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The Impact of Low Fertility Rate on Economic Growth in South Korea

Bachelor's thesis

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Declaration of Authorship

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Prague, July 31, 2024

Hanbee Yoo

Abstract

This thesis investigates the impact of low fertility rates on economic growth in South Korea, a country recognized for having one of the lowest fertility rates in the world. The study explores the negative relationship between low fertility and economic growth, particularly through its effects on resource allocation and investment in human capital. The significance of this research extends beyond South Korea, as many other nations are also grappling with similar low fertility trends. By focusing on South Korea, this thesis aims to provide a deeper understanding of how declining fertility rates can influence economic growth, offering insights that are relevant to other nations.

Given the importance of the Solow growth model in understanding economic growth, we build on this model and incorporate real-world phenomena to develop a regression model that explains the relationship between economic growth and fertility rates, incorporating various other relevant variables. Using panel data from 2000 to 2021 across 16 regions, this study includes control variables such as population density, education, women's workforce participation rate, research and development expenditure, inflation, unemployment, and urbanization. The findings reveal that fertility rates are a significant factor in driving economic growth across these regions, while population growth is found to be insignificant. This research should help policymakers in managing population density and increasing investment in research and development to enhance economic growth in South Korea.

JEL Classification	F12, F21, F23, H25, H71, H87
Keywords	Fertility Rates, Economic Growth, Solow Growth Model, South Korea
Title	The Impact of Low Fertility Rate on Economic Growth in South Korea

Abstrakt

Tato práce zkoumá dopad nízké porodnosti na hospodářský růst v Jižní Koreji, která je známá jako země s jednou z nejnižších porodností na světě. Studie zkoumá negativní vztah mezi nízkou porodností a hospodářským růstem, zejména prostřednictvím jejího vlivu na alokaci zdrojů a investice do lidského kapitálu. Význam tohoto výzkumu přesahuje rámec Jižní Koreje, neboť s podobným trendem nízké plodnosti se potýká i řada dalších zemí. Zaměřením se na Jižní Koreu chce tato práce poskytnout hlubší pochopení toho, jak může klesající míra porodnosti ovlivnit hospodářský růst, a nabídnout tak poznatky, které jsou relevantní i pro ostatní země.

Vzhledem k významu Solowova modelu růstu pro pochopení hospodářského růstu vycházíme z tohoto modelu a zahrnujeme do něj jevy z reálného světa, abychom vytvořili regresní model, který vysvětluje vztah mezi hospodářským růstem a mírou porodnosti a zahrnuje různé další relevantní proměnné. Na základě panelových údajů z let 2000 až 2021 v 16 regionech zahrnuje tato studie kontrolní proměnné, jako jsou hustota obyvatelstva, vzdělání, míra účasti žen na trhu práce, výdaje na výzkum a vývoj, inflace, nezaměstnanost a urbanizace. Zjištění ukazují, že míra porodnosti je významným faktorem ovlivňujícím hospodářský růst v těchto regionech, zatímco růst počtu obyvatel se ukazuje jako nevýznamný. Tento výzkum by měl pomoci tvůrcům politik při řízení hustoty obyvatelstva a zvyšování investic do výzkumu a vývoje s cílem posílit hospodářský růst v Jižní Koreji.

Klasifikace JEL	F12, F21, F23, H25, H71, H87
Klíèová slova	Míra plodnosti, hospodářský růst, Solowův model růstu, Jižní Korea
Název práce	Vliv nízké míry plodnosti na ekonomický růst v Jižní Koreji

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Chapter 1

Introduction

In recent decades, many developed countries have been facing declining birth rates and a rapidly aging population. The decrease in population is influenced by various factors such as mortality, fertility rates, and migration patterns. Amongst these factors, fertility is the most essential in determining population growth and its long term effects. To maintain a stable population in a given area, a Total Fertility Rate (TFR) of 2.1 is considered the replacement level, assuming no immigration or emigration occurs. A TFR above 2.1 indicates that the area's population is likely to increase, whereas a TFR below 2.1 indicates a potential decline in the area's population over time (OECD, 2022). According to the OECD, the total fertility rate ranges between 1.2 and 1.8 children per woman. (OECD, 2022). Kohler et al. (2002) defined *extremely low fertility* as below 1.3. After this threshold, the country enters the area of lowest-low fertility. While many European countries have managed to prevent low fertility levels through various baby-friendly policies, East Asian countries, namely South Korea and Japan, have not escaped this phenomenon. Notably, South Korea has recorded the most extended period of lowest-low fertility among OECD countries (OECD, 2022). Lutz et al. (2006) introduced the phenomenon of persistent low fertility as the "irreversible trap" or a "downward spiral in future fertility rates."

This thesis focuses on how the fertility rate affects economic growth in South Korea. Declining fertility rates have become a critical issue in South Korea, raising concerns about its economic impact. By analyzing the regression model, this thesis aims to understand the relationship between fertility rates and economic growth. Investigating the declining fertility rates and its implications for South Korea's economy, could provide insights for solutions to tackle this economic problem.

The remainder of this thesis is constructed as follows. Chapter 2 provides a literature review. Chapter 3 presents the Solow Model and its empirical framework. Chapter 4 outlines an overview of the subjects of analysis, the data, and the analytical methods used. Chapter 5 summarizes the analysis's results, highlighting key factors. Chapter 6 concludes the results and proposes policy recommendations.

Chapter 2

Literature Review

This relationship between economic growth and population has been extensively studied by many economists throughout history. The idea that population is related to a country's economic level or living standards was first presented by Malthus in his paper published in 1798. Malthus (1798) believed that population growth has a negative impact on economic growth due to a scarcity of resources. Modern economists further explored and debated this perspective when comparing the hypothesis to the modern world such as Kuznets (1967) and Becker et al. (1990).

Developed countries, due to the development of technology, were observed to have an exponentially larger rate of growth of population compared to underdeveloped countries. Malthus's theory observes this positive correlation between population growth and economic growth. This was added later by Kuznets (1967), that a positive correlation could be observed only up until the 1930s, then subsequently followed by a negative correlation. Soon after the Industrial Revolution, European countries experienced a significant population increase due to higher fertility and longer lifespans due to technological developments. Through analyzing the evolution since the 30s, Kuznets (1967) argued that rapid demographic expansion can, in some cases, impede economic growth in developed countries. His work further emphasized the importance of factors such as added technological advancements and human capital.

Becker et al. (1990) suggested an intertwined relationship between fertility rates and economic growth. This work specifically stresses on human capital as a fundamental component of economic growth. The metric of time-intensive child-rearing is given emphasis rather than the number of children. As Becker et al. (1990) states, *"Since human capital is embodied knowledge and skills, and economic development depends on advances in technological and scientific knowledge, development depends on the accumulation of human capital."* This theory emphasizes the idea that the accumulation of human capital, through education and skill development, is important for economic progress. The research was presented through production functions in the consumption, human capital, and fertility sectors. The model that Becker et al. (1990) developed suggests that increases in human capital can reduce fertility. While at low levels of education and skill, the country has a high fertility rate and low investment in human capital per child.

