, the results of the study imply that factors that raise the poverty rate in the region result in lower levels of economic segregation, while factors that reduce the poverty rate lead to the severe level of economic segregation. From a policy standpoint, it should be noted that the poor living in areas where young populations come in, population density increases, homeownership rates rise, and the financial independence of cities increases, are likely to experience a high level of economic segregation. In cities where the poverty rate is relatively low, the economic segregation could rather deepen, so the poor living in the area may have to endure a hard life in a much more isolated situation. Therefore, the urban government needs not only efforts to

reduce the level of poverty in the region by accurately identifying the poverty rate and the level of economic segregation, but also to investigate and analyze how high levels of geographic isolation of the poor are.

Meanwhile, the results obtained from the analysis about the determinants of the economic segregation conducted by the present study show that factors that reduce the poverty rate in the region may be factors that accelerate isolation and exclusion of the poor. In general, however, the level of economic segregation in areas with high poverty rates also increases, which further adds to the socioeconomic disadvantage of those areas. Thus, empirical evidence derived from the Korean case shows that it is difficult to generalize the context of the interaction between poverty and economic segregation to Western perspectives. Subsequent studies to deal with the separation of economic settlements in Asia will require much more sophisticated analysis of the interaction between economic segregation and poverty rates than simply responding to Western views and discourse.

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