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Ph.D. Dissertation of Engineering

Understanding Urban Growth and Shrinkage: Evidence from an Economically Prosperous type in Depopulating Cities

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Seoul National University
Interdisciplinary Program in Landscape Architecture

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Abstract

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In modern society, we are experiencing an unprecedented era of urbanization amidst various challenges such as low birth rates, aging populations, industrial structural changes, and globalization. In this context, many cities around the world are transitioning from a growth-oriented paradigm to one of shrinkage. This shift presents significant challenges for urban planning and regional development, necessitating a precise understanding of urban growth and shrinkage to bolster urban resilience through policies suited to each type of city.

This study aims to present a new perspective on understanding urban growth and shrinkage, closely analyzing city types that experience economic prosperity despite population decline. Through this research, various cases where population decline does not directly correlate with economic decline are identified, aiming to propose methodologies for a more nuanced understanding and prediction

of urban growth and shrinkage. Furthermore, this study seeks to offer essential insights for modern urban planning and regional development by exploring multidimensional approaches for transitioning to cities with growth potential through economic prosperity in an era characterized by declining birth rates and aging populations. This study is structured into three chapters, with the main findings of each study summarized as follows.

Chapter 2 (Paper 1): Proposing the Classification Matrix for Growing and Shrinking cities: A Case Study of 228 Districts in South Korea

In the first study, a classification method was proposed to subdivide urban growth and shrinkage using population and economic indicators. It was revealed that *Complementary Economic Growth (CEG) cities*, characterized by population decline but economic prosperity, can be classified as a type of urban growth. Specifically, this study recognizes that the traditional classification methods based on population and economic indicators overly simplify the characteristics of city types. Therefore, it proposes a new eight-quadrant urban classification matrix that integrates the interactions between population and economic activity indicators. By applying this city classification matrix to 228 administrative districts in South Korea, the study identified six distinct types. The results of this study found that cities with declining populations but increasing economic activity exhibited growth patterns. These findings provide a sophisticated analytical framework for diagnosing and classifying urban changes, which can significantly contribute to the formulation of urban and regional policies.

Chapter 3 (Paper 2): Economic Prosperity Characteristics in Depopulated Cities: Evidence from 146 Cities in South Korea

The second study analyzed the strategic factors that enable CEG cities to exhibit economic prosperity despite population decline. The primary objective of

this study is to identify the unique factors and characteristics that distinguish CEG cities from traditional urban growth or shrinkage models. To this end, descriptive statistics and multinomial logistic regression analysis were conducted using demographic, economic, social, and physical indicators for 146 cities in South Korea. According to the study results, CEG cities primarily experience growth in high-value-added industries, particularly focusing on knowledge-intensive services (KIS) industries. This growth in KIS industries serves as a key factor enabling economic prosperity despite population decline. Specifically, the high mobility and flexibility in housing choices of KIS industry workers create a new urban lifestyle that transcends traditional commuting patterns, suggesting an urban pattern that leverages cultural availability to enhance work, leisure, and quality of life.

Despite this economic prosperity, CEG cities face issues such as high housing prices and limited housing supply, yet they still experience robust economic growth. This provides significant evidence that population decline does not necessarily imply economic decline. Therefore, this study emphasizes the importance of establishing urban and regional policies that can leverage the economic prosperity of CEG cities to address the ongoing challenges of population decline. By understanding and applying the key factors and characteristics that drive economic prosperity in CEG cities, important insights are provided for promoting sustainable development despite challenges such as population decline.

Chapter 4 (Paper 3): Beyond the Shadows of Depopulation: Conditions and Strategies for Economic Prosperity in Local Small and Mid-sized Depopulating Cities

The third study explored the conditions and strategies that enable CEG cities to promote economic prosperity despite population decline in local small and mid-sized cities in South Korea. Specifically, case studies of three cities—Eumseong,

Jecheon, and Yeongju—revealed how three conditions and strategies contribute to economic prosperity: 1) industrial restructuring through regional linkages, 2) activation of cultural tourism through collaboration with local resources and communities, and 3) promotion of cooperation and diversity through social networking. This study points out that efforts by individual enterprises or local governments alone are insufficient for economic prosperity and industrial diversification in small and mid-sized cities. It emphasizes the importance of forming industrial clusters through regional cooperation and the significance of mutually beneficial strategies between regions. Moreover, the study highlights the limitations of relying solely on local cultural or historical resources to activate cultural tourism and raises the need to develop more effective cultural tourism strategies through collaboration among local communities. Additionally, it demonstrates that the establishment of a startup ecosystem and the influx of foreigners through social networking can positively impact the local economy. This approach provides crucial insights into enhancing the economic resilience of local small and mid-sized cities and suggests a direction for achieving tangible economic prosperity through cooperation with various stakeholders.

This study has the following implications. By presenting an eight-quadrant urban classification matrix using population and economic indicators, it offers a more accurate diagnosis of urban growth and shrinkage, providing a new perspective for urban management and policy formulation. This study emphasizes that population decline does not necessarily mean economic decline, and that CEG cities should be distinguished from traditional shrinking cities. It underscores the need to understand the unique characteristics of these cities and effectively harness their economic potential. CEG cities should not be negatively perceived merely because of population decline; rather, it is essential to understand and appropriately utilize their characteristics. In particular, if the conditions and strategies for economic

prosperity are appropriately utilized in local small and mid-sized cities, which experience severe population decline, these cities can seek sustainable growth. This presents a new paradigm of urban development to academia and policymakers and can contribute to the readjustment of urban and regional policies.

Publications

Please note that Chapters 2–4 of this dissertation proposal were written as stand-alone papers (see below). Chapter 2 was published from ˙Habitat International˛ in 2022. Chapter 3 is under review after being submitted to ˙The Annals of Regional Science˛ in May 2024, and chapter 4 will be submitted to an academic journal soon.

Chapter 2

Kim, Y. E., Lee, J. S., & Kim, S. (2022). "Proposing the Classification Matrix for Growing and Shrinking cities: A Case Study of 228 Districts in South Korea". *Habitat International*, 127, 102644.

Chapter 3

Kim, Y. E., Kim, S., & Lee, J. S. "Economic Prosperity Characteristics in Depopulating Cities: Evidence from 146 Cities in South Korea".

Chapter 4

Kim, Y. E., Lee, J. S., & Kim, S. "Beyond the Shadows of Depopulation: Conditions and Strategies for Economic Sustainability in Local Small and Mid-sized Depopulating Cities".

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Chapter 1. Introduction

1. Research Background and Objectives

Modern society is facing unprecedented demographic changes such as low birth rates and aging populations, shifts in industrial structures, and globalization. As a result, many cities around the world have transitioned from a growth-oriented paradigm to one of shrinkage. Population decline has been observed and documented through numerous city cases in countries such as the United States, United Kingdom, Germany, France, Poland, Mexico, Brazil, China, South Korea, and Japan (Bartholomae et al., 2017; Hollander, 2017; Ma, 2017; Martinez-Fernandez et al., 2016a). Specifically, more than half of European cities and about 13% of US cities have experienced population decline in recent years (Turok & Mykhnenko, 2007; Wiechmann & Pallagst, 2012a). Furthermore, among Asian countries, Japan and South Korea have been noted for their significant urban population decline. According to demographer David Colman, South Korea has been identified as one of the countries that could disappear in 30 years due to population decline. These changes have caused the urban development model to increasingly diverge into two

paths: growth and shrinkage, and there has been an increased interest in shrinking cities within the academic community (Großmann et al., 2013; Oswalt & Rieniets, 2006).

Urban decline and shrinking city are referred to differently depending on the perspective. Many studies on urban growth and shrinkage have primarily used the term "urban shrinkage," while the term "urban decline" is mainly used to describe the economic dimension of decline caused by deindustrialization in the United States (Beauregard, 2003). "Shrinking city" has been explained as a suffering population and economic stagnation or physical and population decline of cities due to deindustrialization in Europe. According to Rieniets (2009), shrinking cities are cities with population decline. Thus, "urban decline" focuses on economic aspects, whereas "shrinking city" focuses on population decline (Seo, 2014). The terms *urban decline* and *shrinkage* have been used interchangeably in many studies, but the present study expresses the phenomenon of a declining population and economy as a "shrinking city." In addition, this study highlights the need to consider both the population and economic perspectives.

One of the significant challenges in contemporary urban planning and regional development is accurately understanding and defining urban growth and shrinkage. The discussion surrounding urban shrinkage still involves considerable controversy due to the disparity between concepts and indicators. Numerous studies have defined shrinking cities as phenomena accompanied by both population decline and economic downturn (Hollander & Németh, 2011; Hollander et al., 2009; Martinez-Fernandez et al., 2012; Pallagst, 2009). In the past, since economic decline led to a decrease in population, urban shrinkage was primarily attributed to economic downturns, and traditionally, changes in population have been used as the main

indicators to distinguish between urban growth and shrinkage (Beauregard, 2009; Hospers, 2014a).

However, recent studies show that beyond simple population changes, various factors such as economic elements, sociocultural shifts, and changes in urban structure impact urban growth and shrinkage (Liu et al., 2020). In particular, the transition to a knowledge-based economy and the restructuring of the global economy have brought fundamental changes to the function and structure of cities, and these changes cannot be fully understood through the traditional population-centric approach. Considering these recent urban transformations, many studies emphasize that both population and economic indicators should be considered when distinguishing between urban growth and shrinkage (Bartholomae et al., 2017; Lee & Han, 2014; Ma et al., 2020). As Glaeser and Resseger (2010) argued, despite there being many cities worldwide where the economy is growing even as the population declines, there is still a lack of research on this type of city. Moreover, there is a need for a classification method that moves beyond traditional urban classification models and uses both population and economic indicators to more finely distinguish between growth and shrinkage.

The purpose of this study is to offer a new perspective on understanding urban growth and shrinkage, and to deeply analyze the characteristics of city types that experience economic prosperity despite a decline in population. Through this, the study aims to highlight that population decline does not necessarily lead to economic downturn or social issues. Specifically, it implies that cities which prosper economically despite a decline in population do not necessarily need to be classified as shrinking cities. Moreover, this research interprets the complex interaction between population decline and economic prosperity, and in an era dominated by

low birth rates and aging populations, it explores a multidimensional approach that seeks not just simple population influx but maintains quality of life while fostering cities' potential for economic growth. In other words, this study aims to reassess the traditional understanding of urban population decline and contribute to new strategies for the qualitative growth of cities.

2. Research Structure

This study consists of five chapters, presenting a new perspective on defining urban growth and shrinkage, and the characteristics of city types that show economic prosperity despite a decline in population are analyzed from chapter 2 to chapter 4. Each chapter of the main body is structured as a follow-up study to the previous one, with the scope of research becoming more specific as the chapter number increases (Figure 1).
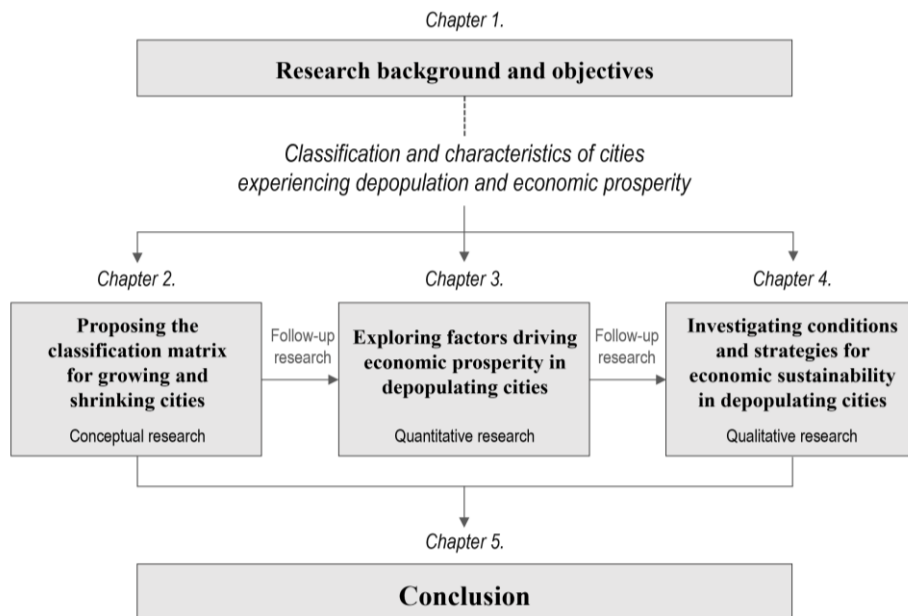
Figure 1. Research structure diagram.

The first chapter introduces the research background, objectives, and structure. The second chapter aims to propose and validate a new classification method for defining urban growth and shrinkage using population and economic indicators. The study categorizes 228 administrative districts in South Korea into eight types based on relative sizes of population and economic change rates. After verifying the accuracy of this typology, the chapter describes the characteristics of each city type through case studies. This chapter involves a mix of qualitative and quantitative analysis. Through this analysis, the research presents that cities showing opposite trends in population and economic indicators (e.g., decreasing population but increasing economy or vice versa) can be classified into growth or shrinkage categories. Interestingly, it was revealed that city types with a higher rate of economic growth than population decline can be classified as growth types despite a decrease in population. However, this chapter does not elucidate the factors that categorize a city as growing despite population decline. In-depth research on this matter has been conducted in the following chapter as a continuation of this study.

The third chapter defines cities with a higher rate of economic growth than the rate of population declines as "Complementary Economic Growth (CEG) Cities" and aims to quantitatively analyze the major factors that classify cities into this type. In this chapter, 146 cities, excluding some at the county level in South Korea, were analyzed using the Multinomial Logistic Regression Model to examine the relationship between depopulation and economic prosperity.

The fourth chapter, as a continuation of the previous one, aims to qualitatively analyze the characteristics of cities that show economic prosperity despite a decline in population. This chapter aims to conduct a detailed analysis of the relationship between population decline and economic prosperity in cities that

are not fully explained by quantitative statistics. Three regional small and mid-sized cities in South Korea were selected for a cross-case analysis. This study examines the policy and management strategies, economic mechanism, and resource utilization of each city, analyzing the characteristics and effects of economic prosperity through literature review and in-depth interviews.

Lastly, the fifth chapter summarizes and discusses the main findings, presents implications, limitations, and suggestions for future research, thereby concluding the study.

Chapter 2.

Proposing the Classification Matrix for Growing and Shrinking Cities: A Case Study of 228 Districts in South Korea

1. Introduction

Urban change can be explained by growth or shrinkage. For the past few decades, urban planning has focused on the process of urban growth, which many scholars have referred to as the concept of demographic change, economic performance, and expansion of the urban scale (Reis et al., 2016). However, as urbanization and population decline in highly urbanized post-industrial areas, interest in urban shrinkage has increased worldwide (Oswalt & Rieniets, 2006; Hollander, 2011; Hartt, 2019).

There has been an increasing number of studies on the causes and effects of urban shrinkage (Lauf et al., 2016; Martinez-Fernandez et al., 2012), but little is known about the classification of shrinking cities around the world. Population

change has been used as a key indicator of urban shrinkage, since studies of shrinking cities have recognized that economic decline is the cause of population decrease (Beauregard, 2009; Hospers, 2014; Lee et al., 2018; Oswalt & Rieniets, 2006; Pallagst et al., 2009; Schilling & Logan, 2008; Wang & Immergluck, 2019). However, population indicators cannot always explain economic change. Population growth is not always accompanied by economic growth, and population decline can coexist with economic growth (Glaeser & Resseger, 2010; Hirt & Beauregard, 2021).

Population and economic growth or shrinkage do not necessarily follow the same path. For example, two indicators often appear to be moving in the opposite directions: population decline and economic growth. However, there is no analytical framework that identifies the characteristics of cities where population and economic changes appear in opposite directions.

In this study, a conceptual framework for classifying cities by population and economic changes is proposed. It is hypothesized that the patterns of a city's growth and shrinkage differ depending on which of the two indicators (population and economic change) is investigated. Then, I use the new framework to categorize South Korean cities and analyze each type of characteristic. This study aims to provide a framework applicable to growing and shrinking city policies as well as suitable for the conditions of each city, while considering the interactions between its population and economic indicators.

The remainder of this study is organized as follows. Section 2 presents a literature review of shrinking cities and the city classification method. Section 3 proposes a city classification matrix as a conceptual framework. Section 4 applies the city classification matrix to Korean cities. Section 5 validates the city classification matrix through the Kruskal-Wallis test and groups cities into different

types of growing and shrinking cities. Section 6 presents the characteristics of such various types and the applicable urban strategies. Finally, Section 7 presents the discussion of the results and the conclusion of this study.

2. Literature Review

2.1. Definition and Diagnosing Indicator of a Shrinking City

The concept of the shrinking city is being actively discussed, as many cities worldwide have been experiencing or will face urban shrinkage (Lee & Han, 2014; Lee et al., 2018). The term "shrinking city" was first coined in Germany to describe a decline in population and the economy (Martinez-Fernandez et al., 2012). A shrinking city is commonly recognized as experiencing economic stagnation due to population decline and industrial structure transformation (Lee & Han, 2014; Lee et al., 2018).

The Shrinking Cities International Research Network (SCiRN) defined a shrinking city as an urban area with a population of 100,000 or more that has had a population loss for more than two years and is simultaneously shrinking economically due to a structural crisis (Hollander & Nemeth, 2011; Hollander et al., 2009; Wiechmann, 2006). Reckien and Martinex-Fernandez (2011) defined shrinking cities as cities that have experienced population decline, employment decline, and prolonged economic stagnation over the past 40 to 50 years. Pallagst et al. (2009) defined shrinking cities as those wherein population declines or changes in the industrial sector are causing a structural crisis. Martinex-Fernandez et al. (2012) defined shrinking cities as cities experiencing population decline, economic stagnation, employment decline, and various social problems as symptoms of a

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structural crisis.

The definition and diagnostic indicators of a shrinking city are different. A shrinking city refers to both population decline and industrial decline, but many studies use only population indicators as the criteria for diagnosing a shrinking city (Alves et al., 2016; Beauregard, 2009; Hospers, 2014; Lee et al., 2018; Oswalt & Rieniets, 2006; Pallagst et al., 2009; Schilling & Logan, 2008; Stryjakiewicz, 2013; Wang & Immergluck, 2019). The population indicator has been traditionally used to identify a shrinking city, but population change cannot fully explain economic change (Liu et al., 2020). Using population change as the only indicator of urban growth and shrinkage may be less effective in proposing policies to counter shrinking cities (Bartholomae et al., 2017). Thus, some studies have mentioned that in judging between urban growth and shrinkage, it is necessary to include both population and economic changes (Bartholomae et al., 2017; Hartt, 2018; Lee & Han, 2014; Liu et al., 2020; Martinez-Fernandez et al., 2012; Wiechmann & Pallagst, 2012).

2.2. City Classification Method

2.2.1. Traditional Quadrant Classification

In recent times, a four-type classification framework has emerged that considers both population and economic indicators in the context of a shrinking city (Bartholomae et al., 2017; Lee & Han, 2014; Wiechmann & Pallagst, 2012). Previous studies used the population growth rate as the demographic indicator and the growth rate of the Gross Domestic Product (GDP), income, employment, and others as the economic activity indicators. In such studies, cities with annual population and economic

growth rates below zero percentage were classified as shrinking cities.
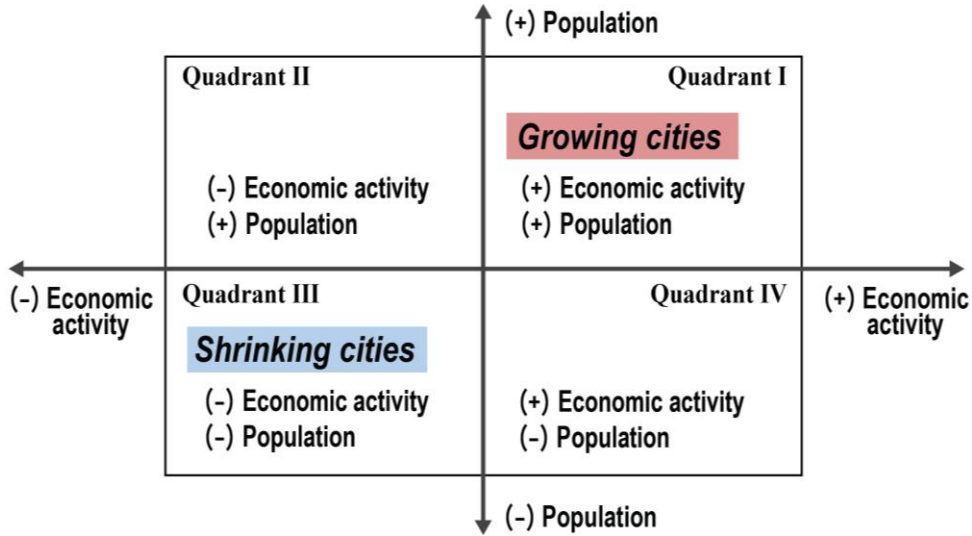
Figure 2. Traditional quadrant method of city classification.

Cities were classified using quadrants with two axes: population and economic changes (Figure 2). This approach classified cities with both population and economic growth as the growing type (quadrant I), whereas cities with both population and economic decline were categorized as the shrinking type (quadrant III). However, the characteristics of cities with population growth and economic decline (quadrant IV) or vice versa (quadrant II) were not clearly defined (Bartholomae et al., 2017; Lee & Han, 2014; Wiechmann & Pallagst, 2012). Furthermore, this traditional quadrant classification method is limited to characterizing cities with a population that is increasing (or decreasing) faster than their economic activity and vice versa. However, currently, few frameworks exist that understand cities in such complex situations. To address the limitations of the traditional classification method, a city classification approach that considers differences in the degrees of population and economic changes is proposed in this study.

2.2.2. Scaling Theory for Urban Characteristic Classification

The scaling theory is mainly used to reveal the relationship between city characteristics (e.g., economic activity, infrastructure, innovation, employment, and patterns of human behaviour) that appear according to an increase or decrease in the population (Bettencourt et al., 2007). The formula for the scaling theory is:

$$Y(N) = Y_0 N^\beta, which\ means: \ln Y = \ln Y_0 + \beta \ln N$$

where β is the slope of the linear regression of $\ln Y$ and $\ln N$; $\ln Y_0$ is ordinate at the origin ($N = 1$); and Y refers to the characteristics of the city. N stands for the population as the measure of the city size (Bettencourt & Lobo, 2016). Because the scaling theory predicts a change in a city's characteristics (Y) according to an increase or decrease in its population (Bettencourt et al., 2007), the x-axis and y-axis can be used as the rate of change of each indicator.

According to the urban scaling theory, the characteristics of cities should be scaled in one of the following three categories, with the population: $\beta > 1$ (superlinear), $\beta = 1$ (linear), and $\beta < 1$ (sublinear). Superlinear scaling is when a city's characteristic (such as GDP; $\ln Y$) is greater than its population ($\ln N$). Linear scaling is when the city's characteristic grows at the same rate as its population. Sublinear scaling is when the city's population grows greater than its characteristic (such as an urbanized area). Applying the urban scaling theory, among the various characteristics of the variable that corresponds to y, the economic activity indicates a linear pattern with the population (Bettencourt & Lobo, 2016). Thus, this study suggests the relationship between the two indicators more closely by introducing a diagonal line with a slope of 1, referring to the scaling theory.

3. Conceptual Framework

This section proposes a city classification matrix that uses population and economic activity indicators to diagnose urban growth and shrinkage (Figure 3). In this study, the population indicator refers to the registered populations living within the administrative boundaries of a city. Population growth is defined as the positive average annual population change during a certain period. The economic activity indicator refers to the number of employments in each city, which measures the economic activity changes resulting from increased or decreased jobs and the structural changes of the economy (Hartt, 2018; Liu et al., 2020; Weaver et al., 2016; Wiechmann & Pallagst, 2012). Moreover, in this study, the growth (or decline) of economic activity is defined as the positive (or negative) average annual employment change rate. As Beauregard (2009) stated, the degree of population or economic activity decline is more relevant than the actual amount of the population or economic activity decline because the size of a city's population varies. Thus, in Figure 3, the degree of economic activity growth on the x-axis and the degree of population growth on the y-axis are standardized by calculating the average annual growth rates.

The city classification matrix introduces a diagonal line representing $y = \pm x$, referring to the urban scaling theory ($\beta = 1$, economic activity versus population), to subcategorize cities by comparing their magnitudes of change based on two indicators. The four quadrants are divided along these diagonal lines into a total of eight parts (Figure 3). In this study, the slope of the diagonal lines is ± 1, indicating which indicator, the population or the economic activity, has the more dominant influence. For instance, in the scaling theory, a super-linear relationship means that if the slope is greater than 1, the population increase will outpace the growth rate of

economic activities. Conversely, if the slope is less than 1, the population growth rate is lower than the economic activity growth rate, which is referred to as a sublinear relationship in the scaling theory.
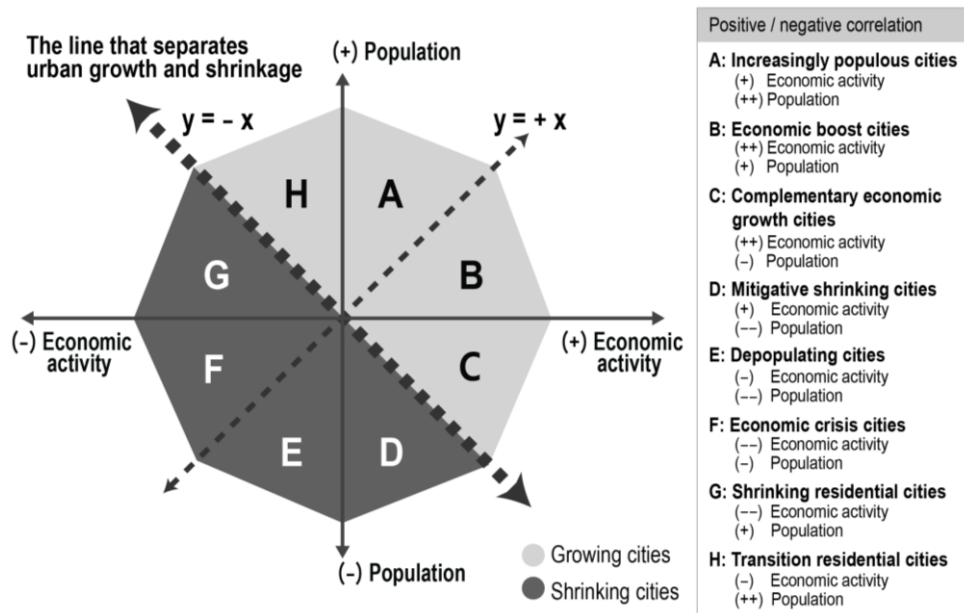
Figure 3. City classification matrix.

The eight types of cities in the city classification matrix are as follows:

A) **Increasingly populous cities.** These cities are growing cities with a population growth rate that is greater than their economic activity growth rate.

