Korean Demographic Cliff Social Impact∗*

Rapid Decline of Population in Korea and its impact on public perception of the society

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Abstract

Korea is facing an unprecedented demographic cliff. Moreover, this is reported and discussed publically by popular media. In this paper, we will look at the current status of Korea demographic, as well as psychological and economic connection of population cliffs to society.

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*Code and data are available at: https://github.com/YoungKim164/kroea__pop

1   Introduction

Population is the most fundamental element of society. A stable demographic structure is the basis for economic growth and determines the form of social structure. But the population structure doesn't form overnight, rather it's accumulation of birth, natural mortality, and the immigration over decades. And it's influenced heavily from political decisions, social movements, and the trend of the times. Population decline is a common phenomenon in developed countries that are on an economically stable track, and Korea, which has made remarkable economic growth in the 50 years since the end of Korean War, could not avoid it. In fact, as a counter reaction of rapid growth, Korea is suffering more deadly and rapid population decline that was never found in any other country. The current situation in Korea is so serious that the term "Demographic Cliff" created by Harry Dent is not difficult to find in public media.

The "Demographic Cliff" is a theoretical term used to describe a social situation in which a country or region experiences a significant decline in its population due to low birth rates and an aging population. This can lead to a range of economic and social challenges, including a shrinking workforce, increased healthcare costs, and reduced consumer spending. The term was popularized by author and demographer Harry Dent, who has argued that demographic trends are a key driver of economic cycles. However, some economists and demographers have criticized Dent's theories, arguing that other factors such as technological innovation and government policy are also important drivers of economic growth. Also, many modern countries like Germany and Japan, does not followed the Harry Dent's Demographic Cliff model. Therefore it remained as a theoretical model to predict population change in limited circumstances until now Korea's population decline happened.

The population decline in Korea is so rapid that it has become a social phenomenon that anyone can easily observe. From elementary school to university, many schools regardless their the level of education in the metropolitan area are closing due to a lack of students, and national security is threatened by a lack of conscription population. As population issues began to become increasingly visible, they began to negatively affect other social issues, including gender conflicts, generational conflicts, regional disparities, and housing issues. This document will focus on how the popular introduction of rapid population decline influenced people's perception of daily life and social problems.

The data used in this report is obtained from Open API KOSIS("Kosis Korean Statistical Information Service," n.d.), Korean Statistical Information Service. The data is analyzed with R(R Core Team 2022) and Rstudio(RStudio Team 2020) and analized with various packages. readxl(Wickham and Bryan 2023) and here(Müller 2020) packages are used to retrieve attained data from KOSIS("Kosis Korean Statistical Information Service," n.d.) to the environment. tidyverse(Wickham et al. 2019), dplyr(Wickham et al. 2023), janitor(Firke 2023), and knitr(Xie 2014) packages are used to manipulate the data in a fit for research purposes. ggplot2(Wickham 2016), kableExtra(Zhu 2021), patchwork(Pedersen 2022), and scales(Wickham and Seidel 2022) are used to shape the result into intuitive visual format. For details of each data and the data cleaning process that is tailored to the purpose of the document can be found in Section 2.

Linear regression model is used in this paper to get an insight of public perception and current trend of Korea demographic changes. Section 3 describes how this model works in purpose of this research and the result of the implication of the model on the data. Section 4 discuss the result of data manipulation with organized result of the data. The discussion is carried out in Section 5 about findings from the result regarding social and political impact of current phenomenon, and suggested reaction to it. It also discusses about potential weaknesses and further reaserches of this paper.

2 Data

2.1 Data Sources

The data used in this report is obtained from Open API KOSIS("Kosis Korean Statistical Information Service," n.d.), Korean Statistical Information Service. The data named "Summary of Census Population(by administrative districtsexage) 1960-2010"is demographic data from the census, which was implemented every five years from 1960, five years after the Korean War armistice, to 2010. This data were used to predict the current population status of South Korea and changes in the number of people over the next 30 years, along with the census's demographics, which were implemented annually from 2015 to 2020 under a changed policy. The second annual census data is named "Population, Households and Housing Units 2015-2020". The analized result can be found in Section 4.1.

