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Financial Projection of the Basic Pension under Selective Eligibility Criteria[†]

By DOHUN KIM*

This study conducts a financial projection of the basic pension in Korea, which provides cash assistance to the bottom 70% of elderly individuals aged 65 and over. The projection is carried out under both expansion and selective eligibility criteria, with particular emphasis on the latter. Specifically, the study examines two well-discussed selective eligibility criteria: 1) fixing the eligibility threshold at the 2024 value and adjusting it according to the inflation rate, and 2) linking the eligibility threshold to the median household income figure. To estimate the number of recipients under these selective scenarios, the study projects the future income evolution of the elderly, assuming the continuation of past income trends. Using the financial model of the basic pension developed by Shin and Kim (2021), the study finds that total fiscal spending could be reduced by 22% under the first selective scenario and by 17% under the second selective scenario, relative to the current system, in real terms between 2024 and 2070. With these fiscal savings, the study concludes that the full benefit amount could be increased from the current level of 334,810 won to 435,000 won under the first scenario and to 405,000 won under the second scenario by 2025.

Key Word: Basic Pension, Selective Eligibility Criteria, Pension Reform, Elderly Poverty, Financial Model of Basic Pension JEL Code: H53, H55, I31, J10

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I. Introduction

A lthough Korea has experienced rapid economic growth over the past few decades, the poverty rate among the elderly ranks at the highest level among OECD countries. One of the main reasons for this high poverty rate can be attributed to the immature national pension system of Korea, which was introduced only in 1988. Due to the short history of the pension system, older generations did not have enough time for the national pension benefit to mature and were unable to prepare for an adequate amount of retirement income. To tackle the high poverty rate of the elderly, the government implemented a basic pension, a non-contributory pension system that provides monthly cash payments to elderly individuals aged 65 and above whose recognized amount of income (hereafter, RAI) falls below the top 70% of their age group.¹

From 2014 to 2024, the maximum benefit amount of the basic pension has increased by nearly 62%, from 200,000 won to 334,810 won. Moreover, due to the aging population, the number of basic pension recipients has increased by 45%, from approximately 435,000 to nearly 624,000 recipients. As both the benefit amount and the size of the elderly population aged 65 and above have increased significantly, the expenditure on the basic pension has also risen substantially. As of 2023, the basic pension system has become one of the largest welfare programs in Korea, accounting for 1% of GDP, and it is projected to increase even further.

Recently, the current selection criteria of the basic pension, which targets the poorest 70% of the elderly aged 65 and above, have received criticism for not being a cost-effective way to address the high poverty rate among the elderly. In particular, there is no clear rationale behind why the basic pension should target 70% of the elderly population despite the fact that the economic condition of the new elderly generation reaching age 65 has improved significantly. For instance, while the bottom 70% threshold income amount that determines the eligibility for the basic pension was only 56% of the median income in 2015, it increased to 94% of the median income by 2023, implying that the elderly covered by the basic pension system have become more affluent relative to the past.

The OECD pension report on Korea suggested a narrowing down of basic pension recipients and an increase the benefit amount to tackle the poverty rate of the elderly more effectively (OECD, 2022). The Basic Pension Adequacy Evaluation Committee, an advisory body to the Minister of Health and Welfare, also suggested that the current selection criteria be transformed from a target population method to absolute criteria so that the number of recipients can gradually decline as the economic condition of the new elderly generation improves relative to the overall population. There have been several specific proposals by different researchers to make the selection criteria more selective. For instance, Yun (2023) suggested fixing the eligibility threshold amount at the year of 2023 and adjusting it according to the

inflation rate. Others suggested setting the eligibility threshold line relative to the median income (Basic Pension Adequacy Evaluation Committee, 2023).

Despite the importance of conducting financial projections based on selective scenarios, there has been limited research on this subject. While NABO (2018; 2023a) considers a selective scenario in which the benefit amount varies across different RAI levels among the elderly, it does not perform a financial projection for a scenario in which the target group is gradually narrowed. Although Ryu *et al.* (2022) does consider a scenario in which the target group is gradually reduced, the size of the target group is artificially adjusted from 70% to 30%. However, under the aforementioned selective eligibility criteria, the number of recipients is determined by the evolution of the RAI distribution among the elderly and the median household income. Therefore, it is crucial to compute the size of the recipient group within the model based on this mechanism. One approach is to forecast the evolution of both the RAI distribution and median household income.

In this study, utilizing the financial projection model of basic pension developed by the Shin and Kim (2021), I conduct a financial projection under both expansion scenarios, in which the benefit amount and size of the recipient pool increase relative to the base case and selective scenarios in which the number of recipients is narrowed down. In particular, this study focuses on two well-discussed selective scenarios: 1) fixing the eligibility threshold amount at the year of 2024, and adjusting it according to the inflation rate (selective scenario 1), and 2) linking the eligibility threshold at the median household income (selective scenario 2).² These selection scenarios have strength in that as the economic condition of future generations improves, the number of recipients will gradually decrease. Furthermore, existing recipients will continue to receive benefits, therefore facing less political resistance as opposed to if the number of recipients was dramatically reduced.

This study makes a strong contribution to the literature by linking the selection criteria for basic pension eligibility to the evolution of the RAI distribution and median household income. To achieve this, it projects the future distribution of the RAI assuming that past trends will continue into the future. Specifically, it calculates the RAI for each percentile of the elderly population from 2014 to 2021 using data from the National Survey of Tax and Benefit (NaSTaB) and predicts the future evolution of the RAI for each percentile by means of linear projection. Similarly, the future evolution of median household income is forecasted based on the assumption that historical trends in the median income will persist. This information is then used to estimate the proportion of recipients under selective scenarios, serving as input for the basic pension model developed by Shin and Kim (2021) to make financial projections of expenditures.

The findings demonstrate that under the current system, the total accumulated fiscal expenditure between 2024 and 2070 amounts to 1,891 trillion won in real terms. Under the expansion scenario, where the benefit amount increases from 334,810 won to 400,000 won, the total accumulated fiscal expenditure rises to 2,236 trillion won, which is 18% higher than that of the current system. Moreover, under

²The eligibility threshold for a single household is 2.13 million won, and for couple households, it is 3.408 million won in 2024. In this study, as will be explained in the main section, the eligibility threshold for couple households is used to project the size of recipients under selective scenarios.

the expansion scenario, where the eligibility criteria are expanded to include all elderly individuals on top of the increase in the benefit amount from 334,810 won to 400,000 won, the total accumulated fiscal expenditure rises to 3.191 trillion won, which is 69% higher than that of the current system. On the other hand, under the selective scenarios, as the proportion of recipients gradually declines from 70% to nearly 50% of elderly individuals aged 65 and above between 2024 and 2070, the total accumulated fiscal expenditure also decreases significantly. Specifically, the total accumulated fiscal expenditure declines by 22% relative to the current system under selective scenario 1 and by 17% under selective scenario 2. Utilizing the savings from each selective scenario, this study demonstrates that the full benefit amount of the basic pension can be increased to 435,000 won and to 405,000 won in 2025 under selective scenarios 1 and 2, respectively, without incurring additional fiscal spending compared to the current system. These results indicate that implementing selective eligibility criteria can provide the government with the financial flexibility to increase benefit amounts by specifically targeting the poorer group in relative terms among the elderly.

The paper is divided as follows: section 2 provides an overview of the basic pension, including the history of the institution and detailed information pertaining to the selective eligibility criteria. Section 3 explains the forecast model of the basic pension and the method used to forecast the future distribution of the RAI using data from the National Survey of Tax and Benefit. Section 4 presents the financial projection results of the basic pension under both expansion and selective scenarios. Finally, section 5 discusses the results and concludes the paper.

II. Overview of Basic Pension Income

A. History of the Basic Pension

Due to its relatively short history, the national pension system in Korea, which was only introduced in 1988 and later extended to cover the entire population, has not yet matured enough to serve fully as an old-age income security system. Given that a large portion of the elderly did not have sufficient time to contribute to the system and secure an adequate pension, the government introduced a cash assistance program in 1991 to supplement the income of the poor elderly in the form of an old-age allowance. However, this program was criticized for its limited effectiveness in reducing the high elderly poverty rate due to the small benefit amounts and restricted target group.

In 2008, the government introduced what was termed the basic old-age pension system, the predecessor of the basic pension.³ It is a non-contributory public pension program that provides monthly cash assistance to elderly individuals whose RAI falls within the bottom 70% among those aged 65 and over. The benefit amount was set

³The major difference between the old-age pension and the basic pension in terms of system operation is that, under the former, government had the discretion to reduce the number of recipients based on budget constraints.

to the 5% of the A value, which is the average salary of national pension contributors over the last three years, and it included a 20% reduction rate for the married-couple households. As of 2014, the benefit amount was 99,100 won for single households and 158,600 won for married-couple households. It also introduced an incomereverse prevention-reduction scheme which reduces the basic amount to prevent cases in which a beneficiary's income exceeds the income of non-beneficiaries after accounting for the basic pension.

The discussion on introducing the basic pension system began due to growing social concern over elderly poverty and gained momentum during the 18th presidential election when candidates proposed introducing the system to expand income security for the elderly. As a result, the basic pension system was introduced following the enactment of the Basic Pension Act, which expanded the existing basic old-age pension system. While maintaining the eligibility criteria for elderly individuals aged 65 and over whose RAI falls within the bottom 70%, the basic pension system further enhanced old-age income security by increasing the full benefit amount from 5% to 10% of the A value. Consequently, the full benefit amount increased to 200,000 won for single households and 160,000 won for married-couple households. While retaining the income-reversal prevention-reduction scheme, the basic pension also introduced a reduction scheme in the benefit calculation for recipients who concurrently receive the national pension. The reduction rate varied according to the A value of the national pension. The history of the basic pension is summarized in Table 1.

