

Documento de Trabajo N° 73: Replacement rates in the Chilean pension scheme and projections under different scenarios

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<https://www.spensiones.cl/portal/institucional/594/w3-article-15856.html>

Abstract

The adequacy and sufficiency of pensions systems are key at evaluating its performance. This report intends to look at them both from a rather elusive measurement: the replacement rate. Although this is not an unknown indicator, its calculation entails tricky challenges since depending on the measurement of pension benefits (its numerator) and income (its denominator) both the results and interpretation may vary greatly. Considering these challenges, we calculate this indicator for current pensioners, focusing on the years 2015-2022 and for future pensioners with the projection model of the Chilean Budget Office of the Ministry of Finance and a selection of synthetic cases.

Median replacement rates for the period 2015-2022 are 17% for self-financed pension and 63% for total pension (that includes benefits from the first pillar). If no changes are introduced, for future retirees, the self-financed rate amounts to 17% in 2044 and 23% in 2070, while the total pension rate rises to 49% and 43%, respectively. These results are without a doubt insufficient. Projections for different reform scenarios significantly improve replacement rates, especially for actual pensioners when inter and intra generational solidarity are considered. Additionally, the evaluation of changes in replacement rates after the large-scale withdrawal of pension funds by the affiliates during the COVID-19 pandemic are presented, showing the size of the damage of such an initiative that significantly undermined social protection.

One important aspect to mention is that the availability of administrative data allowed to undertake this analysis and although the results may be local, the different approaches shown in this paper can be of use in other pension systems to better assess public policy.

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1. Introduction

The main goals of a pension system are the consumption smoothing between working life and retirement and the alleviation of poverty in old age, known also as the adequacy and sufficiency objectives.

The predominant model through the end of the XX century was based on defined benefits systems, financed with contributions from the working class, paying current and future pensioners. In these models the pensioners' benefits were previously defined, generally based in known parameters that ensured adequacy and sufficiency of old age benefits. However, risks on the sustainability of the pension funds became apparent during the '80s. Among other threats, the fast population ageing started to undermine the sustainability of these funds, and significant changes of paradigms related to solidarity in social security started to arise (Zelinsky, 2004). As a result, individual financed schemes raised as the most appropriate design to secure the sustainability of pension's systems, health, and education areas, among others.

In Latin America, Chile was a pioneer country introducing a private pension system of individual capitalization. It's been over 40 years since the implementation of this pension design and many of the recent pensioners have been contributing most of their lives into this private system, so it seems important to assess the adequacy and sufficiency of their pension benefits. One of the main advantages of the Chilean case is the availability of administrative data that allows this type of evaluation.

Chile has a three-tire pension system. The first pillar, or non-contributory one, provides pensions and pensions supplements to old age and disability beneficiaries, financed with general taxes. Chile made important changes to this pillar in 2008 with the introduction of a Solidarity Pillar (Superintendence of Pension, 2010) and in 2020 with the Guarantee Universal Pension (PGU) (SPS, 2023), that greatly improved the coverage, and the level of pensions compared to the Solidarity Pillar in place at the time. The second pillar, or contributory one, is based on a private mandatory pension system of individual saving's accounts and delivers old age and disability benefits that are dependent on the individual savings throughout the working life. This pillar is financed with a monthly contribution of 10% of taxable income of workers, that is saved in individual pension funds, managed and invested by private entities, freely chosen by the worker.

The main purpose of this study is to provide an analysis of the current situation regarding the level of pension benefits received by pensioners and their replacement rates, or ratio between the pension and some level of pre-retirement income. The combined analysis of these indicators allows for a better and more comprehensive assessment of the pension system in the two goals previously mentioned. This report presents indicators for the

second pillar as well as adding the benefits of the first pillar, provided by the State and subject to access requirements. Savings of the third pillar are not included in this study¹.