Various survey data were also researched to gain insight into the current social perception of the childbearing age population. The data named "Class_Awareness" is a survey of where each individual thinks their social position is. It's important to note that this is not data based on actual capital, occupation, or social influence, but rather a questionnaire about one's position that an individual feels when considering various factors. The data named "Degree_of_Stress___General_Life" is a survey of the stress that each individual feels in their overall lives. This data is also a survey of the frequency of stress that individuals feel subjectively, not based on numerical data of work burden, leisure time, or wealth of assets.

The data named "Environment_in_the_future___As_Compared_with_5_Years_Ago" is a prediction of changes in the future environment. This is also a survey of individual guesses, not scientific analysis data through factors such as air quality, degree of industrialization, or future technological development. This data shows how optimistic or pessimistic the Korean people are about future environmental changes. It also indirectly expresses individual thoughts on the current environmental condition of Korea. As environmental climate issues are highlighted in the public, these data are included because the impact of environmental awareness on individual future life design is increasing. The data named "Level_of_Satisfaction_on_Work_Conditions" is a satisfaction survey of the workplace environment. Since Korea is mentioned every year as one of the most working hours country within OECD countries, satisfaction in the workplace environment is a very important data to learn about the public's social perception. The data named "Satisfaction_with_Achievement" is a survey of individuals' achievements in their lives to date that they feel. This is similar to the daily life satisfaction survey, but it does not focus on the present life, but on the satisfaction of the past life so far, and the expectation of the future of how much more you can achieve in the future. The data named "Satisfaction_with_Life" is currently a survey of individual life satisfaction. This is a direct survey of the level of satisfaction with current life. However, it is not a survey of the current standard of living, but a measure of satisfaction with it, and it is a data to find out how people feel about their current living conditions, not the living conditions themselves. The data named "Selfassessment_of_Health" is about how individuals feel about their health. This is also subjective data on the health status of individuals, not objective data calculated by examining national health care, access to medical services, or disease incidence. This indirectly shows satisfaction and reliability with the current level of medical services in Korea.The data named "Sentiment_in_the_Present_Surrounding_Environment" is a survey of how individuals feel about the current environmental conditions in Korea. This directly represents the level of people's awareness of the current environment of the Republic of Korea as they focused on the present, not on speculation and expectation of the future. The data named "Trust_in_Korean_Society"

2.2 Data Cleaning

The obtained data from KOSIS("Kosis Korean Statistical Information Service," n.d.) is cleaned to meet the purpose of focus of this paper. For most of the dataset, unnecessary categories have been eliminated as the point of this paper is aimed at the social awareness of childbearing age citizens. So that the revised figures can provide the most accurate information according to our analysis and not have any information that is unrelevant to our analysis. In addition, general demographic data has been modified to a suitable form for applying the linear regression model used. The modification includes eliminating district specific data, eliminating undefined data, eliminating data summaries, and merging the different forms of census before and after 2015.

2.3 Data Visualization

The sorted data is summarized in graphs and tables for easy visibility. Census data, a vast quantitative data, are represented at a glance by representing it in linear graphs, and surveys based on individual responses are abbreviated into tables, transforming them into distinctions between important categories. This visual data, which will be discussed in greater detail later in the Section 3 and Section 4 section, has provided a deep understanding of the agenda and opened up the possibility of an insighting discussion on Section 5.

3 Model

A linear regression model was used to estimate the trend of population change in Korea and to predict population change over the next 30 years. The most important thing about predicting population change is to remind you that population change can change as roughly as much as possible and escape speculation with big errors. Birth rates, mortality, immigration, etc. that directly affect the population are easily measurable, but the second level factors that affect these first level factors, such as economic stability felt by young people, social views of underage births, parenting burdens in families and societies, and a country's social and cultural image. Of course, it is also absurd to say that all of this is absolutely impossible to measure, but it is also almost impossible to put all of this into the model and include it in the calculation.

The forecast for population change in this document is limited to 30 years, a relatively short period unlike other population-related studies, because population change itself is not the core content of this document, along with the preceding reasons. The purpose of predicting the trend of population change in this document is not to predict the exact figure, but to understand the overall direction and trend of the current population change in Korea. Through this, the focus was on sharing and understanding the feelings and rough perceptions of the public in Korean society, which is currently facing a population cliff.