B) **Economic boost cities.** These cities are growing cities with an economic activity growth rate that is greater than their population growth rate.

C) **Complementary economic growth cities.** In these cities, the absolute value of the economic activity growth rate is higher than that of their population decline rate. These cities can be categorized as growing cities, with economic activity replacing the gap created by population decline.

D) **Mitigative shrinking cities.** Here, the absolute value of the economic activity growth rate is lower than that of the population decline rate. This type of shrinking cities, unlike other types of shrinking cities, represents a less severe decline by supplementing the population decline with economic activity factors.

E) **Depopulating cities.** These cities are shrinking cities with a population decline rate greater than their economic activity decline rate.

F) **Economic crisis cities.** These cities are shrinking cities with an economic activity decline rate greater than their population decline rate.

G) **Shrinking residential cities.** Here, the absolute value of the population growth rate is lower than the economic activity decline. The severe economic decline could increase the outflow of people from these cities and lead to shrinking cities that decline in population and economic activity in the long term (Wu et al., 2019). This type is somewhat similar to shrinking cities because the economic activity decline is distinct even as the population increases.

H) **Transition residential cities.** Here, the absolute value of the population growth rate is greater than the economic activity decline. This type has the characteristics of growing cities transitioning to a residential-led initiative, with population replacing the gap created by economic activity decline.

In comparison to the traditional quadrant classification, the above matrix with eight categories offers a more thorough understanding of the growth and shrinkage trends of cities. Specifically, this city classification matrix helps analyze which effect of population or economic activity indicators is more dominant; Cities where the economy declines first and affects the population decline are different

from cities where the economy is affected by population decline. The city classification matrix assumes that the aforementioned eight types of cities represent distinctive characteristics from the perspectives of the cities' population and economy. The matrix clearly defines the city types especially for areas where population and economic indicators are opposite and where growth is difficult to distinguish from shrinkage (types C, D, G, and H).

4. Application of the City Classification Matrix

4.1. Site and Analysis Period

This study selected South Korean cities for the application and validation of the city classification matrix. South Korea has experienced rapid urbanization since the 1960s. However, since the 1990s, many Korean cities have been experiencing population decline due to low fertility, aging, and staying single (not marrying), as well as changes in their industrial structure caused by the quaternary industrial revolution (Choi, 2020). Moreover, many Korean cities have gone through complicated changes with population decline and economic growth. Therefore, South Korea is a useful study site for applying the classification matrix.

The unit of analysis is the administrative district of South Korea, which consists of cities, boroughs, and counties. Korea's metropolitan cities, such as Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, and Ulsan, are divided into boroughs (each called a *gu* in Korean). Other regions are divided into counties (each called a *gun* in Korean) and cities (each called a *si* in Korean). There are 229 administrative districts in South Korea consisting of 69 *gu*, 82 *gun*, and 78 *si*.

This study classified Korean administrative districts by type from 2014 to

2019, thereby focusing on the short-term perspective of five years, as did Pallagst et al. (2009) and Stryjakiewicz (2013) to catch the administrative districts' temporary growth and recent trends. Previous studies on long-term urban changes analyzed shrinkage for more than 20 years (Reckien & Martinex-Fernandez, 2011; Schilling & Logan, 2008).

4.2. Classification of Administrative Districts of South Korea Using the City Classification Matrix

This study categorized the administrative districts using the city classification matrix. The data came from the Korean Statistical Information Service (KOSIS) and were calculated as the average annual growth rate of population and economic activity over five years.

There are two main types of average annual growth rates: the Average Annual Growth Rate (AAGR) itself and the Compound Annual Growth Rate (CAGR). AAGR is the numerical average of the sum of the annual growth rates. It may lead to distorted results due to abnormalities that increase or decrease rapidly. However, CAGR provides the growth rate at which a variable grows each year for the entire duration of the year by considering compounding. CAGR is a measure of the average rate of growth over a specific period (Sánchez-Gil et al., 2018) and is commonly used to describe yearly growth (Romao et al., 2018; Terekhov, 2017). Thus, I used the following CAGR formula:

$$\text{CAGR} = \left(\frac{Ending\ Value}{Beginning\ Value}\right)^{\frac{1}{n}} - 1,$$

where *n* is the number of years in the dataset.

Only 228 South Korean administrative districts were included in this analysis, as one district (type G) was excluded (Figure 4). because its representative characteristics are difficult to explain and verify through statistics.
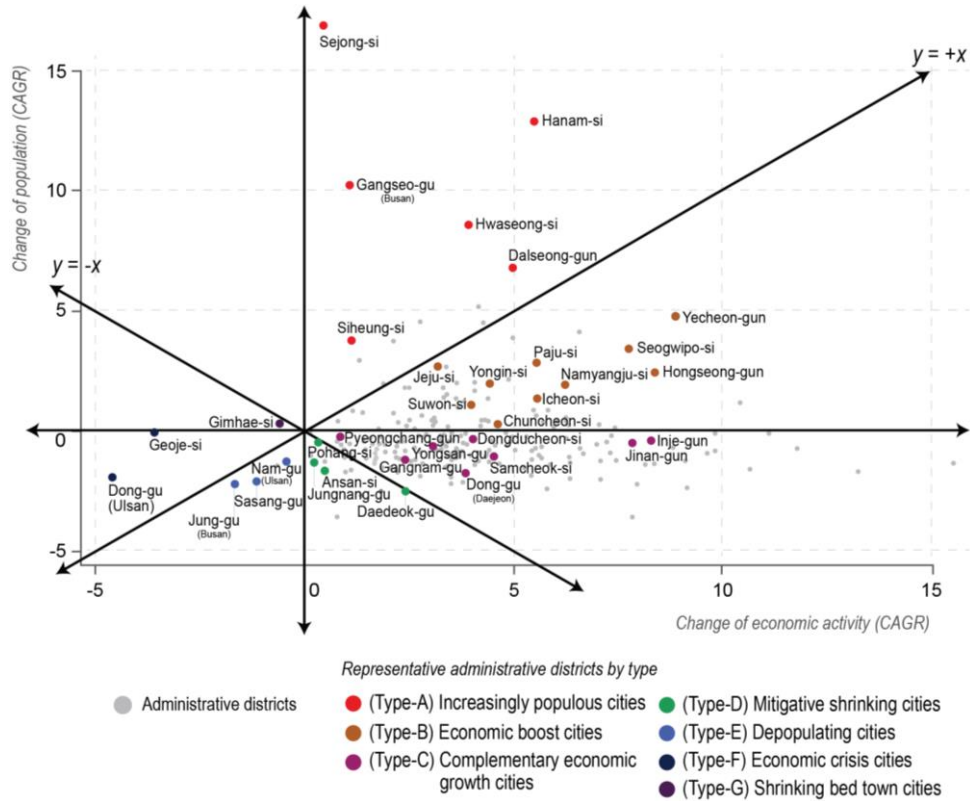
Figure 4. Scatter plot of the administrative districts in South Korea by type.

Several administrative districts of South Korea have seen a declining population trend, whereas economic activity continued to increase due to suburbanization and changes in population and industrial structure (Lee & Han, 2014; Figure 4). Figure 5 presents the spatial distribution of each type's representative administrative district, including the Seoul metropolitan and non-Seoul metropolitan areas. The Seoul metropolitan area, consisting of Seoul (including 25 *gu*), Incheon (including 8 *gu* and 2 *gun*), and Gyeonggi-do (including 3 *gun* and 28 *si*), accounts for more than 50% of both the population and the GDP of Korea.
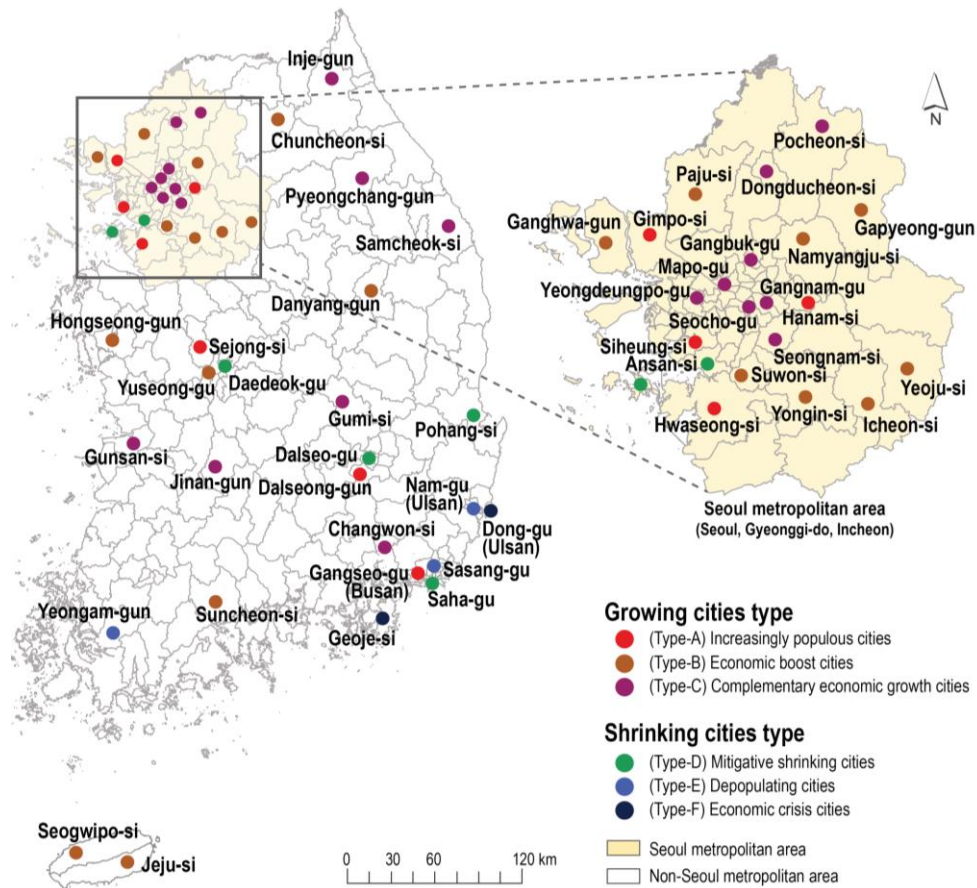
Figure 5. Spatial distribution by types.

5. Validation of the City Classification

5.1. Comparison of the Gross Regional Domestic Product (GRDP) of the Categorized Administrative Districts

To test the validity and reliability of the city classification matrix, I analyzed the administrative districts' GRDP[1] data, which are among the primary indicators of the

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[1] The GRDP represents the gross domestic product (GDP) of each city by region and refers to the sum of the market values of goods and services produced in a country (Rietveld, 1988).

growth and shrinkage of administrative districts. The value of the administrative districts' GRDP was standardized using the CAGR formula.

The Kruskal-Wallis test, a nonparametric verification method, was conducted using GRDP data from 2014 to 2016, since no data have been released recently. In the sample, only a few administrative districts were categorized as types E and F, which epitomize the typical shrinking city characteristics of declining population and economic activity patterns. Thus, I combined types E and F as EF for further analysis. The Bonferroni test, a post-hoc analysis method, was used to verify the pairwise median differences among the five types of cities (types A, B, C, D, and EF).

5.2. Results of the Kruskal-Wallis Test

The results of the Kruskal-Wallis test analysis in Table 1 indicate a significant difference between at least one pair among the five types of cities (p = .0001). The Bonferroni test of the pairwise differences between the types showed that the five types of cities were divided into the types A, B, and C groups, as well as the type D and EF groups, with respect to their GRDP (Table 1). The test did not establish any significant difference among types A, B, and C. In addition, no significant difference between types D and EF was identified. However, there were significant differences between all pairs of the types A, B, and C groups and types D and EF groups.

The types A, B, and C group and the types D, E, and F group were distinguished and found to have similar characteristics. I considered type C, "complementary economic growth cities," as growing cities because they have characteristics similar to those of types A and B, which are typical growing cities.

However, I classified type D, "mitigative shrinking cities," as shrinking cities since this type appears similar to types E and F, which are typical shrinking cities.

Table 1. Results of the Kruskal-Wallis test.

Type	Type-A	Type-B	Type-C	Type-D	Type-EF
Obs.	12	56	142	12	6
Median	.0936427	.0654379	.047694	.0190374	-.0006844
Rank Sum	1934	7297	15966	719	190

Kruskal-Wallis test: chi2(4) = 27.038   Prob > chi2 = 0.0001

Column Mean-Row Mean (p-value)	Type-A	Type-B	Type-C	Type-D
Type-B	1.4709 (0.7066)			
Type-C	2.4574 (0.0825)	1.7166 (0.4303)		
Type-D	3.7599* (0.0008)	3.3545* (0.0040)	2.6485* (0.0404)	
Type-EF	3.9265* (0.0004)	3.4811* (0.0025)	2.9379* (0.0165)	0.8566 (1.0000)

Note: * $p < 0.05$; Type-A: Increasingly populous cities, Type-B: Economic boost cities, Type-C: complementary economic growth cities, Type-D: Mitigative shrinking cities, Type-E: Depopulating cities, and Type-F: Economic crisis cities

6. Characteristics of the Types

6.1. Indicators for the Characterization of the Categories

To shed light on the distinctive characteristics of the various types of cities, an analysis was conducted based on the administrative districts' demographic, economic, social, and physical indicators (Table 2). These indicators were standardized using the CAGR formula. For the demographic dimension, the age distribution was divided into three categories: young, middle-aged, and elderly. The

industrial distribution of the economic dimension was divided into six categories (manufacturing, construction, accommodation and food service, information and communication, science and technology services, and education services) with prominent characteristics by type, referring to the Korean Standard Industrial Classification Table. For the social dimension, housing prices exemplify a city's attractiveness, and the impact of high real estate prices helps explain population decline (Oh & Suh, 2019). The education level[2] is an important factor in economic prosperity (Hartt, 2019). The physical dimension, representing the change rates of housing supply, housing vacancies, and deteriorated dwellings, was also used to indicate growth and shrinkage (Jeon & Kim, 2020; Lee et al., 2018; Yui et al., 2017).

Table 2. Demographic, economic, social, and physical indicators.

Indicators		Description
Demographic	• Age distribution	a) Young population (0 to 14 years) changes b) Middle-aged population (15 to 64 years) changes c) Elderly population (over 65 years) changes
Economic	• Industrial distribution	a) Manufacturing industry changes b) Construction industry changes c) Accommodation and food service industry changes d) Information and communication industry (publishing, video, broadcasting, and information services) changes e) Science and technology services industry changes f) Education services industry changes
Social	• Housing price • Education level	Housing price index changes Highly educated population changes (Master's degree or higher from graduate school)
Physical	• Housing change rate	a) Housing supply changes b) Housing vacancy changes c) Deteriorated dwelling

Note: All data (except education level) were based on KOSIS data from 2014 to 2019. Only the education level data from 2015 was used because recent data has not been released.

Changes in demographic, social, and economic characteristics are analyzed

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[2] Standards for highly educated people vary by country and era; but in Korea, a highly educated person is defined as someone with more than a master's degree.

by type in Figure 6. Additionally, changes in physical characteristics regarding housing supply, housing vacancies, and deteriorated dwellings are presented in Figure 7. Through these characteristics, this study derived the characteristics of the different types of administrative districts.
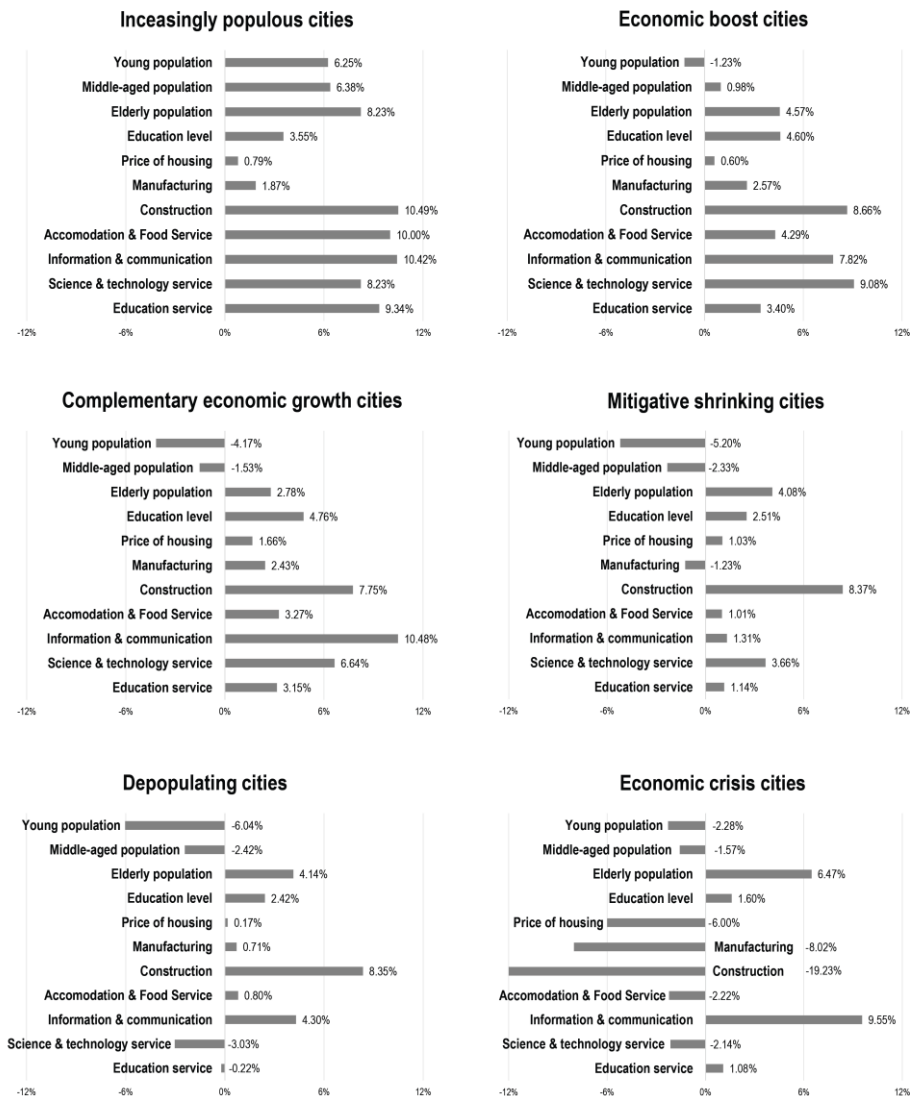
Figure 6. Changes in the demographic, social, and economic characteristics of each type.
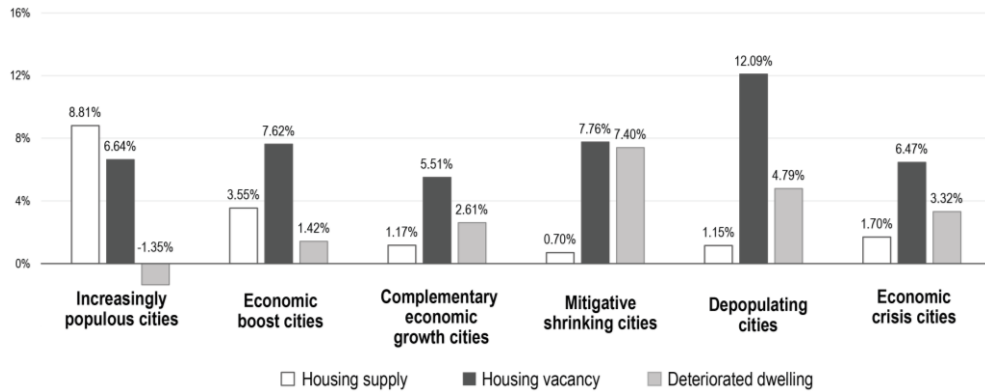
Figure 7. Changes in the physical characteristics of each type.

6.2. Characteristics of the Various Types in South Korea

The results show that the growing and shrinking cities were different for each type depending on the degree of the population and economic activity. Each type has different features, which means that the same policy cannot be applied uniformly to growing or shrinking cities (Lee & Han, 2014; Wiechmann & Pallagst, 2012). Thus, the subdivided classification method presented in this study appears effective in offering strategies suitable for the urban situation by type (Table 3).

Table 3. Summary of features and strategies by types.

Types		Features	Strategies
Growing type	Increasingly populous cities	• New town development	• Maintaining a stable housing price
	Economic boost cities	• Industrial and cultural clusters	• Fostering self-sufficiency in clusters
	Complementary economic growth cities	• High real estate prices • Economic revitalization • High education level	• Housing price stabilization • Maintaining a competitive urban environment

Shrinking type	Mitigative shrinking cities	• Commuter cities • Recovery of economic vitality	• Urban regeneration projects • Influx of residents
	Depopulating cities	• Poor residential environment; many abandoned houses	• Smart shrinkage; improving underutilized housing or infrastructure
	Economic crisis cities	• Downturn in specific industries	• Industrial mix plan (not dependent on a specific industry)

6.2.1. Increasingly Populous Cities

Type A, "increasingly populous cities: new town development," are predominantly characterized by population growth. Most administrative districts of this type, such as Gimpo-si and Hanam-si, grew through massive new town developments and regional transportation networks. The production of public and private housing has increased at the fastest rate in this type, since this type is close to "economic boost cities" (Figures 4 and 6).

"Increasingly populous cities" are characterized by many inflows of the young and middle-aged populations (Figure 6). These populations are drawn to the new towns' affordable new housing, clean environment, well-connected transportation systems, and job opportunities (Oh & Suh, 2019). These administrative districts have also attracted various industries, particularly in education services, which have significantly increased, as many parents with children who cared about their residential environment migrated to the new towns. Cities of this type need to implement strategies to stabilize housing prices to prevent population outflow and to remain growing cities (Kim & Lee, 2016).

6.2.2. Economic Boost Cities

Type B, "economic boost cities: industrial and cultural clusters," is predominantly characterized by economic activity growth in the main industrial sectors of each city. Suwon-si and Paju-si, two administrative districts in the Seoul metropolitan area, have developed into tertiary and quaternary industry clusters that offer manufacturing and cutting-edge research and technology services. Thus, this type is mainly located in the outer boundary of Seoul, with relatively inexpensive and spacious areas (Figure 6). These administrative districts showed that the number of the middle-aged population tends to increase due to population inflow to engage in industrial clusters (Figure 6). In particular, economic activity growth in manufacturing contributed to overall economic activity fluctuations due to the industrial clusters (Min & Park, 2017).

These non-Seoul metropolitan areas, including Seogwipo-si and Jeju-si, are distinguished by concentrations of culture and tourism hubs. They have grown centered on cultural tourism clusters, so they are mainly located in administrative districts with well-developed transportation infrastructure (e.g., airports, trains, and highways) (Figure 6). This type showed the second-highest rate of change in the accommodations and food industry among the six city types, attracting people who work and live near industrial complexes and cultural tourism clusters (Figure 6). For example, Seogwipo-si and Jeju-si, the tourism cluster, accounted for 76.1% of the service sector in 2019, up by 2.2% year-over-year, whereas other industries declined (Ko et al., 2021). Based on these characteristics, cities of this type need to implement a strategy of providing facilities so that industrial and cultural clusters can have self-sufficient functions (Seong & Ha, 2011).

6.2.3. Complementary Economic Growth Cities

Type C, "complementary economic growth cities: economic activity compensates for population decline," are categorized as growing cities because the benefit of their economic growth is greater than the impact of their population decline. This type has the characteristic of increasing economic activity as industries that create knowledge services increase and show different characteristics according to whether they are in the Seoul or non-Seoul metropolitan areas.

The "complementary economic growth cities" of the Seoul metropolitan area, including Gangnam-gu, Seocho-gu, and Yeongdeungpo-gu, are mainly concentrated in Seoul, the capital city of Korea (Figure 6). This type is an administrative district with a high population density and a favorable business environment and has recently specialized in the technology, media, and financial industries (Kim, 2003). Despite this type's attraction of various industries, it is characterized by a decrease in the young and middle-aged population due to the influence of high housing prices (Figure 6). The change rate in housing vacancies in this type was the lowest among the six city types, and the housing supply was significantly lower in this type than the demand (Figure 7). These characteristics seem to cause difficulties in securing additional housing supply due to the social phenomenon in which the proportion of single-person (no-marriage) households increases and high-density residential development ensues. The high housing demand elevated the housing prices, which caused a decline in the population (Alves et al., 2016; Oh & Suh, 2019). Thus, this type experienced a population decline as people moved to adjacent administrative districts with relatively low housing prices.

This type of the non-Seoul metropolitan area located in a significant

industrial hub, such as Gumi-si and Changwon-si, has recently maintained economic activity by fostering quaternary industries. For example, the manufacturing industry of Gumi-si failed due to the downsizing or migration of significant enterprises such as Samsung Electronics and LG Display; as a result, the populace fled to other cities (Jeon, 2019). Although these administrative districts declined due to a manufacturing crisis, they recently recovered economic vitality by nurturing high-tech and renewable energy industries through the "Regional Vitality Recovery Project" promoted by the government of Korea.

This type is typically an economically active city with a declining population but a talented workforce (Figure 6). According to Hartt (2019), a high education level indicates talent, and this mainly occurs in economically prosperous areas. In particular, "complementary economic growth cities" are characterized by the concentration of R&D businesses and IT industries (Oh & Suh, 2019), and they seem to have the highest educational level among the six city types.

Through these characteristics, "complementary economic growth cities" have compensated for the negative influence on them of population decline by maintaining the competitiveness of their urban and business environments and by leading the innovation of local industries. This type requires steady maintenance of economic activity and prevention of the outflow of the population to other cities by stabilizing housing prices and enacting public rental housing supply policies (Kim & Lee, 2016).

6.2.4. Mitigative Shrinking Cities

Type D cities, where the rate of population decline is greater than the increase in economic activity, are referred to as "mitigative shrinking cities: commuter cities afflicted by the transition to emerging industries and deteriorated dwellings." These administrative districts are economically prosperous but with significantly declining populations, showing that population and economic activity indicators may not be directly related (Hartt, 2019). Furthermore, "mitigative shrinking cities" can constitute a positive shrinking type (not a bad decline) because they sustain their economic growth.

This type is characterized by employment in emerging industries, but a substantial population decline occurs when people relocate to other regions with better housing options. For example, Ansan-si was developed as an industrial city with many plants, but its economic vitality decreased due to the recent decline in its manufacturing activities. However, Ansan-si has recently remodeled deteriorated dwellings to provide the youth with start-ups, and economic activity has recovered due to the emerging tertiary and quaternary industries, thereby actively creating jobs and increasing employment rates (Shin & Han, 2018). In this type, the secondary industry has been transformed into tertiary and quaternary industries; most industries, except manufacturing, exhibited an increase (Figure 6). While the economic activity of the "mitigative shrinking cities" is maintained, the population of this type tends to outflow due to deteriorated dwellings in areas where the urban regeneration project has not yet been implemented (Figure 6). These cities are characterized as commuter cities due to their favorable access to other administrative districts via well-connected transport networks, compared to the other types of shrinking cities (Kim & Lee, 2016). This type is mainly distributed adjacent to "increasingly

populous cities," as the working-age population migrates to other cities in favor of better living conditions (Figure 7)

Having experienced population decline vis-à-vis deteriorated dwellings, "mitigative shrinking cities" promote traditional manufacturing industries to make them as prosperous as emerging industries and minimize the negative influence of population shrinkage. This type requires urban regeneration projects, such as housing redevelopment and housing supply strategies, to improve the residential environment and prevent severe population decline. As housing attractiveness increases, the influx of the working-age population is likely to increase, and economic activity is expected to rise (Oh & Suh, 2019). Therefore, if the residential space of these cities is developed well, it is predicted that this type can be changed to "economic boost cities" or "complementary economic growth cities."