System	Old-Age Allowance	Senior Pension	Basic Old-Age Pension	Basic Pension
Year of Implementation	1991	1998	2008	2014
Beneficiaries	Low-income seniors aged 70 and above → seniors aged 65 and above who are eligible for livelihood protection	Low-income seniors aged 65 and above	Seniors aged 65 and above in the bottom 70% income bracket	Seniors aged 65 and above in the lowest 70% income bracket
Benefit Amount	35,000~50,000 won	20,000~50,000 won	5% of the A value of the National Pension	10% of the A value of the National Pension
Reduction	-	12.5% reduction for a couple two beneficiaries	20% reduction for a couple of two beneficiaries, income-reversal prevention adjustment	20% reduction for a couple of two beneficiaries, income-reversal prevention adjustment, reduction linked to the National Pension
Benefit Adjustment	-	-	Adjusted according to the National Pension A value	Linked to the national consumer price index (CPI) fluctuation rate; adequacy evaluation conducted every five years

TABLE 1—HISTORY OF THE BASIC PENSION

Source: NABO, "2018-2027 Estimation of the Expenditure for the Basic Pension," 2018, p.10.

TABLE 2-FORMULA FOR THE RAI CALCULATION

RAI =	RAI = Income Assessment Amount 1) + Assets Converted Income 2)					
1) RA	I = $\{0.7 * (Labor Income - Labor Income Deduction amount) + other income*$					
*	The labor income deduction amount is the amount of income that is deducted to ensure that work motivation is not hindered and it is based on the minimum income level (1.8 million Korean won as of 2023).					
**	Other income is the sum of business income, public transfer income, imputed rent income and property income, with an annual deduction of 40,000 won applied to interest income included in property income.					
2) Ass liabilit	et-converted income = [{(general assets – basic asset amount*) + (financial assets – 20 million won) – y }× income conversion rate for assets** \div 12] + P***					
*	The basic asset amount refers to the minimum amount required for housing maintenance (as of 2023, metropolitan cities: 135 million won, medium-sized cities: 85 million won, rural areas: 72.5 million won)					

** 4% annual rate

*** value of luxury automobiles (over 3,000cc or over 40 million won) and membership rights

Source: Ministry of Health and Welfare, "2023 Basic Pension Program Guidelines," 2023.

The eligibility criteria for the basic pension are based on the elderly whose RAI falls below the 70th percentile among those aged 65 and over. However, civil servants and military pension recipients, as well as their spouses, are excluded from eligibility. The RAI, which serves as the basis for determining eligibility, is calculated by summing the assessed income amount, including labor, business, and asset income, as well as the income-converted amounts of assets. The exact process for calculating the RAI is detailed in Table 2. RAI amounts are calculated separately for single-person households and married-couple households.

Meanwhile, as the economic conditions and national pension benefits for the new elderly generation have improved, the eligibility threshold, which is set at the 70th percentile of the RAI among those aged 65 and over, has continued to increase, as shown in Figure 1. For instance, in 2014, the eligibility threshold for single-person households was 870,000 won, and for married-couple households, it was 1,392,000 won. By 2024, these amounts had increased to 1,392,000 won and 3,230,000 won, respectively.

The full basic pension amount refers to the maximum pension that recipients can receive if they are not subject to any reduction schemes, such as 1) a National-Pension-linked reduction, 2) the income-reversal prevention reduction, and 3) a spousal reduction. The National-Pension-linked reduction applies to recipients who receive a national pension benefit that exceeds 150% of the full basic pension amount. The proportion of national pension recipients among basic pension recipients increased from 30.4% in 2014 to 46.6% in 2022 (Kim, 2023). The income-reversal prevention reduction is applied when the sum of the benefit amount and pre-benefit RAI exceeds the eligibility threshold; this is done to minimize the income reversal between beneficiaries and non-beneficiaries. Approximately 3% of recipients are subject to the income-reversal prevention reduction. The spousal reduction applies to married couples, imposing a 20% reduction on each individual's benefit.

The full basic pension amount is adjusted relative to the inflation rate and has been gradually increasing due to a few jumps in 2018 and 2021. While the full basic pension amount is fixed at the 10% of the A value, which is the average salary of

national pension contributors in last three years, it increased to 11% of the A value (250,000 won) in 2018 and 11.8% of the A value (300,000 won) in 2021, as shown in Figure 2.

The number of basic pension recipients increased gradually from 4.35 million in 2014 to 6.23 million in 2022 due to rapid aging, as shown in Table 3. As a result, the financial expenditure of the basic pension has more than doubled, rising from 9.68 trillion won in 2015 to 20.09 trillion won in 2022.



Source: NABO, "2018-2027 Estimation of the Expenditure for the Basic Pension," 2018, p.10; Ministry of Health and Welfare, "Basic Pension Program Guidelines," 2014-2024.



Source: NABO, "2018-2027 Estimation of the Expenditure for the Basic Pension," 2018, p.12; *Public Pension Reform and Long-term Projections I*, 2023a, p.14.

							(Unit: Th	ousands, 10	Billion won)
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Beneficiaries	4,353	4,495	4,581	4,869	5,216	5,346	5,660	5,973	6,239
Expenditure	462	968	991	1,053	1,196	1,478	1,669	1,890	2,009

TABLE 3—NUMBER OF BENEFICIARIES AND FINANCIAL STATUS OF THE BASIC PENSION EXPENDITURE

Source: NABO, 2018–2027 Estimation of the Expenditure for the Basic Pension, 2018, p.8; Public Pension Reform and Long-term Projections I, 2023a. pp.13~14.

B. Selective Eligibility Criteria

The purpose of the basic pension was to provide a secure income for poor elderly people in order to address the high elderly poverty rate in Korea, which is mainly due to the immature national pension system.

However, the current eligibility criteria for the basic pension, which targets the bottom 70% of the RAI among those aged 65 and over, is not cost-effective with regard to how well it addresses the high poverty rate among the elderly. In that the basic pension targets 70% of the elderly population, increasing the benefit amount of the basic pension will result in large fiscal expenditures in the future. For example, fiscal expenditure on the basic pension is projected to reach 1.5% of GDP by 2050 and 1.2% of GDP by 2070, even if the benefit amount remains fixed in real terms at the current level due to Korea's rapid aging population (NABO, 2023a). Although the basic pension system has a reduction mechanism that reduces the benefit amount for those whose national pension income exceeds 150% of the maximum basic pension benefit has increased substantially, outpacing the increase in national pension income such that only a small proportion of the elderly receiving a national pension are actually subject to the reduction system (Ryu *et al.*, 2022).

Moreover, as the national pension system has matured and economic conditions have improved, relatively economically well-off elderly households have become eligible for the basic pension. In particular, the eligibility threshold, which is the bottom 70% of the RAI, has been rising. For example, while the bottom 70% of the RAI among the elderly amounted to only 50% of the median household income in 2015, it increased to almost 93% of the median household income in 2023. At the current rate, the eligibility threshold is projected to exceed the median household income level.

Therefore, in order to make the basic pension system more cost-effective in terms of its ability to address the high poverty rate in Korea, one approach is to make the eligibility criteria more selective by setting an absolute eligibility threshold. Currently, several proposals in relation to this exist in the literature. For example, Yun (2023) suggested setting the eligibility criteria at the level of 2023 and then increasing the benefit amount according to the inflation rate. The Basic Pension Adequacy Evaluation Committee suggested setting the eligibility line at 50% or 100% of the median household income. In both cases, the number of beneficiaries will decrease compared to the current system as the income of the elderly improves.

In this study, I carry out financial projections of two selective criteria: 1) setting the eligibility threshold at 2023 levels and increasing it by the rate of inflation, and 2) setting the eligibility threshold at 100% of the median income level.⁴ The first proposal has the advantage of gradually reducing the size of the beneficiary population, as new retirees receive relatively high retirement incomes. In addition, this proposal would not exclude current beneficiaries, which may be advantageous in terms of gaining social acceptance to promote the reform. However, one concern with this proposal is that the number of beneficiaries may decrease significantly, and there is no lower limit. Therefore, it is imperative to establish a floor. I set this as 50% of the median household income, which is often used as a measure of relative poverty, for the present proposal. The second proposal has the advantage of making the eligibility condition relative to the median household income, which is often used as a welfare eligibility criterion. Therefore, the basic pension may be more consistent in terms of eligibility criteria with other welfare programs. However, it is possible that if the growth rate of the median household income exceeds the growth rate of the RAI for the elderly, the number of recipients under second selective scenario may in the future become higher than in the current system.

III. Financial Projection Model of the Basic Pension

A. Literature Review of the Financial Projection Model of the Basic Pension

Notable studies that develop basic pension projection models and conduct fiscal projections include NABO (2018, 2023a) and Shin and Kim (2021). These studies employ a stock approach to forecast the future fiscal expenditures of the basic pension system, achieved by multiplying the number of recipients by the average benefit amount, as determined by the following methodology.