Linear regression is a statistical method used to model the relationship between one or more independent variables and the resulting variable. Given sufficient independent variables in measuring the association between the two, you can predict future variations in the variable. In this paper, simple linear regression is selected among linear regression models for estimating population fluctuations because the accuracy of predictions is not of great importance and its purpose is to determine trends. Simple linear regression has only one independent variable, making it easy to apply the model and intuitive to understand. However, since only one independent variable is considered, the results can be significantly fluctuated for other external factors, and it is difficult to speculate on variable data because it assumes a linear relationship between the two variables. The trend of population fluctuations in this study is to see its direction rather than to derive accurate estimates, also since the estimation period is limited simple linear regression analysis is very suitable.

The goal of linear regression is to find the best-fitting line that minimizes the sum of squared errors between the predicted values and the actual values of the dependent variable. This line is represented by a linear equation in the form of following

$$y = b_0 + b_1 x + e$$

where Y represents the dependent variable, that is, the expected number of people, and X is the independent variable, in this case, the time in years. 0 and 1 are the coefficients or parameters of the model, and e is the error term.

The coefficients in the model represent the slope of the line or hyperplane and the intercept using the y-axis. This is the best value calculated from the previous data. For 1, which represents the slope, it represents the degree to which the dependent variable changes when the independent variable changes on a unit basis. For 0, which represents an intercept, it represents the value of the dependent variable when the independent variable is 0.

The results of the model application can be found on Figure 2 in the Section 4.1.

4 Result

4.1 Population Trend

The trend of population change is the most important part of this study. The first 15 years of non-natural population change in the aftermath of the Korean War and the Pacific War were excluded from the data, and the last year, when clear statistics were not yet collected, was not included. But the focus is on how the study group accepts it, so the data is compressed and presented as a linear graph.

Korea's population is deformedly concentrated in the capital city of Seoul. Therefore, by collecting the population change of Korea as a whole and the population change of Seoul individually and placing two graphs at the same time, we observed the overall population change and the population concentration phenomenon.
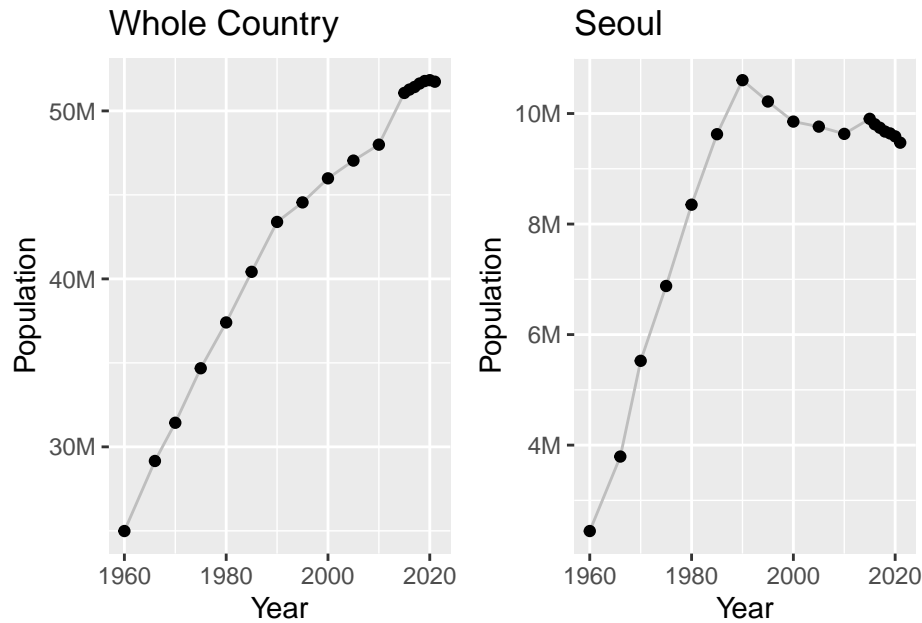

Figure 1: Population chages from 1960 to 2020

The overall population of Korea has a steady upward graph. Korea's population fluctuations are in line with Korea's economic growth. Following the special demand for Vietnam war in the 1960s and the miracle of the Han River in the 1970s and 1980s, the population change shows extraordinary growth. However, the growth rate tends to fall slightly in the 1990s due to the IMF crisis. However, since 2015, the population growth rate has fallen sharply, showing only insignificant growth, and from 2020, the population begins to decline.

