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Relationship between Change of Demographic Composition and Crime : Comparing Areas with Growth in Population to Areas with Decline

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Abstract

This study is to investigate that population change as a result of the decline in population has a correlation with a decrease in crime, with the change in the demographic composition by comparing with two models: model with growth in population and one with the decline in population. We collected demographic data for all cities in Korea from the 2010 Census to 2020 offered by the Korean Statistical Information Service, with crime data comprising serious reported crime events from the Korean Nation Police Agency through requesting data related to the total number of crimes at the same as the period of demographic data. This study can identify the impacts of demographic changes as a result of population change on crime change through a comparative analysis between areas with population growth and ones with population decline. We can confirm that there are differences in determinants of crime between areas with population increase and one with population decrease from the analysis of the impact of demographic change as a result of population change on crime change.

Keywords: *Population Change, Demographic Change, Demographic Composition, Crime Change*

1. INTRODUCTION

One of the more intriguing puzzles emanating from the past century of research and scholarship on cities, neighborhoods, and crime is the lack of serious attention to the idea of change [1]. From the perspective of population change going toward an era of population decline, this puzzle would suggest a new approach to the relationship between population and crime with the proposition that growth in population influences crime. From the starting point of criminology with the individual-level explanation, population change, meaning a rising population, must be the most crucial factor in understanding crime.

In an industrialized society, population expansion in urban areas accompanies rising crime. It is valid and logical to get the idea that an increasing population causes a striking rise in crime, with an increase in crime witnessed after rapid growth in population size. After clearly building the relationship between population and crime, we could access a multitude of approaches, such as structural functionalism, criminal psychology, behaviorism, and the like, coming up with an explanation about why and how crime happens.

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Population growth in the world has begun to slow down since the 2000s, started decreasing amid the 2000s in some countries, such as the United States. For the United States, the population growth rate has been falling sharply since the mid-the 2000s, above all, the natural growth of the population dropped from 1,892,522 in 2007 to 216,742 in 2020 [2]. Countries with large economies have faced a decline or stagnation in population. In addition, crime decline has become a distinct tendency in developed countries, like a reduction in population. In the case of the United States, the crime rate has decreased sharply throughout crimes such as homicide, violence, and property crime since the 1990s.

Korea ranked the lowest among OECD countries in birth rate, 0.86 in the first quarter of 2021. The total population in Korea increased until 2020 as the natural growth like birth exceeded the natural reduction like death due to the high aging rate. Korea's population, however, declined for the first time in 2021, expected to continue to decline. Korea has two patterns of population growth and decline. Urban areas neighboring metropolitan cities have population growth for migration, but rural areas suffer a rapid decline in population for low birth rates and population outflows. Meanwhile, crime in Korea has been steadily decreasing since 2013, from about 1.86 million in 2013 to about 1.6 million in 2020. Here is a critical question. What brought crime to decline?

Based on life cycle theory, population and crime are in the process of decline, considered dynamic entities. In the process of growth in population and crime, there is a positive correlation between population and crime, with a lot of empirical studies showing evidence for the correlation. But, in the process of decline in population and crime, few empirical studies have investigated the relationship between the decline in population and reduction in crime. From the relationship between growth in population and crime supported by much previous literature, we can postulate that there is a positive correlation between the decline in population and reduction in crime, regardless of little evidence.

Population change directly influences demographic composition, such as population size, density, family composition, migration, etc., which have an effect on crime. These factors have an excellent explanation for understanding what the population in an area has changed like in the processes of growth and decline in population.

We will investigate that population change as a result of the decline in population has a correlation with a decrease in crime, with the change in the demographic composition by comparing with two models. One of the models represents cities with growth in population, the other with the decline in population. A comparison of these pairs will help to identify the relationship between population change as a result of population growth and decline and crime. Therefore, this research empirically investigates the relationship between population change as a result of the decline in population and crime.