6.2.5. Depopulating Cities

Type E, "depopulating cities: population exodus due to abandoned spaces in a deteriorated residential complex," is predominantly characterized by population decline. These administrative districts, such as Sasang-gu and Nam-gu (Ulsan), which are far from the Seoul metropolitan area, are industrial cities based on traditional manufacturing complexes and have the characteristics of deteriorated residential complexes (Figure 7)

The urban shrinkage in this type can be attributed to poor residential conditions and stagnation of traditional industries. The residential environment comprises deteriorated dwellings left undeveloped and vacant, which have decreased the population living in these administrative districts. Just as residential vacancies

and abandonment can often cause shrinkage (Hartt, 2019; Newman et al., 2016), this type accounts for the highest change rate in housing vacancies (12.09%) (Figure 7) In addition, this type indicates economic decline by remaining in the traditional secondary industry sector instead of being transformed into a high-tech city in terms of industry, which significantly decreases the employment rate (Oh & Suh, 2019). The traditional manufacturing industry has increased the most in the shrinking city types (Figure 6).

With increased unmanaged and neglected houses, "depopulating cities" have experienced a significant population decline. If the declining birth rate, aging population, and economic decline will worsen in the future, many countries around the world will face the dilemma of shrinking cities. Therefore, rather than following a growth plan that presupposes growth, this type needs a realistic urban planning paradigm that matches the current shrinkage situation (Lee & Han, 2014). As Popper and Popper (2002) noted, "Small can be beautiful (Lee & Han, 2014; Wiechmann & Pallagst, 2012)," which means the shrinking city can be considered an opportunity. Policymakers need to acknowledge the shrinkage phenomenon and come up with smart shrinkage policies, namely, strategies that can better leverage underutilized housing or infrastructure. For example, referring to Japan's shrinkage strategy, in Korea, there is a compact city strategy that reduces the size of a city and integrates urban functions therein or a plan to increase residents' life satisfaction by demolishing houses and constructing parks (Kang & Noh, 2017). In addition, in Youngstown's case, the implementation of a greening strategy was highly evaluated as a realistic alternative to solving the problem of abandoned land and improving the citizens' quality of life. Therefore, a paradigm shift is needed to recognize the crisis of a shrinking city as an opportunity.

6.2.6. Economic Crisis Cities

Type F, "economic crisis cities: stagnation cities dependent on specific industries," have suffered from economic activity shrinkage as a result of the decline of their predominant industries. These administrative districts are heavily dependent on a single specific industry, which loses competitiveness and is destroyed in the face of an industrial crisis (Lee & Han, 2014). Most "economic crisis cities" are located in the non-Seoul metropolitan areas that have insufficient jobs in neighboring administrative districts, such as Geoje-si and Dong-gu in Ulsan (Figure 5)

Geoje-si, which was once the center of the shipping industry, suffered a downturn due to industrial stagnation. As the stagnation of the manufacturing and shipping industries led to restructuring, the administrative district's production and consumption levels reached their lowest points since the financial crisis, which led to a population exodus (Yang, 2019).

This type recorded the lowest changes in the rate of housing vacancies and deteriorated dwellings among the shrinking types (Figure 7). It appears that the impact of the industrial decline on these administrative districts was greater than that of residential environments, and the population rapidly declined as employment collapsed.

"Economic crisis cities" have the characteristic of economy-led shrinking cities, in which industrial stagnation decreases the population. Therefore, it is difficult for these administrative districts to recover through population inflow policies alone, as their economic activity is severely decreased by the stagnation of specific industries. This type requires a strategy to reduce dependence on the specific industry, as well as an industry mix policy in which secondary, tertiary, and

quaternary industries are converged.

7. Discussion and Conclusion

This study proposed the city classification matrix method for a more sophisticated classification of cities by introducing diagonal lines that represent the relative changes in the population and economic activity indicators. Urban shrinkage can be portrayed in different ways depending on which demographic or economic indicator is used. By using a city classification matrix that can have subdivided sections, this study helps to better understand the dynamics of urban change. Different types of cities have different characteristics depending on which demographic or economic indicator dominates. Additionally, the city classification matrix enables the diagnosis of cities where population and economic activity indicators diverge, a feature that has largely remained unaccounted for by conventional categorization approaches.

In many studies that classified cities based primarily on population, the types "complementary economic growth cities" and "mitigative shrinking cities" were often classified as shrinking cities. However, in the present study, such types were classified into cities of growth and shrinkage, respectively. Our results showed that "complementary economic growth cities" with declining populations and increasing economic activity could become a growing type. Similar to Hartt (2019), Hartt and Hackworth (2020), and Hirt and Beauregard (2021), I found that "complementary economic growth cities" depopulated due to negative conditions for population growth (e.g., low birth rates, fewer households, and high-density urban development). In other words, "complementary economic growth cities,"

where populations decline and economic activities grow due to the aforementioned causes, may not belong to the shrinking city type.

Shrinking cities are often considered a problem, that is, are still evaluated from a negative perspective in modern society, which promotes growth (Hirt & Beauregard, 2021). However, our results showed that the shrinking types do not appear to be homogenous; rather, they have very different characteristics depending on whether the shrinkage is due to the residential environment or an industrial downturn, or on whether the shrinking is less severe due to the city's growth potential. I found positive aspects of shrinkage, such as in the "mitigative shrinking cities" type. Since this study showed that "mitigative shrinking cities" are economically prosperous, these cities experience a relatively less severe influence of urban shrinkage.

Many urban planners have suggested job growth policies to overcome the phenomenon of shrinking cities because they classified such cities as experiencing a type of shrinkage without qualifying such shrinkage. However, such job-boosting policies may not be appropriate for certain shrinking cities, such as "mitigative shrinking cities" that are losing their population despite adequate job opportunities. This implies that errors are likely to occur if urban policies are presented without knowing the divergent characteristics of cities classified under the same general type.

To revitalize shrinking cities, many countries have attempted to attract populations via housing supply and support for housing expenses. However, Lee et al. (2016) and Kim et al. (2018) showed that housing expense support policies often fail to motivate young people to settle in a different place. Our results showed a pattern of remigration of young people without long-term settlement in cities, as evidenced by the type known as "economic crisis cities." At the start of the

enactment of housing expense support policies, many people choose to move to and settle down in such cities due to the housing support, but they eventually relocate due to a lack of job opportunities. This means that any effort to restore a shrinking city with only a population inflow policy may be ineffective in attracting an economically active population to play a pivotal role in the economy. Therefore, comprehensive urban policies that promote jobs, residential conditions, and urban experiences in shrinking cities can be more desirable than a policy of forcibly relocating residents with the government's housing expense support.

This study is meaningful due to its conceptual classification of the growth and shrinkage of cities using population and economic activity indicators. I explained the characteristics of the various types of cities by distributing changes in demographic, economic, social, and physical factors. However, this study falls short in terms of accounting for the idiosyncratic attributes of individual cities within a particular type. Even though some cities may be classified as being in the same type, cities may have distinctive characteristics rooted in their own experiences, challenges, and policy responses that are not fully considered. Therefore, a comprehensive analysis of cities' characteristics, in addition to their population and economic activity, is suggested to deepen understanding of their growth and shrinkage.

Chapter 3.

Economic Prosperity Characteristics in Depopulated Cities: Evidence from 146 Cities in South Korea

1. Introduction

Since the start of twentieth century, urban development has shifted from a focus on growing to shrinking cities because of factors like population decrease, economic crises, industrial changes, and globalization (Hollander, 2011; Martinez-Fernandez et al., 2016). Recently, countries like Germany, Japan, and South Korea have been focusing more on the issue of shrinking cities, driven by low birth rates and aging populations. This trend is leading to a growing divide between two models of urban development worldwide: growth and shrinkage (Großmann et al., 2013; Oswalt & Rieniets, 2006).

The concept of urban shrinkage and disconnection between its indicators remain contentious subjects. The definition of shrinking cities has focused on the concomitant phenomena of depopulation and economic downturn (Hollander &

Németh, 2011). In the past, when the workforce and resident population were aligned, economic decline led to population decrease; thus, economic downturn could be seen as a fundamental cause of urban shrinkage. For this reason, population change has traditionally been a primary indicator distinguishing growth from shrinkage (Beauregard, 2009; Hospers, 2014; Pallagst, 2009).

However, with the advent of knowledge-based industries and the development of public transportation, economic changes no longer always mirror demographic shifts. The increasing trend of people commuting to work from different areas has led to discrepancies between residential populations and economically active populations. Therefore, population change alone cannot fully capture shifts in urban economies, as demonstrated by cases such as Leipzig, where depopulation coexists with economic growth (Glaeser & Resseger, 2010; Wiechmann & Pallagst, 2012). This implies that relying solely on population metrics is inadequate for explaining economic changes, necessitating the inclusion of economic changes as a key indicator in classifying urban growth and shrinkage.

Many scholars have employed a four-quadrant method using population and economic indicators to classify the types of urban growth and shrinkage (Bartholomae et al., 2017; Liu et al., 2020; Ma et al., 2020). However, this method faces limitations in accurately categorizing cities exhibiting opposing trends in population and economic changes (Quadrants II and IV in Figure 8). To address this limitation, Kim et al. (2022) classified cities into eight types based on the relative magnitude of population and economic change rates, categorizing cities with opposing trends in these two indicators as either growing or shrinking (Figure 9). In this eight-quadrant classification matrix, it is noteworthy that type C can be categorized as one of the growth types, despite experiencing depopulation. The

present study defines type C, which is classified as part of the growth category, as complementary economic growth cities (hereafter CEG cities)[3]. This type refers to cities where the rate of change in the economy is greater than the rate of population decreases.
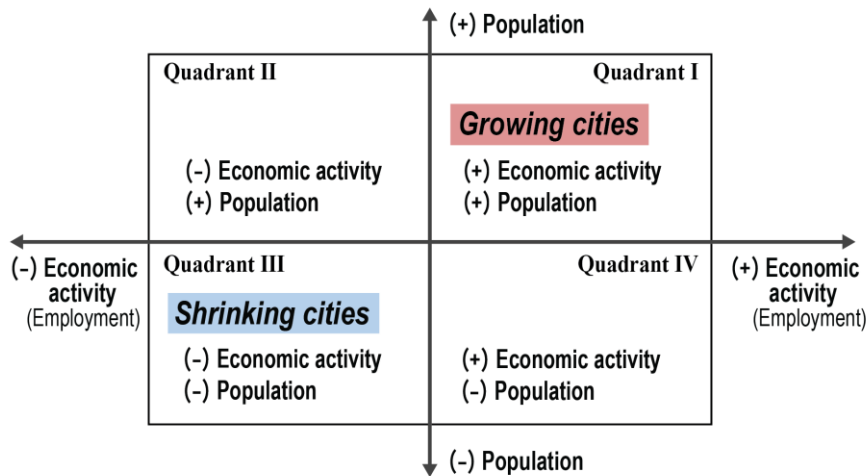
Figure 8. Four-quadrant classification method (Sourced by Kim et al., 2022).

Most research related to depopulation argues that it diminishes social and economic vitality and negatively impacts urban growth potential. However, as Cho and Kim (2023) have noted, cities experiencing depopulation can activate their local economies through job creation, indicating that such situations do not always lead to negative impacts and can also possess positive attributes. These characteristics manifest in CEG cities, where, despite a declining population, growth is still evident. However, research identifying the key factors that drive this growth in the face of

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[3] In eight-quadrant classification, Kim et al. (2022) referred to cities as "smartly growing cities" when economic activity growth outpaces population decline. They explained this term as growing cities with economic activity complementing the gap created by population decline. However, the term makes it difficult to understand whether *smartly growing* is demographic or economic. Therefore, this study revised the term to "*complementary economic growth (CEG) cities*."

depopulation is scarce.
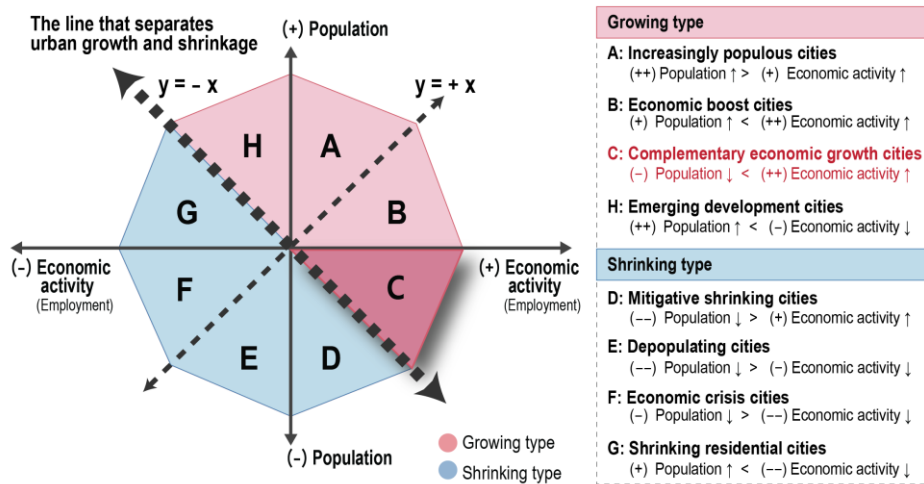
Figure 9. Eight-quadrant city classification matrix (Sourced by Kim et al., 2022).

2. Background Literature

The objective of this study is to analyze the characteristics of cities classified under the CEG cities, one of the categories in the eight-quadrant classification method based on rates of change in population and economy. Accordingly, a literature review was conducted using the scaling theory-applied eight-quadrant classification, depopulation, and regional economic growth.

2.1. Eight-quadrant Classification Matrix

Numerous studies have proposed various methods for classifying city types, including binary, four-quadrant, and eight-quadrant classifications. While many studies use demographic indicators to track urban growth and shrinkage (Turok &

Mykhnenko, 2007; Wolff & Wiechmann, 2018), challenges arise when explaining urban economic changes based solely on population dynamics (Franz, 2004). Because population and economic changes do not always occur in the same direction and with the rise of cities experiencing economic growth despite depopulation, the four-quadrant classification method, which considers both population and economic changes, has been applied: Bartholomae et al. (2017) and Wiechmann and Pallagst (2012) utilized the four-quadrant classification method to distinguish cities experiencing depopulation but economic growth. However, this approach struggles to accurately classify the type where the population decreases but the economy growths, categorizing them as either growing or shrinking (Quadrant IV in Figure 8). The eight-quadrant classification method for a more detailed typification of cities addresses these limitations.

The eight-quadrant classification method uses population and economic data, applying the scaling theory of Bettencourt and Lobo (2016) to identify eight types of urban growth and shrinkage (Figure 1b). It improves upon the four-quadrant system by adding two diagonal lines, $Y = \pm X$, creating eight separate categories. Scaling theory explains how different urban characteristics (such as employment, income, GDP, infrastructure, innovation, etc.) change with population changes (Bettencourt et al., 2007). This suggests that certain indicators consistently increase or decrease as the population grows. The equations of scaling theory are as follows:

$$Y = Y_0 * N^{\beta}$$

where Y stands for an urban feature, such as employment, and N is the urban population. The scaling exponent, β, shows how this feature changes with population growth. Y_0 represents a baseline constant for the urban characteristic. In

this scale theory, the variable Y, which represents urban characteristics, predicts changes based on population dynamics, allowing for the calculation of both the *X* and *Y* axes as the rates of change for each indicator.

Urban scaling theory categorizes the relationship between population size and urban characteristics into three categories: $\beta > 1$ (super-linear), $\beta = 1$ (linear), and $\beta < 1$ (sublinear). In this study, I focus on employment, which exhibits a linear relationship with population—indicating that changes in employment are proportional to population changes. However, scaling theory does not necessarily imply a strict numerical proportionality between population and employment: Depending on regional, economic, social, and technological factors, the change rate of employment can differ from the change rate of population. Hence, while the relationship between population and employment changes at the same rate, it is essential to understand that this can be applied differently based on various factors and regional characteristics.

Some studies using the four-quadrant method have failed to precisely categorize types C and D as either growth or shrinkage, and others classified them as the shrinking type. Our application of the eight-quadrant classification, however, identifies type C (CEG) cities as growth types because their economic growth outpaces population decline. This distinction emphasizes the unique growth characteristics of CEG cities and highlights the need for our study, which seeks to analyze the main factors driving the growth of these cities despite depopulation.

2.2. Depopulation

This study examines the causes of depopulation from two main perspectives. First, depopulation is often a result of shifts in industrial structure and economic conditions stemming from deindustrialization. Depopulation in cities like Manchester and Liverpool has largely been driven by industrial shifts and economic downturns following the deindustrialization that began in the early twentieth century. Initially thriving on manufacturing post-Industrial Revolution, these cities faced rapid population declines as foundational industries weakened, particularly after the 1973 oil crisis (Schett, 2011; Yim, 2018). Cities dependent on manufacturing were especially hard hit, displaying significant urban shrinkage as the younger population migrated in search of better job opportunities. This migration led to reduced urban attractiveness, lower birth rates, and accelerated aging, exacerbating urban decline (Bartholomae et al., 2017; Ploeger, 2012; Seo, 2014).

Second, demographic changes such as low birth rates and aging populations, significantly impact urban depopulation. Although the phenomenon of aging is a global occurrence because of increased life expectancy, declining birth rates have a more significant impact on depopulation, exacerbating natural depopulation across nations (Koo et al., 2016). This demographic change triggers a cycle of urban decay, marked by increased vacancies and diminished industrial and commercial efficiency (Deng & Ma, 2015; Hartt, 2021; Koo et al., 2016). The resulting urban shrinkage is characterized by lower real estate demand and falling property values, which in turn decrease tax revenues (Glaeser & Gyourko, 2006). Furthermore, the decline in fiscal capabilities leads to a reduction in urban infrastructure facilities, such as cultural and welfare services, ultimately exacerbating the issue of depopulation (Elis, 2008; Hollander, 2011).

Beyond the previously discussed elements, the influence of elevated housing prices significantly contributes to recent trends in population decline. Escalating housing costs drive both new and existing lower and middle-income residents to more affordable areas, speeding up population decline (Abrantes et al., 2010). High real estate prices, often fueled by speculative investments and a shortage of affordable housing, lead to economic segregation, and exacerbate depopulation.

2.3. Regional Economic Growth

To understand cities experiencing economic growth despite depopulation, a review of prior research on the term and factors influencing economic growth was undertaken. Regional economic growth refers to the enhancement of the productive capacity of various economic actors, leading to sustained regional development (Moon, 2019).

The factors influencing regional economic growth are analyzed through different theoretical perspectives. Solow (1956)'s neoclassical economic growth theory suggests growth is driven by technological advancement, capital accumulation, and labor increases, but lacks an explanation for the mechanisms behind technological advancements.

Contrastingly, endogenous growth theory, formulated by Romer (1986) and Lucas (1988), positions technological advancement and knowledge dissemination as integral parts of the economic production process, diverging from the neoclassical approach by treating these elements as internal factors. This theory posits that, in a knowledge-based economy, investments in research and development, human capital, and knowledge, along with innovation, act as catalysts for economic growth

through positive externalities and spillover effects. It emphasizes that quality human capital and technological innovation are more significant than mere population growth for achieving sustainable regional economic development (Kim & Park, 2006). As the global economy transitions toward a knowledge-based economic structure, investments in knowledge and technological advancement are suggested to be critical factors for regional economic growth (Wang et al., 2023).

Additionally, regional economic growth is influenced by the industrial structure and its diversity: Changes in the economic paradigm have led to varying regional growth patterns, influenced by the characteristics of the industrial structure. While traditional manufacturing has declined in value, knowledge-based service industry has risen in importance due to their high value-added outputs and job creation (Jeong & Nam, 2022; Moon, 2019).

The concentration and diversity of industries significantly affect regional growth. Industrial concentration significantly affects regional growth by encouraging the clustering of similar industries, which enhances productivity and spurs innovation, as highlighted by Marshall (1890) and Porter (1990). Such concentration facilitates the creation of networks among industrial workers, further boosting productivity and regional economic growth (Moon et al., 2014). Conversely, industrial diversity, based on Jacobs (1969)'s theory, enhances regional economic growth by stabilizing employment across various sectors. While some studies find that diversity is more influential than industrial concentration, it is not always the optimal strategy for regional growth. Industrial diversity supports long-term stability, but concentration may better serve short-term growth objectives (Shuai, 2013).

3. Research Data and Method

3.1. Hypotheses and Study Areas

3.1.1. Hypotheses

Previous studies have tended to perceive depopulating cities negatively, often categorizing them as shrinking cities. However, this study questions whether cities experiencing population decline alongside economic growth should be exclusively viewed negatively due to the characteristic of depopulation. Research questions: 1) Is the proportion of knowledge-intensive service (KIS) industry associated with the likelihood of being categorized as CEG cities? 2) Is housing affordability associated with the likelihood of being categorized as CEG cities? In essence, the findings from this study hold significant importance in guiding policy directions to maintain urban competitiveness and quality of life, even in the face of depopulation.

1) **Is the proportion of KIS industry associated with the likelihood of being categorized as CEG cities?** The KIS industry demands a high level of specialized skills, which encourages the workforce to seek career development and better job opportunities elsewhere. When specific knowledge-based sectors cluster in a city, the industry grows through cooperation and competition, necessitating more workers (Lee & Jung, 2020). Additionally, the KIS industry can offer flexible work environments like remote working, which allows for an increase in the workforce in a city even if the resident population decreases. These characteristics could correlate with the likelihood of a city being categorized as a CEG cities as the proportion of the KIS industry increases.

2) **Is housing affordability associated with the likelihood of being categorized as CEG cities?** A sharp increase in housing prices leads to a rise in living costs, which places a burden on middle and low-income families, prompting them to relocate to more economical areas. Consequently, the resident population in these cities decreases. However, cities with high housing costs typically have active economic environments and numerous high-income job opportunities, particularly attracting workers in specialized professions or industries that require advanced skills. For example, despite its concentration of wealthy IT professionals, San Francisco exhibits a pattern where the residential population decreases due to high housing and living costs, while the number of workers increases. Thus, due to factors related to housing affordability, the resident population may decrease, but the number of workers employed in the city could increase.

3.1.2. Study Area and Analysis Period

This study explores the characteristics of CEG cities in Korea, a nation facing population decline but notable economic growth. Contrary to scaling theory's expectation that economic decline should accompany population decrease, many Korean cities are identified as CEG cities, showcasing economic growth despite of depopulation. This paradox is influenced by factors like economic structural changes, population migration, and changes in the labor population structure. Rapid industrial or technological advancements have stimulated employment and economic growth. Population migration often results from individuals seeking better economic opportunities or escaping less favourable living conditions. Additionally,

demographic changes, particularly the Baby Boomer generation[4] and extended life expectancies due to medical advancements, have significantly reshaped the labor population structure, altering worker age composition and availability (Kim & Park, 2013). Despite a decreasing birth rate and a higher elderly dependency ratio, the extension of the retirement age has kept the workforce relatively stable, presenting Korea as a model where economic growth persists despite demographic challenges.
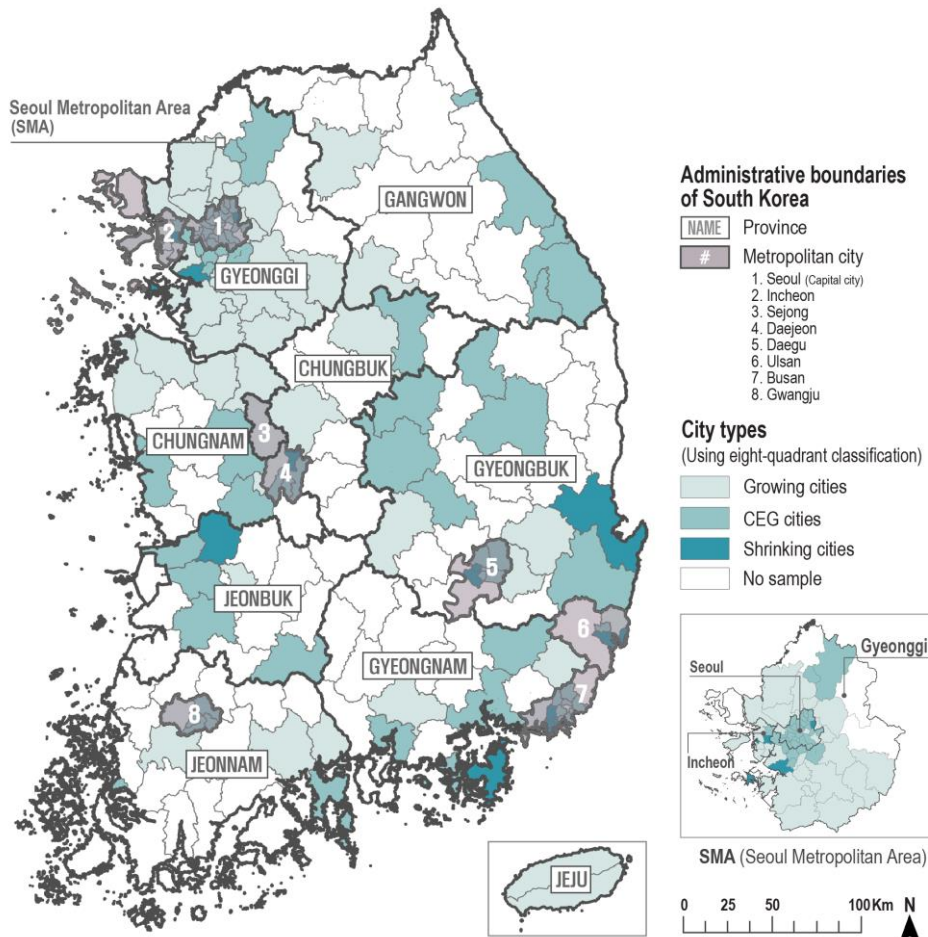
Figure 10. Study areas: 146 cities in South Korea.

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[4] The Baby Boomer generation means a demographic cohort group born between 1946 and 1964, known for a period during which the total fertility rate consistently exceeded 3.0.

This study analysed Korean municipalities, officially designated as "cities" by the Korean government in 2019. Korea's administrative structure includes eight metropolitan cities and nine provinces, with metropolitan cities containing *gu* and *gun* municipalities, and provinces containing *si* and *gun* (Figure 10). The study defined "cities" as the *si* and *gu* units, excluding the rural gun municipalities, and analysed 146 cities in total, which included 69 *gu* and 77 *si* units, while excluding one G type that was outside the study's scope.