Moreover, an increase in human capital raises capita income, affecting the demand for children in two ways: a positive income effect and a negative substitution effect (Becker et al., 1990). The income effect is dominant where human capital is lower, especially if necessities like food, housing, and clothing become the main cost of rearing children. It tends to increase fertility rates since families are more confident and secure in supporting larger families. On the other hand, the substitution effect is dominant where human capital is higher, increasing the opportunity costs of having children. Especially, higher education, skills and increased workforce participation can delay or reduce fertility rates. However, as human capital increases, technological knowledge and economic development increase as well.

Furthermore, Woo (2012) discusses how higher levels of education among women and lower levels of education among men tend to increase the likelihood of remaining single and, consequently, lead to a reduction in family size. This trend is attributed mainly to longer education and higher career aspirations, especially among women prioritizing career success over family expansion. Additionally, delayed marriage due to education often results in older ages at childbirth, leading to fewer children. In Korea, where professional success is highly valued, many women are highly committed to their careers. Therefore, the impact of education on reducing fertility is quite evident (Woo, 2012).

As a result, many countries with limited human capital tend to have large families and invest less in each family member. In contrast, those with large human

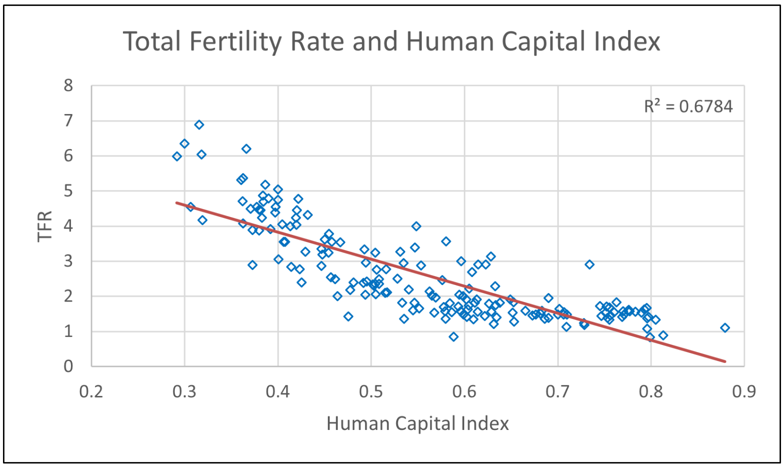

Figure 2.1: Total Fertility Rate and Human Capital Index
Source: Author's own calculation based on data collected from World Data (2020)

capital have smaller families and invest more in each individual.

Figure 2.1 illustrates the relationship between the Total Fertility Rate (TFR) and the Human Capital Index (HCI) across 172 countries. This scatter plot suggests there is a negative correlation between TFR and HCI, evidenced by the downward-sloping trend line. Figure 1 supports the previously discussed results of the economist Becker et al. (1990). The data reveals that many countries demonstrate a decline in fertility rates corresponding with an enhancement in human capital. Moreover, Lee and Mason (2010) suggested that lower fertility rates enable higher child investment in human capital, which can improve standards of living through higher productivity. This can offset the potential negative impacts of an aging population. Hence, the relationship between fertility reduction and economic growth is not defined clearly and is influenced by how well the country adapts to demographic changes. The study by Lutz et al. (2006) finds a consistent negative relationship between population density and fertility rates across 145 countries. They suggest that high population density contributes to a decrease in fertility rates. Given South Korea's urban concentration, especially in its metropolises, population density is considered an essential variable in South Korea's low fertility rates.

2.1 Background of South Korea

Following the Korean War in the 1950s, South Korea's population was plunged into poverty, trying to recover from the many losses and mass destruction. In the 1960s, the country remained rural and centered around agriculture. At that time, the total fertility rate exceeded 5.5 children per woman (World Bank, 2024a). The government thus began the national family planning program, which marked the start of its explicit population control policy.

Key policies included the introduction of contraception, such as condoms and vasectomies, and nurses visiting the homes of prospective contraception takers. In the center, the slogan stood: "Have few children and bring them up well." (Cho, 1996). Throughout the 1970s, the government's birth control policy intensified. Despite these efforts, the cultural preference for male children resulted in families continuing to have more children in the hope of having a son (Bae, 1988). Figure 2.2 illustrates the imbalance in the sex ratio at birth from 1979 to 1988, defined as the number of male births per 100 female births.

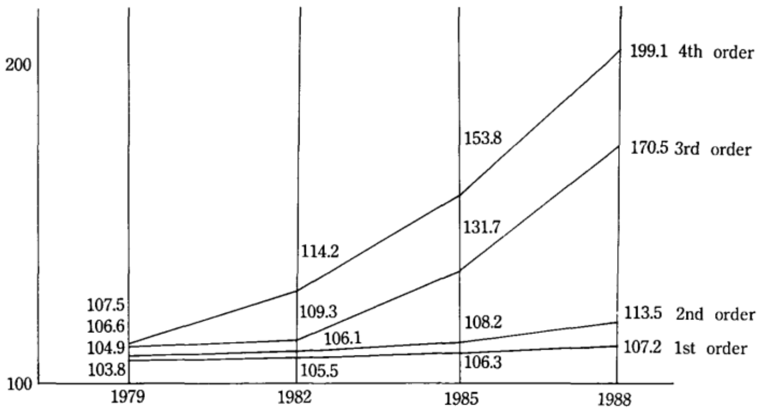

Figure 2.2: Sex Ratio at Birth by Birth Order
Source: Korea Institute for Health and Social Affairs (KIHASA) (1988)

The graph shows an increase in the sex ratio for first-order births, rising from 103.8 in 1979 to 107.2 in 1988. In contrast, fourth-order births show the fourth-order births show the most dramatic increase, with a ratio from 107.5 in 1979 to 199.1 in 1988. This pattern suggests that families with three or more children were likely to continue having additional children until a son was born. In response to this phenomenon, the government stipulated that people must "Stop at two regardless of sex." for "A well-bred girl surpasses ten boys." (Cho, 1996).

The Maternal and Child Health Law legalized induced abortions under certain conditions. In the 1980s, due to many population reduction policies, the norm shifted from having two children to one. In 1983, the fertility rate fell below the population replacement level of 2.1, recorded at 2.06 World Bank (2024a). Nevertheless, the government continued to implement new restrictions on childbirth, fearing that the drop in fertility rates would be temporary. Entering the 1990s, the government began revising many population control policies. The government shifted towards avoiding gender imbalance and improving population welfare (Yang, 2019).

As a result, the fertility rate has continued to decline. In response to this phenomenon, the government shifted its focus towards adopting pronatalist measures in the mid-2000s, aiming to increase birth rates (Yang, 2019). Since then, these initiatives have been in place, yet they need to be more effective in halting the decline.