2. THEORETICAL BACKGROUND FOR RESEARCH MODEL

Various theoretical models posit a relationship between population and the amount of crime. Here are some models that can explain the relationship between population and crime. Wirth (1938) regarded population size and density as related but separate concepts that play crucial roles in determining the context of a crime. The simple size of large populations multiplies the range of potential differentiation between individuals [3]. Mayhew and Levinger (1977) formalized this concept of multiplicative growth in social ties as the population grows, demonstrating that an individual's number of ties can grow exponentially, but that, at the same time, the amount of possible time devoted to each tie plummets at a decreasing rate [4].

In theorizing about population density, one must consider three main perspectives: (1) theories of overcrowding and anti-social behavior fostered by high levels of density [5]; insight that physical contacts intensify as density increases [3]; and routine activities theory [6].

The first perspective describes a psychological mechanism rooted in animal studies demonstrating increased violence and mortality in overcrowded conditions, generally implying a monotonic linear relationship between population density and crime [5]. In the second perspective, physical contacts increase within high density. Higher density creates increased competition for urban space with resultant interpersonal friction and, potentially, higher crime rates, with another monotonic positive relationship [3]. The third micro-environmental perspective is the routine activities theory, emphasizing that crime is an ecological event that occurs within a certain time and space, also positing crime events occur with the temporal confluence of three spatial factors: (1) the presence of motivated offenders; (2) the presence of suitable targets; and (3) the absence of guardians who might intervene [6].

Despite our theoretical explanation regarding the relationship between population size and density and crime rates, the empirical evidence looks quite confused. Many studies have tested the effect of population size but ignored the effect of population density. Other studies have tested the effect of population density but ignored effects of population size [7]. Studies testing both simultaneously have found a stronger effect for population size and almost no effect for population density [8,9]. Overall, there is very little evidence that population density affects crime when accounting for population size [7].

3. DATA AND ANALYSIS

3.1 Data

We collected demographic data for all cities in Korea from the 2010 Census to 2020 offered by the Korean Statistical Information Service, with crime data comprising serious reported crime events from the Korean Nation Police Agency through requesting data related to the total number of crimes at the same as the period of demographic data. The population structure in Korea has begun to change, the decline in both a natural increase and a natural decrease in population, since 2010 due to the low fertility rate (1.23 per woman) and high aging rate (11.0%), with a slight increase in population. Some of the data collected have large deviations in the measured values depending on the type of city, urban or rural, which is more likely to make the measurement values for analysis unstabilized, with an increased variance of the data measurements. So, we will replace data with large deviations as a result of the types of the city with percentage or natural logarithm.

3.2 Variables

Our crucial independent variables measure various iterations of demographic composition. Considering the correlation between population size and crime, we created a measure of the total population from 2010 to 2020, the size of the population. Given the propensity for adolescents and young adults to commit a crime and the higher rate of crime committed by men than women [7], we computed the population proportion aged 14-34 and the population proportion of men. We also computed a ratio of those aged 35-83 to those aged 14-34, given that the younger and men groups represent those at the highest risk of being offenders, compared with the old group [7]. We should consider aging and racial heterogeneity as independent variables, given that there are increasing rates of crime in recent years caused by the old and other races, computing a proportion aged over 65 and a proportion of other races respectively. Finally, we selected population proportion of migration, in-migration, representing population-moving in, given that areas with much more in-migration are more likely to be places friendly with crime, because it increases population. Hence, we computed a total crime from 2010 to 2020 as our dependent variable.

Table 1. Summary Statistics of Variables Used in Analysis

	Mean (2010-2020)	Std Dev.
Outcome variable		
Logged crime size	14.3006	.07186
Predicator variables		
Logged population size	17.75110	.00963
Proportion aged 14-34	26.44570	1.58394
Ratio 35-83 to 14-34-year-olds	45.31216	4.66222
Proportion men	.49980	.00080
Proportion old people	18.24600	1.97380
Proportion other races	15.45280	1.98733
Proportion in-migration	14.77147	.83707

3.3 Analysis

We assumed differences in variables included in our research model between areas with population growth and ones with population decline, positing that rates of crime, the youth, men, the elderly rate, racial heterogeneity, in-migration, and the like in areas with population would be higher than those in areas with population decline. That means that these characteristics correlate with population change, with the fact that population change can contribute to any transition in demographic characteristics. Criminology, therefore, highlights the correlation between demographic change and crime for population growth and decline.