First, these studies categorize recipients into eight distinct groups, reflecting differences in the benefit calculation for: 1) married couples, 2) those who concurrently receive both the national and basic pensions (hereafter referred to as concurrent recipients), and 3) those subject to income-reversal prevention measures. The number of recipients in each group is estimated using future population projections from the National Statistics Office, projections of the number of pension recipients from the fourth National Pension Financial Estimation Committee, projections of the future proportion of pension recipients among basic pension recipients, and historical ratios for each group as provided by Shin and Kim (2021). The average benefit amount for each group is then calculated by applying a reduction rate or an actual reduction formula to the maximum benefit amount.

Meanwhile, Shin and Kim (2021) sought to reflect the projection process more accurately compared to existing models by more fully accounting for the fact that the proportion of concurrent beneficiaries and the average benefit amount increase

⁴I assume the second selective eligibility criteria, which links the eligibility threshold to the median income, only takes in effect when the original eligibility criteria, which is 70th percentile of RAI exceeds the median income.

as the national pension system matures. Specifically, to project the number of concurrent beneficiaries among the bottom 70% more precisely, first they estimated the number of concurrent beneficiaries in the top 30% and then subtracted this figure from the total number of pension beneficiaries projected in the fourth National Pension Financial Estimation Committee. They chose to focus on the top 30% rather than the bottom 70% because the former shows a more consistent trend. The future number of concurrent beneficiaries among the bottom 70% is more uncertain, as this group includes a significant number of elderly individuals over 70 who receive a special pension introduced specifically for those who were already too old to satisfy the minimum contribution period when the national pension system was established in 1988. As the number of these elderly individuals receiving the special pension decreases, the number of concurrent beneficiaries among the bottom 70% may decrease rapidly.

Moreover, the strength of Shin and Kim's (2021) projection model lies in its use of an actual formula for calculating the reduction rate for simultaneous recipients. The reduction rate is applied to simultaneous recipients when the national pension benefit exceeds 150% of the maximum basic pension benefit. This rate is applied differentially depending on the portion of the national pension benefit associated with the A value.⁵

In contrast, NABO (2018) does not use an actual reduction formula for concurrent recipients. Instead, it applies a reduction rate derived from historical data that is based on the strong assumption that the reduction rate applied to concurrent recipients will remain consistent over time. However, merely applying a constant reduction rate rather than an actual reduction formula fails to capture the potential non-linear relationship between the maximum basic pension benefit and the reduction rate. This non-linear relationship can be accurately modeled by incorporating an actual reduction formula into the projection model.

Another distinguishing feature of Shin and Kim's (2021) projection model is its ability to incorporate differentiation strategies for gender, age, and type of national pension (early old-age pension, special pension, normal old-age pension) when calculating the reduced benefit amount. Because benefit levels vary according to these characteristics, the reduction size associated with each category should also differ. Therefore, it is crucial to forecast the reduction size by categorizing concurrent recipients into these distinct groups.

For the reasons stated above, this study employs the basic pension model implemented by Shin and Kim (2021). However, due to data limitations, the study applies a simplification process. First, because information pertaining to estimated old-age national pension benefits is lacking, this study uses the most recent estimates of the national pension (early old-age pension, special pension, normal old-age pension), assuming they increase according to the inflation rate. Consequently, the estimated old-age national pension benefits used in this study to project fiscal spending may be lower than the actual estimates, as the national pension system in Korea is maturing. This implies that the reduction level applied to simultaneous

⁵The national pension benefit consists of two parts: 1) the part associated with the A value, which is the average monthly salary of the pension participant, and 2) the part associated with the B value, which is the average monthly income of the individual during the contribution period.

recipients may be underestimated, which could result in an overestimation of fiscal spending. Therefore, caution is warranted when interpreting the fiscal spending estimates in this study.

Second, the proportions of recipient types apart from concurrent recipients are based on the values as of June of 2021. One caveat when using previously determined numbers of recipient types introduces a disadvantage in that such an approach does not reflect the trend over time of the size of each group. To do this, it is necessary to the access National Pension Administrative Data to find and use previous size calculations for each recipient type. However, such data are not made available to the public.

B. Basic Pension Projection Model Formula

The model is based on the fiscal projection model developed by Shin and Kim (2021). To project the fiscal expenditure of the basic pension, this study categorizes recipients into eight different types according to the following criteria: 1) the status of their reception of national pension benefits, 2) family type (singles or married couples), and 3) whether the income-reversal prevention-reduction scheme applies. While the eligibility criterion for the basic pension is set as the lower 70% of the RAI for elderly individuals aged 65 and over, the rate of reduction applied to the benefit level varies for each type.

First, for those receiving a national pension benefit, the basic pension is reduced by the amount of the national pension's A benefit for each individual. Second, if both spouses receive benefits simultaneously, the benefit amount for each spouse is reduced by 20% to reflect the difference in the cost of living between single and couple households. Third, if the total amount of the basic pension and the RAI exceeds the 70th percentile of the RAI, an income reduction rate is applied.

The number of each type of recipient as of June of 2021 is shown in Table 4. There are several points to note. First, only three percent of all beneficiaries are subject to the income-reversal prevention reduction. Second, females make up a larger share of non-pensioners, who are not recipients of the national pension, compared to the number of males. However, as the duration of female enrollment to the national pension increases, the share of females among concurrent recipients is expected to increase.

The fiscal expenditure on the basic pension is calculated through the following steps. First, I calculate the population aged 65 and over. Second, I determine the number of concurrent beneficiaries among the recipients of the basic pension. Third, I calculate the average benefit amount for the national pension in each of the following four cases: 1) early old-age pension, 2) special pension, 3) normal pension with less than 20 years of contributions, and 4) normal pension with at least 20 years of contributions. Fourth, I categorize basic pension beneficiaries into eight different types, as explained above, and calculate the average basic pension benefits by applying the reduction rate for each type. The specific procedures are as follows.

Туре	Classification	Spousal-	Income-Reversal	Number of Individuals in Each Type (as of June 2021)		
		Reduction	Prevention Reduction	Male	Female	
Type 1		0	0	8,928	36,268	
Type 2	Non Densionen	0	×	462,971	938,372	
Type 3	Non-Pensioner	×	0	5,155	19,372	
Type 4		×	×	487,312	1,728,965	
Type 5		0	0	45,021	17,683	
Type 6	Concurrent Beneficiary	0	×	728,065	252,814	
Type 7		×	0	25,507	12,932	
Type 8		×	×	522,410	526,857	

TABLE 4—NUMBER OF EACH TYPE OF INDIVIDUAL RECIPIENTS (AS OF JUNE OF 2021)

Source: Shin and Kim (2021).

Step 1: Calculation of the Number of Basic Pension Beneficiaries

For every year (t), the number of basic pension recipients (BPR) can be computed by taking 70% of the population projection of the elderly aged 65 and over.

$$N_{BP}(t) = Population_{age \ge 65}(t) \times 0.7$$

Step 2: Calculation of the Number of Concurrent Recipients

In order to forecast the number of concurrent recipients (CR), one technically needs to calculate the number of national pension recipients (NPR) among the elderly whose RAI is below the 70th percentile. However, Shin and Kim (2021) proposed a more effective means of determining the number of concurrent recipients that involves subtracting the number of elderly individuals whose RAI is in the upper 30th percentile from the total number of national pension recipients. The number of concurrent recipients can then be calculated using the proportion of national pension recipients within the upper 30% of the RAI, as provided by Shin and Kim (2021). I denote the proportion as $\alpha(t)$. The formula for calculating the number of concurrent recipients is as follows.

$$N_{CR}(t) = N_{NP}(t) - Population_{age \ge 65}(t) \times 0.3 \times a(t)$$

For selective scenarios, the number of basic pension beneficiaries is not fixed at 70% of the elderly population but gradually decreases as the RAI of the elderly improves, resulting in a smaller proportion of beneficiaries. To compute the size of

concurrent recipients under such selective scenarios, it is necessary to determine the proportion of national pension recipients whose RAI is above the kth percentile of the elderly, where k is greater than 30. For example, if the number of beneficiaries of the basic pension decreases to 60%, the number of concurrent recipients among those 60% of the elderly can then be calculated by subtracting the number of national pension recipients whose RAI is above the upper 40th percentile from the total number of national pension recipients. However, information that would inform us of the proportion of national pension recipients whose RAI is above the kth percentile of the elderly is not publicly available.

To address this, I derive the proportion of national pension recipients whose RAI is above the kth percentile of the elderly through a weighted average of two proportions: the proportion of national pension recipients among all elderly aged 65 and over, $\alpha(t)$, and the proportion of national pension recipients in the upper 30th percentile, $\alpha_{30}(t)$. I assign weights to each part of the equation based on the distance of $q_s(t)$ from 70. The closer $q_s(t)$ is to 30, the more weight is assigned to $\alpha_{30}(t)$. On the other hand, the closer $q_s(t)$ is to 70, the more weight is assigned to $\alpha(t)$. For instance, if $q_s(t)$ is equal to 0.6, the weight that is assigned to $\alpha_{30}(t)$ is then 60/70 and the weight that is assigned to $\alpha(t)$ becomes 10/70. The formula is as follows.

$$N_{CR}(t) = N_{NP}(t) - Population_{age \ge 65}(t) \times (1 - q_s(t))$$
$$\times \left\{ \alpha_{30(t)} \times \frac{q_s(t) \times 100}{70} + \alpha(t) \times \frac{70 - (q_s(t) \times 100)}{70} \right\}$$

Step 3: Calculation of Basic Pension Benefits for Each Type

Before presenting the detailed formulas for each type, first I will explain the three fundamental elements that form the basis of these formulas. First, for Type 4, which includes non-pensioners and is not subject to the income-reversal reduction, the basic pension benefit is equivalent to the full basic pension benefit without any reduction. The full basic pension benefit amount is 334,810 won as of 2024 (Ministry of Health and Welfare, 2024). Second, for types 1, 3, 5, and 7, where income-reversal prevention reduction is applied, the basic pension amount is calculated using the ratio of the reduced basic pension amount relative to the maximum basic pension amount based on actual figures from 2020 (Shin and Kim, 2021).