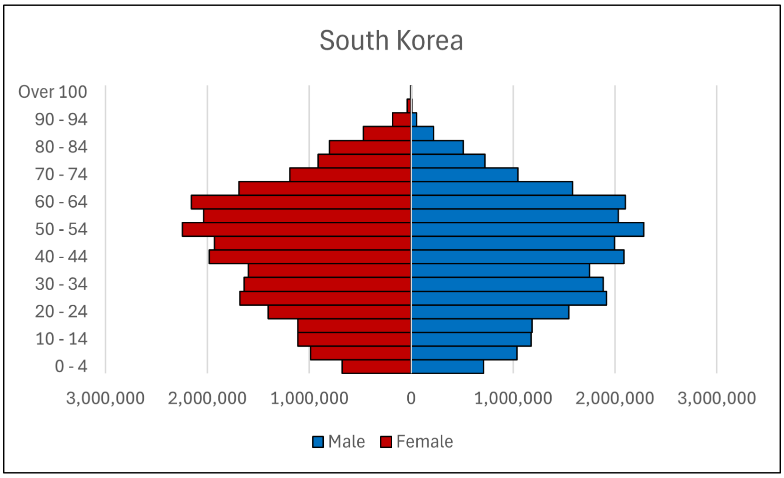

Figure 2.3: Population pyramid for South Korea
Source: Author's own calculation based on data collected from KOSIS (2022)

Figure 2.3 iillustrates the population pyramid for South Korea in 2022. The population in their late 40s to early 50s is huge, revealing concentrated in the middle of the pyramid. Korean Statistical Information Service (KOSIS) (2022) predicts that this concentrated will gradually move up the pyramid, increasing the old population. The narrowing bottom shows fewer children are born, potentially reducing the younger workforce. The population pyramid shows South Korea faces demographic changes, including an aging population and declining fertility.

Furthermore, South Korea, with a population of 51 million, is one of the world's most densely populated countries (World Bank, 2024b). Most of the population lives in large metropolises; notable examples include Seoul, Incheon, and Gyeonggi-do. According to the "Social Indicators in 2022" by Statistics Korea (KOSTAT) (2022), approximately 26 million people live in urban areas, accounting for 50.5% of the total population.

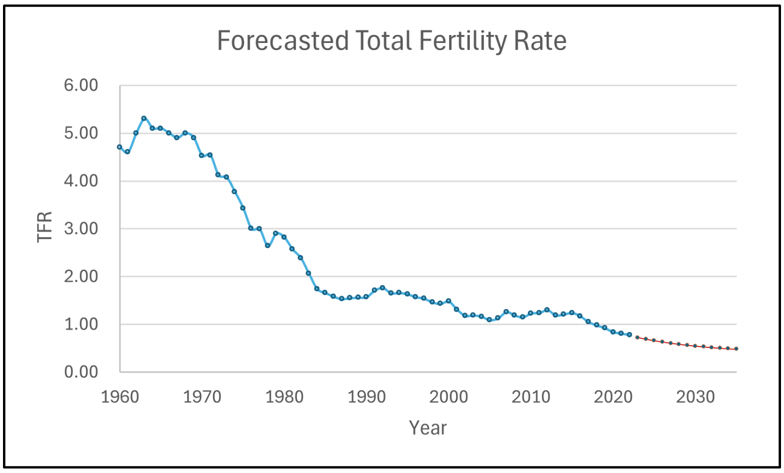

Figure 2.4: forecasted total fertility rate
Source: Author's own calculation based on data collected from KOSIS (2022)

Figure 2.4 illustrates the forecasted TFR from 2023 to 2033 based on Korean Statistical Information Service (KOSIS) (2022) data, utilizing the ARIMA model in R. The auto.arima function in R was used to automatically identify the optimal parameters for forecasting by analyzing past data patterns. The graph shows a continuous gradual, with the TFR falling below 0.6 by 2033. This downward trend in fertility rates shows the challenges of an aging population and a shrinking younger workforce. The combined analysis of the population pyramid and the forecasted TFR highlights the urgent demographic issues facing South Korea.

2.2 Output and Fertility

As previously stated, most countries have a remarkably consistent inverse relationship between income and fertility (Becker et al., 1990). As income increases, the cost associated with child-rearing, which emphasizes time and opportunity costs, also increases. Moreover, it can lead to a reduction in fertility. Jones et al. (2008) also pointed out that higher-income individuals often have access to better education and career opportunities, which could cause them to delay or reduce fertility rates in favor of other personal or professional goals.

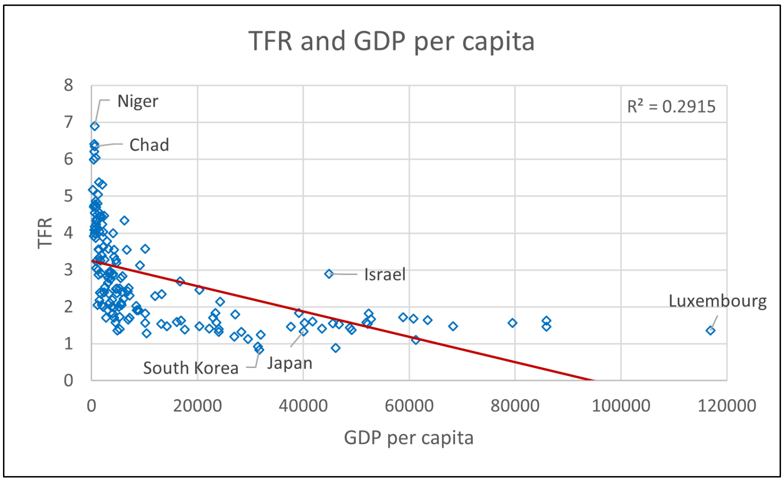

Figure 2.5: Total Fertility Rate and GDP per Capita (current US$)
Source: Author's own calculation based on data collected from World Bank, 2020

Figure 2.5 illustrates that countries with higher levels of economic development experience lower fertility rates, whereas countries with lower economic development tend to have higher fertility rates. This analysis is based on data from 170 countries provided by the World Bank (2024a). For instance, in 2020, Japan, a highly developed nation with a per capita GDP of US$ 40,040, recorded a total fertility rate of 1.33 children per woman. On the other hand, Niger, which had a significantly lower per capita GDP of $564 in the same year, recorded a much higher total fertility rate of 6.89 children per woman (World Bank, 2024a). This inverse relationship between fertility rates and economic development is evident across many countries, supporting the negative correlation. Additionally, while lower fertility rates are correlated with higher GDP per capita, they are also correlated with lower growth rates in GDP per capita, implying the complicated relationship between fertility rate and economic growth. The correlation coefficient of -0.521, calculated by the author, highlights the tendency for wealthier nations to have lower fertility rates.