Additionally, the projection of the future replacement rates is analysed under different scenarios of changes to the system in place, mainly in contributions and benefits, currently being discussed in Congress. Although the scenarios and the parameters are very contingent to the Chilean situation, this exercise can be an example to other jurisdictions on how the regulator can provide information and relevant technical analysis to help moving forward pension system reforms' discussion. It's important to notice that, for the proper comparison of the assessed scenarios, one of the dimensions being studied is the fiscal neutrality. This means that the changes involved does not demand additional fiscal resources, beyond the necessary ones to accelerate the transition, and that these resources are paid back to the State.

It's also important to highlight two aspects analysed in this document. On one hand, regarding the methodology for the calculation of the replacement rate, the reference income used as denominator is crucial for the construction of the indicator. The options mostly vary the length of the reference income period (for instance, the average income obtained during the working life cycle, last 10 years before retirement, 3 years before retirement, last year prior to retirement, among others) or the inclusion/exclusion of periods without working activity (average income may include periods with no income, or *zeros*, decreasing the denominator). This range of possibilities can result in significant different replacement rates for the same individual. The choice of measurement will depend on the research question and in this document, we choose to use more recent income to analyse current pensioners².

On the other hand, we analyse the short- and long-term impact on pensions and replacement rates given the pension funds withdrawals during the economic crisis caused by the COVID-19 pandemic. The importance of this analysis lays in the quantification of the effects of populists' actions that undermined the protection of the pension funds and the loses for individuals and their pensions.

The next section presents the methodology for the construction of the replacement rate indicator. Section 3 states the data and the definition of the indicator of replacement rate calculated in this report. In section 4 current pensioners and their replacement rate are studied. Section 5 analyses the simulations and projections of these indicator in the future, under different scenarios of changes in the current Chilean pension system regulation.

¹ The third or voluntary pillar was introduced in 2008 to the system and to this date it accounts to less than 2% of total pension funds.

² Replacement rates using other measures of average income are shown in the appendix, not changing the main conclusions.

Section 6 presents the short- and long-term effect of pension funds withdrawals in pensions and replacement rates. Last section presents the conclusion of the study.

2. Methodology

2.1. Analysis on current pension level and replacement rates

For the analysis on the current level of pensions and replacement rates (RR), empirical replacement rate is used. This ratio is estimated for each living pensioner as to December of the year 2022, receiving old-age pensions, with at least five years since they joined the system (to moderate distortion caused by the impact of women who joined the system exclusively to obtain the Grant per Child (*Bono por Hijo*) after the 2008 pension reform). Given the sensitivity of the average to extreme values in highly asymmetrical distributions, the report considers the median of the indicators analysed.

Self-financed pension used to estimate RR corresponds to Reference Self-financed Pension (*Pensión Autofinanciada de Referencia, PAFE*), calculated by Pension Fund Administrators (*Administradoras de Fondos de Pensiones, AFP*) and reported to the Social Security Institute (*Instituto de Previsión Social, IPS*)³.

PAFE is an estimated pension used to determine the base pension a person would have⁴, calculated as an immediate life annuity, without special conditions for coverage, using implicit average interest rate in old-age life annuities as observed in the last six months immediately preceding the month in which the person reached the legal age of retirement. Its calculation considers age, family group and total funds accumulated in the mandatory individual capitalization account⁵ by the person at the legal age for retirement, if they requested to pension or not.

PAFE is used instead of the pension paid, as a permanent income measurement during old age is needed, isolating the effects of the choice of pension modality, between life annuity and programmed withdrawal and the income trajectories offered by these modalities.

The total pension, which results from adding the Guaranteed Universal Pension (PGU) to self-financed pension, is calculated for both men and women assuming they have 65 years-old, hence, they meet the requirements to access PGU. Even though legal retirement age for women is 60 years old, this is done to prevent unfair comparisons by gender on the level of pensions before turning 65 years-old with those that already reached that age and are eligible for the PGU.