The formula for the basic pension benefit is as follows: when the national pension amount is 150% or less of the full basic pension amount, recipients receive the full basic pension amount. However, when the national pension amount exceeds 150% of the full basic pension amount, recipients receive a benefit amount between the full amount and half of the full amount. Specifically, when the national pension amount is reduced according to the person's A benefit of the national pension, which represents the income redistribution portion of the national pension.

The scenario in which the national pension amount exceeds 200% can be further

divided into three cases. First, if the A benefit is less than 75% of the full basic pension amount, the person receives the full basic pension amount. Second, if the A benefit falls between 75% and 150% of the full basic pension amount, the person receives a benefit amount between the full basic pension and half of the full amount. Third, if the A benefit exceeds 150% of the full basic pension amount, the person receives 50% of the full basic pension. When the national pension amount lies between 150% and 200%, the basic pension amount is the greater of the basic pension amount reduced according to the A benefit or 250% of the full basic pension amount.

The formula for the basic pension amount explained above is as follows. Specifically, the basic pension amount is calculated differentially depending on the range in which the national pension benefit amount falls: below 150%, between 150% and 200%, and over 200% of the full basic pension amount. In the formula below, BPA refers to the basic pension amount, FBPA refers to the full basic pension amount, and NatPA likewise is the national pension amount. K represents the full basic pension amount, A refers to the A benefit of the national pension, and X denotes the basic pension amount reduced according to the A benefit. Regarding the subscripts, t represents the year, a represents age, and s represents gender.

$$BP[t] = \begin{cases} FBP[t] & \text{if } NP[t,a,s] \le 1.5FBP[t] \\ \max(X[t,a,s], 2.5FBP[t] - NP[t]) & \text{if } 1.5FBP[t] < NP[t,a,s] \le 2FBP[t] \\ X[t,a,s] & \text{if } 2FBP[t] < NP[t,a,s] \end{cases}$$

Meanwhile, the basic pension amount, referred to as X, which is reduced based on the A benefit, is calculated as follows: X is a value between the full basic pension amount and half of that amount, depending on the value of the A benefit. As the A benefit from the national pension increases, X decreases, falling between the full basic pension amount and 50% of that amount.

$$X[t,a,s] = \begin{cases} FBP[t] & \text{if } 0 < A[t,a,s] \le \frac{3}{4}FBP[t] \\ FBP[t] -\frac{2}{3}A[t,a,s] + \frac{FBP[t]}{2} & \text{if } \frac{3}{4}FBP[t] < A[t,a,s] \le \frac{3}{2}FBP[t] \\ \frac{FBP[t]}{2} & \text{if } \frac{3}{2}FBP[t] < A[t,a,s] \end{cases}$$

The basic pension benefits for concurrent recipients vary according to the A value of the national pension benefits, as described in the formula above. Because the national pension can be broadly classified into four types based on the amount of the pension benefit – i.e., early national pension, special pension, and normal old-age pension with less than and at least 20 years of contributions - it is important to classify recipients into these four types. The information pertaining to the proportion of recipients and the average benefit amount for each type by age and gender is taken from the 2020 National Pension Annual Report. I then use the ratio of the A benefit to the national pension benefit amount to calculate the A benefit from the average benefit amount for each type by age and gender (Shin and Kim, 2021). Then, the benefit amount for concurrent recipients can be calculated by applying the average benefit amount by gender and age and the A benefit to the reduction formula of the basic pension benefit for each type of national pension.

The fiscal expenditure of the basic pension is projected separately for each of the eight types of recipients under the assumption that the proportion of each type remains constant at the June 2021 level, as provided by Shin and Kim (2021). To predict future trends in the proportions of each type, administrative data from a source such as the National Pension Database, which is not publicly accessible, would be required. The specific procedures for the fiscal projection are included in the Appendix.

C. Previous Financial Projection Scenarios and Results

Previous studies presented financial projection results for the basic pension based on two scenarios: universal eligibility criteria, where the basic pension is expanded to all elderly, and selective eligibility criteria, where the target group gradually shrinks over time and the benefit amount varies according to the RAI. For example, NABO (2018; 2023a) projects that the financial expenditure of the basic pension will increase to 109.8 trillion won under the current system. In the universal eligibility scenario, where the criteria are expanded to include all elderly aged 65 and over and the benefit amount increases to 400,000 won as of 2024, the additional financial expenditure relative to the current system is projected to amount to 61 trillion won by 2090.

While NABO (2018; 2023a) did not conduct a financial projection under selective criteria where the target group gradually shrinks, it did consider selective criteria where the benefit amount is differentially paid according to the RAI. For instance, while maintaining 70% of the elderly as the eligibility criteria, it considered a selective case in which the benefit amount increases to 450,000 won for those in the bottom 40% in terms of the RAI and 400,000 won for the remaining 30% of the elderly. These results show that by 2090, the expenditure declines by 15 trillion won compared to the universal criteria case.

Ryu *et al.* (2022) conducted financial projections under selective criteria, where the size of the recipient pool shrinks only for the new generation of elderly who begin receiving the basic pension, while ensuring a minimum income level for the poor elderly by introducing a supplemental income program on top of the basic pension. Specifically, their study considered a scenario in which the basic pension amount is adjusted to 12% of the A value starting in 2023, equivalent to 326,000 won in 2023, while gradually lowering the eligibility criteria from the bottom 70% in terms of the RAI to the bottom 30% of the RAI. Under this scenario, the study shows that under

the current system, the projected expenditure amounts to 360 trillion won by 2092, whereas under the selective criteria, 195 trillion won could be saved compared to the current case by 2092.

The selective criteria considered in earlier studies are limited in that they artificially reduce the size of the recipient pool over time, rather than linking it to the income distribution of future generations. The size of the recipient pool under the currently discussed selective criteria, which either fixes the threshold at the 2023 value in real terms or links it to median household income, depends on the future evolution of the income distribution among the elderly. Therefore, this study uses the basic pension financial projection model by Shin and Kim (2021) to conduct financial projections under selective criteria, where the size of the recipient pool is determined by the evolution of the RAI distribution over time. This projection is made under the strong assumption that the future linear trend of the RAI distribution will remain consistent with the trend observed between 2014 and 2021.

D. Forecasting the Number of Recipients under Selective Criteria

Previous studies conducted financial projections of the basic pension under selective criteria by artificially reducing the pool of basic pension recipients over time. However, this approach has a limitation in that the pool of basic pension recipients is exogenously determined at the discretion of the researcher rather than through the actual process involving selective eligibility criteria.

Here, I explain the specific procedures for forecasting the proportion of basic pension recipients under the two aforementioned types of selective eligibility criteria: fixing the eligibility RAI threshold at the 2024 level and linking it to the inflation rate (selective scenario 1), and setting the eligibility RAI threshold to 100% of the median household income for two-person families (selective scenario 2). The critical information needed to predict the proportion of basic pension recipients under these selective scenarios is the future distribution of the RAI of the elderly, as the evolution of the number of basic pension recipients will depend on the evolution of the future distribution of the RAI.

First, the RAI for each elderly household between 2014 and 2021 can be measured using National Survey of Tax and Benefit (NaSTaB) data from 2014 to 2021 based on the RAI formula for single and couple households, as described in the Appendix. Figure 3 shows the 70th percentile of the measured RAI using panel data and the 70th percentile of the actual RAI, representing the publicly announced eligibility criteria for the basic pension by the government between 2014 and 2023 for single and married-couple households. It turns out that the accuracy of the 70th percentile of the measured RAI is much higher for couple households compared to single households. For instance, in 2022 and 2023, the measured 70th percentile RAI corresponds to 2.93 million won and 3.13 million won for couple households, very similar to the actual 70th percentile of the RAI, 2.88 million won and 3.23 million won, respectively. However, for single-person households, the discrepancy between the 70th percentile of the measured RAI and the actual RAI is relatively large compared to that for married-couple households. Hence, for simplicity, throughout the analysis here, I focus on married-couple households when estimating the future

(Unit: 10,000won)



HOUSEHOLD TYPE

Source: Calculated using the data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

distribution of the RAI and the proportion of recipients. I assume that the future proportion of single-person households will follow that of couple households.

Second, for each year, the measured RAI is divided into percentiles. Using this measured RAI for each percentile, I run the following linear regression to derive the predicted value of the future RAI for each percentile and year.

$$\operatorname{RAI}_{s,t} = \beta_0 + \beta_{1,s}t + \varepsilon_{s,t}$$

In this equation, *s* represents the percentile and *t* represents the year. For each percentile of the measured RAI, I use eight samples from 2014 to 2021 to estimate β_1 . Table 5 reports the coefficient values, β_1 , corresponding to married-couple households in each tenth percentile of the RAI. As shown in the table, β_1 increases as the percentile of the RAI increases. This implies that the growth rate of the RAI increases with the percentile of the RAI. Using the estimated coefficients from the linear regression, I predict the future RAI for each percentile for 47 periods from 2024 to 2070.