First, this study conducted t-test to identify whether there are differences between areas with population growth and ones with population decline. As we can see from Table 2, there are significant differences in almost over all variables at 95% confidence level, but except logged population size and proportion of men at 99% respectively. Mean (9.16030) of logged crime size in areas with population growth is much higher than mean (8.7227) of one in areas with population decline ($p<0.01$). there is the largest difference in proportion of other races between both areas, mean (37.11000) of areas with population growth and mean (2.0109) of ones with population decline, which means that the increase in foreigners is related to incentives such as getting jobs which is the strongest of the incentives that the areas in population growth have.

Table 2. Comparison in Means between Two Groups

	Areas with Population Growth	Areas with Population Decline	t-test
	Mean (SD)	Mean (SD)	
Logged crime size	9.16030 (.05824)	8.72270 (.09415)	3.964***
Logged population size	12.58160 (.05854)	12.16321 (.02702)	1.958*
Proportion aged 14-34	26.19746 (1.68124)	23.78355 (1.94704)	1.999**
Ratio 35-83 to 14-34-year-olds	48.59565 (4.36351)	44.97590 (5.56294)	2.976***
Proportion men	48.87660 (.06735)	48.98660 (.45439)	1.877*
Proportion old people	18.24600 (1.97380)	20.17310 (2.28908)	3.009***
Proportion other races	37.11000 (3.08321)	2.01090 (.18881)	11.986***
Proportion in-migration	15.64930 (.85174)	13.93810 (.93271)	2.542**

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

As shown in Table 1, the annual changes in variables in areas with population growth, there have been steady increases in crime size, population size, youths aged 14-34, ratio 35-83 to 14-34-year-olds, the elderly over 65, and foreigner population, and population of in-migration since 2010, but population size of men with steady decline.

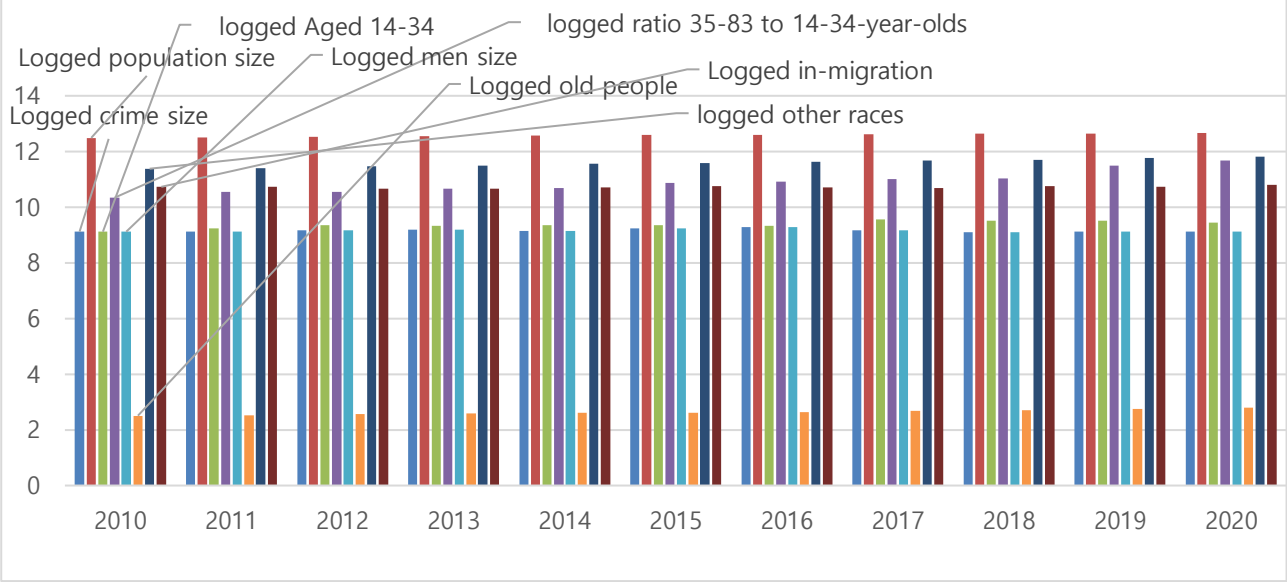

Figure 1. Annual Changes in Areas with Population Growth

As we can see from Figure 2, the annual changes in variables in areas with population decline, there have been steady decreases in crime size, population size, youths aged 14-34, population size of men, and population of in-migration since 2010, but ratio 35-83 to 14-34-year-olds and population size of the elderly with steady rises.