This analysis, covering the period from 2014 to 2019, aimed to understand recent urban changes using the methodologies outlined by Pallagst (2009) and Stryjakiewicz (2013). The selected timeframe allowed for observation of rapid economic and demographic responses due to shifts in industrial structures. Furthermore, this study was based on data up to 2019 to exclude the impact of specific urban events during the COVID-19 era.

3.2. Analytical Framework

In this study, I analysed the unique characteristics of CEG cities and how they differ from typical growing and shrinking cities. I conducted in the following sequence (Figure 11): First, this study utilized population and economic activity indicators to classify city types into three categories within an eight-quadrant classification matrix. Second, I conducted descriptive statistical analyses to differentiate CEG cities from typical growing and shrinking cities. Finally, to identify the factors influencing the CEG cities, MNL regression analysis was performed.

In the context of city classification indicators, population refers to the number of residents in each city, while the economic activity indicator is defined by

the employment number, representing the city's economic growth. Although the gross regional domestic product (GRDP) has been used as a regional economic growth indicator in some studies, it has limitations because it only reflects the production output of a specific area and can significantly differ when compared with the area's distributive or expenditure income (Lee & Lee, 2017). Considering these constraints, recent studies have increasingly employed the number of employees as an indicator of regional economic growth and economic vitality (Kim, 2020).
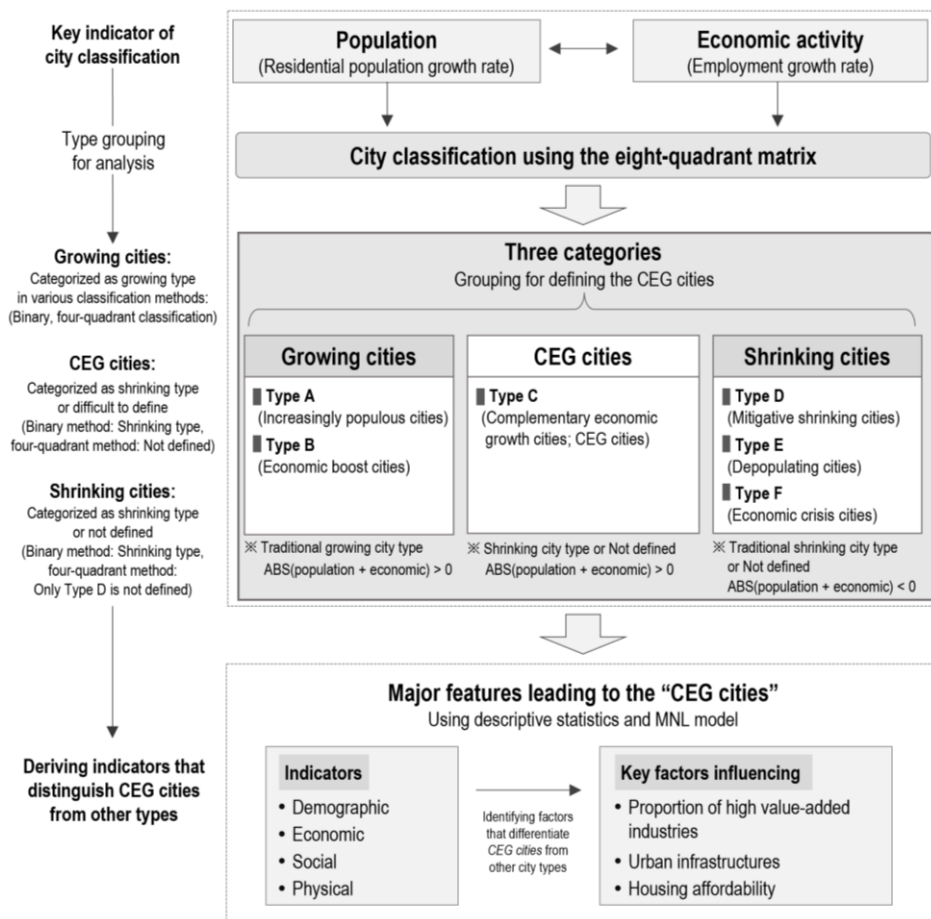
Figure 11. Research flow.

This study employed the eight-quadrant classification matrix, categorizing cities based on the calculation of the five-year compound annual growth rate (CAGR)

for both population and economic activity from 2014 to 2019. The formula for the CAGR is as follows:

$$\text{CAGR} = \left(\frac{Ending\ year\ value}{Beginning\ year\ value}\right)^{\frac{1}{n}} - 1 \qquad (1)$$

where n is the number of years in the dataset.

Korea's 146 cities were classified into six types. These city's types were then grouped into the following three categories:

(1) **Growing cities**: This category includes cities in which both population and economic activity increased. In this study, types A and B are classified as a growing type, which includes 53 cities (36.3%).

(2) **CEG cities**: As stated earlier, the CEG cities includes those areas where the rate of population decline in each city is less than the rate of employment growth. This city type includes 77 cities and is the most common type in Korea (52.7%).

(3) **Shrinking cities**: This category includes type D, in which the rate of population decline has had a more dominant impact than the rate of increase in economic activity, and types E and F, in which the population and economic activity decreased. Several studies have been categorized type D as a shrinking type, including using the binary method and the eight-quadrant classification method. Considering the constrained sample size and the categorization of type D as a shrinking type in various studies, this study amalgamated types D, E, and F, defining them collectively as shrinking cities. Therefore, 16 cities were classified as shrinking cities (11.0%).

3.3. Data, Variables and Measurements

3.3.1. Data and Variables

This study has chosen a categorical dependent variable, which is classified into three categories: growing cities, CEG, and shrinking cities. I have delineated two primary arguments to explain why CEG cities can still be classified as growth type despite population decline. To analyze these characteristics, demographic, economic, social, and physical variables were selected (Table 4).

First, to illustrate the characteristics of economic growth attributed to the prominence of specific industry sectors, the following variables were selected: proportion and CAGR by industry sector, distribution of top firms, micro business, industrial diversity, and talent. The shift toward a knowledge-based economy, driven by globalization and advancements in information and communication technologies since the late twentieth century, led to a reclassification of the industrial structure (Lee & Jung, 2020; Moon, 2019). Moving away from traditional classifications, the data was organized into three main industry groups to better reflect these industrial changes: (1) knowledge-intensive service (KIS) industry; (2) knowledge-intensive manufacturing (KIM) industry; and (3) traditional manufacturing (TM) industry. These industries were categorized using the 10th Korea Standard Industry Classification Table, Moon (2019), OECD (2018) and the Bank of Korea's interindustry table. The subcategories of the KIS, KIM, and TM industries are detailed in Table 5. In particular, the KIS industry is recognized as a high value-added industry because it focuses on creating and utilizing knowledge to provide valuable services (Moon, 2019). The data on the change rates for the three major industry sectors were calculated as the CAGR of the number of employments in each sector from 2014 to 2019. Additionally, the proportion data were computed as the

average values representing the percentage share of these three industry sectors during the study period.

This study analyzed the distribution of Korea's top firms based on sales to understand the economic impacts on different city types. It used data from the top 1,000 firms in 2016 and the top 100 firms in 2019, sourced from the Ministry of Land, Infrastructure, and Transport's National Spatial Data Infrastructure Portal. This data included information on firm headquarters, plants, and branches. Furthermore, the study employed entropy equations representing industrial diversity for each type to examine their distribution. The data on top firms and diversity were averaged for each type during the study. Micro-business is defined as enterprises employing between one to nine populations (Korea Statistics, 2023), and serve as indicators to analyze the small-scale business activities. The data was calculated using the CAGR during the study period. Moreover, the talent variable in social factor, was utilized. It has been observed that economically prosperity cities often exhibit a higher educational level (Hartt, 2019). Therefore, I leveraged the talent variable, which influences economic characteristics. This variable is based on the categorizations from the year 2015: This data, sourced from the Korean Statistical Information Service (KOSIS), have a limitation in that they only provide data every five years, resulting in only one data available for the study period.

Second, to elucidate the features associated with depopulation, the subsequent variables were chosen. From a demographic perspective, I utilized data on birth and aging rates, and net migration, calculating them as CAGR for the study period. I investigated the assumption that residential affordability, rather than the lack of urban infrastructure, exerts a greater influence. In terms of social aspects, this study used variables such as cultural infrastructure, tourism, housing price index, and

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life satisfaction. The variables for cultural infrastructure and tourism represent the average values during the study period. Tourism data refers to the average number of famous tourist destinations relative to the population and was obtained from a Cultural Big Data Platform Portal.

To examine the rate of increase in housing prices by type, this study calculated the CAGR of the housing sales price index from the Real Estate Statistics Information System Portal. The life satisfaction variable refers to the extent to which individuals are satisfied with their lives, here analyzed both in terms of subjective and emotional states. This variable utilized life satisfaction survey data from the National Happiness Map provided by the National Assembly Futures Institute. As physical factors, I characterized the residential environments of each type using variables such as the ratio of vacant housing, deteriorated dwellings, and housing supply. These variables were calculated as the CAGR during the study period to track changes. Geographically, this study controlled for regional variations by including the Seoul Metropolitan Area (SMA) variable, which comprises Seoul, Gyeonggi, and Incheon—regions collectively representing over half of the nation's population and GDP. I collected most of the data from KOSIS, except for the top firms, housing prices, and life satisfaction.

Table 4. Demographic, economic, social, physical, and geographical variables.

Factors		Description
Demographic	· Aging rate	Ratio of the elderly (over 65 years) group.
	· Birth rate	Total fertility rate by age (15–49 years) per 1,000 population.
	· Net migration	Changes no. of net migration (difference between inflow and outflow) population.
Economic	· Industrial distribution	Change and proportion by three (KIS / KIM / TM) industries (See Table 2).
	· Top Firms	No. of firms among the Top 100 / 1000 firms in Korea.
	· Micro business	Changes no. of micro (1–9 workers) business.
	· Industrial diversity (DIV)	Industrial diversity of the cities.
Social	· Talent	No. of the highly educated population (master's and doctoral degrees).
	· Cultural infrastructure	No. of cultural infrastructure per 100,000 population.
	· Tourism	No. of tourist destinations compared to population.
	· Housing price	Total Housing (including single-family homes, multifamily homes, and apartments) sales price index.
	· Life satisfaction	Life satisfaction survey.
Physical	· Vacant housing	Ratio of the vacant housing.
	· Deteriorated dwellings	Ratio of the deteriorated dwellings.
	· Housing supply	Ratio of the housing supply.
Geographical	· SMA	Seoul metropolitan area (SMA) or non-Seoul metropolitan area.

Table 5. Industry structure in three categories

Category	Industrial subcategories
1) KIS industries	Information and communication services, Software, E-commerce, Business services, Research and development and engineering, Design, Newspaper broadcasting, Culture-related technology industries
2) KIM industries	Electronic information devices, Semiconductors, Mechatronics, Fine chemicals, Bio-industry, Precision instruments, New materials, Environment, Aerospace
3) TM industries	Textile, Apparel, Footwear, Textile chemicals, Steel, Machinery, Home appliances, Automobiles, Shipbuilding

3.3.2. Multinomial Logistic Regression

The MNL regression model can be used to predict the probability of occurrence in a category as an outcome variable based on multiple independent variables (Osanya et al., 2020). Specifically, this model was used to predict the probability of occurrence of the J categories compared with that of the base category:

$$ln\frac{\Pr(Y_i=j)}{\Pr(Y_i=J)} = \beta_j * X_i \ (j = 1, 2, \cdots, J-1) \tag{3}$$

$$Pr(Y_i = j) = P_{ij},$$

where Y_i is the resulting random variable that can belong to one of the 1, 2, $\cdots$, and J categories; p_{ij} is the I variable that belongs to the J category; and β_j refers to a coefficient associated with the J category. The following equation indicates the exponential value for the MNL regression:

$$P_{ij} = \frac{exp^{\alpha_j+\Sigma_{k=1}^{K}\beta_{kj}X_{ki}}}{\sum_{j=1}^{J}exp^{\alpha_j+\Sigma_{k=1}^{K}\beta_{kj}X_{kji}}} \tag{4}$$

where K is an independent variable, and several variables that affect urban growth and shrinkage were used.

The ratio of the probability of choosing one outcome category to the probability of choosing the base category is often referred to as the *relative risk ratio* (RRR). An RRR > 1 indicates that the comparison group is more likely to belong than the base category. If the RRR < 1, the outcome is more likely to be in the base group.

The present study has calculated the RRR relative to the base category, which is the CEG cities, and has used Stata to estimate the MNL model. Additionally,

multicollinearity checking between continuous variables is required prior to MNL model analysis to avoid parameter estimation errors of individual independent variables (Lei et al., 2021). Multicollinearity is assessed using the Variance Inflation Factor (VIF), with a VIF greater than 10 signifying the presence of multicollinearity.

4. Findings

4.1. Descriptive Statistics of the Growing, CEG, Shrinking Cities

4.1.1. Impact of the Industrial Sector's Proportion on Economic Growth

This section explores the relationship between industrial structure and economic growth in cities with contrasting growth patterns: CEG cities, growing cities, and shrinking cities (Table 6). First, cities categorized as CEG, despite population declines, exhibit a high concentration (57.56%) in the KIS industry, a sector known for high value-added production. In contrast, growing cities have a more balanced industrial distribution—with KIS at 35.47%, KIM at 26.38%, and TM at 38.15% (Figure 12a). Shrinking cities primarily rely on the TM industry, which comprises 64.39% of their industrial base.

Second, examining the CAGR of the three major industrial sectors reveals that the high-value KIS industry has increased the most in CEG cities, accounting for 63.51%, followed by growing cities at 55.48% and shrinking cities at 11.15% (Figure 12b). In growing cities, the TM industry appeared to decrease only slightly and remained relatively stable, while there was a tendency for an increase in the proportion of knowledge-based industries, including KIS and KIM industries. CEG cities, on the other hand, showed a distinct increase in the proportion of KIS industry, despite the decline in the TM industry. Shrinking cities exhibited a phenomenon resulting from changes in the knowledge-based economy, with a partial increase in the proportion of the KIS industry but a significant

decrease in the proportion of KIM and TM industries, which can be considered a negative feature.

Furthermore, CEG cities are distinguished by their high concentration of competitive firms and educated talent, particularly evident in the aggregation of top 1000 and top 100 firms in the KIS industry. This suggests that these firms significantly contribute to economic growth (Figure 12c). According to previous research, cities with declining populations typically exhibit a trend where the younger and highly educated segments tend to migrate elsewhere (Choi, 2021). The current findings, however, highlight a seemingly paradoxical situation in CEG cities: despite population decline, they exhibit a greater concentration of talent compared to growing cities (Figure 12d). This warrants further investigation to understand the factors attracting talent in these specific contexts.
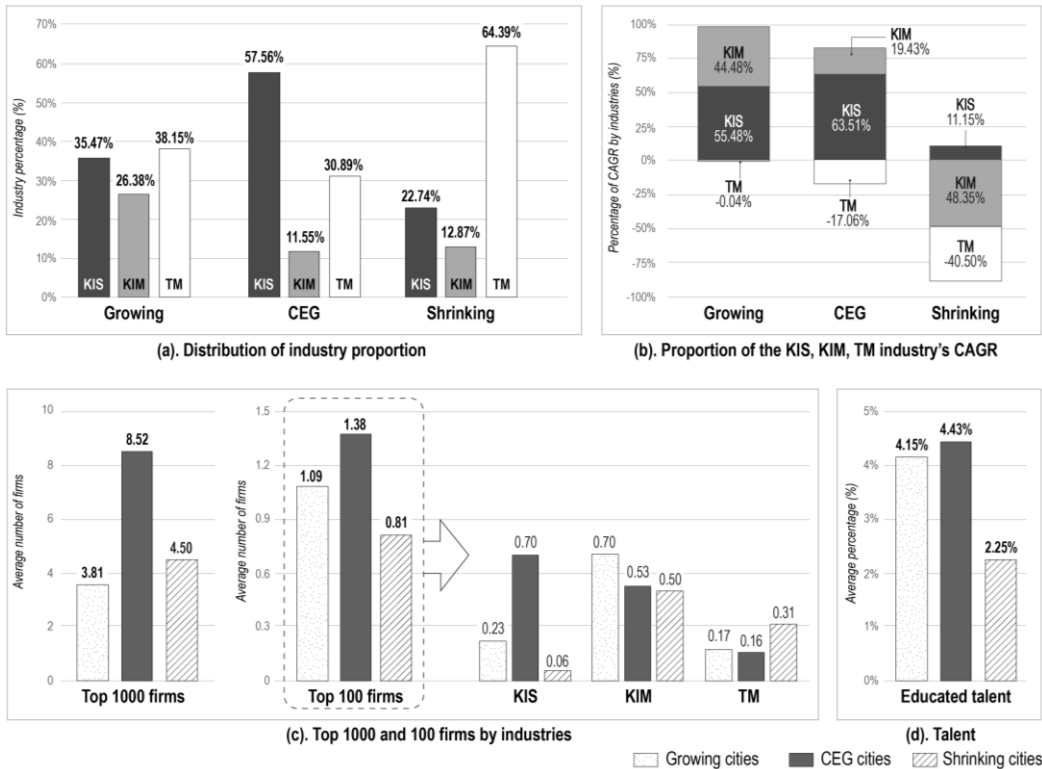
Figure 12. Distribution of economic variables by types.

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4.1.2. Depopulation Associated with Housing Affordability

I conducted a detailed examination of the phenomenon in which cities exhibit characteristics of depopulation concurrent with economic growth. First, birth and aging rates play a significant role in population dynamics. CEG cities exhibited lower birth rates and aging rates compared with growing cities, but higher rates compared to shrinking cities (Table 6). In other words, birth rates tended to be lower in cities with a higher population decline rate, while aging rates were higher. While CEG cities may attract young talent for economic opportunities, the overall birth rate might remain low due to factors like career focus or delayed childbearing. Additionally, the aging population in CEG cities likely results from younger individuals moving to other regions seeking economic stability, leading to a higher proportion of elderly residents.

Secondly, it can be speculated that housing affordability may be a more significant factor influencing population decline in CEG cities compared to deteriorating living conditions. Descriptive statistics analysis reveals the lowest vacancy rate change compared to housing supply in CEG cities, contrasted by the highest in shrinking cities (Table 6). CEG cities also have a lower percentage of deteriorated housing compared to shrinking cities. Notably, the CAGR for total housing prices in CEG cities tops at 1.83%, the highest, reflecting significant price increases (Figure 13a). This escalation is more pronounced in CEG cities, especially in the apartment market, which is highly favored in Korea. This aligns with Alves et al. (2016) who suggest that rising housing costs can lead to outmigration. Individuals, particularly younger generations or those with lower incomes, may be priced out of the CEG cities housing market, leading them to seek more affordable options in other locations.

Lastly, despite population decline, CEG cities maintain economic growth and vibrancy. This is evident in their high number of cultural facilities and tourist destinations,

with the highest number of cultural facilities per city at 6.53 and an average of 0.11 tourist destinations (Figure 13b). Additionally, high life satisfaction in CEG cities, comparable to growing cities, indicates that a declining population does not necessarily equate to a decline in overall well-being (Figure 13d).
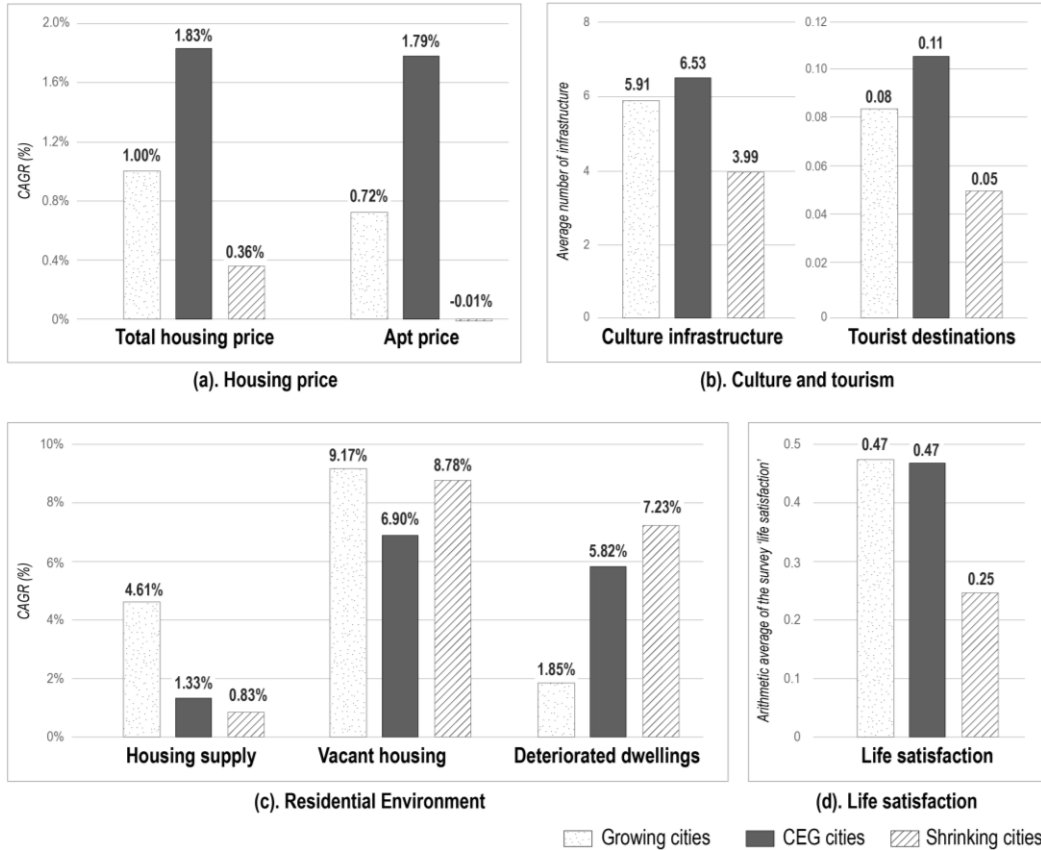
Figure 13. Distribution of social and physical variables by city type.

Table 6. Descriptive statistics for the characterization of the growing, CEG, shrinking cities (N = 146).

Variables	Definition and treatment of variable	Total mean	Total S.D.	Growing	CEG	Shrinking
Demographic factors						
Aging rate	CARG (%) of the elderly (Over 65 years) group's ratio	4.36	1.91	3.26	4.67	6.50
Birth rate	CARG (%) of the birth ratio	-5.30	2.09	-4.65	-5.42	-6.89
Net migration	CAGR (%) of net migration population	-0.47	0.91	-0.51	-0.50	-0.19
Economic factors						
P_KIS	Percentage (%) of KIS industry workers	45.72	29.36	35.47	57.56	22.74
P_KIM	Percentage (%) of KIM industry workers	17.08	18.19	26.38	11.55	12.87
P_TM	Percentage (%) of TM industry workers	37.20	24.23	38.15	30.90	64.39
KIS_CAGR	CAGR (%) of KIS industry workers	6.07	6.16	9.39	4.70	1.63
KIM_CAGR	CAGR (%) of KIM industry workers	2.72	15.12	7.53	1.44	-7.06
TM_CAGR	CAGR (%) of TM industry workers	-1.32	8.30	-0.01	-1.26	-5.91
DIV	Industrial diversity index	0.76	0.24	0.85	0.70	0.72
Firms_1000	Average No. of firms among the top 1000 firms	6.37	16.81	3.81	8.52	4.50
Firms_100	Average No. of firms among the top 100 firms	1.21	2.65	1.09	1.38	0.81
Micro business	CAGR (%) of micro (1–9 workers) business	2.99	4.96	4.19	2.71	0.39
Social factors						
Cultural infrastructure	Average No. of cultural infrastructure	6.02	5.58	5.91	6.53	3.99
Tourism	Average No. of tourist destinations compared to population	0.09	0.12	0.08	0.11	0.05
Housing price	CAGR (%) of the total housing sales price index	1.37	1.73	1.00	1.83	0.36
APT price	CAGR (%) of the apartment sales price index	1.20	2.48	0.72	1.79	-0.01
Talent	Average ratio (%) of the highly educated population	4.09	2.96	4.15	4.43	2.25
Life Satisfaction	Arithmetic average of the survey "life satisfaction"	0.45	0.24	0.47	0.47	0.25
Physical factors						
Vacant housing	CAGR (%) of vacant houses ratio	7.93	10.35	9.17	6.90	8.78
Deteriorated dwellings	CAGR (%) of deteriorated dwellings ratio	4.53	10.80	1.85	5.82	7.23
Housing supply	CAGR (%) of housing supply ratio	2.47	2.63	4.61	1.33	0.83
Vacant to supply	Vacancy-to-housing supply ratio	0.60	2.85	0.50	0.40	1.90
Geographical control						
SMA	Seoul Metropolitan Area	0.42	0.50	0.51	0.39	0.25

Note: The dependent variable represents the city type, which is divided into growing, CEG (complementary economic growth), and shrinking city types.

4.2. Results of the MNL Regression

Table 7 analyses the probability ratio by comparing growing and shrinking city types based on CEG. The analysis employed a Variance Inflation Factor (VIF) of 3.53, confirming minimal multicollinearity among the variables. The MNL regression identified eight statistically significant variables influencing city type:

- Demographics: Aging rate (CAGR) and net migration (CAGR)
- Economic structure: Proportion of KIS industry, CAGR of KIM industry, and micro business (CAGR)
- Social factors: Housing price (CAGR) and tourism (average)
- Regional control: Seoul Metropolitan Area (SMA) or not

During the modelling process, variables such as the vacancy rate, deteriorated housing rate, and birth rate were excluded due to their lack of statistical significance and high correlation with other variables like housing prices and aging rates. Specifically, the aging rate was significant in distinguishing between growing and shrinking CEG cities, whereas the birth rate was not, due to its correlation with the aging rate. This led to the exclusion of the birth rate from the final model, highlighting the aging rate's greater relevance in differentiating city types.

The MNL analysis showed that growing cities exhibited significant differences from CEG cities in factors such as aging rate, housing prices, tourism, net migration. The findings indicated that cities with a lower CAGR in housing prices and aging rates, as well as a lower tourism, and net migration, are more likely to be classified as growing cities. The interaction effect between the proportion of the KIS industry and housing prices with SMA was not statistically significant.

I confirmed that the proportion of KIS industry, CAGR of KIM industry,

micro business, and SMA did not demonstrate statistically significant differences between the growing and CEG cities. This implies that, although differences between the types were observed in descriptive statistical analysis, when complex variables were included in the modelling, these specific variables ultimately did not prove to be statistically significant: The proportion of the KIS industry was deemed insignificant because of its high correlation ($r = 0.601$) with the housing price (Figure 14). The KIM industry was presumed to be statistically insignificant because of its correlation with aging rate ($r = -0.255$) and the micro business ($r = 0.157$). Moreover, the SMA was deemed insignificant because of its high correlation with the housing price ($r = 0.439$) and tourism ($r = -0.593$).