It should be noted that this analysis estimates the future distribution of the RAI under the strong assumption that each percentile of the RAI will grow linearly at a rate identical to the linear growth rate observed between 2014 and 2021. Thus, it

Percentile	10th	20th	30th	40th	50th	60th	70th	80th	90th	100th
β_1	4.774	5.049	6.167	9.0814	12.756	15.613	18.629	22.707	29.107	87.433
SE	0.626	0.444	0.324	0.603	0.682	1.137	1.725	3.804	5.679	42.993
Number of Obs	8	8	8	8	8	8	8	8	8	8

TABLE 5—COEFFICIENT VALUES PER EACH 10TH PERCENTILE

Source: Calculated using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.



FIGURE 4. MEASURED AND ESTIMATED RAI OF COUPLE FAMILIES PER 10TH PERCENTILE (2014-2021)

Source: Calculated using the data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

implicitly assumes that the changes in the inflation rate, economic growth rate, and income distribution structure observed from 2014 to 2021 will continue into the future.

Figure 4 shows both the estimated and predicted values of the RAI between 2014 and 2021 for each tenth percentile of the RAI. Because the estimated RAI increases linearly over the years, the predicted RAI, which was derived from the linear regression, matches the level and trend of the estimated RAI fairly well.⁶

Figure 5 illustrates the model fit by showing the official, measured, and estimated values for the 70th percentile of the RAI between 2014 and 2024. The official values

⁶The estimated RAI at the 80th and 90th percentiles fluctuates somewhat over the years; therefore, the difference between the predicted and estimated RAI is greater than that at the lower percentiles. However, the predicted value of the RAI at the 80th and 90th percentiles is rarely used to predict the proportion of basic pension recipients under the selective eligibility criteria.

for the 70th percentile of the RAI, reported annually by the Ministry of Health and Welfare of South Korea, represent the figures used to determine the actual eligibility criteria for the basic pension. The measured values for the 70th percentile of the RAI refer to the values obtained from NaSTaB, while the estimated values are those predicted by means of an OLS regression. The left side of Figure 5 shows the yearly official, measured, and estimated values for the 70th percentile of the RAI between 2014 and 2024, while the right side of Figure 5 displays the percent difference between the estimated and official values. The model fit for the values from 2022 to 2024 demonstrate the performance of out-of-sample forecasts, as these values are not used to estimate the parameter values of the OLS.

As shown on the left side of Figure 5, the yearly estimated and official values for the 70th percentile of the RAI exhibit a similar trend. The similarity in the level can be more accurately assessed by comparing the difference between the estimated and official values, as shown on the right side of Figure 5. The average difference between the estimated and official values from 2014 to 2024 is approximately 5.7%. When examining the yearly differences, the model's prediction performance improves as the data points become more recent.⁷ Since 2021, the percentage difference has fallen below 5%. Notably, the differences are 1.8%, 3.5%, and 3.1% in 2022, 2023, and 2024, respectively, indicating relatively high forecast accuracy in out-of-sample periods.

Figure 6 shows the predicted value of the RAI for married-couple households. Specifically, the figure on the left shows the 70th percentile of the predicted RAI between 2015 and 2060 and that on the right shows the distribution of the predicted RAI between the tenth and 90th percentiles in nominal value for the years 2023, 2033,



FIGURE 5. OFFICIAL, MEASURED AND ESTIMATED ELIGIBILITY THRESHOLD AND CORRESPONDING PERCENT DIFFERENCES

Source: Calculated using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

⁷The source of the difference between the estimated and the official values can be decomposed into the difference between the measured and official values and the model misspecification from the fact that linear regression is used to derive the estimated values.

(Unit: 10.000won)





Source: Calculated using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

and 2043. The figure on the left shows that the eligibility threshold, the 70th percentile of the RAI, is predicted to increase to 13.4 million won for married-couple households in nominal terms in 2070, which is more than three times the 70th percentile of the RAI in 2024 at 3.408 million won. The figure on the right indicates that the distribution of the predicted RAI shifts to the right over time, which reflects the improving economic situation of future generations of the elderly.

Thus far, I have explained the specific procedures used to estimate the RAI for each percentile using National Survey of Tax and Benefit data from 2014 to 2021 and the predict the future RAI sourced from linear regression analyses. In order to derive the proportion of elderly under selective scenario 1, I calculate the proportion of the elderly below the 70th percentile of the predicted RAI in 2024 value in nominal terms, which is 3.408 million won.

Figure 7 shows the estimated proportion of recipients. Specifically, the figure on the left depicts the proportion of married-couple households below the eligibility criteria threshold in 2024 (3.408 million won), while the figure on the right shows the proportion of married-couple households below the median household income. As illustrated in the figure on the left, the proportion of married-couple households below the eligibility threshold of 3.408 million won in 2024—adjusted for 2% inflation annually—declines from 70% to 50% between 2024 and 2050 as the living standards of the new elderly generation improve. After 2050, this proportion stabilizes at 50%. This stabilization occurs because the estimated nominal value of the threshold line in 2023 follows a convex pattern due to the annual 2% increase, while the future RAI per percentile is projected under a linear trend. Consequently, my projection of recipients under selective scenario 1 may overestimate the number of recipients if the future inflation rate is lower than 2% or if the true trend of RAI is convex rather than linear.⁸

The right side of Figure 6 shows the proportion of recipients whose incomes are lower than the median income for two-person households. These results indicate that the proportion of households below the median household income gradually converges from 70% to 52% between 2024 and 2070. It is important to note that the proportion of recipients remains at 70% until 2026 because the original eligibility threshold, which is the 70th percentile of the RAI, is lower than the median income of two-person households until 2026. Therefore, selective scenario 2 only takes effect after 2026, when the 70th percentile of the RAI is projected to surpass the median income. Afterward, the rate declines gradually throughout the period between 2024 and 2070, as both the median income and the RAI are estimated under a linear trend.

The proportion of recipients declines at a faster rate under selective scenario 1 compared to scenario 2 in the short term. Figure 6 shows that the proportion of recipients under selective scenario 1 reaches 0.5 much earlier than it does under selective scenario 2. This occurs because, in the short term, the growth rate of median income exceeds the inflation-adjusted value of the eligibility threshold set in 2024. Overall, the proportion of recipients under selective scenario 2. Meanwhile, it is important to assess whether the inflation-adjusted value of the 2024 eligibility threshold ever falls below 50% of the median income for two-person households, which is the poverty line and which also serves as the lower boundary for selective scenario 1. The analysis shows that, throughout the period between 2024 and 2070, the inflation-adjusted threshold line from 2024 never falls below 50% of the median income.



Source: Calculated using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

IV. Financial Projection under Various Pension Reform Scenarios

A. Explanation of Pension Reform Scenarios

In this study, I conduct financial projections under different scenarios that vary in two aspects: eligibility criteria and benefit levels. The baseline scenario follows the current eligibility criteria, which target the bottom 70% of the RAI, and the benefit amount, which is set at 334,810 won in 2024 and evolves according to an inflation rate of 2% thereafter.

For the alternative scenarios, I assume that the benefit amount increases to 400,000 won starting in 2025. I consider two alternative scenarios. The first is the expansion of old-age income security (hereafter the expansion scenario). These expansion scenarios are characterized by an increase in both the coverage and the level of benefits compared to the basic pension scheme. Specifically, I consider two expansion scenarios: in the first such scenario, the benefit amount is increased to 400,000 won in 2025 and adjusted according to the inflation rate (expansion scenario 1); in the second scenario, in addition to the benefit increase, the eligibility criteria are expanded from the bottom 70% to the bottom 100% of the population (expansion scenario 2).

The second type of alternative scenario includes selective eligibility criteria (hereafter referred to as the selective scenario), designed to reduce the number of basic pension beneficiaries as the economic situation of the elderly improves. I consider two selective scenarios as well. The first sets the eligibility criteria threshold at the 70th percentile of the RAI among married-couple households in 2024, which is 3.408 million won, and then inflates this threshold in subsequent years (hereafter, selective scenario 1). The second selective scenario sets the RAI threshold at the median income for two-person families (hereafter, selective scenario 2). It should be noted that selective scenario 2 only takes effect when the original eligibility threshold, which is the 70th percentile of the RAI, surpasses the median income of two-person households.

Scenario	Full Benefit Amount	Eligibility Criteria Threshold		
Baseline Scenario	334,810 won in 2024 inflation adjusted value (~2024)	70th percentile of RAI		
Expansion Scenario 1	334,810 won in 2024 400,000 won (2025) inflation adjusted value (~2025)	70th percentile of RAI		
Expansion Scenario 2	334,810 won in 2024 400,000 won (2025) inflation adjusted value (~2025)	100th percentile of RAI		
Selective Scenario 1	334,810 won in 2024 inflation adjusted value(~2024)	Inflation Adjusted Value of 2024 Eligibility Criteria Threshold (3.408 million won)		
Selective Scenario 2	334,810 won in 2024 inflation adjusted value (~2024)	Median Income of Two-Person Households		

TABLE 6—PROJECTION SCENARIOS

B. Financial Projection under the Baseline Scenario

Before projecting the financial expenditure under the baseline case, first I present the population of elderly individuals aged 65 and over, basic pension recipients, and concurrent recipients, as doing so is essential for forecasting financial expenditure in Figure 8. Due to rapid aging, the population of elderly individuals aged 65 and over rises significantly, increasing by 1.9 times from ten million in 2023 to 19 million in 2050. However, due to the low fertility rate, the population size decreases slightly after 2050, reaching 17.5 million, which is still 1.75 times higher than the 2023 level. Similarly, the number of basic pension recipients, which is 70% of the elderly population, reaches its peak in 2050 and then begins to decline. Conversely, for concurrent beneficiaries, as the ratio of national pension recipients to the total population increases over time, there is an upward trend until 2070, although the growth rate slows somewhat after 2050.