Urbanization is another crucial factor influencing economic growth and fertility rates. The analysis by White et al. (2008) on fertility patterns in Coastal Ghana reveals that urbanization can reduce fertility rates. Their study indicates that women living in urban areas have an 11% lower fertility rate compared to those in rural areas. Building on this theory, Gries and Grundmann (2018) explore the broader implications of urbanization. They highlight that high-quality urbanization, characterized by low slum incidence, correlates with reduced fertility rates. Additionally, they emphasize both education and the availability of skill-intensive jobs could drive this outcome.

Furthermore, the example of South Korea provides evidence supporting these findings, showing that the relationship between urbanization and reduced fertility rates is not limited to developing countries but also applies to developed countries. In Seoul, the capital city, the fertility rate is 0.550, which is lower than the national average of 0.720 (Korean Statistical Information Service (KOSIS), 2023). On the other hand, Gangwon-do, the region with the lowest population density and financial independence in South Korea, recorded a total fertility rate of 0.89, which is higher than the national average. This trend is observed in many urban areas across South Korea, where fertility rates tend to be below the national average, further explaining the impact of urbanization on fertility reduction.

Chapter 3

Theoretical Model

3.1 Solow Growth Model

The Solow Model, developed by Robert Solow in the 1950s, is foundational for studying economic growth (Solow, 1956). It provides a theoretical structure to understand how factors such as capital, labor, and technology contribute to economic growth over time. This thesis is based on Solow Model as presented in the textbook version by Barro and Sala-I-Martin in *'Economic Growth'* and Romer in *'Advanced Macroeconomics'*. These textbook versions are chosen because they better suit the discrete-time and empirical framework required for the further research.

Economic output is generated by the production function

$$Y = F(K, AL) = K^{\alpha}(AL)^{1-\alpha} \tag{3.1}$$

where Y denotes the total output, K is the capital, L is the labor, A is the level of technology, and AL is effective labor. The Solow model assumes the function $F(K, AL)$ satisfies constant returns to scale, which means $\alpha \in (0, 1)$ and the Inada conditions.[1] Furthermore, the initial levels of capital, labor, and technology are considered to be strictly greater than zero (Romer, 2012).

[1] The curve is vertical at the origin and horizontal in the limit: $\lim_{K\to 0}\left(\frac{\partial F}{\partial K}\right) = \lim_{L\to 0}\left(\frac{\partial F}{\partial L}\right) = \infty$, and $\lim_{K\to\infty}\left(\frac{\partial F}{\partial K}\right) = \lim_{L\to\infty}\left(\frac{\partial F}{\partial L}\right) = 0$.

In a closed economy with no government spending, saving S must equal investment I.

$$S_t = I_t \tag{3.2}$$

Thus, the output Y is the sum of consumption C and investment I

$$Y_t = C_t + I_t \tag{3.3}$$

Assuming that the savings S are a constant fraction of the total output Y, where s is the saving rate ($0 < s < 1$):

$$S_t = sY_t \tag{3.4}$$

In the Solow model, labor growth and technological growth play a crucial roles in determining the economy's development. The following equations describe how labor and technology evolve over time.

Labor growth is defined by the equation:

$$L_{t+1} = (1 + n)L_t \tag{3.5}$$

L_t is the labor force at time t and L_{t+1} is the labor force at time $t + 1$. This equation shows that the labor force in the next period (L_{t+1}) is equal to the current labor force (L_t) multiplied by the $(1 + n)$, which denotes the growth rate of the population.

Technological growth is represented by the equation:

$$A_{t+1} = (1 + g)A_t \tag{3.6}$$

Similarly, this equation shows that the technology level in the next period (A_{t+1}) is equal to the current technology level (A_t) multiplied by the factor $(1+g)$, which indicates the growth rate of technology.

Next, the analysis advances to the law of motion of capital. The law of motion is essential because it is fundamental to understanding the dynamics of capital.

The law of motion of capital implies that the growth rate of K is given by:

$$K_{t+1} = (1-\delta)K_t + I_t \tag{3.7}$$

where I_t represents investment, and δ represents the depreciation rate.

As the Barro and Sala-I-Martin (2003) describes the equations (3.2) and (3.4), it transitions to:

$$K_{t+1} = (1-\delta)K_t + sY_t \tag{3.8}$$

Normalization in the Solow model is necessary because it allows the model to analyze the steady state of the economy. By normalizing variables, the model focuses on the capital and output adjusted per unit of efficiency levels, which are expressed as follows:

$$y_t = \frac{Y_t}{A_t L_t}, k_t = \frac{K_t}{A_t L_t} \tag{3.9}$$

Next, we transform the production function in terms of effective labor. To simplify further, substituting k_t into the equation gives $y_t = k_t^{\alpha}$, which shows that output per effective labor is a function of capital per effective labor raised to the power of the capital share of output (α).

$$y_t = \left(\frac{Y_t}{A_t L_t}\right) = \frac{K^{\alpha}(AL)^{1-\alpha}}{A_t L_t} = k_t^{\alpha} \equiv f(k_t) \tag{3.10}$$

Change in capital is a fundamental concept in the Solow model as it drives the dynamics of economic growth over time. The change in capital is determined by two main factors: investment and depreciation. We derive the equation through the law of motion of capital, which is presented in equation (3.7)

$$\Delta K_{t+1} = K_{t+1} - K_t = (1-\delta)K_t + I_t - K_t \tag{3.11}$$

which simplifies to:

$$\Delta K_{t+1} = sY_t - \delta K_t \tag{3.12}$$

Similarly, the change in capital per effective labor is

$$\Delta k_{t+1} = k_{t+1} - k_t \tag{3.13}$$

Further analytical computation with (3.5), (3.6), and (3.10) leads to the derivation of the following equation:

$$\Delta k_{t+1}(1+g)(1+n) = sf(k_t) - [g+n+\delta+gn]k_t \tag{3.14}$$

Equation (3.13) is the most important equation of the Solow model since it clearly explains how capital is adjusted for key factors that contribute to economic growth (Barro and Sala-I-Martin, 2003). The change in capital per effective labor (Δk_{t+1}) is adjusted by the combined growth rates of technology and population, denoted by $(1+g)(1+n)$. The resulting change in capital per effective labor is formed by the savings rate, adjusted for the break-even investment. This break-even investment includes depreciation, technological growth, population growth, and their interaction.

3.2 Empirical Framework and Hypothesis Development

As mentioned in the previous section, the textbooks by Barro and Sala-I-Martin (2003) and Romer (2012) will continue to be used. Building on the Solow growth model and real-world phenomena, such as South Korea's demographic challenges, this section will develop a regression model that explains the relationship between economic growth and various variables.

First, the analysis begins with the equation (3.8) $K_{t+1} = (1-\delta)K_t + sY_t$ and given the equation (3.10) y_{t+1} is transformed to k_{t+1}^{α}.