³ For those people who do not have PAFE information available, they are attributed, in this order, the value of their life annuity (LA) if they retired through this modality or an immediate LA is calculated for them, without special conditions, using the balance of its individual capitalization account at the time of retirement, with the pension rates correspondent to that same period.

⁴ More details at <https://www.spensiones.cl/portal/institucional/594/w3-article-7975.html>

⁵ On accumulated balance of mandatory individual capitalization account and none of the voluntary savings are included.

Regarding the time frame of the income used in the quotient of the replacement rate indicator, both availability of data and approach to assess the indicator shall be considered. While using a wide time frame allows to evaluate the system's effectiveness in turning savings into pension, utilizing recent income is closer to the subject's viewpoint in their income trajectory. This study has prioritized the average income from the last 12 months⁶ as it adapts better to the goal of this study, evaluating consumption smoothing for people in retirement.

On the other hand, in relation to additional measurements to evaluate other dimensions, the average income throughout life is another common measure used for the calculation of replacement rate, which including *zeros* when the person does not contribute (Bravo, 2023). It should be noted that there are limitations of data availability for longer enough periods to cover the life cycle of pensioners. In fact, the affiliates database, which is monthly reported by Pension Funds Administrators and must comply with quality standards and reviews before being used by the Superintendence for statistics and diffusion purposes, started being reported as of 2007. Thus, monthly data from the last 10 years of incomes are only available for those who retired after 2017, excluding from the analysis a significant group of current pensioners, risking misleading conclusions on the global situation. Moreover, even though the database contains a summary variable with average incomes from the last 10 years preceding retirement, such variable is reported only for pensioners who had the option of choosing among different pension modalities, preventing the estimation of the replacement rate on the last 10 years for around 30% of pensioners, with greater loss among those with the least number of years of contribution and among women, which, again, could lead to wrong conclusions regarding the general situation.

Finally, this study is focused on estimating gross RRs over net ones to isolate from the assessment on the pension system performance, tax, and social security designs. Furthermore, net RR estimations would require the use of information on other sources of pensioners' income (capital incomes or employment incomes⁷) and the rate of income tax each member is subject to (or the application of simplifying assumptions).

⁶ Specifically, it includes the average of every income recorded during a period of 12 months, starting right after the last income before retirement. The last income is not included to avoid extraordinary values not accurately reflecting monthly income, such as retirement bonuses, compensations for different reasons and other additional income. Likewise, income from the last period prior to retirement could be lower than real for not working the whole month, having worked part-time or due to other reasons.

The average for 12 incomes is calculated considering from the month preceding the last income up to a maximum of 12 months going backwards, only including into this average the months with positive values (i.e. *zeros* are not considered). There is a 2.5% of pensioners for which there is no information and for which replacement rates cannot be calculated. These are concentrated among pensioners before 2007.

⁷ Pensioners that are still working in the formal labour market are not obligated to keep on contributing for the pension system.

2.2. Projection towards the future of pensions and replacement rates

This paper presents simulations and projections of replacement rates under various settings, using different methodologies. On one hand, there is an analysis of simulations for synthetic cases developed by the Budget Office and the Superintendencia de Pensiones; on the other hand, projections of the pension model from the Budget Office are presented.

2.2.1. Synthetic cases

The simulator of synthetic cases⁸ is a tool allowing to forecast pensions for contributors' profiles of men and women, by age, income, and density of contributions. It simulates past and future pension contributions, to assess the impact of changes in the pension system over specific cases of beneficiaries.

It is assumed that people affiliate at 24 years-old and pay contributions with a flat density⁹ for an income increasing according to wages annual real growth¹⁰, up to 65 years-old, when they retire without beneficiaries. The observed contributory ceiling is used up to 2022 and then the same growth assumed for wages. Annual real return for pension fund C is used, deflated by inflation up to the year 2022 and, afterwards, a constant value equal to 3.38%¹¹. Pensions are calculated as simple life annuities, with an interest rate of 3.11%¹² and 2020 mortality tables.