Figure 9 illustrates the financial projection results under the current system. Figure 9 shows that the financial expenditure for the basic pension amounts to 25 trillion won in 2024, 76 trillion won in 2050, and 102 trillion won in 2070. Relative to the nominal GDP, these expenditure levels reach 1% in 2024, 1.5% in 2050, and 1.3% in 2070.

It is evident that while the number of recipients declines after 2050, the financial expenditure continues to rise even beyond 2050. This is due to the expenditure being presented in nominal terms. When converting the financial expenditure to real terms, as shown on the right side of Figure 10, there is a slight decline after 2050. Over time, the proportion of financial expenditure contributed by concurrent beneficiaries increases as their numbers grow.



FIGURE 8. YEARLY POPULATION PROJECTIONS

Source: Calculated based on population projections by the Department of Statistics and the basic pension formula.

(Unit: %)

(Unit: Trillion won, %)



Note: Calculated based on the basic pension formula.



FIGURE 10. COMPARISON WITH FINANCIAL EXPENDITURE FROM NABO (2023a)

Note: The figure on the left is based on current prices and that on the right is based on 2023 constant prices.

Source: Basic pension financial projection results calculated by the author and NABO (2023a).

To assess the adequacy of the financial projections in this study, I compare them with the results from NABO (2023a). As shown on the left side of Figure 10, the result from NABO (2023a) and this study exhibit similar levels and trends between 2023 and 2032.⁹ For instance, NABO (2023a) predicts that the financial expenditure

⁹For a valid comparison with earlier studies that used projections from 2023, I make the financial projection assuming 2023 as the most recent year In the main results of this study, I use actual data from 2024 for the full

for the basic pension will amount to 30.8 trillion won and 40.4 trillion won for the two respective years, while this study's projections amount to 30 trillion won and 39.2 trillion won for the same years.

The right side of Figure 10 compares the financial expenditure projections from this study with those of NABO (2023a) between 2023 and 2070 in real terms. Although both studies show similar trends over the period, the results begin to diverge as time elapses. For example, NABO (2023a) projects financial expenditure levels for 2050, 2060 and 2070 to be 48.6, 48.7 and 46.4 trillion won, respectively, while this study projects corresponding values of 43.6, 42.5 and 39.6 trillion won, resulting in differences ranging from approximately five to seven trillion won. The divergence in real terms may be due to the different inflation rates used in the projections.¹⁰ In contrast, when comparing financial expenditure levels relative to GDP, this study's financial projections align quite closely with those of NABO (2023a).

C. Financial Projection under Expansion Scenarios

First, I present the financial projection results based on two scenarios that expand old-age income security: 1) increasing the basic pension to 400,000 won starting in 2025 while keeping the eligibility threshold at the bottom 70% of the elderly aged 65 and over (expansion scenario 1), and 2) extending the recipients from the bottom 70% to 100% of those aged 65 and over (expansion scenario 2). Given that both scenarios either increase the benefit level or both increase the benefit level and expand the number of recipients relative to the current system, the expenditure increases significantly compared to the base case.

Figure 11 shows the projection results. The figure on the left displays the expenditure per year under each scenario, while the figure on the right shows the change in expenditure per year relative to the current system. As the results indicate, under expansion scenario 1, the expenditure rises to 31 trillion won in 2025, which is approximately 1.3% of GDP, and then gradually increases to 121 trillion won, which is equivalent to 1.6% of GDP, by 2070 in nominal terms. Relative to the current system, the additional expenditure is about five trillion won in 2025 and increases to 19 trillion won in 2070.

Under expansion scenario 2, where on top of the increase in the benefit amount, all elderly aged 65 and over become eligible for the basic pension, the expenditure increases to 45 trillion won, which is equivalent to 1.8% of GDP in 2025, and 173 trillion won, which is equivalent to 2.2% of GDP in 2070. Relative to the current system, the expenditure is about 18 trillion won higher in 2025 and 71 trillion won higher in 2070. This shows that expanding the number of recipients to all elderly aged 65 and over can amplify fiscal spending on the basic pension.

benefit amount and the 70th percentile RAI.

¹⁰This study assumes a future inflation rate of 2% whereas, NABO(2023a) employed an internally determined inflation rate, which is not disclosed in the document.

(Unit: Trillion won, %)



FIGURE 11. FINANCIAL PROJECTIONS UNDER THE EXPANSION SCENARIOS

D. Financial Projections under the Selective Scenarios

Under the selective eligibility criteria, the proportion of recipients will decline as the RAI of the new generation of elderly improves. Consequently, over the long term, with the decrease in the proportion of recipients, the expenditure relative to the current system will also decrease.

Firstly, as shown on the left side of Figure 12, under selective scenario 1, where the eligibility threshold is fixed at the 2024 level, the basic pension expenditure is projected to increase from 26 trillion won in 2025 (approximately 1% of GDP) to 76 trillion won in 2070 (around 0.97% of GDP) in nominal terms. Compared to the base case scenario, the financial expenditure gradually decreases, resulting in a reduction of 26 trillion won in nominal terms by 2070.

Secondly, under selective scenario 2, the expenditure initially aligns with the base case scenario because the 70th percentile of the RAI remains below the median income of two-person households until 2026. Selective scenario 2 only takes effect when the original eligibility criteria, based on the 70th percentile of the RAI, exceed

Note: Calculated based on the basic pension formula.



FIGURE 12. FINANCIAL PROJECTIONS UNDER THE SELECTIVE SCENARIOS



the median income for two-person households. After 2026, as the 70th percentile of the RAI surpasses the median income of two-person households, the proportion of recipients falls below the median household income, resulting in a smaller proportion of recipients compared to the base case scenario. This leads to a decrease in financial expenditure relative to the base case scenario. By 2070, financial expenditure is projected to decline by 26 trillion won.

E. Total Fiscal Expenditure

Table 7 shows the total fiscal expenditure, or accumulated fiscal expenditure, under each scenario. The total fiscal expenditure is calculated as the sum of all fiscal expenditures from 2024 to 2070. Under the baseline scenario, the total fiscal expenditure is 3,173 trillion won in nominal terms and 1,891 trillion won in real terms. Under scenario 1, where the benefit amount rises to 400,000 won in 2024, the total fiscal expenditure rises to 2,236 trillion won in real terms, which is approximately 18% higher than the expenditure under the baseline scenario (i.e.,

(Unit: Trillion won, %)

					(Unit: Trillion Won)	
Category	Base Scenario	Expansion	n Scenario	Selective Scenario		
		1	2	1	2	
Nominal Value	3,173	3,756	5,363	2,420	2,590	
Real Value	1,891	2,236	3,191	1,467	1,575	

TABLE 7-TOTAL FISCAL EXPENDITURE FOR EACH SCENARIO

Note: Present value is converted assuming an inflation rate of 2%.

Source: Calculated by the author using the basic pension projection model.

(2236-1891)/1891). Scenario 2, in which the eligibility criteria are extended to all elderly people in addition to the benefit amount being increased to 400,000 won, has the highest total fiscal expenditure of 3,191 trillion won in real terms, about 69% higher than the expenditure under the baseline scenario (i.e., (3191-1891)/1891).

Under selective scenarios 1 and 2, as recipients decline from 70% to nearly 50%, the total fiscal expenditure decreases relative to the base case. Specifically, under selective scenario 1, the total fiscal expenditure declines by 424 trillion won in real terms, which is nearly 22% lower than that of the base case (i.e., (1891-1467)/1891). Under selective scenario 2, the total fiscal expenditure declines by 311 trillion won, which is approximately 17% lower than that of the base case (i.e., (1891-1575)/1891). Under selective scenario 1, the decline in the total fiscal expenditure exceeds that of selective scenario 2 because the proportion of recipients declines at a much faster rate under selective scenario 1 compared to selective scenario 2 until 2050.

F. Revenue Neutral Analysis

Subsequently, I calculate how much the government can increase the full benefit amount, keeping the eligibility criteria as in selective scenario 1, to achieve revenue neutrality with the base case scenario. Figure 13 shows the difference in fiscal



FIGURE 13. DIFFERENCES IN TOTAL FISCAL EXPENDITURE LEVELS ACROSS VARIOUS BASIC PENSION AMOUNTS

expenditure between the base case scenario and selective scenario 1 when the benefit amount is gradually increased by 10,000 won from 350,000 and 700,000 won from 2025. As shown in the figure, the benefit amount can be increased to approximately 435,000 won in order to maintain the same total fiscal expenditure as in the baseline scenario between 2024 and 2070. This means that under the eligibility criteria of scenario 1, the government can increase the benefit amount to 435,000 won to achieve a total fiscal expenditure level similar to that of the baseline scenario. Likewise, under selective scenario 2, the government can increase the full benefit amount to approximately 405,000 won to keep the revenue neutral, as in the base case. These results indicate that under selective eligibility criteria, the government would have greater flexibility to increase the benefit amount to 400,000 won, a proposal included as one of the 120 key national tasks and discussed in the 2023 Fifth Comprehensive National Pension Plan (Ministry of Health and Welfare, 2023).