To show how capital per effective labor evolves over time, the equation recomputes as:

$$\frac{K_{t+1}}{A_{t+1}L_{t+1}} = k_{t+1} \tag{3.15}$$

To find the total capital stock K_{t+1}, we rearrange the equation (3.15) by multiplying both sides $A_{t+1}L_{t+1}$.

$$K_{t+1} = k_{t+1}A_{t+1}L_{t+1} \tag{3.16}$$

This suggests that the total capital (K_{t+1}) is expressed as the product of the capital per effective labor (k_{t+1}), technology level (A_{t+1}), and the labor force (L_{t+1}). Using equation (3.8), where the equation is divided by A_tL_t, the expression is normalized to reflect capital per unit of efficiency levels.

$$\frac{K_{t+1}}{A_tL_t} = s\left(\frac{Y_t}{A_tL_t}\right) + (1-\delta)\left(\frac{K_t}{A_tL_t}\right) \tag{3.17}$$

By applying the equation (3.16) , substituting it into the capital accumulation equation yields:

$$\frac{k_{t+1}A_{t+1}L_{t+1}}{A_tL_t} = sy_t + (1-\delta)k_t \tag{3.18}$$

Substituting the equation (3.5) and (3.6) into (3.18) results in

$$k_{t+1}(1+g)(1+n) = sy_t + (1-\delta)k_t \tag{3.19}$$

Based on equation (3.10), the equation for the growth rate of output per effective labor can be rewritten in terms of population growth n and technological progress g.

$$y_{t+1}^{\frac{1}{\alpha}}(1+g)(1+n) = sy_t + (1-\delta)y_t^{\frac{1}{\alpha}} \tag{3.20}$$

After dividing by $y_t^{\frac{1}{\alpha}}$, the equation simplifies to:

$$\left(\frac{y_{t+1}}{y_t}\right)^{\frac{1}{\alpha}}(1+g)(1+n) = sy_t^{1-\frac{1}{\alpha}} + (1-\delta) \tag{3.21}$$

As shown below, a logarithmic transformation is applied to simplify equation (3.21) into a regression model.

$$\log\left[\left(\frac{y_{t+1}}{y_t}\right)^{\frac{1}{\alpha}}\right] + \log(1+g) + \log(1+n) = \log[sy_t^{1-\frac{1}{\alpha}} + (1-\delta)] \tag{3.22}$$

To transform the equation (3.22) for use in regression analysis, the entire equation is multiplied by α.

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \alpha\log[sy_t^{1-\frac{1}{\alpha}} + (1-\delta)] - \alpha\log(1+g) - \alpha\log(1+n) \tag{3.23}$$

In the Solow model, g is treated as exogenous and constant over time to simplify assumptions about technology. Therefore, $\alpha \log(1+g)$ is considered a constant intercept β_0 in the regression equations.

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \alpha\beta_1 \log\left[sy_t^{1-\frac{1}{\alpha}} + (1-\delta)\right] + \alpha\beta_2 \log(1+n) \tag{3.24}$$

we consider δ as constant and eliminated $(1-\delta)$ from the equation. The equation is recalculated as:

$$\alpha \log[sy_t^{1-\frac{1}{\alpha}}] = \alpha \log(s) + (\alpha - 1)\log(y) \tag{3.25}$$

Given the saving rate (s) and capital share of output (α) as constant variables, the equation is as follows:

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y) + \beta_2 \log(1+n) \tag{3.26}$$

This is the final regression model derived from the Solow model.

Chapter 4

Methodology

This chapter presents the methodology used to estimate the theoretical model from the previous chapter. The regression model is created to estimate the impact of population growth on the economic growth rate. The model incorporates variables from the Solow model, which was developed in the previous chapter. Further, it includes control variables suggested by literature in Chapter 2 and the data for analysis will be collected from reliable sources such as Korean Statistical Information Service (KOSIS) (2022), OECD (2022), and World Bank (2024a).

The dataset used for this methodology has a panel data structure, incorporating annual time series data spanning from 2000 to 2021 with a total of 352 observations. The data includes observations from 16 regions in South Korea: Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi-do, Gangwon-do, Chungcheong buk-do, Chungcheong nam-do, Jeolla buk-do, Jeolla nam-do, Gyeongsang buk-do, Gyeongsang nam-do, and Jeju. Regions with financial independence ratios exceeding 67% are defined as urban areas, whereas those with lower ratios are defined as rural. A high ratio indicates a better revenue collection base. The author calculated the quantiles for classification into urban or rural categories and set the 75th percentile as the threshold for urban classification since quantile-based classification methods are widely used in statistical analysis and geographic studies. For instance, Seoul, the capital of South Korea, is considered an urban region due to its financial independence ratios consistently over 67% each year from 2000 to 2021. Using statistical methods, this will further explore the relationship between low fertility rates and economic growth across these 16 regions.

4.1 Variable Description

Table 4.1 provides detailed explanations, relevant authors, and expected signs of all variables included in our regressions. All the variables, with the exception of inflation, are expressed in logarithmic form.

Variable	Explanation	Author	Sign
FR	Demographic expansion impedes economic growth in developed economies.	Malthus (1798), Kuznets (1967)	(-)
DR	Demographic expansion impedes economic growth in developed economies.	Malthus (1798), Kuznets (1967)	(+)
PD	High population density tends to lower fertility rates, and it leads to higher economic growth.	Lutz et al. (2006)	(+)
educ	Higher education can lead to lower fertility rates and higher economic growth.	Becker et al. (1990)	(+)
w__workforce	Female workforce participation rate tends to reduce fertility rates and leads to higher economic growth.	Woo (2012)	(+)
RnD	Increase in human capital can increase advances in technological knowledge and skills, resulting in increased economic growth.	Becker (1990)	(+)
inflation	Control variable to manage the business cycle	Mankiw (2009)	(+)
unem	Control variable to manage the business cycle	Mankiw (2009)	(-)
urban	Urbanization is associated with lower fertility rates and higher economic growth	White et al. (2008)	(+)

Table 4.1: Summary of Variables and Expected Signs

The dependent variable in this analysis is the Regional Gross Domestic Product (RGDP) per capita. The independent variables contain demographic, economic, and social factors. The annual population growth rate (n) by region includes all individuals residing in the region, regardless of their legal status or citizenship. The fertility rate (FR) is measured by the crude birth rate, calculated by dividing the annual number of live births by the mid-year population and expressed per 1,000 individuals. Similarly, the death rate (DR) is measured by the crude death rate, calculated by dividing the annual number of deaths by the mid-year population and expressed per 1,000 individuals (Korean Statistical Information Service (KOSIS), 2022).

Population density (PD) is determined by dividing the population by the region's area, expressed as individuals per square kilometer. The education level variable is calculated as the percentage of college graduates aged 15 years and older within the population. The women's workforce participation rate is the percentage of women aged 15 and older who are economically active. This includes all women who supply labor for the production of goods and services during a specified period, excluding military personnel, combat police officers, public service workers, and prisoners with confirmed sentences (Korean Statistical Information Service (KOSIS), 2022).