Shrinking cities exhibited statistically significant differences in the aging rate, the proportion of KIS industry, the CAGR of the KIM industry, the prevalence of micro businesses. A higher aging rate, a lower proportion of the KIS industry, a lower CAGR in the KIM industry, and fewer micro businesses were associated with an increased likelihood of shrinking cities. This occurrence displayed the highest aging rate, resembling the results typically associated with urban decline or shrinkage. Additionally, the interaction effect between the proportion of the KIS industry and housing prices with SMA was statistically significant.

In terms of the housing price, tourism, net migration variables, shrinking cities did not show any differences from CEG cities. Although descriptive statistics suggested differences in housing prices across city types, this variable became insignificant in the final MNL model due to its interactions with the tourism, and SMA variables. A lower tourism ($r = -0.388$), and the presence in SMA ($r = 0.439$) were associated with a higher correlation with the increase in housing price (Figure 14). Moreover, net migration was deemed insignificant because of its high

correlation with housing price ($r = -0.191$). The reasons for the increased net migration in areas with lower housing price are as follows. Affordable housing reduces economic burdens, making these areas attractive to low-income individuals, young people, and early-career workers, thereby promoting population influx. This factor combined are likely to contribute to the increase in net migration.

	Aging rate	Proportion of KIS	KIM industry	Micro business	Housing price	Tourism	Net migration	SMA
Aging rate	1.000	0.028	-0.255*	-0.293*	-0.018	-0.421*	-0.027	0.057
Proportion of KIS	0.028	1.000	-0.044	-0.124	0.601*	-0.172	-0.280*	0.097
KIM industry	-0.255*	-0.044	1.000	0.157*	-0.117	0.186	0.076	-0.064
Micro business	-0.293	-0.124	0.157*	1.000	-0.069	0.102	0.154	-0.062
Housing price	-0.018	0.601*	-0.117	-0.069	1.000	-0.388*	0.191*	0.439*
Tourism	-0.421	-0.172	0.186	0.102	-0.388*	1.000	0.043	-0.593*
Net migration	-0.027	-0.280	0.076	0.154	-0.191*	0.043	1.000	-0.054
SMA	0.057	0.097	-0.064	-0.062	0.439*	-0.593*	-0.054	1.000

The correlation coefficient is represented as *r*.

Figure 14. Correlation matrix.

Table 7. Results of the MNL model for the growing and shrinking cities (Base category: CEG cities).

Variable	Growing cities					
	RRR	Robust std. error	z-value	p-value	95% conf. interval	
Aging rate	0.177	0.068	-4.50	0.000***	0.083	0.377
Proportion of KIS (P_KIS)	1.019	0.019	0.98	0.328	0.982	1.057
KIM industry	1.063	0.034	1.94	0.053	0.999	1.132
Micro business	1.018	0.040	0.47	0.640	0.943	1.100
Housing price (H_price)	0.584	0.158	-1.99	0.046*	0.344	0.991
Tourism	0.120	0.069	-3.70	0.000***	0.039	0.369
Net migration	0.513	0.158	-2.17	0.030*	0.280	0.939
SMA	6.564	7.262	1.70	0.089	0.751	57.39
P_KIS x SMA	0.997	0.040	-0.08	0.939	0.921	1.079
H_price x SMA	0.421	0.344	-1.06	0.290	0.085	2.087
Constant	8.751	11.264	1.69	0.092	0.702	109.08

Variable	Shrinking cities					
	RRR	Robust std. error	z-value	p-value	95% conf. interval	
Aging rate	7.930	7.084	2.32	0.020*	1.377	45.672
Proportion of KIS (P_KIS)	0.822	0.050	-3.25	0.001*	0.730	0.925
KIM industry	0.888	0.037	-2.88	0.004**	0.819	0.963
Micro business	0.751	0.079	-2.72	0.007**	0.610	0.923
Housing price (H_price)	1.308	0.442	0.79	0.427	0.674	2.537
Tourism	1.257	1.316	0.22	0.827	0.162	9.779
Net migration	1.048	0.694	0.07	0.944	0.286	3.838
SMA	99.81	220.5	2.08	0.037*	1.314	7581.1
P_KIS x SMA	0.514	0.134	-2.55	0.011*	0.308	0.858
H_price x SMA	5.450	4.841	1.91	0.046*	0.955	31.085
Constant	0.000	0.000	-2.54	0.011	0.000	0.092

Wald chi2(20) = 78.60, Prob > chi2 = 0.000, Pseudo R2 = 0.5542

Note: RRR = relative risk ratio. Constant estimates the baseline relative risk for each outcome. The KIM industries, micro business, aging rate, housing price variables and net migration were calculated based on their CAGR. The variables of proportion of KIS and tourism were calculated based on their average. * p <0.05, ** p <0.01, *** p <0.001.

To analyze the characteristics of CEG cities in detail, Figure 15 demonstrates the features of two key variables based on whether they are within the SMA area using interaction terms. In the SMA area, the proportion of the KIS industry showed almost similar levels between growing and CEG cities. Conversely, in non-SMA regions, a higher proportion of the KIS industry was associated with an increased probability of being classified as CEG cities. This suggests that merely attracting the KIS industry in non-SMA areas does not necessarily lead to population inflow.

As the CAGR of housing prices increases, the probability of being classified as a CEG city also increases. In both SMA and non-SMA areas, lower housing price CAGR is associated with a higher probability of being classified as growing cities, while higher housing price CAGR increases the probability of being classified as CEG cities. Although the difference between CEG cities and other city types was not pronounced in SMA areas, it was more significant in non-SMA areas. This trend can be attributed to the higher average housing prices (not CAGR) in SMA areas compared to non-SMA areas. Therefore, the findings suggest that CEG cities experience population outflow due to high housing prices.
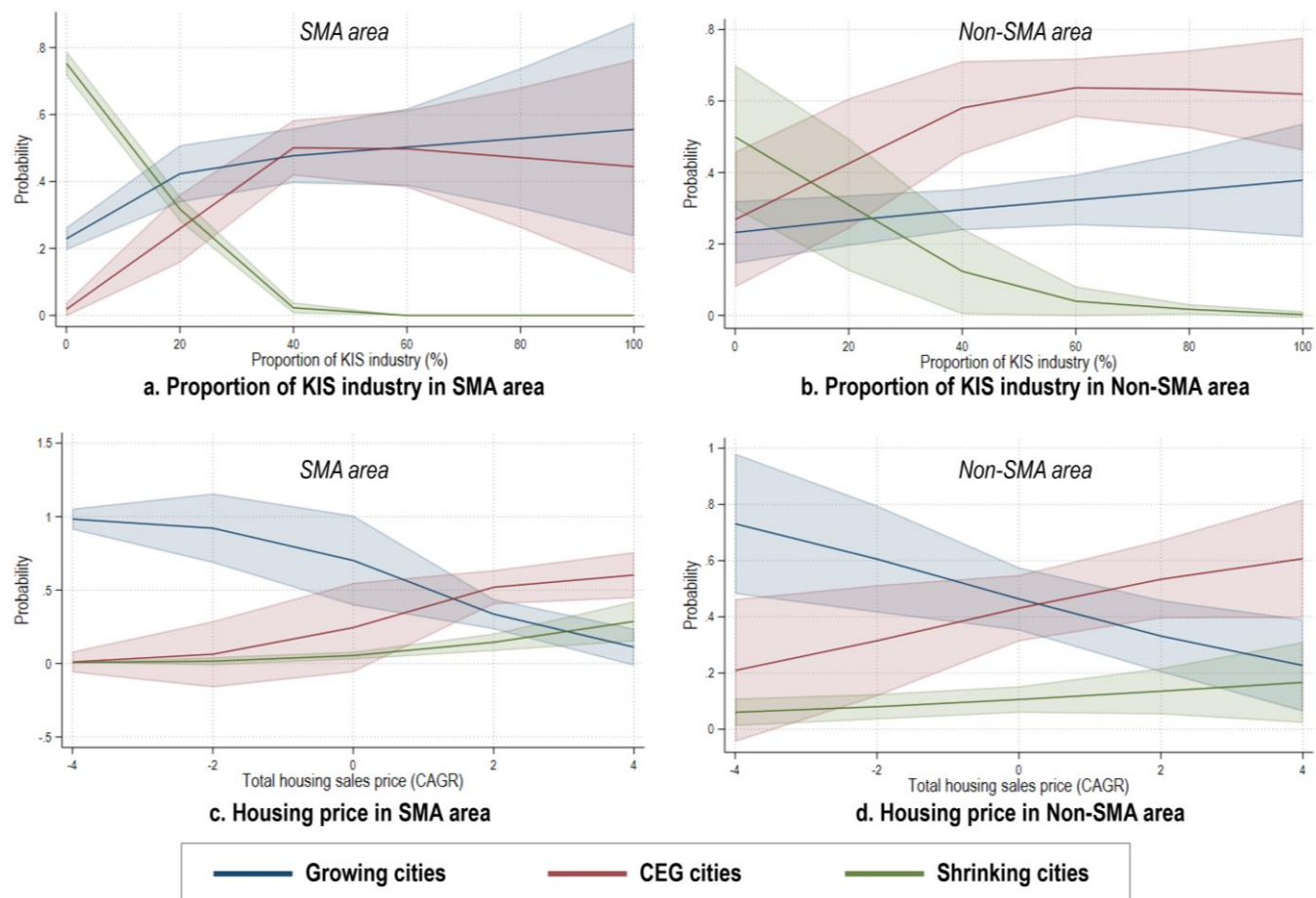
Figure 15. Predicted probability of key variables (interaction).

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5. Discussion and Conclusion

This study expands the understanding of urban dynamics by highlighting the importance of factors beyond traditional population metrics. It introduces the concept of CEG cities, characterized by population decline but economic prosperity.

The analysis revealed a higher proportion of Knowledge-intensive Services (KIS) industry in CEG cities compared to traditional growing cities. This indicates that, despite population decline, investment in and focus on high-value-added industries can play a critical role in fostering economic prosperity.

A key distinction was observed between the industrial structures of growing and shrinking cities. Growing cities exhibited a more balanced distribution across KIS, KIM, and TM industries. In contrast, shrinking cities displayed a concentration in TM industry, potentially indicating a slower transition towards a knowledge-based economy. This aligns with previous research by Bartholomae et al. (2017) and Shan et al. (2020). Based on this analysis, this study posited that cities experiencing population decline can enhance economic outcomes through the strengthening of KIS industry.

Furthermore, in CEG cities, which are experiencing population decline yet exhibit economic prosperity, the primary issues have been identified as high housing prices and a limited housing supply rather than a lack of urban infrastructure. These elements, together with an increasing aging rate, are major factors accelerating the phenomenon of population decline. Despite CEG cities having well-developed infrastructures, the escalation of housing prices has been found to counteract these infrastructural advantages, leading to population outflow. As a result, addressing the issue of population decline in cities necessitates improving stable housing prices and

increasing the housing supply.

This study revealed that, in CEG cities, the proportion of KIS industry is predominant over KIM industry, emphasizing the consequent economic impact. Because of the nature of KIS industry, the workforce employed within these sectors is characterized by high mobility, which influences residential choices to favor commuting flexibility over proximity to the workplace, resulting in relatively longer commuting times (Choi & Kim, 2015). The traditional urban model of living close to one's workplace prioritized minimizing commute times and enhancing the convenience of life. However, CEG cities—leveraging the availability of cultural facilities—indicated a new pattern in which work, leisure, and life are more organically interconnected. This granted individuals the flexibility to reside farther from their workplace and offered opportunities to enhance quality of life through leisure activities and cultural engagement in diverse locations.

Within the CEG cities, characteristics can be distinguished by several factors. Specifically, SMA and non-SMA of CEG cities in Korea show different characteristics of economic prosperity, influenced by economic and social drivers amidst a common challenge of population decline. CEG cities located in SMAs tend to specialize in service-oriented industries requiring high levels of education and specialized skills. These areas attract top-performing firms within the KIS sector, known for generating high revenue in Korea. A prime example demonstrating these characteristics is the city of Seongnam in Gyeonggi Province. This city is highlighted by the presence of top firms, a significant portion of the KIS industry, and high housing prices. Seongnam boasts numerous high-value-added large firms, including industry giants like Naver, Kakao, KT, SK, NC Soft, and Nexon, which contribute significantly to the city's economic landscape. This city, where KIS industry is

concentrated, there is a notable trend of telecommuting, reflecting the adaptability of the workforce to modern work practices. Moreover, the influence of high housing prices has led many residents to commute to adjacent cities for work opportunities, highlighting the economic interdependence within the region (Kim & Seo, 2017). Despite a decline in population, Seongnam experiences a paradoxical phenomenon of increasing employment, indicating the dynamism of its economic ecosystem.

CEG cities located outside SMAs face challenges in attracting major corporations. However, they demonstrate success in creating new jobs across various sectors through regional specialization. Additionally, these areas often show a higher ratio of foot traffic[5] populations, such as visitors or tourists, compared to their resident populations. Boryeong city in Chungnam Province exemplifies this path. Boryeong is transitioning from an agriculture-based economy towards one focused on tourism and the energy sector. The renowned Boryeong Mud Festival has significantly boosted tourism, while the city's coal-fired power plants and energy industries play a vital role in its economic infrastructure. Moreover, the growth of niche industries like cosmetics utilizing mud reflects this city's effort to leverage its local resources and foster small-scale firms (Byun, 2006). Boryeong's integration of KIS industry with its tourism sector has contributed to economic prosperity, as evidenced by a foot traffic population outnumbering residents by fourfold (Chungcheongnam-do data portal, 2023). Despite challenges such as a scarcity of high-quality job opportunities, demographic shifts towards an aging population, and slight increases in housing prices compared to metropolitan areas, this city utilizes its local characteristics to achieve economic resilience and prosperity.

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[5] The foot traffic, which has been used as an indicator of urban vitality, refers to data that aggregate the areas in which people are located at a specific time, which is done using a telecommunications network.

Depopulation has often been viewed negatively, which is typically perceived as a result of diminished socio-economic vitality and reduced accessibility to essential services, which lowers the quality of life (Min, 2018). However, CEG cities demonstrate that a decrease in population, often driven by high housing prices, does not necessarily equate to negative outcomes. These cities showcase strong economic growth in high-value industries and are equipped with quality urban infrastructure and living environments, contributing to elevated levels of life satisfaction. Therefore, in an era of population decline, policies should surpass merely increasing housing supply or offering financial incentives. Considering characteristics such as housing choice flexibility and housing prices observed in CEG cities, a balanced approach between housing and economic activities becomes essential. Specifically, to maintain or enhance residents' overall quality of life, it is necessary to provide ample leisure and educational opportunities and strengthen networking abilities.

Based on the insights of this study, strategies are proposed for different types of cities (figure 16). CEG cities differ from growing cities in terms of industrial balance, housing prices, and aging rates. For cities within the CEG type to transition into growing cities, it may be necessary to implement policies that manage and attract a balance of industries to ensure long-term economic prosperity. Additionally, to address high growth rate of the housing prices and aging rates, policies may need to be introduced that provide affordable housing options, such as rental housing for the youth. However, such housing policies could enable a growing city to become CEG cities, or vice versa. This could ultimately lead to a zero-sum game of population shifts between cities, necessitating careful, region-specific strategies that consider local circumstances.

Numerous studies suggest industrial attraction and population influx strategies for shrinking cities, yet such approaches often result in a zero-sum game with a high potential for failure. This research proposes an alternative: acknowledging the difficulty of dramatic changes in the short term, it suggests strategies for a gradual transition of shrinking cities into CEG cities. Traditional secondary and tertiary industries in these shrinking cities may need to transition to high-value industries. To facilitate this, incentives for utilizing vacant land and empty houses to attract small-scale, high-tech industries or local-based startups can be crucial. Moreover, expanding branches and factories of leading companies could prevent the outflow of highly educated talent and stimulate economic activity.

However, in some shrinking cities with low educational or professional levels, expanding knowledge-based industries can be challenging. Thus, integrating industries considering local characteristics or specializing in unique regional industries might be necessary. Additionally, shifting from reliance on financial support to strengthening urban social networking is essential. This could lead to economic prosperity through education and training provided by local universities and technical schools. Strengthening social networking can also enhance the self-reliance of the local economy through small enterprises like cooperatives and social businesses. Moreover, for the revitalization of cultural tourism, leveraging local resources to increase foot traffic population is essential.

In cases where shrinking cities cannot transition into growing cities or CEG cities, the 'smart shrinkage' (or 'smart decline') strategy may be appropriate. Introduced by Popper & Popper (2002), the *smart decline* concept offers strategies for cities facing population decrease or economic decline to manage and adapt wisely. For example, spatial reduction can lower infrastructure maintenance costs and

adjusting residential density can lead to more efficient service delivery. If a transition to other types of cities proves difficult, shrinking cities need to explore methods to reconfigure and optimize themselves in accordance with diminishing resources and population.

Growth type in terms of population and economic activity

Growing cities (Pop ↑, Economy ↑)

Features
- **Balanced industries distribution**
- Low CAGR of housing sales price
- Highest housing supply
- **Lowest aging rate**

Strategies to sustain a growing cities
- ✓ Maintaining industry balance and fostering innovation
- ✓ Maintaining housing price stability

CEG cities (Pop ↓, Economy ↑)

Features
- **Highest proportion of KIS industries**
- Highest distribution of competitive firms
- High micro business
- **Highest CAGR of housing sales price**
- **Highest cultural facilities and tourism**
- High life satisfaction

Transition

Shrinking cities (Pop ↓, Economy ↓)

Features
- **Highest aging rate**
- Highest vacancy rate compared to supply
- **TM-centered industry distribution**
- **Lowest life satisfaction**

Strategies (Shrinking→ CEG cities)
- ✓ Convergence of new growth industries and industrial specialization utilizing local resources
- ✓ Encouraging small-scale / community-based economic activity; Building a startup using vacant houses
- ✓ Strengthening social networks within the city; Collaborate with local universities or technical schools
- ✓ Increasing foot traffic population through local resources

Strategies (CEG → Growing cities)
- ✓ Promoting industrial balance for long-term prosperity
- ✓ Lowering the aging rate through housing policies for the younger generation; Stabilization of housing prices through housing supply

Continued decline

Smart shrinkage (decline)
- Accepting urban shrinkage
- Actively managing it to improve urban sustainability and quality of life
  (Downsizing and using empty land as green space.)

Figure 16. Summary and strategies.

In this study, many cities in Korea exhibited characteristics of the CEG cities, with economic activity increasing significantly during the analysis period, despite population declines. Specifically, although the resident population on resident registration has been declining, the population engaged in consumption and economic activities in each city may be substantial. In addition, the address of resident registration may not correspond to the area in which they reside. For this reason, the population active in the area has recently become more critical than the resident population, and foot traffic data analysis has been used to measure it more accurately. This foot traffic, which has been used as an indicator of urban vitality,

refs to data that aggregate the areas in which people are located at a specific time, which is done using a telecommunications network. This study has limitations because it did not reveal population mobility and commuting characteristics because of difficulty in acquiring foot traffic data. Furthermore, because our findings were applied to Korea using an eight-quadrant city classification matrix, they may have different implications when applied to countries with different demographic and economic activity characteristics than Korea.

Chapter 4.

Beyond the Shadows of Depopulation: Conditions and Strategies for Economic Sustainability in Local Small and Mid-sized Depopulating Cities

1. Introduction

Population decline has become a common issue globally, with over a quarter of the world's largest cities already experiencing it (Galster, 2019; Xie et al., 2018). Population decline is driven by a combination of factors including aging populations, low birth rates, and younger generations migrating to urban centers in pursuit of better economic opportunities. As a result, many local cities are facing various socio-economic challenges such as economic stagnation, underutilization of social infrastructure, and the breakdown of local communities (Martinez-Fernandez et al., 2016; Mykhnenko & Turok, 2008; Wiechmann & Pallagst, 2012). Due to these phenomena, population decline has been negatively perceived as it can adversely

affect the growth potential of cities and diminish social and economic vitality, as well as quality of life.

There is a tendency in traditional perspectives to equate population decline with economic decline in cities. However, cases of economically thriving cities despite population decline provide a paradox to such assumptions. Regions like the Ruhr area in Germany and certain cities in the United States have achieved remarkable economic prosperity despite declining populations (Bartholomae et al., 2017; Hartt, 2019). This phenomenon arises as modern societies witness a disconnect between residential areas and areas of labor and cultural consumption, unlike past patterns, due to suburbanization, industrial transitions, and shifts into the new normal era (Choi & Kim, 2015).

As population indicators are not directly linked to the economic changes in cities, there is no need to view population decline cities solely through a negative lens. In fact, in some population decline cities, industrial shifts and transitions in economic structure—particularly, the transition from traditional manufacturing to advanced technology industries—have created new employment opportunities, leading to economic prosperity, as observed in the Ruhr area of Germany (Bartholomae et al., 2017). Furthermore, population decline cities can serve as opportunities to improve residents' quality of life by lowering urban density and can transform into cities where vibrant consumption activities occur by leveraging cultural and tourism resources.

Kim et al. (2022a) mention that cities demonstrating economic prosperity despite population decline are defined as Complementary Economic Growth (CEG) Cities, characterized by high-value-added jobs and socio-cultural attributes, and can be explained as part of a growth type. However, the specific economic and socio-

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cultural mechanisms through which cities can exhibit growth potential through economic prosperity in an era of declining populations have not been fully elucidated.

Research on cities that thrive economically despite population decline has received relatively less attention compared to shrinking cities. Especially, local small and mid-sized cities experience complex patterns of population decline and economic change, yet understanding how these changes influence the long-term development of cities remains limited. Local small and mid-sized cities often possess unique social, economic, and cultural assets, enabling different forms of growth and prosperity compared to large cities. Additionally, these cities may face more challenges in maintaining infrastructure and providing services compared to large cities, but they also have the potential to leverage unique advantages such as close community connections. This study aims to illuminate the characteristics, challenges, and opportunities of local small and mid-sized cities and contribute to exploring new strategies and approaches in urban planning and policy-making processes by uncovering cases that demonstrate population decline does not necessarily mean economic decline.

Specifically, this study aims to identify and analyse the conditions and strategies used by economically thriving CEG cities despite experiencing population decline, as mentioned in Chapter 3. Case studies were conducted on three local small and mid-sized cities in Korea that demonstrate population decline but exhibit economic prosperity. The study addressed the following questions: (1) What are the potential positive aspects of economic prosperity observed despite population decline in local small and mid-sized cities? (2) How do conditions and strategies to promote economic growth in response to population decline interact in each city? This study aims to demonstrate that population decline does not inevitably mean

economic decline and provide important insights into approaches that promote economic and social prosperity in population decline cities through qualitative analysis.

2. Background Literature

2.1. Depopulating Cities

Population decline is one of the critical challenges faced by many cities worldwide. The problems arising from population decline manifest in various forms across social, economic, and environmental dimensions of city areas. Socially, aging and shifts in population structure pose significant challenges, imposing considerable strain on local finances and potentially leading to reductions or discontinuations in cultural and social service provision (Haase et al., 2014; Koo et al., 2016; Liu et al., 2020). This directly impacts the quality of urban life and may accelerate population outflows (Gilcher, 2013).

Economically, population decline is closely linked to labor market shrinkage, with a high likelihood of resulting in decreased productivity for businesses. Particularly, declining labor force contributes to reduced municipal revenue, increasing pressure on the maintenance of public services and infrastructure (Clark et al., 2010).

Environmentally, while population decline can offer opportunities for environmental improvement in some areas, it also brings issues such as increased housing vacancies, which heighten the burden of maintaining urban infrastructure. Consequently, this can lead to investment discontinuations, failed business attraction

efforts, and deteriorating city finances, including deficits in tax revenues, ultimately weakening the city's economic foundation (Gilcher, 2013; Martinez-Fernandez et al., 2012; Zakirova, 2010). These issues often lead to the perception of population decline as symptoms and side effects of crises (Rieniets, 2006).

2.2. Economic Prosperity in Depopulating Cities

Population decline does not necessarily imply solely negative outcomes. Rather, in some cities, population decline can coexist with economic prosperity and even offer opportunities for new development (Glaeser & Resseger, 2010; Hirt & Beauregard, 2021). This study examines the key theories explaining this phenomenon and investigates the factors that contribute to economic prosperity despite population decline.

2.2.1. Industrial Restructuring and Innovation

Technological innovation is identified as a critical factor in sustaining economic growth even in the context of population decline. According to Neoclassical Growth Theory, technological progress, along with capital accumulation, is a primary exogenous driver of economic growth (Solow, 1956). This technological progress enhances labor productivity and compensates for labor shortages, thereby contributing to sustained economic growth. From the perspective of Endogenous Growth Theory, such technological innovation occurs endogenously through research and development (R&D) and corporate innovation activities, serving as a major driving force for long-term economic growth (Romer, 1986). This perspective

emphasizes that technological advancement is not merely externally given but is stimulated by internal activities and investments within the economic system.

Industrial restructuring and innovation provide key opportunities for economic prosperity in depopulating cities. Some cities in Germany, experiencing population decline, have achieved economic prosperity by restructuring their economies to attract modern industries and services (Bartholomae et al., 2017). The contraction of traditional industries promotes the transition to new industrial sectors and technological innovation, which can reconfigure the local economy and foster sustainable development (Ma et al., 2020). Specifically, innovation activities conducted by local firms ensure structural changes in the urban economy and guarantee long-term economic growth (Turok & Mykhnenko, 2008).

Even in cities experiencing population decline, appropriate industrial restructuring and innovative approaches can drive economic growth and accelerate the transition to new growth industries (Bartholomae & Schoenberg, 2019). The localized jobs generated in this process strengthen the economic foundation of the city and provide opportunities to create new industrial dynamics.

2.2.2. Human Capital Accumulation

The accumulation of high-quality human capital is another crucial factor that enables economic growth despite population decline. In neoclassical growth theory, human capital is considered an exogenous factor, whereas Endogenous Growth Theory emphasizes that human capital is an intrinsic driver of economic growth (Lucas, 1988). High-quality human capital, characterized by advanced education and specialized skills, enhances productivity and thus fosters economic growth. As

evidenced by Germany's experience, a high level of education and a skilled labor force positively impact economic growth (Bloom et al., 2010). This is particularly evident in technology-intensive industries, where high-quality human capital drives innovation and productivity improvements.

2.2.3. Community Strengthening and Consumption Productivity

Population decline can serve as an opportunity for increased cohesion among attached local stakeholders as dissatisfied individuals leave the city (Cho et al., 2022). Community strengthening has positive impacts on economic, social, and cultural dimensions. Putnam (2000) argues that strong communities provide a foundation of trust and cooperation that facilitates economic activities. Regions with high social capital benefit from cooperative networks and trust, which are conducive to economic prosperity.