The main goal of the pension projection is to evaluate the pension reform sent to Congress in November 2022, and variations regarding the distribution of the additional contribution rate stated in the original proposal. The original reform proposal has components that would immediately benefit current pensioners and other components, more for the long term, so total benefit shall be received by young people starting to contribute nowadays and by future generations. Accordingly, profiles for 3 generations are evaluated: current pensioners, pensioners in transition and under the new regime.

For each of the generations evaluated, three pairs of wages and density of contributions are assumed: minimum salary and density of 30%; medium salary and density of 49% women and 58% men; and high salary and density of 81%.

⁸ This tool was initially developed by the Budget Office, as an Excel spreadsheet with macros, and was later modified by the Superintendencia de Pensiones to add new calculations. The version of this tool is made available to the public together with the original Spanish version of this report at <https://www.spensiones.cl/portal/institucional/594/w3-article-15856.html>

⁹ It is assumed that people pay contributions each year with the constant density of their profile.

¹⁰ Actual growth is assumed up to 2022 and afterwards a real growth of 1.25% annual (assumption used for the calculation of pensions from the document "*Pensions at a Glance*" from the OCDE).

¹¹ Return used in the Pension Simulator from the Superintendencia de Pensiones for fund C.

¹² Implicit interest rate for life annuities used in the Pension Simulator from the Superintendencia de Pensiones.

Consequently, and as profiles of women and men are considered, there is a total of 18 profiles evaluated. Table 2.1 summarizes the main features of the profiles assessed.

Table 2.1. Summary of profiles and their assumptions.

	Current pensioners	Pensioners in transition	Pensioners in regime
Age of affiliation	←	24 years-old	→
Age of pension	←	65 years-old	→
Year of pension	2022	2044	2070
Age in 2024	67 years-old	45 years-old	19 years-old
Salary 2024 and density	←	USD \$511; density 30% USD \$959; density 49% (W); 58% (M) USD \$2,222; density 81%	→
Maternity compensation (women at 25 and 27 years-old)	x	x	✓
Caregiver compensation (women at 54 and 55 years-old)	x	✓	✓
Unemployment gap insurance (years 2028 and 2033)	x	✓	✓

Source: Superintendence of Pensions

It's assumed that the individual is affiliated at 24 and retires at 65 years-old for each of the simulated cases. The simulated affiliate pensioner in 2024 retired on the year 2022 (being 65 years-old), pensioner in transition represents an individual of 45 years-old in 2024 and the pensioner under the new regime simulates someone young who will affiliate on the year 2029 and will retire in 2070. Under the simulations introduced, women have children at 25 and 27 years-old, only for women retired under new regime. In turn, it's assumed that women have a role of caregiver for people with disability, at 54 and 55 years-old, and that every affiliate receives pension contributions during unemployment periods the years 2028 and 2033. Consequently, transition and new-regime generations benefit from these last two benefits.

The simulator of synthetic cases allows to visualize in a simple and straightforward manner the effect from various alternatives of pension scheme reforms (and its components) for different types of beneficiaries (for instance, depending on gender, income level and generation). It constitutes a simplified tool to compare and evaluate redistribution components from the reform. Nevertheless, it is relevant to indicate that it's not possible to make overall conclusions on redistribution such as how many people shall benefit from one or other proposal or inferences over the sustainability of each of the alternatives.

2.2.2. Projections for the pension model.

The projection of the different indicators is the result of the actuarial pension model of the Chilean Budget Office. The model has been officially used during the last decade to assess

the sustainability of the fiscal budget given general national reforms. A more detailed description of the model can be found in the report “Sustainability Evaluation for the Integrated Pension Funds”.¹³

In simple terms, the model simulates what the person saves for pension during their work life. This saving depends on different factors incorporated into the model, such as, probability of working, of contributing (considering that the subject may be an informal worker), income for which they pay contribution, multi-fund in which they are accumulating, probability of requiring pension due to disability and, finally, moment of retirement. Simulations provide a forecast of future pensioners, their level of savings, self-financed pension, income over the last 12 months and if the person is or not eligible for the first pillar pension (*Pensión Garantizada Universal*, PGU). With such information, the replacement rate at the time of retirement can be calculated.