Variables for inflation and unemployment are included to control for the business cycle. Inflation is determined using the Consumer Price Index (CPI). Expenditures on research and development (RnD), expressed as a percent of GDP, account for both capital and current expenditures in three main sectors: self-funded R&D expenses, R&D expenses received from external sources (such as government and institutes), and R&D expenses paid to external sources. Additionally, the variable called urban is a dummy variable indicating whether an area is urban or rural, with values of 0 and 1. These data were collected from the Korean Statistical Information Service (Korean Statistical Information Service (KOSIS), 2022).

The basic equation used to evaluate population growth is *population growth = births - deaths + net migration.* According to the World Bank (2022), net migration is 29,998, while the total population is 51,628,120. This results in a net migration rate of 0.058%, which is relatively low. Given the negligible impact of this migration rate on the overall population dynamics, it is considered an insignificant factor in demographic changes. Therefore, the net migration will be omitted and focus primarily on birth and death rates to understand population growth trends, as we do not have the net migration rate data.

Table 4.2 describes the variables used in the analysis in detail. The descriptive statistics for these variables, including their means, standard deviations, minimum and maximum values, are summarized in the table below.

Statistic	Mean	St. Dev.	Min	Max
n	0.14%	0.92%	−3.45%	4.01%
PD				
(Unit: per square kilometer)	2,254	3,912	89	16,758
FR	8.74%	2.1%	4.2%	16%
DR	5.85%	1.49%	3.7%	9.6%
RGDP				
(Unit: thousand krw)	26,897.360	11,970.840	9,195	69,392
Y_{t+1}/Y_t	0.95	0.03	0.84	1.07
w_workforce	51.16%	4.22%	41.10%	66.10%
unem	3.26%	0.94 %	1.30 %	7.10%
inflation	2.4%	1.4%	−0.3%	6.0%
educ	28.22%	7.98%	11.13%	48.26%
RnD	2.90%	3.78%	0.36%	20.21%

Table 4.2: Descriptive Statistics for Variables

The descriptive statistics reveal several interesting points about the dataset. The population density (PD) varies widely. For instance, the highest population density is recorded at 16,758 per square kilometer in Seoul, while the lowest is 89 per square kilometer in Gangwon-do. The fertility rate (FR) has a mean of 8.737%, while the death rate (DR) averages 5.852%, showing moderate variability. Inflation averages 2.429%, with values ranging from -0.321% to 6.012%, showing changing economic conditions across the regions.

Moreover, it is important to ensure that a data set containing stationary and non-stationary series does not lead to significant errors in the analysis. The Augmented Dickey-Fuller (ADF) test was used to identify the non-stationary variables in our data set. The ADF test identifies log_DR as a non-stationary series due to its p-values of 0.05691. However, given its p-value slightly above 0.05, we retained the original values without applying differencing.

4.2 Model Specification

In this section, the Solow model developed in Chapter 3 is estimated to analyze the impact of population growth, fertility rates, and death rates on RGDP. For the initial specification, we use the model derived from the Solow growth model, specifically referring to the final regression equation presented as equation (3.26)

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(1+n) \tag{4.1}$$

We have two branches of models: one focusing on population growth and the other on fertility and death rates. Given our emphasis on the impact of the fertility rate, we replace the population growth rate with fertility and death rates in our analysis. Control variables are incorporated further within both branches.

While the first specification derives the exact model from the Solow, the second specification extends the population growth model to incorporate fertility and death rates. The second specification is:

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(FR) + \beta_3 \log(DR) \tag{4.2}$$

Given the seven control variables, including a dummy variable, two separate models are created to balance the analysis before moving to a final model that incorporates all seven variables. The first model includes population density, education, and women's workforce participation rate, as these three variables represent demographic and human capital factors. The second model includes R&D expenditure, unemployment, and inflation, focusing on economic and financial factors. Now, additional variables are incorporated into both branches. (4.1) and (4.2).

The models with population density, education, and women's workforce participation rate within the two branches are as follows:

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(1+n) + \beta_3 \log(\text{PD}) \\ + \beta_4 \log(\text{educ}) + \beta_5 \log(\text{w\_workforce}) + \beta_6 \text{urban} \tag{4.3}$$

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(\text{FR}) + \beta_3 \log(\text{DR}) + \beta_4 \log(\text{PD}) \\ + \beta_5 \log(\text{educ}) + \beta_6 \log(\text{w\_workforce}) + \beta_7 \text{urban} \tag{4.4}$$

The models with inflation, R&D expenditure, and unemployment within the two branches are as follows:

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(1+n) + \beta_3 \log(\text{RnD}) \\ + \beta_4 \text{inflation} + \beta_5 \log(\text{unem}) + \beta_6 \text{urban} \tag{4.5}$$

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(\text{FR}) + \beta_3 \log(\text{DR}) + \beta_4 \log(\text{RnD}) \\ + \beta_5 \text{inflation} + \beta_6 \log(\text{unem}) + \beta_7 \text{urban} \tag{4.6}$$

The final model includes all control variables within the two branches.

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(1+n) \\ + \beta_3 \log(\text{PD}) + \beta_4 \log(\text{educ}) + \beta_5 \log(\text{w\_workforce}) \\ + \beta_6 \log(\text{RnD}) + \beta_7 \text{inflation} + \beta_8 \log(\text{unem}) + \beta_9 \text{urban} \tag{4.7}$$

$$\log\left(\frac{y_{t+1}}{y_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 \log(\text{FR}) + \beta_3 \log(\text{DR}) \\ + \beta_4 \log(\text{PD}) + \beta_5 \log(\text{educ}) + \beta_6 \log(\text{w\_workforce}) \\ + \beta_7 \log(\text{RnD}) + \beta_8 \text{inflation} + \beta_9 \log(\text{unem}) + \beta_{10} \text{urban} \tag{4.8}$$

Chapter 5

Results

5.1 Estimator Selection

According to Wooldridge (2012), the first step in analyzing panel data is to choose the appropriate model. This involves considering several potential models, such as the pooled OLS model, the fixed effects model, and the random effects model. The Breusch-Pagan (BP) test is used to check the presence of heteroscedasticity. Given that all eight models discussed in Chapter 4 exhibit p-values below 0.05, indicating the presence of heteroscedasticity, we now proceed to the Hausman test. The Hausman test is then used to determine the most suitable model by choosing between the fixed effects and random effects models.

	FE estimator	**RE estimator**
H_0	Consistent, Inefficient	Consistent, Efficient
H_A	Consistent	Inconsistent

Table 5.1: Choice of Hausman test for FE and RE

Table 5.1 indicates the preferred estimator under the null and alternative hypotheses. Under the null hypothesis, the RE estimator is more efficient and consistent, while under the alternative hypothesis, the FE estimator is consistent and therefore preferred (Wooldridge, 2012).