On the other hand, Seoul's population shows much faster growth than Korea's total population. From 1960 to 1990, Seoul's population more than quadrupled, compared to the 1.7-fold increase in Korea's total population. The population of Seoul, which peaked in 1990, has been dispersed due to the development of the surrounding metropolitan area, maintaining about 10 million, but has gradually declined since 2015 and has now fallen below 9.5 million.

Comparing the two graphs, we can see that since 1990, Seoul has maintained a population of about 10 million until 2015, but has not maintained a ratio of the total population. This makes it easy to guess that although the overall population growth rate has fallen since 1990, the population growth rate has not been felt outside of Seoul. Against this backdrop, the simultaneous decline in the total population and the population of Seoul, which began in 2015, can be expected to have made citizens of each province feel that population reduction was more severe than visible figures.
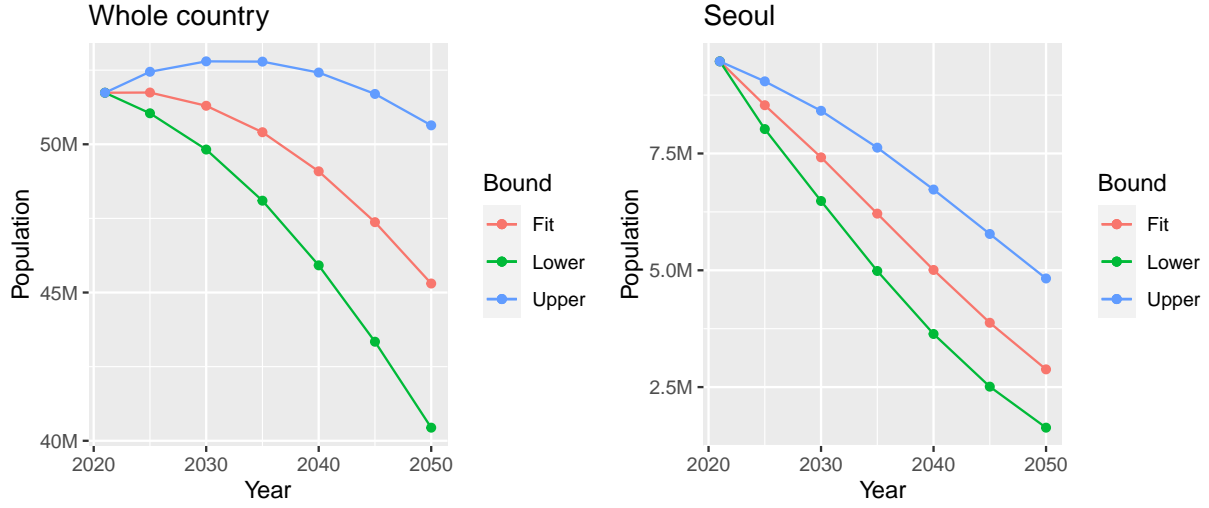
Figure 2: Population Trend Prediction from 2020 to 2050

Figure 2 uses a linear regression model to predict the total population of Korea and Seoul over the next 30 years based on the current population change rate. According to the model, if the current rate of population change remains the same, Korea's total population is expected to return to its pre-1990 level by 2050, and Seoul's population is expected to return to 1970 or earlier after a more rapid decline. Of course, considering Seoul's economic capabilities and infrastructure level, it is not expected that Seoul will suffer such a rapid population loss, but it allows to guess the seriousness of the population decline currently observed in Seoul.

The following tables presented in Section 4.2 will examine how civilians, especially for those who are in a childbearing age, feels about current status of Korean society from multiple perspectives.