Assumptions used to simulate the model are as follows:¹⁴

- Annual real growth of wages of 1.25%.¹⁵
- Regarding different multi-funds, below are the rates of return by fund type:

Table 2.2: Assumption of annual real return of multi-funds-

Fund	Return rate
A	4.49%
B	4.02%
C	3.38%
D	2.81%
E	2.11%

Source: Budget Office

- Before 2022, observed return rate is used.
- Interest rate for life annuity 3.11% and for programmed withdrawal 2.81%.

Like the synthetic cases, since one of the main goals is to simulate future replacement rates under different contributions’ structure and pension’s benefits, these results are projected in three moments: 2024, that is, to the beginning of new contributions (reform); the year

¹³ “Evaluación de Sustentabilidad del Fondo Integrado de Pensiones”. For more details of the study, see <https://www.dipres.gob.cl/598/w3-article-302536.html>

¹⁴ Additionally, there are other elements impacting simulations: Mortality tables from 2020 with improvement factor over time and rise of the contribution ceiling in five years, reaching on 2029 the level of the Unemployment Insurance of 122.2 UF.

¹⁵ Source: OECD 2023

2044, a stage of transition to the reform; and, finally, 2070, when new contributions are already in force.

In addition to forecasts the replacement rates, the system's sustainability is analysed, as one of the requirements for any reform is to be sustainable over time and tax neutral; in other words, not requiring a loan by the State that cannot be returned later. This does not mean the system may not have shortfalls any given year, but rather than in the long-term this shortfall can be paid by the system. Note that the concept of sustainability is directly related to the benefits considered.

2.2.3. Settings assessed.

As stated before, the calculation of projected replacement rates allows simulating different scenarios of pension's design. We are interested in evaluating settings proposed in the discussion of the pension reform in Chile regarding different options for the additional contribution rate and pension benefits derived from these new contributions.

In both the synthetic cases and the projection model, five scenarios are assessed (table 2.3) with different allocations for an additional 6% contribution, between a new Social Insurance setting and the current system Decree-Law 3,500 (DL 3,500).

Table 2.3: Scenarios to simulate.

Scenario	Additional contribution rate (6%)	
	Social Insurance	Individual Account DL 3,500
Current	-	-
1	6%	-
2	4%	2%
3	3%	3%
4	2%	4%
5	-	6%

Source: Own elaboration.

Current Scenario

This setting considers current contributory pension from the system by DL 3,500 financed with a contribution of 10%, and no additional contribution.

Reform with contribution of 6% to a Social Insurance (Scenario 1)

This setting corresponds to the original proposal sent to Congress in November 2022. It considers that the new contribution and its benefits starts in 2024, even though some changes initiate later or gradually. Contributory pension from the system of DL 3,500 is financed with a contribution of 10,5% and a commission over the balance, instead of commission over salaries.

Additional contribution of 6%¹⁶ is destined to a Social Insurance and it finances the following benefits:

- Contributory pension with intra-generational solidarity: 70% of the contribution is based in the affiliate's own salary and the remaining 30% is calculated over the average salary of contributors. This implies that people earning less than the average wage accumulate contributions for a higher amount, while others with salaries higher than the average accumulate less than without solidarity.
- Maternity compensation equivalent to 24 contributions of 6% from the median salary¹⁷ per each child born since the beginning of the reform.
- Compensation for duties as third-party personal caregiver, equivalent to one contribution of 6% from the median salary per each month of caregiving.
- Compensation for difference in life expectancy of women, equivalent to the difference in pension with a man of the same age and accumulated balance.
- Contribution gap insurance, equivalent to 6% of the unemployment benefit, financed by the Unemployment Insurance System.
- Guarantee per years of contributions, equivalent to 0.1 UF (USD \$4.01) per year worked, with a limit of 3 UF (USD \$120.4). The amount guaranteed is reached adding the contributory pension from the Social Insurance and the guarantee.