For convenience, models will now be referred to simply by their numbers (e.g., Model 1, Model 2) rather than (e.g., 4.1, 4.2, etc.). Based on the results of the Hausman test in Table 5.2, the p-values for Model 3 and Model 7 exceed the significance level of 0.05. This suggests that the Random Effects model is the most appropriate for these cases. For the remaining models, the Fixed Effects model is the best-fitting model.

Model	Chi-Sq Statistic	p-value	Type of Regression Model
Model 1	41.775	8.484e-10	Fixed Effects
Model 2	39.579	1.309e-08	Fixed Effects
Model 3	12.322	0.05516	Random Effects
Model 4	20.497	0.004591	Fixed Effects
Model 5	31.438	2.09e-05	Fixed Effects
Model 6	32.702	3.009e-05	Fixed Effects
Model 7	13.347	0.1475	Random Effects
Model 8	18.313	0.04991	Fixed Effects

Table 5.2: Hausman test results

5.2 Result Derived from the Solow Model

The result of Model 1 implies a statistically significant negative relationship between the regional GDP at time t and the subsequent growth rate, with an estimated coefficient for $\log(y_t)$ of -0.049 and a p-value of less than 2.22×10^{-16}. According to the model, regions with higher GDP tend to have lower growth rates due to the catching-up effect or convergence theory, as a 1% increase in RGDP affects a 0.049% decrease in the change in RGDP. However, the population growth rate (n) is not statistically significant (p-value = 0.58), implying that population growth does not affect RGDP growth.

In the Model 2, we expanded the set of explanatory variables to include the logarithms of the fertility rate and the death rate instead of the population rate

	Dependent variable:	
	$\log\left(\frac{y_{t+1}}{y_t}\right)$	
	Fixed Effects (1)	Fixed Effects (2)
log(y)	-0.049^{***}	-0.078^{***}
	(0.005)	(0.009)
n	0.142	
	(0.256)	
log(FR)		-0.039^{***}
		(0.015)
log(DR)		0.020
		(0.036)
Observations	352	352
R^2	0.212	0.241
Adjusted R^2	0.172	0.200
F Statistic	45.027^{***} (df = 2; 334)	35.185^{***} (df = 3; 333)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5.3: Regression Model Derived from the Solow Model

(n). Similarly, the coefficient of the logarithm of RGDP is estimated to be -0.078. The fertility rate (FR) likewise has a negative and statistically significant effect on RGDP growth, with a coefficient of -0.039 (p-value = 0.008). It indicates a 1% increase in fertility rate affects a 0.039% decrease in RGDP growth. The concept that higher fertility rates can lower economic growth matches Becker et al. (1990)' theory. According to this theory, a decrease in fertility rates results in higher human capital investments per child and subsequently driving economic growth, which aligns with the observed trends in the Korean case. In contrast, the death rate (DR) does not appear to significantly affect RGDP growth due to a higher p-value. Both models explain over 20% of the variation in GDP growth rates, with an R^2 of 0.21 and 0.24.

5.3 Result with Demographic and Human Capital Variables

In the extended analysis, we added more variables to our Solow models to better understand the determinants of regional GDP growth. Building on Model 1, we included variables related to demographics and human capital, such as log(PD), log(educ), log(w_workforce), and urban dummy variable.

The results indicate that the regional GDP at time t ($\log(y)$) remains a significant negative influence on RGDP growth, with a coefficient of -0.013 due to the convergence effect. Interestingly, among the new variables, education has a negative and significant impact on GDP growth. The coefficient for education is -0.0462, indicating that a 1% increase in the education level could lead to a 0.046% decrease in GDP growth. In contrast, population density positively and significantly affects GDP growth (coefficient = 0.005; p-value = 0.002). This result suggests that population density has a positive impact on economic growth. Other variables, such as death rate, women's workforce participation rate, and urbanization, are not statistically significant.

In Model 4, we further extend the Model 2 by including the same additional variables. The results demonstrate a negative relationship between the regional GDP at time t and the subsequent growth rate, with a coefficient of -0.080 and

	Dependent variable:	
	$\log\left(\frac{y_{t+1}}{y_t}\right)$	
	Random Effects (3)	Fixed Effects (4)
log(y)	-0.013^{***}	-0.080^{***}
	(0.005)	(0.024)
n	0.267	
	(0.185)	
log(FR)		-0.039^{**}
		(0.016)
log(DR)		0.003
		(0.044)
log(PD)	0.005^{***}	-0.024
	(0.002)	(0.040)
log(educ)	-0.046^{***}	0.003
	(0.008)	(0.030)
log(w_workforce)	0.023	0.024
	(0.023)	(0.059)
urban		0.002
		(0.003)
Constant	0.045^{*}	
	(0.027)	
Observations	352	352
R^2	0.197	0.243
Adjusted R^2	0.186	0.193
F Statistic	84.972^{***}	15.099^{***} (df = 7; 329)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5.4: Result with Demographic and Human Capital Factors

a p-value of 0.0009. The fertility rate also remains a significant negative variable, with a coefficient of -0.039 and a p-value of 0.013, supporting Malthus (1798)'s idea that higher fertility rates can impede economic growth. In contrast to the previous findings, education and population density does not significantly affect GDP growth, and other variables also remain statistically insignificant.

5.4 Result with Economic and Financial Variables

In this extended analysis, we have incorporated additional economic variables to better understand the determinants of regional GDP growth. Control variables such as log(RnD), inflation, log(unem), and urban dummy are included.

These two models provide similar results as the previous models, with RGDP at time t ($\log(y)$) and fertility rates remaining significant factors in RGDP growth.

Interestingly, inflation is a positive and statistically significant variable (coefficient = 0.00128, p-value = 0.002) in Model 5. It demonstrates a 1% increase in inflation leads to an approximate 0.128% increase in the GDP growth rate. Other variables such as inflation, research and development expenditure, and urbanization are not statistically significant.

In Model 6, besides log(y) and the fertility rate, R&D expenditure and inflation are also statistically significant. R&D expenditure has a coefficient of 0.017 and a p-value of 0.089. Although this p-value exceeds the conventional significance level of 0.05, it is still below the 10% significance level, indicating that R&D expenditure is a significant variable. This means that a 1% increase in R&D expenditure is associated with an approximate 0.017% increase in RGDP growth. This result supports Becker et al.'s idea that technological knowledge and skills contribute to economic growth. Additionally, inflation remains significant, with a coefficient of 0.001 and a p-value of 0.026. Unemployment and urbanization, however, do not show statistical significance.