V. Discussion and Conclusion

The basic pension benefit system has been criticized for being cost-ineffective with regard to its ability to address the high poverty rate among the elderly, largely due to its broad target group and low benefit amounts. It was implemented out of necessity to supplement income, as the national pension system had not yet matured enough to provide secure income for the elderly. However, because eligibility criteria are set to the bottom 70% of the RAI among the elderly aged 65 and over, as the national pension system in Korea matures and the economic condition of the elderly improves, newly entering basic pension recipients are relatively less poor compared to past recipients. For instance, while the eligibility threshold for a married-couple household-set at the 70th percentile of the RAI among elderly married-couple households—was 55.9% of the median income for a two-person household in 2015, it increased to 93.4% of the median income for a two-person household by 2023. At the same time, as the basic pension targets 70% of the elderly, the corresponding financial burden is projected to increase due to rapid aging and the low fertility rate. In particular, because the target group is wide, there is less financial flexibility to increase the benefit amount.

Hence, it is imperative to readjust the eligibility criteria of the basic pension to be more selective, and this can be done by narrowing down the target group and increasing the benefit level. This study has conducted financial projections under two selective eligibility criteria: 1) fixing the threshold line at the level of 2024 and readjusting the benefit level according to the inflation rate, and 2) setting the eligibility criteria as the median household income. In order to forecast the financial expenditure of the basic pension, this study forecast the projection of the RAI distribution of the elderly under the assumption that the linear trend of the past RAI between 2012 and 2021 will be consistent in the future. The result shows that under selective scenario 1, the accumulated financial expenditure can decline by 424 trillion won in real terms while under selective scenario 2, the accumulated financial expenditure can decline by 311 trillion won in real terms between 2024 and 2070.

Using the financial savings from narrowing down the number of recipients, the benefit amount can increase to 435,000 won in selective scenario 1 and can increase to 405,000 won in selective scenario 2 from 2025.

To implement the selective basic pension system successfully, it is important to strengthen the national and private pension systems. To narrow down the target group for the basic pension, the national and private pension systems must be reinforced to provide secure income for the majority of the elderly. Therefore, if the basic pension becomes selective, the government must work to reduce blind spots in the national pension system. In particular, the government must develop an action plan to increase the contribution periods for income-vulnerable women, low-wage workers, and the self-employed, who typically have shorter contribution periods compared to average contributors. Although the government has initiated social insurance subsidy programs such as Durunuri to encourage low-wage workers and small business owners to participate in the national pension system, recent studies, such as Kwon et al. (2022), have found that these programs do not effectively increase the number of contributors. The government needs to analyze the reasons behind the ineffectiveness of these subsidy programs and improve them to ensure their effectiveness. Moreover, the National Pension Childbirth Credit, which grants additional contribution periods to women who have given birth, is currently only available to those who have had a second or subsequent child. This credit should be extended to women upon the birth of their first child to help improve their contribution periods. At the same time, while the fund for the Childbirth Credit is currently financed at a rate of 30% from the national treasury and 70% from the National Pension Fund (NABO, 2023b), the proportion of the budget that is financed by the national treasury may need to be increased to reduce the financial burden on future generations.

A limitation of this study is that it projects future financial expenditure for the basic pension based on the assumption that the past linear trend of the RAI will continue into the future, without considering the underlying structural processes driving RAI evolution. This approach implicitly assumes that the economic growth and income distribution structure observed between 2014 and 2021 will remain unchanged in the future. However, under different scenarios, the projection results may vary. For instance, if income distribution among the elderly worsens compared to the period between 2014 and 2021, the proportion of the elderly eligible for the basic pension will increase, leading to higher financial expenditures in the future relative to the current scenario. This could occur if the growth rate of the average pension amount for the new generation of the elderly weakens or there are fewer elderly employment opportunities compared to corresponding trends observed between 2014 and 2021. Conversely, if the income distribution among the elderly improves, the proportion of those eligible for the basic pension will decrease, resulting in a lower future financial expenditure level compared to the current scenario. Moreover, if median household income rises faster than the income of the elderly, the proportion of elderly whose RAI falls below the median income will also be lower than projected. I leave the task of making financial projections for the basic pension under a structural model that incorporates the fundamental elements determining RAI evolution and median household income to future researchers.

Appendix

A. Calculation of RAI¹¹

This section explains the procedure for calculating the RAI. To estimate the longterm proportion of basic pension recipients under the selective eligibility criteria, it is necessary to project the future distribution of the RAI. The future distribution is forecasted based on the linear trend of past RAI levels, under the assumption that the growth rate of this index will remain consistent.

The RAI is calculated separately for single and married-couple households. When elderly individuals live with their parents, each household is considered to be a separate unit. In this study, household types are divided into three categories: those with a household head, those with the household head's spouse, and those of the parents of either the household head or the household head's spouse, each defined as a distinct household unit. It should be noted that while recipients of occupational pensions who meet exclusion criteria or special exceptions may still be eligible to receive the basic pension, this study did not consider these special cases and excluded individuals receiving occupational pensions.

RAI refers to the combined value of the income assessment amount (IAA) and the converted value of assets (CVA). It is calculated based on the individual's income and assets for single households and based on the combined income and assets of both the individual and their spouse for couple households. The formula for the RAI is given below.

RAI = Income Assessment Amount + Income Converted Asset,

where

Income Assessment Amount
= {0.7×(Labour Income – Earned Income Deduction)}
+
$$\begin{pmatrix} Business Income + Public Transfer Income + \\ Imputed Rent Income + Property Income \end{pmatrix}$$

and

¹¹The RAI is calculated by Choo SeokHyeon, a research staff member at KDI.

Income Converted Asset =

$$\begin{cases} (General Property - Basic Property Amount) + \\ (Financial Asset - 20 million won) - Liability \end{cases} \times Property Income Conversion Rate \\ 12 months \end{cases}$$

+ Value of Luxury Cars and Memberships

1. Method for Calculating the Income Assessment Amount

To calculate the income assessment amount, one needs to compute labor income, business income, public transfer income, imputed rent, and property income. First, labor income refers to income from employment for three consecutive months with a fixed monthly salary (Ministry of Health and Welfare, 2023). In this context, income from public jobs or self-sufficiency work is excluded from labor income. However, in practice, NaSTaB lacks information with which one can identify whether the individual worked continuously for more than three months in the previous year. Therefore, in this study, the average monthly labor income is calculated by dividing labor income from the previous year by the number of months worked in the previous year.

Business income is the sum of rental income and other business-related income. Annual rental income is converted into a monthly value by dividing the yearly rental income by 12. To calculate other business income on a monthly basis, the annual net business income is divided by the number of months worked. Property income consists of the sum of interest income and private pension income combined. Interest income is calculated using annual interest, dividends, and capital gains, with a deduction applied for amounts up to 40,000 KRW per month. Private pension income is derived from the total private pension insurance income.

Public transfer income includes national pension income, industrial accident insurance benefits (such as sickness benefits, disability benefits, survivor benefits, occupational disease compensation pensions, pneumoconiosis compensation pensions, and pneumoconiosis survivor pensions), as well as benefits paid to veterans and other individuals eligible for national merit and honor. Therefore, public transfer income is calculated as the sum of national pension income (including oldage pensions, disability pensions, survivor pensions, and divided pensions), industrial accident insurance benefits (including occupational injury sickness benefits, occupational disability benefits, and occupational accident survivor pensions), and veteran benefits from NaSTaB.

Imputed rent income refers to the amount calculated as the rental income equivalent for residing in a high-value property owned by a first-degree lineal descendant, such as a child. However, this is excluded from the current analysis.

2. Method for Calculating Imputed Income from Assets

The value of each individual's automobile assets is determined by applying the

type of car, engine displacement information, and the year of purchase by the residual value rates according to the vehicle age as provided by the National Pension Service. Vehicles with an engine displacement of less than 3,000 cc or valued below 40 million won are classified as general assets. Additionally, cars used by individuals with disabilities for living purposes should not be counted as automobile assets; however, this level of detail is not considered in this study.

Differentiated basic asset values and imputed income conversion rates according to the metropolitan areas, for medium-sized cities, and for rural areas are derived from the official annual values provided in the Basic Pension Program Guidelines. General assets include land, buildings, housing, aircraft and ships, rental deposits, forest resources and fishing rights, as well as automobile assets (vehicles with an engine displacement of less than 3,000 cc or valued below 40 million won) (Ministry of Health and Welfare, 2023). General assets are derived from data on the market value of real estate, the market value of ships, rental deposit amounts, and automobile assets (vehicles with an engine displacement of less than 3,000 cc or valued below 40 million won). To distinguish the general assets of basic pension recipients accurately, it is necessary to identify the asset holder within the family. However, because it is difficult to distinguish these asset holders using NaSTaB data, this study utilizes family-level information on general assets.

Financial assets include cash, checks, bonds, promissory notes, stocks, government and public bonds, deposits, savings accounts, insurance, investment securities, and pension insurance (Ministry of Health and Welfare, 2023). In this study, the value of financial assets is calculated by summing all of the financial asset variables provided by NaSTaB. However, national and private pensions received as a lump sum are not included in the calculation of financial assets for this study.

Liabilities include loans obtained from financial institutions such as first-tier banks, second-tier banks, and lending companies (Ministry of Health and Welfare, 2023). This study calculates liabilities by summing the total amount of family liabilities from NaSTaB.

B. Procedures for Projecting Fiscal Expenditure by Recipient Types

Type 1: Non-pension recipients who are subject to both the income-reversal prevention reduction and the spousal reduction for married couples.