This scenario introduces solidarity to the contributory system in two ways: intra-generational solidarity, that is, among everybody paying contributions on the same period; and inter-generational solidarity, among both active employees and pensioners, through the financing of the guarantee per years of contributions. These two components of solidarity are implemented differently, but they are bound.

This scenario, unlike the next ones, includes notional accounts, in which the contribution to the Social Insurance is accumulated. These notional accounts have a 2% real annual return, and they generate pensions that are calculated as unisex life annuities¹⁸, with an annual interest rate of 2%. Actual returns of notional accounts are inferior to the real returns of individual accounts (multi-funds) assumed in scenarios 2 to 5.

¹⁶ In the projection model the increase in the contributions paid by the employer, 6% between 2024 and 2029, changes in a proportion of one percentage point per year.

¹⁷ Median for wage is projected assuming the growth rate of salaries.

¹⁸ Unisex pensions are estimated by the average annuity factor corresponding to men and women.

Reform with mixed additional contribution between DL 3,500 system with redistribution and Social Insurance (Scenarios 2 - 4)

As well as the previous scenario, in these settings, contributory pension of the DL 3,500 system is financed with a contribution of 10,5%. Moreover, part of the 6% contribution is also destined to the DL 3,500 system, but with intra-generational reallocation (70% of the contribution based on the person's salary and the other 30% on the average salary of contributors). Commission on contributions is replaced by a commission on the total accumulated balance, considering both the current contribution and its increase.

The other part of the 6% contribution is destined to a Social Insurance, financing compensations for maternity, third-party caregiver, and difference of life expectancy. Also, it finances the guarantee per years of contribution, but the amount guaranteed is achieved adding the new pension from the DL 3,500 system and the guarantee.

The contribution intended to the Social Insurance determines the sum of the compensations for maternity and caregiving. The other benefits from this Insurance depend on the amount of the new contribution destined to the DL 3,500 system: the compensation for life expectancy is proportional to the self-finance pension, which includes the contribution of 10.5% and the new contribution; and the guarantee is a complement of the pension funded with the new contribution. Assessment of these settings allows to compare the amount of the benefits.

Scenario with contribution of 6% to the DL 3,500 system (Scenario 5)

In this scenario, the new contribution of 6% is directed to the DL 3,500 system, with a total contribution rate of 16.5% and with a commission over balance, instead of over contributions.

In this scenario, all the extra contribution is assigned to the individual account,¹⁹ so there are none of the benefits described in the previous settings. By construction this scenario is sustainable.

¹⁹ In this case, all resources go directly to individual accounts, without redistribution within generations (intragenerational benefit) in contrast to the other exercises that actually do.

Integrated Pension Fund (FIP) and sustainability

In settings 1 to 4, resources from the contribution that are assigned to the Social Insurance become part of the Integrated Pension Fund (*Fondo Integrado de Pensiones*, FIP), from which benefits are paid (also, in scenario 1 pensions are paid based on notional accounts). This fund is only simulated in the projection model.

In these four scenarios the guarantee per year of contribution is the same. The only change, as the amount sent to individual account is rising, is how much the FIP is going to pay each person for the guarantee.

Individuals not receiving anything from the guarantee are those who accumulate enough savings in their individual accounts (considering only the part going to the individual account from the 6% contribution, not including individual's contribution of 10.5%) financing at least 0.1 UF per year of contribution. This means that, if individuals work 30 years, and because of their savings in individual account receive a pension higher than 3 UF, they do not receive anything from the FIP, as they self-financed the value of the guarantee. In this case, there is a redistributive effect since these people's contribution to the Social Insurance is financing the guarantee for all pensioners not able to self-finance their guarantee.