Consumption productivity is a crucial factor for economic growth, as organizing consumption activities in a way that enhances productivity maximizes economic benefits. Glaeser et al. (2001) explain that cities centered around the service industry can sustain economic prosperity. In particular, the tourism industry is a key element in strengthening communities and enhancing consumption productivity. Tourism introduces external consumption into the city, maintaining economic vitality. The UNWTO (2015) emphasizes that tourism contributes to urban economic growth. Barcelona is a prime example of sustained economic growth driven by the development of its tourism industry.

Moreover, promoting consumption through urban regeneration strategies is a vital means of fostering economic growth. Providing diverse shopping

opportunities, restaurants, and hotels can lead to business growth, tourism, and talent attraction (Turok & Mykhnenko, 2008). For instance, the Shoreditch area in London achieved economic growth through urban regeneration focused on creative industries and cultural spaces.

Previous studies have primarily focused on individual factors such as technological innovation, human capital, and industrial structural changes to explain economic growth in the context of population decline. However, these studies tend to concentrate on single factors rather than adopting a comprehensive approach. Additionally, many of these studies offer theoretical explanations without adequately analyzing how these factors operate in specific regional contexts, leading to a lack of concrete policy implications.

To address these limitations, this study adopts a comprehensive approach to examine how various factors interact to drive economic growth. By analyzing real-world cases, this research aims to provide strategies that enable economic prosperity despite population decline, thereby distinguishing itself from existing studies.

3. Research Method and Case Studies

This study aims to identify the characteristics of cities that have successfully transitioned through economic prosperity while maintaining quality of life in depopulating cities. Specifically, this study employs a qualitative research methodology, namely a case study approach, to explore the relationship between population decline and economic prosperity by categorizing cities into types in local small and mid-sized cities to gain an in-depth understanding of these cities. This study selected three cities as case study locations, with the aim of generalizing

findings through comparative analysis across multiple case studies: single case studies often focus on revealing their characteristics, which can be seen as an approach that emphasizes specificity rather than generalization (Greene & Caracelli, 1997). As mentioned by Yin (2009), consistent patterns or results discovered through multiple case studies suggest the possibility of generalization within a broader theoretical context. In Korea, small and mid-sized cities refer to cities with a population of less than 500,000, excluding metropolitan cities, metropolitan cities, special cities, special autonomous provinces, and the capital region (Yoon & Lee, 2015). The flow of the study is illustrated in Figure 17.

Firstly, this study identified cities demonstrating economic prosperity despite a decrease in population and applied the eight-quadrant city classification matrix methodology using population and economic activity indicators (Figure 9 in Chapter 3). In this methodology, the population indicator refers to the total population, including foreigners residing in each city, while the economic activity indicator represents the number of employments in the respective area. The 8-quadrant city classification matrix is based on the CAGR of population and economic activity over a five-year period from 2017 to 2022, using the recent five-year changes as criteria for city classification. Given that the COVID-19 pandemic, which garnered global attention, began in 2020, according to Kim et al. (2022b), it can be considered somewhat recovered by 2022. Hence, this study analysed population and economic changes using data up to 2022. The formula for the CAGR is as follows:

$$\text{CAGR} = \left(\frac{Ending\ year\ value}{Beginning\ year\ value}\right)^{\frac{1}{n}} - 1 \tag{1}$$

where *n* is the number of years in the dataset.
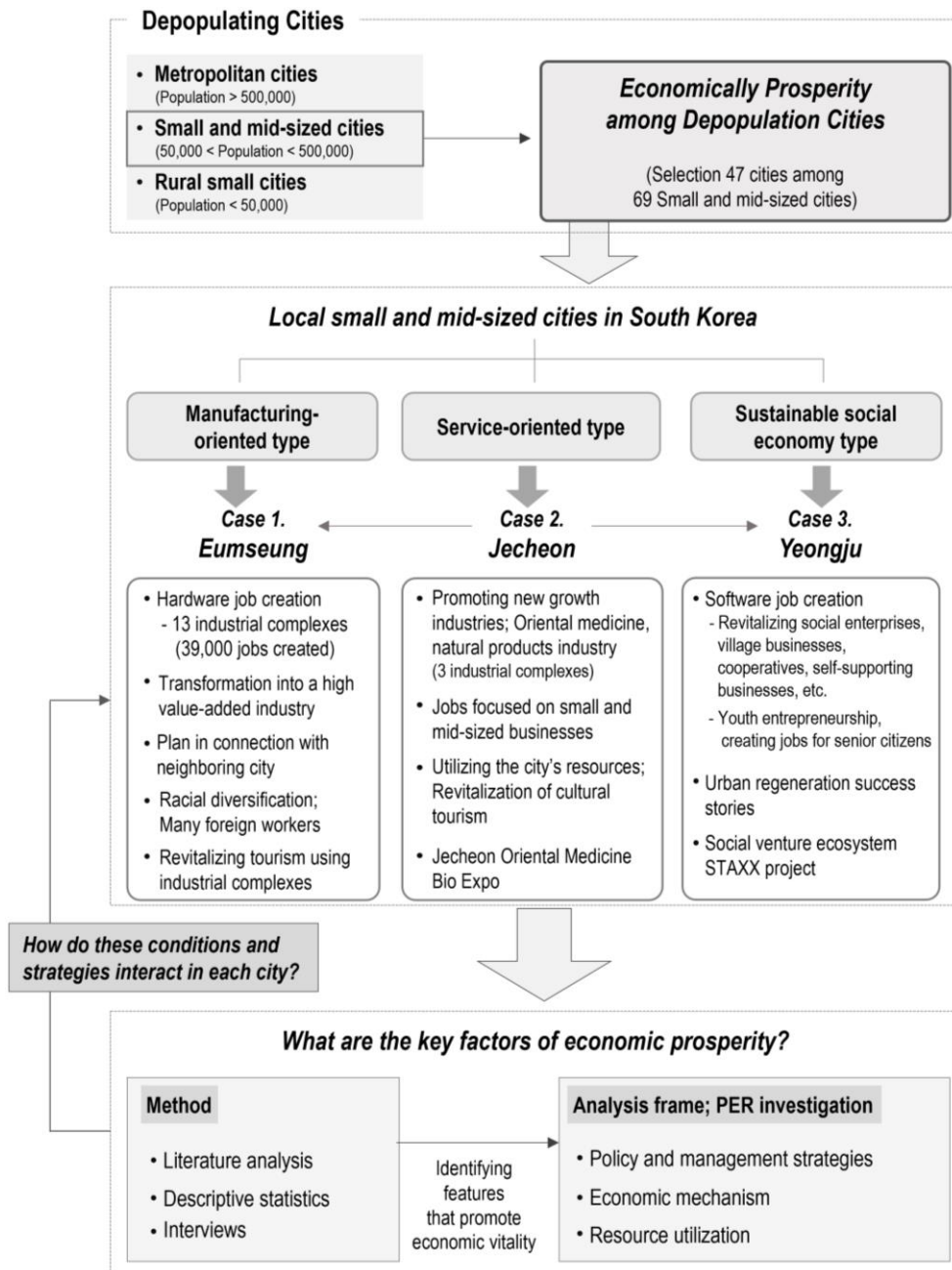
Figure 17. Diagram of a cross-case analysis.

Korea exhibits a trend where the elderly dependency ratio surpasses the youth dependency ratio due to low birth rates and an aging population, and the working-age population has been declining since 2016 (Statistics Korea, 2023). Furthermore, since 2020, a phenomenon known as 'Dead-cross' has emerged, where the number of deaths surpasses the number of births, leading to a significant population decline. Research results have indicated that Korea's population decline exceeds the rate of decline in Japan. Korea's economy has shown a tendency towards slow growth since 2011, as it began losing the vitality of its main industries (Bank of Korea, 2019). Examining these demographic and economic changes, Korea demonstrates a pattern where the population is declining while the economy remains stagnant or experiences slight growth. Moreover, due to the concentration of a large population and job opportunities in the capital region on a narrow landmass, Korea's population decline is predominantly observed in local small and mid-sized cities. Korea's regional disparities, characterized by deindustrialization in the capital region and industrial decline in non-capital regions, asymmetric population declines, and the outflow of young populations to the capital region, are particularly pronounced in local small and mid-sized cities (Lee et al., 2021). Therefore, this study focuses on classifying Korea's local small and mid-sized cities, and 47 CEG cities demonstrating economic prosperity despite population decline have been identified.

Next, the local small and mid-sized cities were classified into three main types based on factors of economic prosperity of CEG cities: *Manufacturing-oriented, Service-oriented, and Sustainable social economy types*. The criteria for classifying local small and mid-sized cities into three city types are determined by each city's major economic activities and how the region utilizes resources.

A) **Manufacturing-oriented type**: This type refers to cities that primarily

focus on the manufacturing sector. This type centers around large production facilities and industrial complexes, which serve as major drivers of the local economy. A manufacturing-focused economy plays a crucial role in product production, import-export activities, and job creation. It also concentrates on technological innovation and industrial upgrades, which strengthen the community's economic foundation and contribute to sustainable growth.

B) **Service-oriented type**: This type is characterized by robust infrastructure that supports a wide range of service-based businesses and activities. The economic strength of service-oriented cities is often determined by their ability to attract tourists and provide retail and entertainment options. A service-centered economy stimulates local consumption, creates jobs, and ultimately supports the diversification and growth of the local economy.

C) **Sustainable social economy type**: This type is centered around social enterprises, cooperatives, and community-based economic activities. Such cities aim for sustainable and inclusive economic growth by utilizing local resources, pursuing both economic benefits and social value simultaneously

This study categorizes cities based on their unique strengths and potential, as well as key policies being implemented regionally. It aims to understand how small and mid-sized cities can achieve economic prosperity despite population decline. Representative cities for each category were selected to conduct a cross-case analysis. Quantitative analysis struggles to ascertain the effectiveness of specific city policies and understand the mechanisms through which job-related initiatives and policies lead to economic prosperity. Therefore, this study selected representative

research sites for each city type and conducted literature reviews, descriptive statistics, and in-depth interviews as the basis for analysis.

To analyze the key factors of economic prosperity, I structured the analysis framework into three main areas: policy and management strategies, economic mechanisms, and utilization of local resources (Figure 17). Firstly, the analysis of policy and management strategies focuses on each city's efforts in attracting investments and supporting enterprises, aiding social enterprises, and interacting with local communities from an economic development perspective. Secondly, the economic mechanisms analysis examines the main industries generating employment and changes in industrial structures, analyzing mechanisms that increase the number of workers in the labor market. Lastly, the resource utilization analysis explores how local natural and cultural resources contribute to economic value creation, enabling economic prosperity.

3.1. Case Selection

This study selected three local small and mid-sized cities, namely Eumseong in Chungbuk province, Jecheon in Chungbuk province, and Yeongju in Gyeongbuk province, as case study sites for the following reasons: Firstly, despite population decline in the past five years, all three cities exhibited economic prosperity. Even though the resident population decreased, the number of workers engaged in economic activities increased, indicating a significant population living in these cities. From 2017 to 2022, the CAGR of population for Eumseong was -0.81%, Jecheon was -0.78%, and Yeongju was -1.31%. Economic changes showed growth rates of 4.76% for Eumseong, 2.88% for Jecheon, and 2.27% for Yeongju. This

phenomenon mirrors the trend observed in Leipzig, Germany, where despite population decline, economic prosperity is achieved.

Secondly, cities with similar population sizes were selected based on the three types of local small and mid-sized cities. Analysing cities with different characteristics and strengths individually makes it challenging to consistently explain the characteristics of economic prosperity. Therefore, it is necessary to classify the characteristics of economic prosperity based on the three types of cities. Based on the characteristics observed in small and mid-sized cities, three cities were categorized into manufacturing-oriented, service-oriented, and sustainable social economy types (Figure 17). Each type was represented by a city with a similar population size and density: Eumseong with a population of 101,809, Jecheon with 130,988, and Yeongju with 100,749 as of 2022. Their population densities were 195.71 pop/km^2, 148.27 pop/km^2, and 150.35 pop/km^2, respectively (Figure 18). When comparing and analysing these cities, similar population sizes and densities are crucial for explaining the urban policies, economic mechanisms, and socio-cultural effects manifested in the cities.

3.1.1. Eumseong

Eumseong, located in northern Chungcheongbuk-do near the Seoul Metropolitan Area, has shifted from a rural landscape to an industrial city. It hosts three agricultural-industrial complexes and thirteen industrial complexes, contributing to its economic revitalization since 2017. This transformation has attracted numerous companies, significantly boosting employment and resulting in the second-highest overall employment rate and the highest youth employment rate in the region by

2022. Additionally, a continuous influx of foreign workers has led foreigners to comprise 15.9% of its population, the highest in the nation (KOSIS, 2022). exemplifies economic revitalization through manufacturing-oriented job creation, supported by both central and local governments.

3.1.2. Jecheon

Jecheon, located in northern Chungcheongbuk-do near Gangwon-do, transitioned from a cement industry hub to a center for services and tourism. This city, a key transportation and logistics hub at the crossroads of the Jungang, Taebaek, and Chungbuk lines, hosts six agricultural-industrial complexes and three industrial complexes. Recent growth in Bio Valley and the automotive parts sector has increased job opportunities. Additionally, Jecheon focuses on the natural products and traditional Korean medicine industries. The city's prime attraction is its outstanding natural environment, promoting its development as a 'Natural Healing City.' The natural settings of the Sobaek and Charyeong mountain ranges have spurred cultural and tourism activities, leading to a consistent rise in tourist numbers. Jecheon exemplifies a service-oriented type, merging manufacturing, service industries, and tourism.

3.1.3. Yeongju

Yeongju, located in northern Gyeongsangbuk-do, transitioned from an agricultural and railroad hub to addressing economic challenges through urban regeneration starting in 2014 and job creation by social enterprises from 2017. The city houses six agricultural-industrial complexes and five general industrial complexes,

primarily supporting small and mid-sized enterprises in the rayon industry. In partnership with SK Materials, Yeongju launched the 'STAXX Project' to foster a local startup ecosystem. This initiative includes anchor stores, co-working spaces, and business accommodations, enhancing interactions among local youths, entrepreneurs, and residents, thus revitalizing the economy. These efforts have shaped Yeongju as a sustainable social economy type, driven by social and small enterprises.
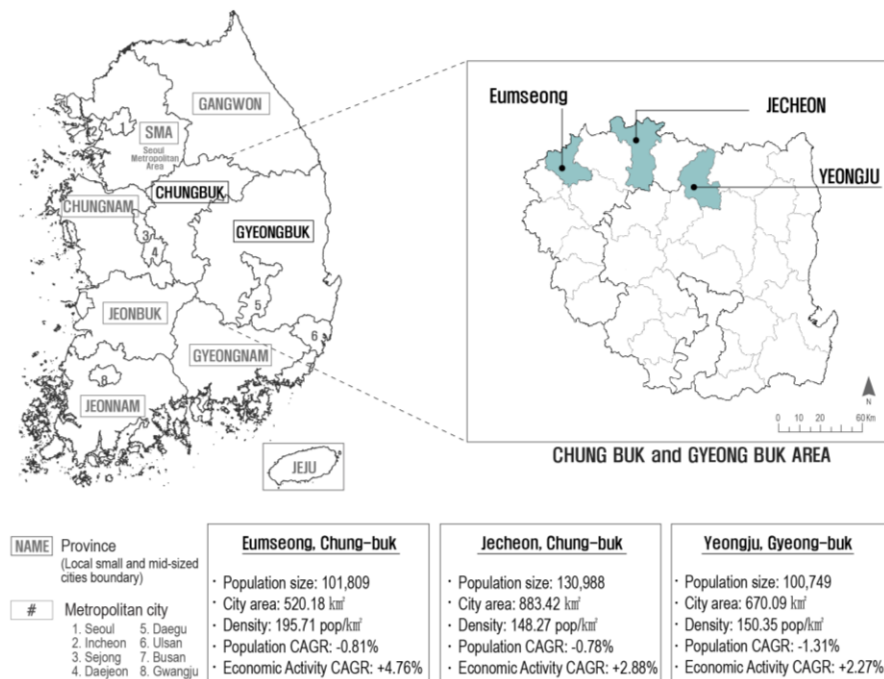
Figure 18. Site area.

3.2. Data Collection and Analysis

This study conducted field research to identify potential characteristics that indicate economic prosperity and sustainable development in cities experiencing population decline. Data is collected in various forms including literature, statistical data,

observations, and interviews.

Data for each representative case of the different types includes government policies and development plans, municipal white papers, community reports, news articles, and previous academic research. The study focuses on changes from 2012 to the present, considering the introduction of the low-growth era since 2011 and the emergence of the Dead-cross phenomenon since 2020.

Therefore, data regarding population changes, the number of businesses and employees by industry classification from 2012 to 2022 were obtained from Statistics Korea. Interviews were conducted with 24 local stakeholders, including municipal officials and workers from each city (Table 8). Specifically, for a deeper understanding of policies related to economic prosperity, this study targeted officials with at least five years of experience working in these cities. The interview questions were structured around the policy and management strategies, economic mechanisms, and local resource utilization aspects outlined in the analytical framework and were conducted in a semi-structured format (Table 9). All participants were provided with information about the research (e.g., purpose of the interview, right to refuse participation, confidentiality of interview data). Interviews were conducted with permission and recorded for transcription.

The collected data were analyzed to investigate the economic prosperity processes of three representative city types. Initially, a comparative analysis of municipal policy white papers and performance documentation from the 7th municipal administration (2018 to 2022), along with statistical data, was conducted to explore how economic prosperity manifests in cities experiencing population decline. Subsequently, the study analyzed the mechanisms and effects of each city's potential for beneficial growth through interviews.

Table 8. Information on the 24 interviewees.

Name	Cities	Position	Gender	Interview time(min.)
Interviewee A	Eumseong	Municipal official (employment)	Male	80
Interviewee B	Eumseong	Municipal official (investment)	Male	48
Interviewee C	Eumseong	Factory tour coordinator	Male	39
Interviewee D	Eumseong	Municipal official (tourism)	Female	44
Interviewee E	Eumseong	Foreigner Help Center	Female	75
Interviewee F	Eumseong	Chungbuk Research Institute	Male	30
Interviewee G	Eumseong	Employee	Male	32
Interviewee H	Eumseong	Employee, Resident	Female	27
Interviewee I	Jecheon	Chungbuk Research Institute	Male	53
Interviewee J	Jecheon	Municipal official (employment)	Female	52
Interviewee K	Jecheon	Municipal official (investment)	Male	62
Interviewee L	Jecheon	Municipal official (foreigners)	Male	46
Interviewee M	Jecheon	Municipal official (tourism)	Male	53
Interviewee N	Jecheon	Municipal official (specialized industry)	Male	52
Interviewee O	Jecheon	Employee, Resident	Male	37
Interviewee P	Yeongju	Municipal official (employment)	Female	45
Interviewee Q	Yeongju	Municipal official (investment)	Male	38
Interviewee R	Yeongju	Municipal official (tourism)	Female	43
Interviewee S	Yeongju	Social enterprise manager	Male	86
Interviewee T	Yeongju	Gyeongbuk Research Institute	Male	46
Interviewee U	Yeongju	Regional accelerator manager	Male	69
Interviewee V	Yeongju	Small-business owner	Female	37
Interviewee W	Yeongju	Small-business owner	Male	58
Interviewee X	Yeongju	Employee, Resident	Male	46

Table 9. Key questions from the interview.

Analysis frame		Key questions
1) Policy and management Strategies	· Economic development policy	· Is there a differentiated strategy for attracting investment in the city?
	· Sustainable development strategy	· How does the interaction between social enterprises and local communities manifest in the city?
2) Economic mechanism	· Industry structure changes	· How do changes in industrial structure (Industry integration) occur in the city?
	· Labor market trends and changes	· How do labor market trends (inflow of migrant workers, job training programs) appear in the city?
3) Resource utilization	· Utilization of local resources	· What local resources have been utilized in the city to develop industries (culture, tourism) and achieve economic prosperity?

4. Results

4.1. Features of Economic Prosperity in the Three Depopulation Cities

This study explored the demographic and economic dynamics, investigating how cities experiencing population decline can still seize opportunities for economic prosperity. Interviews focused on municipal policy and management strategies, economic mechanisms, and the utilization of local resources. The features identified in the three depopulating cities, corresponding to research question (1), are as follows.

Eumseong has relatively mitigated the impact through active foreign influx and job creation compared to other cities, despite experiencing a population decline since 2016 (Figure 19b). Eumseong has the highest number of commuters among national towns, with 23,900 more employees based on workplace than residence, highlighting its characteristics as a commuter city (KOSIS, 2024). Compared to neighboring cities, interviews revealed that the primary cause of population decrease is the migration of residents seeking better living conditions (Interviewee A). Consequently, Eumseong has become characterized by a high number of external workers commuting into the city.

> *"During the development of the Chungbuk Innovation City, Eumseong and Jincheon both contributed to its creation, but Eumseong primarily focused on acquiring commercial land, while Jincheon secured more residential land. Over time, as many people settled in Jincheon's residential areas, commercial activities there increased. In contrast, Eumseong's commercial land demand gradually declined. This strategy of securing commercial land had been a factor accelerating population outflow to surrounding cities."* (Interviewee A)

Eumseong has been implementing various strategies focused on job creation in the realm of urban policy and management (Eumseong Municipal White Paper, 2023). The city has bolstered its industrial structure by adjusting construction schedules and providing manpower and financial support to attract high-revenue advanced industry companies, achieving high employment rates as a result. Moreover, competitive pricing in industrial complexes offers economic advantages to businesses. Economically, Eumseong has diversified its industrial structure through proactive investments in emerging industries and a significant influx of foreign labor. This influx has not only formed a strong foreign network but has also helped to slow the rate of population decline in the city (Lim, 2023). Despite a lack of natural tourist resources, Eumseong has developed industrial tourism themes using its industrial complexes, providing new momentum to the local economy.

Jecheon and Yeongju, typical local cities in Korea, are experiencing ongoing population decline primarily due to young workers relocating to larger cities for better opportunities (Figure 19a). In response, Jecheon has prioritized the development of tourism and health-related industries, dedicating significant budgets to these sectors as highlighted in the Jecheon City Municipal White Paper (2024). Although Jecheon consistently works to attract companies through industrial complexe developments, the specialized and traditional manufacturing-focused industry structure limits job creation, perpetuating the outflow of young talent. To counter these limitations, Jecheon is enhancing economic opportunities through its tourism sector, particularly by utilizing its natural landscapes and historical sites, which significantly contribute to revitalizing the local economy.

Yeongju is grappling with an aging population exacerbated by high agricultural dependency and an increasing proportion of native residents, leading to

urban decline and population loss (Lee, 2020). Efforts to revive the economy through urban regeneration projects since 2014 have focused on fostering social enterprises, making Yeongju recognized for its supportive policies (Yeongju City Social Enterprise Center, 2023). Despite attempts to attract companies to industrial complexes, challenges persist due to a labor shortage and a focus on agriculture and manufacturing, resulting in high vacancy rates. While industrial diversification has lagged, Yeongju has enhanced its social networking to support local businesses and startups, improving investment attraction. Furthermore, its cultural and historical tourism initiatives have seen diminished attention due to similarities with neighboring city and insufficient community cooperation.
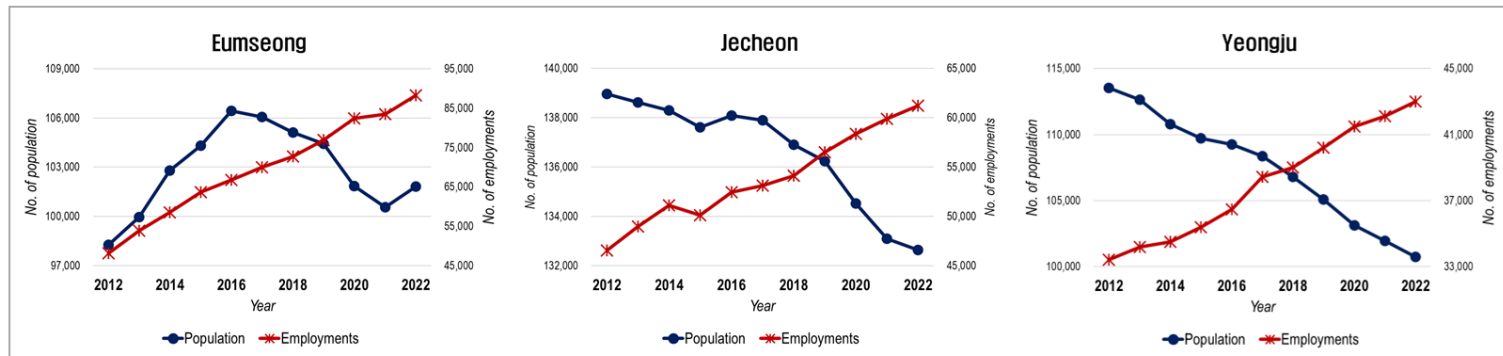
(a). Changes in population and economic activity
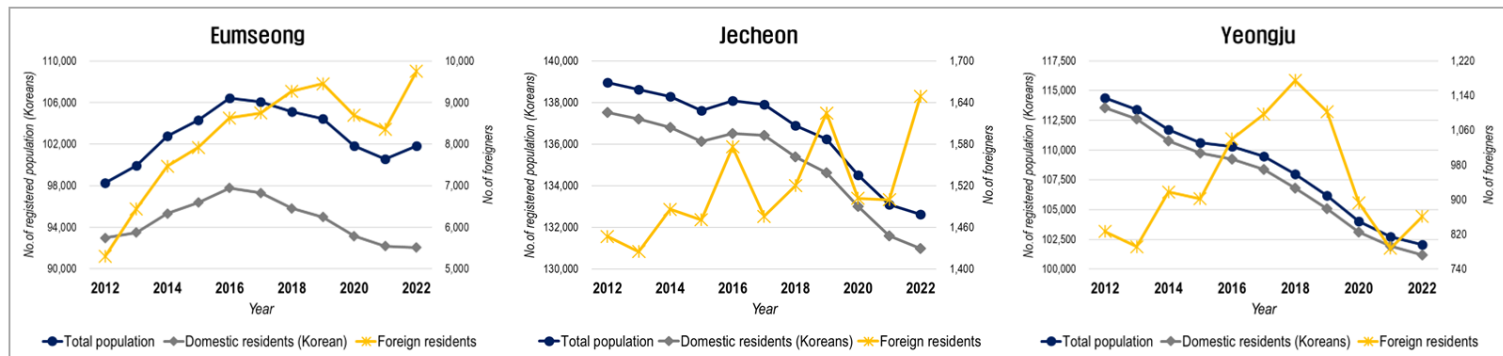
(b). Population changes (Koreans and foreigners)

Figure 19. Changes in population and economic activity by city.

4.2. Economic Prosperity in Depopulating Cities: Conditions and Strategies

Population decline poses a challenge for small and mid-sized cities. In response, cities are adopting various strategies to promote economic prosperity. In this section, I analysed three strategies aimed at fostering economic growth in response to population decline and how they interact. These conditions and strategies include the restructuring of industries through regional linkages, activating cultural tourism through the utilization of local resources, and fostering collaboration and diversity through social networking.