The number of Type 1 recipients is calculated by multiplying the number of nonpension recipients (NonP)—derived by subtracting the number of concurrent beneficiaries from the total number of basic pension recipients—by the proportion of non-pension recipients who are subject to both the income-reversal prevention reduction and the spousal reduction for married couples. This proportion is based on the actual figures from 2021, as recorded in Table 4.

$$N_{Type1}(t,s) = N_{NonP}(t,s) \times \frac{N_{Type1}(2021,s)}{N_{NonP}(2021,s)}$$

The total fiscal expenditure for Type 1 can be derived by multiplying the number of Type 1 recipients by the full basic pension amount. Specifically, since Type 1 is subject to both the income-reversal prevention and spousal reductions, I multiply the actual ratio of the full basic pension benefit to the average basic pension amount paid to Type 1 recipients, using the 2021 values provided by Shin and Kim (2021). Although Shin and Kim (2021) provide age-specific ratios, given that there is little variation by age, I apply the ratio at age 65 uniformly across all ages in the calculation, which I denote as g(2021, 65) in the formula.

$$Exp_{Type1}(t,s) = FBP(t) \times g_{Type1}(2021,s,65) \times N_{Type1} \times 12$$

where, $g_{type1}(2021,s,65) = \frac{BP_{Type1}(2021,s,65)}{FBP(t)},$

Since the full basic pension amount (FBP) is calculated on a monthly basis, it is multiplied by 12 to convert it into the annual expenditure.

Type 2: Non-pension recipients who are subject to the spousal reduction for married couples.

To calculate the number of recipients who are Type 2 recipients, we multiply the proportion of non-pension recipients who are subject to the spousal reduction for married couples but not subject to the income-reversal prevention reduction by the total number of non-pension recipients.

$$N_{Type2}(t,s) = N_{NonP}(t,s) \times \frac{N_{Type2}(2021,s)}{N_{NonP}(2021,s)}$$

Since the spousal reduction rate is 20%, Type 2 recipients receive 80% of the pension amount.

$$Exp_{Type2}(t,s) = FBP(t) \times N_{Type2}(t,s) \times 0.8 \times 12$$

Type 3: Non-pension recipients who are subject to income reverse prevention reduction.

To calculate the number of recipients who are Type 3 recipients, we multiply the

proportion of non-pension recipients who are subject to the income-reversal prevention reduction but not subject to the spousal reduction for married couples by the total number of non-pension recipients.

$$N_{Type3}(t,s) = N_{NonP}(t,s) \times \frac{N_{Type3}(2021,s)}{N_{NonP}(2021,s)}$$

The basic pension expenditure for Type 3 is then calculated by multiplying the number of Type 3 recipients by the product of the full basic pension amount and the actual ratio of the full basic pension benefit to the average basic pension amount paid to Type 3 recipients, based on the 2021 data provided by Shin and Kim (2021).

$$Exp_{Type3}(t,s) = FBP(t) \times N_{Type3}(t,s) \times g_{Type3}(2021,s,65) \times 12$$

Type 4: Non-pension recipients who are not subject to the spousal reduction for married couples or the income-reversal prevention reduction.

To calculate the number of recipients who belong to Type 4, multiply the proportion of non-pension recipients who are neither subject to the income-reversal prevention reduction nor the spousal reduction for married couples by the total number of non-pension recipients. This proportion is based on actual 2021 data provided by Shin and Kim (2021).

$$N_{Type4}(t,s) = N_{NonP}(t,s) \times \frac{N_{Type4}(2021,s)}{N_{NonP}(2021,s)}$$

The basic pension expenditure for Type 4 is calculated by multiplying the number of Type 4 recipients by the full benefit amount. This figure is then multiplied by 12 to convert it into an annual value.

$$Exp_{Type4}(t,s) = FBP(t) \times N_{Type4}(t,s) \times 12$$

Type 5: Concurrent recipients who are subject to the income-reversal prevention reduction and the spousal reduction for married couples.

Number of Type 5 recipients can be calculated by the product of the concurrent

recipients and the ratio of Type 5 recipients among the concurrent recipients. This proportion is based on the actual figures from 2021, as recorded in Table 4.

$$N_{Type5}(t,s) = N_{CR}(t,s) \times \frac{N_{Type5}(2021,s)}{N_{CR}(2021,s)}$$

Then the basic pension expenditure for Type 5 is calculated by multiplying the number of Type 5 recipients by the product of the full basic pension amount and the actual ratio of the full basic pension benefit to the average basic pension amount paid to Type 5 recipients, based on the 2021 data provided by Shin and Kim (2021).

$$Exp_{Type5}(t,s) = FBP(t) \times g_{Type5}(2021,s,65) \times N_{Type5} \times 12$$

Type 6: Concurrent recipients who are subject to the spousal reduction for married couples.

Number of Type 6 recipients can be calculated by the product of the concurrent recipients and the ratio of Type 6 recipients among the concurrent recipients. This ratio is based on the actual figures from 2021, as recorded in Table 4.

$$N_{Type6}(t,s) = N_{CR}(t,s) \times \frac{N_{Type6}(2021,s)}{N_{CR}(2021,s)}$$

Then the basic pension expenditure for Type 6 is calculated by multiplying the number of Type 6 recipients by the product of the basic pension amount and the 80% discount that is applied to the spousal reduction. Here, the basic pension amount is calculated based on the benefit formula for concurrent recipients as mentioned in section 3.

$$Exp_{Type6}(t,s) = BP(t) \times N_{Type6}(t,s) \times 0.8 \times 12$$

Type 7: Concurrent recipients who are subject to the income-reversal prevention reduction.

Number of Type 7 recipients can be calculated by the product of the concurrent recipients and the ratio of Type 7 recipients among the concurrent recipients. This

ratio is based on the actual figures from 2021, as recorded in Table 4.

$$N_{Type7}(t,s) = N_{CR}(t,s) \times \frac{N_{Type7}(2021,s)}{N_{CR}(2021,s)}$$

The basic pension expenditure for Type 7 is calculated by multiplying the number of Type 7 recipients by the product of the basic pension amount and the actual ratio of the full basic pension benefit to the average basic pension amount paid to Type 7 recipients, based on the 2021 data provided by Shin and Kim (2021).

$$Exp_{Type7}(t,s) = FBP(t) \times N_{Type7}(t,s) \times 12$$

Type 8: Concurrent recipients who are subject to neither the income-reversal prevention reduction nor the spousal reduction

Number of Type 8 recipients can be calculated by the product of the concurrent recipients and the ratio of Type 8 recipients among the concurrent recipients which is based on the actual figures from 2021, as recorded in Table 4.

$$N_{Type8}(t,s) = N_{CR}(t,s) \times \frac{N_{Type8}(2021,s)}{N_{CR}(2021,s)}$$

The basic pension expenditure for Type 8 is then calculated by multiplying the number of Type 8 recipients by the product of the basic pension amount, which is calculated based on the benefit formula for concurrent recipients, as mentioned in section 3.

$$Exp_{Type8}(t,s) = BP(t) \times N_{Type8}(t,s) \times 12$$

C. Method for Estimating Median Income

To convert the RAI derived in this study into a ratio relative to the median income, it is necessary to estimate future median household income trends. Assuming the trend in median household income remains consistent between 2015 and 2024, this study estimates median household income from 2025 onwards. First, the officially reported median household income data from 2015 to 2024 are used to predict future

(Unit: 10,000won)



FIGURE A1. OFFICIAL AND ESTIMATED VALUE OF MEDIAN INCOME OF TWO-PERSON HOUSEHOLDS

values from 2025 onwards. Specifically, ordinary least squares (OLS) regression is applied to predict median household income from 2025 onwards using the official values for two-person households. The estimation results indicate that the median income for a two-person household is projected to increase from 3.61 million KRW in 2025 to 8.27 million KRW in 2070.

D. Comparing the forecast performance between OLS and ARIMA

In this section, I compare the forecast performance outcomes of linear regression and the autoregressive integrated moving average (ARIMA) model when used to estimate the RAI distribution. The ARIMA models are denoted as ARIMA (p,d,q), where p represents the number of lags, d stands for the degree of differencing, and qis the order of the moving-average model (Wikipedia Contributors, 2024). I selected ARIMA (1,1,0) because it has the lowest AIC and BIC compared to other ARIMA models, with p and q values that are less than or equal to 2, and with d equal to 1. I forecast the 70th percentile of the measured RAI using both ARIMA (1,1,0) and linear regression, and I report the yearly estimates for each model on the left side of Appendix Figure A2 and the percent difference between the official and estimated values for each model on the right side.

The forecast performance outcomes of the OLS and ARIMA models vary in the earlier period. However, after 2021, the forecast performances of both models converge, with the percent difference between the official and estimated 70th percentile of the RAI falling below 5% for both models, as shown on the right side of the figure. When comparing future projections using the OLS and ARIMA models up to 2070, both exhibit a similar linear trend, as illustrated in Appendix Figure A3. This suggests that the long-term forecast performance capabilities of OLS and ARIMA do not differ significantly. Therefore, for the purposes of this paper, I use OLS regression to predict the RAI distribution.

Note: Official values for the median income are reported by the Ministry of Health and Welfare.



FIGURE A2. YEARLY ESTIMATES AND PERCENT DIFFERENCE UNDER OLS AND ARIMA

Source: Calculated using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.



FIGURE A3. YEARLY ESTIMATES UNDER OLS AND ARIMA: 2014-2070

Source: Predicted using data from the 7th to 14th waves of the NaSTaB survey by the Korea Institute of Public Finance.

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