	Dependent variable:	
	$\log\left(\frac{y_{t+1}}{y_t}\right)$	
	Fixed Effects (5)	Fixed Effects (6)
log(y)	-0.056^{***}	-0.085^{***}
	(0.010)	(0.014)
n	0.137	
	(0.263)	
log(FR)		-0.036^{**}
		(0.015)
log(DR)		0.015
		(0.039)
log(RnD)	0.014	0.017^{*}
	(0.010)	(0.010)
inflation	0.002^{***}	0.001^{**}
	(0.001)	(0.001)
log(unem)	0.004	-0.007
	(0.010)	(0.010)
urban	0.004	0.001
	(0.002)	(0.003)
Observations	352	352
R^2	0.244	0.262
Adjusted R^2	0.196	0.213
F Statistic	17.748^{***} (df = 6; 330)	16.677^{***} (df = 7; 329)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5.5: Result with Economic and Financial Factors

5.5 Final Result Including All Variables

Given that all control variables are included in these models, the results demonstrate similarities to the previous models. In Model 7, (log(y)) remains a significant negative influence on RGDP growth (coefficient = -0.010, p-value = 0.043). Also, population density (p-value = 0.029) and inflation (p-value = 0.0007) continues to show significant positive effects on RGDP growth. However, the analysis reveals a negative relationship with education (p-value = 5.595e-06), pointing that higher levels of education are associated with a reduction in GDP growth. Other variables such as women workforce participation rate, unemployment, among others do not show significant effects.

Model 8 indicates a significant negative relationship between regional GDP at time t and the subsequent growth rate, with a coefficient of -0.092 (p-value = 0.0005). The fertility rate has a nearly significant negative influence (coefficient = -0.032, p-value = 0.052). Among the control variables, inflation remains significant, with a coefficient of 0.001, p-value= 0.023. R&D also demonstrates a significant influence on RGDP growth. Although the p-value for R&D is 0.084, which slightly exceeds the regular significance level of 0.05, it is considered statistically significant within this context. The coefficient for R&D is 0.018, meaning that a 1% increase in R&D expenditure is associated with a 0.018% increase in RGDP growth. Other variables, such as education, population density, unemployment, and urbanization, do not show significant individual effects.

	Dependent variable: $\log\left(\frac{y_{t+1}}{y_t}\right)$	
	Random Effects (7)	Fixed Effects (8)
log(y)	-0.010^{**}	-0.092^{***}
	(0.005)	(0.026)
n	0.247	
	(0.210)	
log(FR)		-0.032^{*}
		(0.016)
log(DR)		0.009
		(0.045)
log(PD)	0.005^{**}	-0.004
	(0.002)	(0.041)
log(educ)	-0.045^{***}	0.009
	(0.010)	(0.032)
log(w_workforce)	0.024	0.054
	(0.024)	(0.059)
log(RnD)	0.002	0.018^{*}
	(0.003)	(0.010)
inflation	0.002^{***}	0.001^{**}
	(0.001)	(0.001)
log(unem)	0.0004	-0.009
	(0.009)	(0.011)
urban	0.002	0.001
	(0.002)	(0.003)
Constant	0.026	
	(0.030)	
Observations	352	352
R^2	0.226	0.264
Adjusted R^2	0.205	0.207
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5.6: Final Result Including All Variables

Overall, the analysis reveals that population growth (n) does not have a significant effect on GDP growth, indicating that changes in population size alone do not influence economic outcomes. In contrast, fertility rates consistently show a significant negative impact on GDP growth across the models, supporting Malthus' theory that higher fertility rates can impede economic growth. The death rate, however, does not have a significant effect.

In our analysis, the adjusted R-squared values were used to identify how well each model explains the variability in GDP growth. Model 6 has the highest adjusted R-squared value at 0.213, indicating that it explains approximately 21.3% of the variability in GDP growth. Model 8 follows with an adjusted R-squared of 0.207, showing a slightly lower explanatory power.

To further support the selection of the best model, we used Akaike Information Criterion (AIC). According to Cavanaugh and Neath (2019), The AIC helps identify a model with an appropriate structure and dimension from a set of candidate models by evaluating whether a fitted model achieves an optimal balance between goodness of fit and complexity. The results from the AIC were consistent with those from the adjusted R-squared values. Model 6, with the lowest AIC value of -2052.259, was identified as the best model. Model 8, with an AIC of -2047.170, was the second best. Both the adjusted R-squared and AIC values point to Model 6 as the most effective model, followed closely by Model 8, suggesting that these models provide the most reliable explanations of the determinants of GDP growth in our analysis.

Chapter 6

Conclusion

This thesis examined the impact of population growth on GDP growth in South Korea. Given the country's demographic challenges, the regression model results provide an understanding of the factors that drive economic growth in South Korea. The fertility rate has been identified as a significant factor negatively affecting GDP growth. According to the results of the final regression model, the negative relationship between higher fertility rates and economic growth in South Korea is statistically significant (p-value$<$ 0.1). This finding supports the theories of Malthus, Kuznets, and Becker, which argue that increased fertility rates can impede economic growth.

Based on the analysis's results, population density, education, inflation, research and development expenditures and fertility rates are significant factors. Policymakers should consider the findings related to these factors. Detailed explanations and recommendations for some variables are provided, though certain variables do not include specific recommendations, which will also be discussed below.

It has been argued that Seoul has an extremely high population density. Ahn (2003) suggests reallocating the capital or establishing a new administrative capital to distribute the population more evenly across the country. Reducing Seoul's population density could lead to an increase in population density in other regions.

With regard to education, Becker et al.'s theory was partially proved, as education levels were found to have a significantly negative impact on economic growth, which is unexpected. In contrast, R&D expenditure is statistically significant at the 10% level (the p-value was slightly high but still met the 10% significance level), and it proves that technological advancements can increase economic growth.

Inflation is observed to be the most significant factor. It is important to note that higher inflation does not necessarily lead to increased economic growth. Inflation can cause uncertainty regarding future costs and prices, as well as price distortions that mislead consumers and producers about the scarcity of goods and services (Mankiw, 2009). As shown in Table 4.2, the average inflation rate is 2.429%. Since South Korea has experienced a relatively low period of inflation, a slight increase in inflation can stimulate spending and investment, as people expect higher prices in the future and prefer to spend money now rather than later. Therefore, the result indicates that inflation is the most important factor due to the low inflation environment.

Lederman and Maloney (2003) explained that increasing R&D investment is crucial for economic development. To maximize the benefits of R&D for economic growth, the government should provide tax incentives and increase investments in R&D to encourage innovation and technological advancements. Collaborations between private companies and public institutions should be promoted, and experts from other developed countries in fields such as IT to enable shared resources and further expertise to accelerate technological advancements and boost the economy.

Taking the earlier policy recommendation into account, we must also note that the forecasted fertility rate graph in Figure 2.4, the TFR is expected to be 0.4779376 in 2035. Although many economists such as Malthus (1798), Kuznets (1967) suggest that higher fertility rates can impede economic growth, it is acknowledged that an extremely low fertility rate will eventually affect economic growth negatively. Therefore, any specific policy regarding demographic factors such as immigration, migration, and fertility rate is not recommended. By focusing on managing population density and increasing R&D expenditure, South Korea can better navigate its economic challenges and foster long-term growth and stability.

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