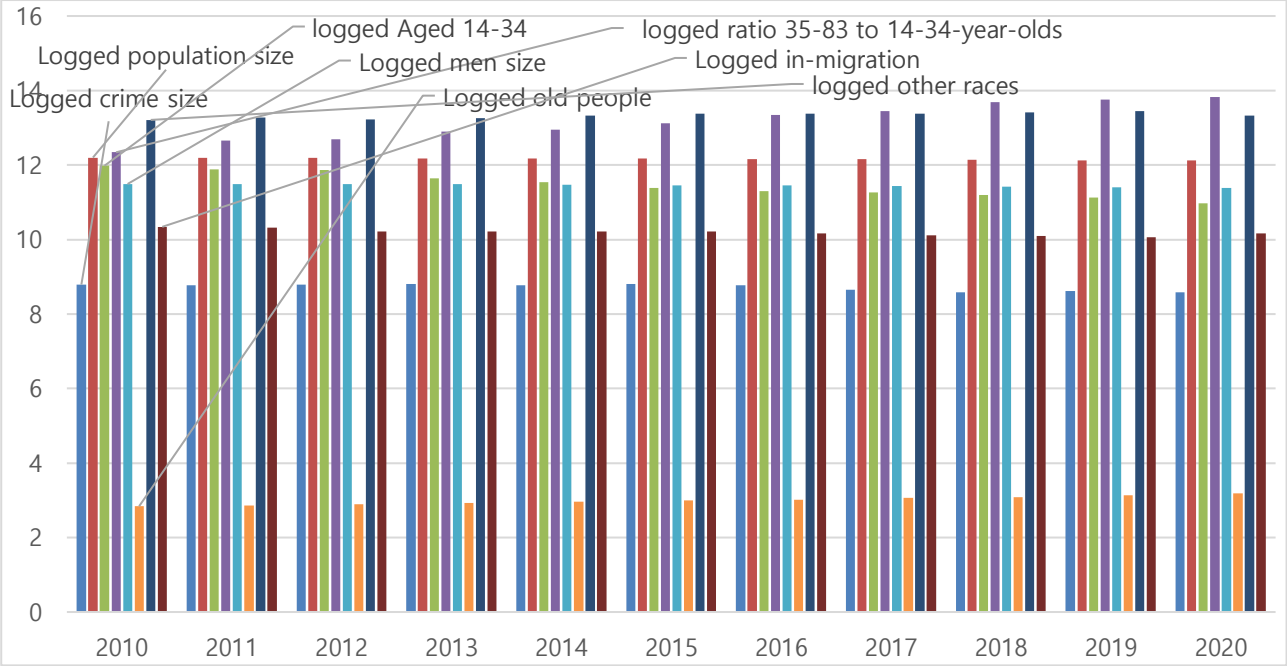

Figure 2. Annual Changes in Areas with Population Decline

Second, regression analysis was conducted to examine the impact of demographic changes on crime change, with samples of both areas with population growth and ones with population decline. Second, we conducted a regression analysis to examine the impact of demographic changes on crime change, with samples of both areas with population growth and ones with population decline. As we can see from Table 3, the result of regression analysis to areas with population growth, logged population size (β=.391, p<0.01), the proportion aged 14-34 (β=.031, p<0.05), and proportion of in-migration (β=.088, p<0.05) have a positive relationship with crime size, the ratio of 35-83 to 14-34-year-olds (β=-.153, p<0.01), and proportion of old people (β=-.231, p<0.01) have a negative relationship. But for the proportion of men and proportion of other races, no significant impact on crime.