4.2.1. Industrial Restructuring through Regional Linkages

Local small and mid-sized cities experiencing population decline focued on industrialization using local resources and attracting new industries. Two key conditions for their economic prosperity are effectively utilizing local resources and establishing industrial linkages with nearby cities. These conditions are crucial for maximizing economic potential and promoting sustainable development. Resource-linked industrialization leverages each area's unique characteristics to enhance competitiveness, while expanding industries through connections with neighboring cities involves utilizing their resources and industries to form industrial clusters.

Eumseong, satisfying these two conditions, has specialized in the cosmetics and bio industries by leveraging its pristine natural environment and abundant agricultural products. This has resulted in a 164% increase in the number of businesses from 2017 to 2022 (Table 10). Eumseong is now fostering innovative

growth sectors such as new energy, system semiconductors, secondary batteries, and healthcare. These industries are expanding through linkages with the industries and companies in neighboring cities (Eumseong Municipal White Paper, 2023). Given the low fiscal self-sufficiency of small and mid-sized cities, focusing on high value-added new industries is essential to enhancing youth employment rates. However, local resources alone are often insufficient for industrial restructuring. Eumseong has effectively demonstrated this by actively attracting and investing in relevant enterprises through collaboration with universities, research facilities, and businesses in nearby cities such as Chungju and Cheongju, thereby expanding into new growth industries (Figure 20, Interviewee F).

> "*Eumseong's industrial complexes mainly accommodate cosmetics factories and agriculture-related businesses. With a population of around 100,000, Eumseong lacks a dominant industry and has low fiscal self-sufficiency. Thus, attracting innovative growth industries is crucial. To create quality jobs and become business-friendly, we collaborated with strategic industries, universities, and research institutions in nearby cities. This approach diversifies our industrial base. Instead of competing alone, fostering cooperation with similar industries in other cities is essential for mutual growth.*" (Interviewee F)

In contrast, Jecheon and Yeongju have utilized local resources to develop their industries and achieve economic prosperity. However, these cities face difficulties in industrial diversification due to challenges in expanding industries through regional linkages, leading to slower economic progress compared to Eumseong. Jecheon initially grew through the cement industry with regional cooperation, but as the cement industry declined, it shifted its focus to the traditional medicine and natural products industries (Jecheon City Municipal White Paper, 2024). Despite these efforts, these industries struggled to generate high value-added and job creation. Similarly, Yeongju developed its economy around local resources

like ginseng, Punggi silk, and historical and cultural industries (Yeongju City Municipal White Paper, 2023). However, these industries also face limitations in becoming high value-added sectors and improving youth employment rates (Interviewee K).

> *"Jecheon initially over-specialized in traditional medicine and natural products, hindering industrial diversification. Significant budgets were allocated to these low value-added sectors, leading to limited job creation and industrial expansion. Now, the city seeks to attract any industry, resulting in unfocused industrial complexes. For example, Chungju's materials and components factories create stable, high-value jobs. Our city is trying to follow suit, but our image as a traditional medicine hub has slowed other industries' growth. Companies hesitate to settle due to job-labor mismatches. To attract young talent, we need to focus on high-value new growth industries and collaborate with neighboring regions."* (Interviewee K)

For economic prosperity and sustainable development, strategic utilization of local resources and industrial linkages with neighboring cities are essential. Local small and mid-sized cities often lack the human resources and infrastructure compared to larger cities, making growth solely based on local resources challenging (Lee, 2022). Thus, collaboration with research facilities, universities, and businesses in nearby cities is necessary to expand industrial sectors and transition to new growth industries, enhancing industrial value. Integrating surrounding regional industries into clusters is a crucial strategy.

In local small and mid-sized cities, industrial attraction typically around the development of industrial complexes. Unlike cities with competitive advantages that face high land costs, these smaller local cities, experiencing population decline, offer relatively low land prices and make use of idle land to provide an attractive investment environment for businesses. This environment has facilitated the

establishment of new businesses and the expansion of existing ones, ultimately leading to the creation of new jobs and economic revitalization. Specifically, maintaining low land prices through mixed-use development strategies has proven to be a critical factor in attracting competitive businesses to these cities. All three cities have made similar efforts to develop industrial complexes and attract numerous businesses by offering incentives. Among these cities, Eumseong is particularly noteworthy. Despite its proximity to the SMA and the potential for high land prices due to its status as an innovation city, Eumseong has managed to keep land prices relatively low through a financial circulation strategy involving mixed-use development in its industrial complexes. This provides attractive conditions for business attraction (Interviewee A).

The financial circulation strategy involves reinvesting profits from residential and commercial land within industrial complexes into industrial land development, promoting capital circulation and fostering local economic self-sufficiency and growth. This allows businesses to expand their operations at lower costs, significantly contributing to job creation and economic revitalization (Figure 20). While Eumseong's land prices are not substantially lower than those in Jecheon and Yeongju, its mixed-use development approach helps stabilize land and real estate demand and supply (Interviewee B). This prevents sharp fluctuations in land and property prices, providing predictability for investors. Such strategies are particularly effective in depopulating cities, enhancing economic stability and growth for the entire community. This strategic approach has enabled the establishment of numerous factories belonging to large conglomerates, and its success is evident in Eumseong receiving the Local Government Job Creation Award in 2022.

"Facing labor shortages and population decline, small cities offer attractive conditions to compete with the Seoul metropolitan area for business investment. Local governments have established dedicated investment offices and strengthened efforts to attract businesses by directly visiting potential investors. Key factors include low land prices, geographical advantages, and specialized local resources." (Interviewee A)

"Eumseong has differentiated itself by stabilizing land prices through a financial circulation strategy. Profits from residential and commercial land sales are reinvested into industrial land development, providing businesses with affordable prices. For instance, industrial land is sold at 700,000 KRW per pyeong, while residential land within the same industrial complex sells for 2.1 to 3 million KRW per pyeong. This profitable model allows developers to subsidize industrial land costs, making Eumseong's mixed-use development strategy distinct and competitive." (Interviewee B)

In contrast, Jecheon and Yeongju develop industrial and residential zones separately when creating industrial complexes. They provide industrial land for companies and establish residential areas at a distance for workers. This separation limits the application of a financial circulation strategy through mixed-use development, as seen in Eumseong.

The improper management of interregional linkage strategies can foster competition for resources, leading to short-term profit-seeking rather than long-term regional development, ultimately exacerbating regional disparities. While low land prices can reduce initial investment costs and make an area attractive to businesses, workforce recruitment remains a significant challenge that must be addressed separately. Particularly in small and mid-sized cities experiencing population decline, it is essential to develop and implement educational and training programs in close collaboration with local universities and research institutions (Interviewee I). These measures can improve both the quality and quantity of the workforce, thereby

promoting industrial attraction and laying the foundation for growth.

Furthermore, small and mid-sized cities experiencing population decline may struggle to attract advanced industries and achieve regional integration. In response, it is crucial to develop systematic technical education and retraining programs and to activate collaborative networks with nearby universities, research institutions, and businesses to promote technology exchange and joint research and development. Additionally, strengthening industrial connections through regional joint research projects and infrastructure development is vital for fostering regional economic independence and prosperity. By promoting interregional cooperation and establishing mechanisms for sharing resources and technology, regions can move beyond simple competition towards collaboration and mutual growth. This approach is essential for creating a structure that allows regions to leverage synergies through interregional linkages.

> *"In smaller cities, the presence of companies often highlights a manpower issue. It's important not only to attract a new workforce but also to retain local young people. One approach is to introduce advanced industry programs, like semiconductors, at local universities and facilitate student internships and job placements. For example, Eumseong's Meister High School, the first semiconductor high school in the country, reflects such initiatives. However, merely setting up these programs isn't enough. Smaller cities struggle to form single industrial clusters. Thus, creating a robust industrial cluster through regional collaboration involving local universities, nearby institutions, and businesses is vital for fostering university-industry links and enhancing job opportunities for students."* (Interviewee I)
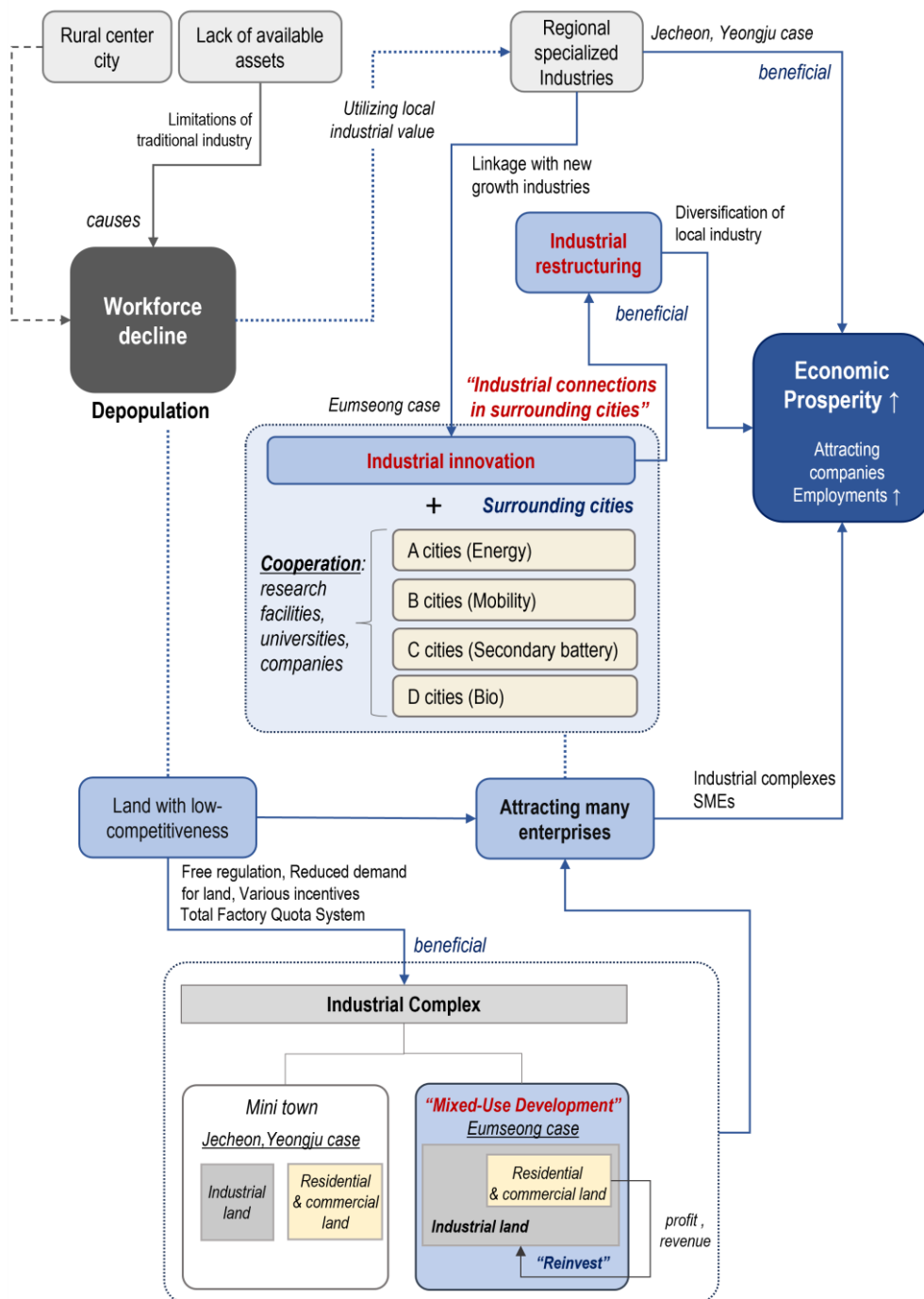
Figure 20. Industrial restructuring through regional linkage.

4.2.2. Revitalizing Cultural Tourism Using Local Resources

To address population decline, local cities must go beyond traditional industrial attraction strategies and pursue economic prosperity by leveraging cultural and environmental resources to promote cultural tourism (Hollander & Meaney, 2022). Cultural tourism can stimulate economic activity, create jobs, and preserve local culture, enabling regional development without increasing the resident population (Lim, 2022). Two key conditions and strategies have been identified in this process.

The first condition is leveraging unique cultural, historical, and industrial assets through festivals and events, which serve as key drivers of the tourism industry. These events attract a significant number of tourists in a short period, providing direct economic benefits to the local economy (Seo & Bae, 2023). For instance, Eumseong's Pumba Festival attracted 216,623 visitors over five days, generating an economic impact of 16.8 billion KRW, with most visitors coming from other cities. Jecheon's Traditional Medicine Bio Expo generated an economic impact of 36 billion KRW, while Yeongju's Punggi Ginseng Festival brought in 45 billion KRW. These festivals also create jobs for residents and strengthen the identity of local culture. Such cultural festivals demonstrate an effective way to bring long-term economic benefits and revitalize the community.

The second strategy involves close collaboration within the local community and the development of cultural tourism products using unique regional resources. This approach has shown economic benefits in Jecheon and Eumseong, enhancing the resident population and creating jobs. As a representative city with natural resources, Jecheon has developed recreation and healing tourism based on mountains, rivers, and hot springs. Additionally, it has created traditional medicine-

based programs that employ local residents, boosting cultural tourism through community cooperation. This led to a 13.24% increase in visitors from the previous year (Jecheon City, 2022). In 2021, Jecheon attracted 6.93 million tourists, proving its status as a wellness tourism hub with tailored policies like wellness programs, glamping, tourism taxis, and culinary marketing (Korea Culture & Tourism Institute, 2022). Notably, Jecheon was identified as the region with the highest per capita local consumption expenditure among depopulated areas (Korea Tourism Data Lab, 2022). By leveraging its unique characteristics and fostering networks among residents, artists, small business owners, and tourism operators, Jecheon has created economic opportunities that enhance employment and consumption. This approach strengthens local economic activity and improves residents' quality of life, rather than merely increasing population numbers.

These efforts are evident not only in the public sector but also among private companies. Eumseong's 'Factory Tour' program attracts tourists by developing unique experiences and tours through a close network of local industrial complex companies. This innovative cultural tourism model combines industry and tourism, offering visitors the opportunity to experience the manufacturing process and create products themselves. Initiated through collaboration between the local government and private enterprise H, the program now involves 16 companies working together to develop tourism products and activities, increasing Eumseong's foot traffic population. The Factory Tour Center serves as a hub, forming close networks among local schools, welfare facilities, and companies, and fostering a sustainable economic cycle (Figure 21, Interviewee C, D and H).

> *"Eumseong, with its numerous industrial complexes but limited tourism resources, addressed this by opening the Factory Tour Center in 2018, in collaboration with Handok (H) enterprise. The center, created by remodeling*

an abandoned building on Handok's site, works with the local industrial council to develop tour products that showcase factory operations and offer interactive activities. Participating companies increase their credibility, promote their products, and attract specialized travel agencies." (Interviewee C)

"*Visitors increased from 8,702 in 2018 to 13,921 in 2023, a 160% rise. Profits from the center's cafe fund (when paying for coffee, it is called the Industrial Tourism Development Fund) public purposes, support activity costs, employ baristas from local welfare facilities, and sell bread from local schools at cost, contributing to the local economy and job creation. This virtuous cycle enhances the sustainability of the initiative.*" (Interviewee D)

"*Factory tours in Eumseong offer visitors the opportunity to experience product making firsthand at local businesses. Tour activities include making tofu, sausages, handwash, tasting beer, and creating Sikhye (a traditional sweet rice drink). The tours attract families, couples, and foreigners. Additionally, a local toilet factory has innovated by allowing visitors to repurpose toilets into plant pots and chairs, and even features a café for a unique experience. Eumseong's open factory approach transforms typically closed spaces into hubs of activity and interaction, fostering a vibrant economic environment. Companies participate actively in these tours, with a brewery also involved, leading to robust networking and economic benefits as businesses purchase each other's products during events and celebrations.*" (Interviewee H)

In contrast, Yeongju promoted cultural tourism by highlighting its UNESCO World Heritage sites and other historical and cultural locations. However, Yeongju's strategy primarily focused on visits to historical sites, with limited expansion into cultural experiences or diverse tourism activities, resulting in less impact compared to the cases of Eumseong and Jecheon. Despite having many social enterprises that could boost tourism, Yeongju faced challenges in fostering close

networking among local businesses, residents, and the local government (Interviewee R). This resulted in tourism offerings mainly limited to food, lodging, and incentives for external visitors, with a lack of diverse content. As a result of these factors, Yeongju was rated low on the tourism development index (Korea Culture and Tourism Institute, 2023).

> *"Yeongju primarily offers tourism products based on Confucian culture but loses visitors to nearby cities with similar programs. The city mainly provides incentives for food and lodging businesses, which limits sustainability. Despite having many small enterprises, Yeongju lacks a strong network to connect them with tourism. The focus on historical resources and government-led tourism development has resulted in insufficient collaboration with local communities, making it difficult to develop differentiated content and tourism products."* (Interviewee R)

Figure 21. Revitalizing cultural tourism using local resources.

4.2.3. Collaboration and Diversity through Social Networking

Despite population decline, two key conditions for achieving economic prosperity are social networking and support for foreigners. Compared to large cities, these local cities have relatively limited economic opportunities. Social networking can foster collaboration among local youth, small business owners, and entrepreneurs, thereby stimulating economic activity. Effective networking facilitates the efficient use of local resources and economic self-sufficiency, contributing to regional economic growth.

The first finding highlights that social networks can achieve economic prosperity by strengthening community solidarity and cooperation. All three cities established advanced industry programs in collaboration with local universities, creating jobs through education-to-employment pathways. They also provided employment support through Job Welfare Plus Centers. Notably, Eumseong developed a robust system where close communication between company HR departments and the Job Welfare Plus Center ensured seamless transitions for contract workers into new employment. Eumseong's collaboration with neighboring cities on the Employment Stability Proactive Response Package Project supported stable employment services for job seekers and new growth industries, driving economic prosperity.

In Yeongju, social networking is particularly active, with the Social Enterprise Support Center enhancing collaboration among social enterprises. These enterprises develop products that leverage their strengths, recently launching a tourism package involving seven companies (Yeongju Social Enterprise Center, 2024). Additionally, experienced entrepreneurs provide mentoring and training

through active networking. A prime example, 'Halmae Muk Factory,' overcame financial difficulties through collaborative networking, maintaining stable operations. These enterprises reinvest part of their profits into regional development, creating a virtuous economic cycle.

> *"Established in 2016, Halmae Mook Factory is a social enterprise that was started by local grandmothers through an urban regeneration project. Initially, the business ran smoothly, but it faced management difficulties. The COVID-19 pandemic dealt an even greater blow, but the company was able to survive with the help of some social enterprise leaders who collaborated to support administrative tasks, sales, and pre-orders. As social enterprises in Yeongju became more active, collaborations and partnerships flourished, leading to an increase in the size and number of social enterprises. As a result, Yeongju has the second highest number of social enterprises per capita in Gyeongsangbuk-do. Thanks to this active networking, Yeongju was awarded the top prize for excellence in fostering social enterprises nationwide."*
> (Interviewee S)

Notably, Yeongju has achieved economic success through the youth startup ecosystem project 'STAXX.' This public-private partnership, launched by SK Specialty, social venture accelerator Impact Square, and the Yeongju municipality, aimed to create a regional co-prosperity model by increasing social ventures. STAXX remodels underutilized old buildings into economically valuable spaces, fostering collaboration and mutual growth through networking, education, and information exchange. Local accelerators reside in these spaces, helping businesses thrive and promoting startups in small cities (Figure 22). This approach has led to a rise in small social enterprises with 1 to 4 employees, positively impacting economic prosperity (Table 11). Businesses involved in the STAXX project have shown a 26.4% annual revenue increase, contributing 280 million KRW to local income through local agricultural purchases and employment, and generating approximately 2,200

affiliated population, including tourists. Additionally, around 30 young people have moved to Yeongju, injecting new vitality into the local economy (Yeongju City, 2024). Additionally, in Yeongju, vibrant networking for youth is evident at the 'Youth Smart Startup Factory' and 'Startup Support Center' besides STAXX (Interviewees U and V).

> *"The Youth Smart Startup Factory was created in Yeongju to help reduce youth unemployment and generate new jobs. It supports startups by connecting with relevant institutions and focuses on future industries, including the fourth industrial revolution. It's located at Gyeongbuk Polytechnic College and uses its space for various cultural events and exhibitions for the youth. The Idea Factory encourages young people to start their businesses by providing support from the beginning and ongoing help, working closely with the college and local community. Equipment like machining centers, sliding angle adjusters, and small wood processing machines help young people turn their ideas into reality. Also, in social dining events, food entrepreneurs can come together to experiment with and taste new menus and share their thoughts."* (Interviewee U)

> *"We moved my F&B business from Seoul to Yeongju due to rising rent. After considering several places, we chose Yeongju because of its strong support for the startup ecosystem through the STAXX program. Here, we run a restaurant and cafe using local produce and receive housing support from the Return-to-Farm Town initiative. The STAXX program offers valuable resources like information exchange, startup education, and networking with locals."* (Interviewee V)

The STAXX project, a regional contribution initiative by SK Speciality, aims to establish a youth entrepreneurship ecosystem. However, there was a significant issue wherein the youth of Yeongju could not to participate in this project; The project was opened to all regional youths through an external corporate application process without providing any incentives to the young people of Yeongju.

As a result, local young people are being marginalized. This situation has led to an influx of entrepreneurs from outside the area, reducing employment opportunities for local youth and ultimately causing a decline in the native population. Additionally, while the Yeongju local government does provide support for youth entrepreneurship, the networking and mentoring opportunities are insufficient compared to collaborative projects involving companies like STAXX, accelerators, and the municipality. This lack of support poses challenges for sustainable business operations post-startup (Interviewee W). This suggests that while the competitive process for supporting youth entrepreneurship may lead to an influx of economically active populations from outside, it simultaneously implies the potential for native residents to miss out on opportunities and consequently be driven out.

> *"I was born and raised in Yeongju but moved to another region for college. I returned after being selected for a local entrepreneurship support program. However, upon arrival, I found that while financial support is provided, it is grossly insufficient for sustainably continuing a business, and there aren't many opportunities for communication. There are no mentoring programs, and the financial support will end after a year, leading me to worry about possibly having to relocate again. Actually, the residents of Yeongju do not seem to welcome those of us who have moved here to start businesses; they think we will leave once the financial support ends. I also applied to the STAXX project, which has intense competition with many youths from across the nation and well-established companies from Seoul applying. This competition was fierce from the presentations, resulting in no young people from Yeongju being selected. Eventually, I wonder if the youth of Yeongju will have to leave for better job opportunities in other cities?"* (Interviewee W)

Despite a well-established entrepreneurship ecosystem in Yeongju, the issue of labor shortages remains unresolved. While Yeongju experiences active small-scale entrepreneurship, efforts by local authorities to attract headquarters of a

start-up firms ironically may accelerate the relocation of established businesses to other cities. The Social Enterprise Center in Yeongju supports networking and collaboration for businesses when they relocate headquarters or start up in the region. However, this relocation can exacerbate the labor challenges faced by small enterprises, potentially having a long-term negative impact on the local economy (Interviewee V).

> *"Through the STAXX project, a major issue that many entrepreneurs face when coming to Yeongju is the shortage of skilled workers. It's becoming increasingly difficult to find good talent. Most of our staff are those who moved here with their previous employers from other regions. For instance, in the F&B sector, if you need to hire cafe or restaurant staff in Yeongju, who will want to come all the way here? Would they come just because the headquarters are in Yeongju? Considering you have to live in Yeongju permanently... To further invigorate the entrepreneurial ecosystem, it might be better to keep the headquarters in another region but operate a branch in Yeongju, consider rotating staff, and if necessary, actively utilize foreign workers."* (Interviewee V)

While local governments in small and mid-sized cities are making efforts to support the relocation and entrepreneurship of youth through financial assistance, it is evident that the role of social networks in building an entrepreneurial ecosystem is even more crucial. This highlights the importance of 'economic gardening,' which involves using local resources to facilitate entrepreneurship, particularly in the development of prototypes. Such an approach is likely to contribute to creating a sustainable entrepreneurial environment that positively impacts the local economy.

The second strategy involves attracting and supporting foreign workers as a key driver of economic prosperity. Recruiting foreign labor addresses workforce shortages in labor-intensive industries and local businesses. Additionally, expanding

social and economic opportunities through multicultural networking contributes to regional economic revitalization. Eumseong exemplifies how attracting foreign workers can lead to economic prosperity.

Eumseong has addressed labor shortages in its industrial complexes by attracting foreign migrant workers, transforming the area into a hub for foreign residents. Despite initial challenges in networking and job placement, support organizations like the Sophia Foreign Assistance Center have facilitated their integration and economic contribution. These organizations offer diverse support, including Korean language education, cultural understanding programs, and counseling services for multicultural families (Lim, 2023).

Economic prosperity in Eumseong is driven not only by the direct labor supply from foreign workers but also by the growth of diverse cultural restaurants and service industries (Figure 22). The number of employment agencies increased from 45 in 2017 to 105 in 2022, supporting this economic revitalization (Eumseong City, 2023). The Foreign Assistance Center provides comprehensive support to migrant workers, including job placement, social events, and addressing life cycle issues. They also offer Korean language education to help migrant workers upgrade their visas (E9, E7, F2, F4) for long-term settlement with their families. Attracting and supporting foreign workers is thus a key strategy for revitalizing depopulating cities economically, culturally, and socially, fostering sustainable growth (Interviewee E).

> *"Eumseong is home to migrant workers from many countries, and sports unite them, just as it does everywhere. The increasing number of foreigners has led to the spontaneous creation of support centers. This concentration of foreign residents has resulted in increased consumption and job creation, which are positive outcomes. However, due to some negative perceptions, continuous*

education in Korean language, crime prevention, Korean culture, safety, and fire protection is provided to help foreigners integrate well. Migrant worker visas can be upgraded based on Korean proficiency, average income, age, industry, and whether they reside in a depopulating area. Higher visa levels determine if their spouses can live and work in Korea or if their children can attend college. I believe that having foreigners in depopulating areas contributes significantly not only to the population but also to job creation." (Interviewee E)
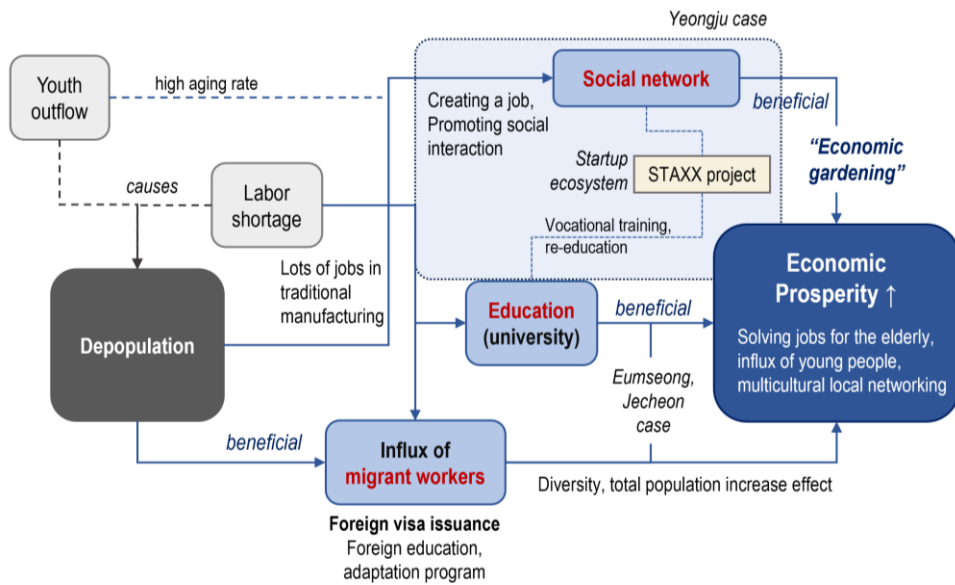
Figure 22. Collaboration and diversity through social networking.