4.2 Social Survey

The following Table 1 is summarized and summarized items related to the research subjects among the survey data on the current, future, and past perceptions of Korean society from various perspectives. The first table is a survey of overall stress, satisfaction with work, and opinions about one's health. In Korean society, where the culture of comparing with others is rooted, stress is an important measure of the social pressure felt by individuals. There may be many sources of stress, but work is expected to be the biggest factor for the study subjects of this paper, who have just started or are on the verge of starting their social life in modern society, especially in Korea, where urbanization has progressed throughout the country. We will look at this most important factor through a job satisfaction survey. After learning about the overall stress and the work environment that is expected to be the most important of the factors, we will look at surveys related to personal health to learn about the physical impact they have on individuals.

Table 1: Social Survey A

(a) Stress Assessment

Degree of Stress	Total	Severe	Moderate	Weak	None
Total	100	4.1	40.8	44.2	10.8
20~29 years old	100	3.5	36.1	46.1	14.3
30~39 years old	100	4.8	46.7	40.8	7.7

(b) Work Satisfaction

Work Satisfaction	Total	Very satisfied	Moderately satisfied	Neither satisfied nor dissatisfied	Moderately dissatisfied	Very dissatisfied	Dont Know
Total	100	22.0	28.0	38.0	5.0	2.3	4.7
20~29 years old	100	24.3	26.2	36.0	5.0	2.7	5.8
30~39 years old	100	23.9	27.6	36.5	5.6	2.5	3.9

(c) Self Health Assessment

Self Health Assessment	Total	Very good	Good	Average	Bad	Very bad
Total	100	11.5	41.6	34.9	10.8	1.2
20~29 years old	100	23.2	49.1	23.9	3.7	0.1
30~39 years old	100	15.2	50.2	29.7	4.6	0.2

Results from the Table 1 show that the stress level for people in their 20s are less than average, while those in their 30s are noticeably higher than average. Due to fierce competition for college entrance and mandatory military service obligations for men, Korean has relatively late in entering society compared to other countries. The 30s are the time when expectations from families and society for childbirth and marriage are highest. The high stress gap between those in their 20s and 30s is believed to be due to the conflict between these expectations and individual values. Sensibly rapid population decline and unstable future forecasts appear to be accelerating this conflict even more violently.

On the other hand, satisfaction at work does not seem to differ significantly from the average for both people in their 20s and 30s. This is a very unusual value considering the burden of adapting to a new environment that is unfamiliar as a beginner in society. Considering these particular situations in their 20s and 30s, this figure can be interpreted as 20s and 30s are relatively satisfied with their jobs. The pressure from the falling birth rate rather made young people avoid starting a family and having children and focus more on their jobs.

In the self-health assessment, both people in their 20s and 30s diagnosed positively than average, but there is a noticeable gap between those in their 20s and 30s. Considering the difference in the degree of stress felt between those in their 20s and 30s, it can be suspected that the burden of childbirth has led to direct physical problems.

The Table 2 contains a survey of overall satisfaction with life, satisfaction with individual achievements, and trust in society. The survey on life satisfaction and satisfaction with individual achievements are in same line. One is a survey of the current situation and environment of the individual, and the other is satisfaction with how they came to their current situation. These are put two together, because these two

together allows to indirectly guess what can be expected for the future when individuals maintain the current direction. As we have seen earlier, people in their 20s and 30s are in a situation where individual values and social expectations collide. Therefore, confidence in society can be expected to contradict the results of the previous two surveys.

Table 2: Social Survey B

(a) Life Satisfaction

Life Satisfaction	Total	Very Satisfied	Moderately Satisfied	Neither satisfied nor dissatisfied	Moderately Dissatisfied	Very Dissatisfied
Total	100	12.1	31.2	42.6	11.6	2.5
20~29 years old	100	15.5	32.2	40.1	10.1	2.1
30~39 years old	100	13.5	32.3	40.9	10.6	2.8

(b) Achievement Satisfaction

Achievement Satisfaction	Total	Very Satisfied	Moderately Satisfied	Neither satisfied nor dissatisfied	Moderately Dissatisfied	Very Dissatisfied
Total	100	7.5	27.5	46.1	15.1	3.8
19~29 years old	100	8.5	24.8	47.1	14.9	4.6
30~39 years old	100	8.9	28.7	43.0	14.6	4.8