Table 3. Regression Analysis to Areas with Population Growth

Dependent Variable: Logged crime size	B	SE	Beta	t	VIF
Logged population size	.386	.035	.391	11.128***	1.140
Proportion aged 14-34	.038	.018	.031	.2109**	1.033
Ratio 35-83 to 14-34-year-olds	-.176	.058	-.153	-3.028***	1.085
Proportion men	.036	.034	.035	1.061	1.030
Proportion old people	-.262	.070	-.231	-3.734***	1.137
Proportion other races	.014	.021	.023	.692	1.026
Proportion in-migration	.083	.032	.088	2.616**	1.044
Constant	3.369				
R^2	.223				
Adjusted R^2	.218				
F	41.279***				
Durbin-Watson	2.039				

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

Table 4. Regression Analysis to Areas with Population Decline

Dependent Variable: Logged crime size	B	SE	Beta	t	VIF
Logged population size	.235	.036	.213	6.584***	2.955
Proportion aged 14-34	.026	.014	.019	1.845*	1.349
Ratio 35-83 to 14-34-year-olds	-.064	.021	-.057	-3.042***	1.892
Proportion men	.165	.040	.148	4.143***	2.831
Proportion old people	-.074	.039	-.034	-1.889*	1.211
Proportion other races	.067	.018	.074	3.736***	1.474
Proportion in-migration	.344	.032	.357	10.891***	2.047
Constant	1.255				
R^2	.541				
Adjusted R^2	.540				
F	408.709***				
Durbin-Watson	1.969				

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

From table 4, the result of regression analysis to areas with population decline, we can see that logged population size (β=.213, p<0.01), the proportion aged 14-34 (β=.019, p<0.10), the proportion of men (β=.148, p<0.01), proportion of other races (β=.074, p<0.01), and proportion of in-migration (β=.357, p<0.01) have a positive relationship with crime size, with negative impacts of ratio 35-83 to 14-34-year-olds (β=-.057, p<0.01), and proportion of old people (β=-.034, p<0.10) on crime.

4. CONCLUSION

We can identify the impacts of demographic changes as a result of population change on crime change through a comparative analysis between areas with population growth and ones with population decline. First of all, for areas with population increase, the population of young people aged 14-34 years, the population of in-migration have a positive effect on crime, and the population of the elderly and population aged the population aged 35-83 to 14-34 years old have a negative effect on crime. For areas with population decline, the population size, the youth population aged 14-34, the population size of men, the population size of foreigners, and the population of in-migration have a positive impact on crime, the population of the elderly, and population aged 35-83 to 14-34 years old have a negative impact on crime.

We can get out some implications from these analytical results. First, the increase in population from the natural growth by birth and the artificial growth by in-migration, and adolescents with high potential crime motives can cause the rise in crime. Second, men and other races can have a positive correlation with crime. In areas with a population decline with a decreasing population of young people and an increasing population of women and the elderly, men can be considered a powerful criminal factor, supported by the fact, as mentioned in criminological works, that men have much higher motivation for crime than women. Third, it can be found in much previous literature that the increase in the foreign population can bring a rise in crime to the neighborhood. From this, we can posit that the increase in foreigners brings growth in populations, and then the increase in population can cause an increase in crime. Whether the crime committed by foreigners should be considered a demographic change as a result of population change might be controversial. Given that crimes by foreigners have been increasing, the influx of foreigners in areas suffering population decline can be potential criminal spots. Finally, the increase of the elderly population and population of 35-83 years, with relatively much lower motivation for crime than adolescents, to 14-34 years old can contribute to the decrease in crime. The fact that the change of population structure due to aging can contribute to crime reduction can be challenge to the existing recognition of the relationship between aging and crime. That is why more empirical research on the relationship between aging and crime decline should be needed.

We could confirm that there are differences in determinants of crime between areas with population increase and one with population decrease from the analysis of the impact of demographic change as a result of population change on crime change. We hope that this research will be the starting point of developing a model that can predict the impacts of demographic change and social change as a result of population decline on crime change.

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