The active influx of foreigners can invigorate the economy of local small and mid-sized cities and contribute to solving the issue of labor shortages. However, it can also lead to various social issues. Notably, the increase in crime rates, language barriers, and cultural and religious differences can heighten tensions between local communities and foreign communities, potentially increasing social instability (Flores & Schachter, 2018). These issues may deepen the divide between nationals and foreigners and hinder social interactions (Interviewee E). To minimize these side

effects, local governments need to take proactive measures through foreigner support centers. Regularly hosting events and projects that blend local and foreign cultures is crucial for fostering understanding and respect among people from diverse backgrounds. Additionally, developing tailored educational programs for foreign workers and their children, including language skills and vocational training, is essential for integrating them into the community and nurturing talents that can contribute to the community in the long run. Such measures will promote comprehensive social integration within the region and help small and mid-sized cities maximize the positive effects and minimize the negative impacts of foreign influx.

> *"Residents in Eumseong voiced complaints about immigrants gathering around foreign grocery stores, citing issues like littering and disorder. There were also concerns about public safety. To address this, a Foreign Help Center was established to help immigrant workers settle in and prevent divisions between locals and foreigners. The center conducted regular interviews with immigrant workers to prevent crime and organized volunteer clean-ups, collecting litter and cigarette butts from the streets. Additionally, they formed a "Foreign Security Patrol" by nationality, patrolling busy areas on Friday and Saturday nights to ensure safety. Such social network organizations are essential for helping immigrants settle in and promoting multicultural acceptance among Eumseong residents. It is anticipated that this active networking may lead to events involving both locals and immigrants."* (Interviewee E)

Table 10. Change of businesses in the Eumseong, Jecheon, and Yeongju city in 2017 and 2022 per major industries.

City	Year	Total number of businesses	Number of businesses per major industrial sector							
			Agriculture, forestry and fishing	manufacturing	Wholesale and retail trade	Information and communication	Professional, scientific and technical activities	Arts, sports and leisure-related service	Business facilities management and business support services	Others
Eumseong	2017	9,361	30	2,123	1,891	22	144	214	253	4,684
	2022	16,068	102	3,495	3,218	167	411	489	325	7,861
Jecheon	2017	12,874	27	924	3,330	48	182	216	393	7,754
	2022	19,001	74	1,090	4,246	85	298	336	453	12,419
Yeongju	2017	9,608	11	788	2,780	42	137	107	233	5,510
	2022	13,546	36	907	3,345	75	209	172	255	8,547

Table 11. Change in number of businesses and by employee size of the Eumseong, Jecheon, and Yeongju city in 2017 and 2022 total industries.

City	Year	Total number of businesses	Number of businesses per major industrial sector					
			1-4 workers	5-9 workers	10-49 workers	50-299 workers	300-499 workers	Over 500 workers
Eumseong	2017	9,361	6,879	1,182	1,068	219	7	6
	2022	16,068	13,055	1,392	1,381	225	8	7
Jecheon	2017	12,874	10,869	1,127	770	103	3	2
	2022	19,001	16,989	1,061	827	118	4	2
Yeongju	2017	9,608	8,185	801	549	68	3	2
	2022	13,546	12,244	766	464	67	2	3

5. Discussion and Conclusion

This study explores how local cities experiencing population decline can avoid economic decline. The study demonstrates that appropriate economic strategies and innovations can lead to the revitalization and prosperity of these cities. Through a cross-case analysis of various economic revitalization strategies implemented in three small and mid-sized cities, the study identifies key strategies: industrial restructuring through regional linkage, revitalization of cultural tourism through the collaboration of local resources and communities, and enhancement of collaboration and diversity through social networking. Based on these strategies, the following insights and implications can be derived.

This study demonstrates the potential for economic revitalization in small and mid-sized cities, showing that economic prosperity can be achieved despite population decline through appropriate strategies. This contributes to shifting the negative perception of small and mid-sized cities. Moreover, as noted by Bartholomae et al. (2017) and Ma et al. (2020), achieving economic prosperity in these cities requires the diversification of the economic base through innovative industrial structures.

Firstly, fostering advanced industries through regional linkage is considered a key strategy for the economic prosperity of local small and mid-sized cities. This approach is particularly prominent in domestic examples, where these cities adopt strategies to cultivate advanced industries through active industrial linkage with neighboring cities. For instance, cities like Eumseong have attracted small and medium-sized enterprises (SMEs) and entrepreneurs through cooperation with adjacent cities, utilizing local resources to form industrial clusters and provide

new momentum to the regional economy. In contrast, international cases such as Pittsburgh in the USA and Leipzig in Germany have successfully fostered advanced industries primarily through collaboration with local universities and research institutions (Lee, 2020). This difference highlights that different strategies are required depending on each region's economic structure and resource availability. In environments like the USA and Germany, where strong research and educational infrastructure is available, university-industry collaboration can act as a key driver for advanced industries.

In South Korea's local small and mid-sized cities, directly applying this university-industry collaboration model may be challenging, but inter-regional cooperation can combine each area's strengths and enable the sharing of technology and resources through networks. This contributes to the diversification and innovation of the local economy, emphasizing the strategic importance of inter-regional linkage. Therefore, it suggests that these cities need to strengthen networks and cooperation between regions to foster advanced industries and pursue sustainable development. This strategic approach can play a crucial role in enhancing urban competitiveness while maximizing the use of domestic regional characteristics and resources.

Secondly, the revitalization of cultural and tourism industries serves as a strategy to diversify local economies by leveraging unique cultural assets to generate external revenue, a method proven effective in depopulated German areas (Turok & Mykhnenko, 2008). Success in such endeavors relies not just on possessing resources but on developing unique tourism products through local community collaboration. For instance, while Yeongju has seen limited tourism growth due to an overemphasis on preserving local uniqueness or inadequate community collaboration, Jecheon and

Eumseong have thrived by partnering with local businesses. A similar trend is observed in Japan, where smaller cities like Kawaba combat depopulation and economic decline by engaging local residents as 'storytellers' and forming cooperatives to develop and sell unique tourism products (Lim, 2022).

This approach plays a crucial role in strengthening the sustainability of local communities and economies. In small and mid-sized cities with limited resources, the tourismification through close collaboration with local residents and businesses becomes even more vital. This strategy can invigorate the local economy and contribute to long-term economic prosperity by effectively responding to population decline and economic downturn through the development of a tourism industry that capitalizes on the region's unique characteristics.

Lastly, social networking and the promotion of diversity are essential elements for economic innovation and growth in small and mid-sized cities. Strong social networks provide the necessary support for local youths, entrepreneurs, and foreigners, enabling sustainable economic activities. In this context, industry-academia cooperation and vocational training through cooperation with educational and research institutions and local accelerators have been proven to be success factors for hidden champion companies in Germany. (Kim, 2020). The case of Yeongju illustrates the need for specialized entrepreneurial ecosystems through social networks rather than just attracting large corporations. Strengthening technological development and entrepreneurial support through cooperation with local universities and industry sectors, nurturing local industries and small businesses, and revitalizing underutilized spaces can enable local companies to serve as 'seeds' for economic prosperity. These characteristics are consistent with the recovery of Allentown in the United States, which suffered an economic crisis, by

strengthening local startups, increasing population and achieving economic prosperity. Through the Ben Franklin Program, Allentown brought together local business, university, and labor leaders into one community and fostered entrepreneurship, resulting in population growth and economic prosperity (Lee, 2015).

These strategies create a stable entrepreneurial ecosystem in the region, allowing local talents to sustain economic activities without leaving. This requires a strategic approach that goes beyond mere financial support, emphasizing the importance of long-term strategies that support economic prosperity beyond short-term measures like relocation and settlement assistance. This demonstrates how small cities can overcome economic crises and secure new drivers for growth.

Comprehensively, the economic prosperity and diversification of industries in small and mid-sized cities cannot be achieved through the efforts of corporations or local governments alone. Many cities try to inject economic vitality by attracting advanced industries, but long-term prosperity can be challenging if new jobs do not replace or complement the existing mainstay industries. Particularly in small and mid-sized cities with limited resources and workforce, it is essential to foster industries that can take root locally through collaboration among various stakeholders and to build strong networks. Moreover, to address demographic imbalances such as those resulting from zero-sum scenarios, integration and cooperation at a broader regional level are necessary, rather than competition between cities.

Specifically, regional capacity and policy efforts are significantly influenced by how central government and metropolitan municipality view the city, beyond the scope of local government units. Therefore, when establishing regional

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linkage strategies, it may be necessary to pursue wide area linkage strategies along with urban hub strategies. This approach can create wide-area clusters and promote mutual growth among regions, playing a crucial role in fostering small businesses through social networking and innovation and in developing sustainable cultural and tourism products. Such strategic approaches are critical in enabling small and mid-sized cities to achieve economic leaps and diversify their industries.

This study integrates these elements to propose concrete and practical strategies for achieving economic prosperity despite population decline. This approach addresses critical factors that have not been sufficiently explored in previous research, clearly distinguishing this study from existing ones. By exploring the conditions and strategies for economic prosperity in small and mid-sized cities experiencing population decline, this study contributes to establishing a foundation for sustainable growth and economic revitalization.

However, this study is limited to the cases of three cities, which constrains the generalizability of the findings to other regions. Considering the unique economic, cultural, and social conditions of each area, additional research and tailored approaches are necessary for broader application of the results. Moreover, the long-term effects and sustainability of the proposed economic revitalization strategies were not thoroughly evaluated due to time constraints. Therefore, future research should comprehensively analyze a wider range of regions and apply multidimensional evaluation criteria to achieve a more in-depth and comprehensive understanding.

Chapter 5. Conclusion

1. Research Findings

This study re-examines the relationship between population decline and economic growth, demonstrating that population decrease does not necessarily equate to economic decline. In the second chapter, I developed a new classification method using population and economic indicators, specifically the 'Eight-quadrant city classification matrix.' Unlike previous studies, this research subdivided the types where population and economic indicators show opposite trends (e.g., decreasing population but increasing economic activity, increasing population but decreasing economic activity), categorizing them respectively as urban growth and shrinkage.

Notably, the complementary economic growth (CEG) cities, characterized by a declining population but economic growth, were classified as urban growth type, revealing that population decline is not a definitive indicator for distinguishing between urban growth and shrinkage. This study's significance lies in proposing a methodology that more clearly differentiates between growing and shrinking cities, providing a deeper understanding of urban realities. This approach contributes

significantly to enabling policymakers to develop more detailed and responsive strategies.

The third chapter analyzed the distinguishing characteristics of CEG cities as compared to typical growth and shrinking cities. According to the analysis, CEG cities focus on high-value industries driven by knowledge intensive services (KIS) industry, which act as a crucial factor enabling economic prosperity despite population decline. The high mobility and flexible residential choices of KIS industry workers foster a new lifestyle that transcends traditional commuting patterns, and they leverage cultural availability to enhance work, leisure, and quality of life in urban settings. Additionally, the fact that CEG cities experience strong economic growth despite high housing prices and limited housing supply provides evidence that population decline does not necessarily equate to economic decline.

In the fourth chapter, I explored the potential for cities experiencing population decline—referred to as CEG cities—to stimulate urban revitalization and economic prosperity through appropriate economic strategies and innovation. This chapter presented case studies from three small and mid-sized cities, illustrating how industrial restructuring through regional linkage, activation of cultural tourism through collaboration with local resources and communities, and enhancement of cooperation and diversity through social networking can interact to drive economic prosperity in each city. It highlighted that the restructuring required for economic prosperity and industrial diversification in these cities cannot be achieved solely through the efforts of corporations or local governments and noted the challenges these cities face in attracting advanced industries. Thus, it emphasized the importance of creating industrial clusters and promoting mutual growth strategies through regional cooperation rather than competition between cities. Furthermore,

CEG cities have demonstrated that building an entrepreneurial ecosystem and attracting foreign nationals are feasible through local social networking. Collaborations with local residents and businesses play a crucial role in developing sustainable cultural and tourism products. This approach strengthens the economic resilience of small and mid-sized cities and offers a direction for achieving tangible economic prosperity through cooperation with various local and external stakeholders.
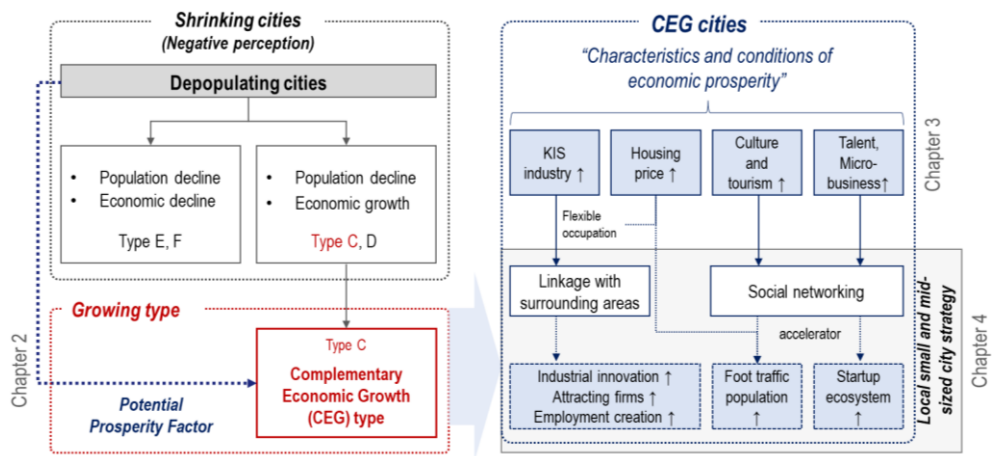
Figure 23. Features and conditions of the CEG cities.

2. Implications and Suggestions for Future Research

This study developed an urban classification matrix, emphasizing the importance of both population and economic indicators in distinguishing between growing and shrinking cities. Unlike traditional studies on shrinking cities, it revealed that CEG cities, despite population decline, exhibit growth patterns similar to growing cities, suggesting a positive perspective on population-declining cities.

Furthermore, the study highlighted the limitations of understanding urban population and economic variables through a simplistic lens in a knowledge-based economy, unlike in the past when population and labor were aligned. The research identified key factors that differentiate CEG cities from growing and shrinking cities based on knowledge-based industrial structures, exploring the potential for economic prosperity even amid population decline. These findings have significant implications for urban policy and planning, offering insights for sustainable urban development.

Firstly, CEG cities specifically aim to diversify their economic foundations and energize their urban economies by fostering new industries, particularly KIS industry. In cities experiencing population decline and traditionally dependent on conventional industries, it is crucial to transition to high-value industries to create new jobs and enhance economic vitality. In small and mid-sized cities, there are challenges in nurturing high-value industries due to limited resources. Therefore, these cities should explore industrial expansion through linkages with surrounding areas and create economic synergies through regional cooperation and cluster formation. Specifically, while simple competition between regions may successfully attract businesses and populations, it carries the risk of devolving into a zero-sum

game with other cities. As an alternative, small and mid-sized cities should foster mutual growth in the regional economy through cooperation and linkage rather than competition. In this process, strategies that seek common benefits play a crucial role in creating regional synergies and securing long-term economic stability.

Secondly, the CEG cities model emphasizes the flexibility of residential choices and high mobility, suggesting new lifestyle possibilities that transcend traditional commuting patterns. The concentration of high-value industries, flexible job markets, competitive business locations, and high investment value have led to rising housing prices, which in turn promote fluidity in residential choices. To address population, decline due to the high growth rate of housing prices, there is a need for housing stabilization policies, such as providing rental housing for young people. While such housing stabilization policies may be beneficial in the short term, they must be carefully considered, as lowering housing prices in CEG cities could attract populations from surrounding areas experiencing growth or decline, ultimately leading to population imbalances such as zero-sum outcomes.

Moreover, to strengthen a city's competitiveness, it is more crucial to implement policies that promote the influx of the foot traffic population from the perspective of population decline. The influx of the foot traffic population can enhance the economic and cultural vitality of the city, stimulating consumption and activity within the city and contributing to economic growth. Through these measures, CEG cities can mitigate the negative effects of population decline and promote more sustainable growth.

Thirdly, in an era of population decline, it is essential to identify and leverage unique cultural assets to promote cultural tourism. This approach goes beyond zero-sum efforts to attract new residents from another cities; it is a crucial

strategy for enhancing urban economic vitality. Small and mid-sized cities, in particular, need to develop differentiated tourism products using historical or natural resources. Collaboration with local communities is crucial in this process. By working with residents to offer unique tourism experiences, cities can strengthen cultural identity and return economic benefits to the community.

This strategy maximizes the use of local cultural assets and potential to invigorate the local economy and positively impact the broader community through sustainable development. Strategically utilizing and promoting the region's unique characteristics to boost cultural tourism is vital for diversifying the local economy and laying the foundation for long-term prosperity. Such a strategy helps address population decline and transforms economic challenges into opportunities.

Lastly, strengthening social networking in CEG cities plays a crucial role in diversifying and enhancing the resilience of the local economy. Enhanced networking in small and mid-sized cities increases local connectivity, expands social capital, and promotes economic cooperation. Networking among local businesses, universities, and research institutions can attract and retain regional talent, mitigating the issues of population decline and economic downturn. Additionally, strategies to encourage international immigration and strengthen immigration policies are necessary to counter natural population decline. Policies to attract foreign workers and encourage young people to settle can help CEG cities overcome the negative effects of population decline and promote sustainable growth.

Furthermore, developing programs to increase the economic participation of the elderly population is essential. Re-education programs and flexible working conditions for seniors can alleviate labor shortages and stimulate economic activity. These measures strengthen the economic and social sustainability of cities,

contributing to growth driven by the interaction between population and economy. Therefore, urban planners and policymakers must develop and implement policies that promote and support such networking.

This study presents strategies for achieving long-term prosperity and sustainable development in cities, emphasizing the need for inter-city cooperation and interdependence. It supports the study's core hypothesis that there is no direct correlation between population decline and economic deterioration, offering ways to turn challenges into opportunities.

While this study explored the characteristics and strategic approaches of CEG cities, it did not fully address the long-term effects and complexities of implementing these strategies. Future research should analyze how CEG cities are linked with surrounding regions to enhance economic vitality and the specific outcomes of these linkages. Additionally, evaluating the long-term impacts of cluster formation on regional economies is necessary to verify the sustainability and effectiveness of the CEG cities.

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Abstract in Korean

도시 성장과 축소 이해:
인구감소 도시에서 경제적으로 번영하는 유형을 근거로

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현대사회는 저출산, 고령화, 산업구조의 전환, 그리고 글로벌화와 같은 다양한 도전을 맞이하며 전례 없는 도시화의 시대를 경험하고 있다. 이러한 맥락에서, 전 세계 많은 도시들은 성장 지향적 패러다임에서 축소로의 전환을 겪고 있다. 이 변화는 도시계획과 지역 발전의 중요한 과제로, 도시의 성장과 축소를 정확히 이해하고 각 도시 유형에 적합한 정책을 통해 도시의 회복력을 강화할 필요성을 제기하였다. 본 연구는 도시 성장과 축소를 이해하는 새로운 관점을 제시하며, 인구 감소에도 불구하고 경제적 번영을 경험하는 도시 유형을 면밀히 분석하는 것을 목표로 한다. 연구를 통해 인구 감소가 경제적 쇠퇴로 직접 연결되지 않는 다양한 사례를 식별하고, 이를 통해 도시의 성장과 축소를 보다 세밀하게 이해하고 예측할 수 있는 방법론을 제시하고자 하였다. 더 나아가, 본 연구는 저출산 및 고령화가 주도하는 인구 감소의 시대에 경제적 번영을 통한 성장 잠재력을 갖춘 도시로의 전환을 위한 다차원적 접근 방식을 모색함으로써, 현대 도시계획과 지역 발전에 필수적인 시사점을 제공하고자 한다. 본 연구는 다음의 세 개의 장으로 구성되어 분석을 진행하였으며, 각 연구에 대한 주요 결과는 다음과 같다.

첫번째 연구에서는 인구와 경제적 지표를 이용해 도시의 성장과 축소를 세분화할 수 있는 분류법을 제안하였으며, 인구가 감소하지만 경제적 번영을 나타내는 유형인 CEG cities 가 도시 성장 유형으로 분류될 수 있음을 밝혔다. 구체적으로, 본 연구는 기존의 인구와 경제 지표에 기반한 도시의 성장과 축소 분류 방식이 도시 유형의 특성을 과도하게 단순화했다는 문제점을 인식하고, 인구와 경제 활동 지표 간의 상호작용을 통합한 새로운 8 사분면 도시 분류 매트릭스를 제안하였다. 본 연구에서는 한국의 228 개의 행정구역을 대상으로 도시분류 매트릭스를 적용한 결과, 6 개의 유형으로 세분화되었다. 본 연구에서의 결과로 인구는 감소하였으나 경제 활동이 증가한 도시들이 성장 패턴을 보이는 것을 발견하였다. 이러한 결과는 도시 변화의 진단 및 분류를 위한 정교한 분석 프레임을 제공하며, 이는 도시 및 지역 정책 수립에 중요한 기여를 할 수 있음을 시사한다.

두 번째 연구에서는 CEG 도시들이 어떠한 전략적 요인으로 인구 감소에도 불구하고 경제적 번영을 나타낼 수 있는지를 분석하였다. 이 연구의 주요 목적은 CEG 도시들이 전통적인 도시 성장 또는 축소 모델과 구별되는 독특한 요인과 특성을 식별하는 것이다. 이를 위해 한국의 146 개 도시를 대상으로 인구학적, 경제적, 사회적, 물리적 지표를 활용하여 기술 통계 및 다항 로지스틱 회귀 분석을 수행하였다. 연구 결과에 따르면, CEG 도시들은 주로 지식 집약적 서비스(Knowledge-Intensive Services, KIS) 산업을 중심으로 고부가가치 산업에서의 성장을 경험하고 있으며, 이는 인구 감소에도 불구하고 경제적 번영을 가능하게 하는 주요 요인으로 작용하고 있다. 즉, KIS 산업 종사자들의 높은 이동성과 주거지 선택의 유연성은 전통적인 출퇴근 패턴을 초월하는 새로운 도시 생활 양식을 조성하며,

이는 문화적 가용성을 활용하여 일, 여가 및 삶의 질을 향상시키는 도시 패턴을 제시할 수 있다.

이러한 경제적 번영에도 불구하고, CEG 도시들은 높은 주택 가격과 제한된 주택 공급이라는 문제에 직면하고 있음에도 강력한 경제 성장을 경험하고 있다. 이는 인구 감소가 반드시 경제적 쇠퇴를 의미하지 않는다는 중요한 증거를 제공한다. 따라서, 본 연구는 CEG 도시들의 경제적 번영을 활용하여 인구 감소의 지속적인 도전에 대응할 수 있는 도시 및 지역 정책을 수립하는 데 있어서의 중요성을 강조하였다. 이는 CEG 도시들이 경제적 번영을 이끌어내는 핵심 요인과 특성을 이해하고 적용함으로써, 인구 감소와 같은 도전에도 불구하고 지속 가능한 발전을 도모할 수 있다는 중요한 시사점을 제공한다.

세 번째 연구에서는 한국의 지방 중소도시에서 인구 감소에도 불구하고 CEG 도시들이 경제적 번영을 촉진할 수 있는 조건과 전략을 탐구하였다. 구체적으로, 음성, 제천, 영주 세 도시를 대상으로 한 사례 연구를 통해 세가지 조건과 전략이 경제적 번영에 어떻게 기여하는지 밝혔다: 1) 지역 연계를 통한 산업 재구조화, 2) 지역 자원 및 커뮤니티와의 협업을 통한 문화관광 활성화, 3) 사회적 네트워킹을 통한 협력과 다양성 증진. 이 연구는 지방 중소도시에서 경제적 번영과 산업의 다각화를 위한 재구조화가 기업이나 지방자치단체의 단독 노력으로는 부족하다는 점을 지적하며, 지역 차원의 협력을 통한 산업 클러스터 형성과 지역 간 상생 전략의 중요성을 강조하였다. 또한, 문화관광을 활성화하기 위해 지역의 문화적 또는 역사적 자원에 의존하는 것에 한계가 있음을 밝히고, 지역 커뮤니티 간의 협업을 통해 더 효과적인 문화관광 전략을 개발할 필요성을 제기하였다. 이와 함께, 사회적 네트워킹을 통한 창업생태계 구축과 외국인 유입이 지역 경제에 긍정적 영향을 미칠 수 있음을 보여주었다. 이러한 접근은 지방

중소도시의 경제적 회복력을 강화하고, 다양한 주체들과의 협력을 통해 실질적인 경제적 번영을 도모할 수 있는 방향을 제시할 수 있다는 중요한 시사점을 제공한다.

본 연구는 다음과 같은 시사점을 갖는다. 본 연구는 인구와 경제적 지표를 이용한 8 사분면 도시분류 매트릭스를 제시함으로써, 도시의 성장과 축소를 보다 정확하게 진단하고, 도시 관리 및 정책 수립에 새로운 시각을 제공한다. 본 연구는 인구 감소가 반드시 경제적 쇠퇴를 의미하지 않으며, 경제 보완형 성장 도시(Complementary Economic Growth, CEG) 유형이 전통적인 축소 도시와 구별되어야 하며, 이들 도시의 독특한 특성을 이해하고 경제적 잠재력을 효과적으로 활용해야 할 필요가 있다고 강조하였다. CEG 도시들이 인구감소라는 이유로 부정적으로 인식되어서는 안 되며, 오히려 이들 도시의 특성을 이해하고 적절히 활용할 필요가 있다. 특히, 인구감소가 심각하게 나타나는 지방 중소도시에서 경제적 번영의 조건과 전략을 적절히 잘 활용한다면, 이러한 도시들은 지속 가능한 성장의 길을 모색할 수 있다. 이는 학계 및 정책 입안자들에게 도시 발전의 새로운 패러다임을 제시하며, 도시 및 지역 정책의 재조정에 기여할 수 있다.

주요어: 도시 축소, 경제적 번영, 도시 분류, 인구 감소 도시, 지방 중소도시, 한국

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