(c) Trust in Society

Trust in Society	Total	Very Trustworthy	Moderately Trustworthy	Little Trustworthy	Never Trustworthy
Total	100	4.5	51.1	39.1	5.3
20~29 years old	100	3.9	44.0	43.7	8.3
30~39 years old	100	4.2	48.0	40.7	7.0

In the survey of life satisfaction, there is no noticeable difference between those in their 20s and 30s. Those in their 30s showed slightly lower satisfaction than those in their 20s, but this seems to be a natural phenomenon considering the social burden of those in their 30s. However, both groups showed above-average responses, indicating that modern young people who have given up forming and giving birth to families and choosing a personal life are satisfied with the current situation.

Similarly, there is no significant difference between those in their 20s and 30s in the satisfaction survey of past achievements. Those in their 30s show slightly higher confidence than those in their 20s, which shows that those in their 30s who have made individualistic choices do not regret their past choices.

Unlike the above-average satisfaction surveys, as previously predicted, the social confidence survey showed below-average confidence in both groups in their 20s and 30s. It will not be easy for them to have a good impression on society in a social trend that emphasizes the direction of life that exceeds individual values.

The individualistic trend among modern 20s and 30s born between the late 80s and 90s, also known as the MZ generation, is already an observed phenomenon. But apart from what has already happened, this generation is showing satisfaction and confidence, not regretting their individualistic moves, amid low birth rates, unstable futures, and the social pressures that follow.

5   Discussion

5.1   Individualism and Generation Conflict

Historically, Korean society has emphasized communityism and group life. Recently, however, as individualism has begun to prevail between the 20s and 30s, conflicts between the older and the new generation have emerged as a social issue. Generational conflict is a common phenomenon that can be found anywhere in any era, and it was easy to predict a serious generational conflict because Korea has continued to develop rapidly. However, through this study, the rapid population decline, commonly known as the population cliff phenomenon that began in the 2020s, has given individualistic tendencies to people in their 20s and 30s and makes generational conflicts more serious.

In general, the social atmosphere is likely to be seen as a factor affecting population change, but the situation in Korea, which is undergoing rapid population change, gives us the need to look in the opposite direction from the general interpretation. It seems obvious that rapid population change is having a profound impact on young people's social perception, and it seems reasonable to worry that it will have a negative impact on population change.

To escape this vicious cycle, we need to move away from the preference of the family form, which is considered stable in traditional concepts, and change into a society that respects individualism and embraces new forms of families. This requires pre-policy changes that recognize more diverse types of assumptions and social changes that do not give a negative look to new types of family relationships.

5.2   Social Pressure

In general, the main reason for the low birth rate problem is that the younger generation avoids giving birth. The individualism of the younger generation is strongly criticized in society and puts strong social pressure on those who do not have a family by putting the frame of a failed life.

However, this phenomenon is not welcomed by any generation and is promoting generational conflict. Also, it is impossible for a family pushed by these social pressures to maintain harmony for a long time. It should be recognized that population change is a phenomenon that occurs over decades and that every member of society living in the present day is responsible for it. It is necessary to form a society that understands the cause and respects choices, rather than criticizing the avoidance of family formation and childbirth in their 20s and 30s. By forming a consensus through mutual understanding, it is expected that if we find a solution to the problem by making concessions little by little as a sense of community, we will be able to come up with a solution that all generations are satisfied with.

Older generations who have already passed childbearing age should think of ways to divide the burden of childbirth and parenting for younger generations, and younger generations should remember the importance of families by recalling the family bonds they have experienced during their growing years.

5.3   Weakness and Further Research

The study focused on a relatively recent phenomenon that began to appear in 2020. It is difficult to predict whether Korea's population fluctuations will continue to decline or begin to rebound in the future. It's also only been a short time since the public began to feel the phenomenon. That's why there's limited data on popular surveys since the population began to plummet, and there's only a sample that's too small to measure the change. Therefore, it is not known whether the current response will continue or if it will adapt to population changes and react anew. The need for future re-investigation is too important to observe with continuous interest in changes in public perception.

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