Thus, the increase in contribution going to the individual account (scenarios 2 to 4) has two impacts. First, it diminishes revenues for the FIP, as there are fewer resources entering from the 6% and, second, it reduces expenses due to less benefits being funded from the guarantee. The difference between fewer resources versus less expenses, is what is reviewed by the sustainability analysis^{20 21}.

2.3. Effect of withdrawals on replacement rates

Effect in current pensioners 2015-2022

To calculate the impact on replacement rates caused by anticipated pension fund withdrawals, authorized by Laws N° 21,248, N° 21,295 and N° 21,330 in 2020 and 2021, the pension that people would have obtained without these withdrawals is compared with the actual pension received.

The pension without withdrawals is estimated adding up the sum of those withdrawals to the final balance of the affiliate at retirement and, from that amount, the PAFE without

²⁰ Regarding the other benefits, maternity and caregiver, when the contribution to the individual account increases, both benefits decrease, as these are calculated over the contribution going to the Social Insurance.

²¹ It's assumed that the interest rate for the annual loan to the FIP is 2.3%, and that the FIP return depends on fund size, when reaching US\$ 8,000 million its annual real return is 3.9%.

withdrawals is calculated²². This methodology could slightly distort the effect of withdrawals as it does not consider returns that the amount withdrawn failed to earn until retirement. The direction of such bias shall depend on the actual return accumulated between the date of withdrawal and the date of retirement. Moreover, given that it is assumed that the average income for the last 12 months does not change with withdrawals, the fall of the replacement rate is equivalent to the fall in the PAFE as a result of the withdrawn funds²³.

²² An annuity factor is used for every pensioner that is the result from the quotient between the balance at retirement and the PAFE.

²³ It is assumed that the person's professional career would have been the same without withdrawals so these funds retirements, therefore, did not affect the last months of work nor their last income.

3. Data and replacement rate definition

3.1. Data

Current pensioners²⁴

The main source of information is the Pension System's Database of Affiliates, Contributors, Beneficiaries, Pensioners and Deceased Persons (*Base de Datos de Afiliados, Cotizantes, Beneficiarios, Pensionados y Fallecidos del Sistema de Pensiones, BDA*), which contains administrative records of all those individuals who participate or have participated at some point in the Pension System. The BDA is monthly reported, and it is based on information sent by the Pension Fund Administrators (AFPs) to the Superintendence of Pensions.²⁵

The analysis focuses on the following interest groups: (i) all alive pensioners in December of 2022; (ii) all alive pensioners that retired between 2015 and 2022; (iii) affiliates in December 2022 that having reached the minimum retirement age have not done so and have withdrawn pension funds. We built a panel data of their monthly contributions and work income between 2007 and 2022. Also, the data contains demographic variables such as sex, age, date of birth, and other work-related traits such as the number of months contributed during all their working life and date of affiliation. As stated before, unfortunately there are limitations of data availability regarding monthly contributions. Affiliates database which is monthly reported by AFPs and shall comply with quality standards and reviews before being used by the Superintendence for statistics and diffusion purposes, started being reported as of 2007, so the contribution history for the analysed pensioners only starts in 2007.

Projection model²⁶

The administrative records used in this model are drawn from the Pension Data Information System (*Sistema de Información de Datos Previsionales, SIDP*) and the BDA data transmitted by the Pension Superintendence to the Budget Office periodically.

²⁴ Data available at www.spensiones.cl: *Estadísticas e Informes > Estadísticas y bases de datos > Acceso a bases de datos*. The database corresponds to a sample of 10% of pensioners between 2015 and 2022, results in which this study is focused. Also, a sample is published of 10% of people that made withdrawals from their pension funds and who, meeting the legal requirements for pension, still do not retire. Likewise, *do files* are made available to guide users in replicating tables displayed within this report. Even so, results can marginally vary due to variable rounding applied to protect people's identity.

²⁵ The BDA is provided by the Superintendence of Pensions exclusively for the purpose of technical studies, audits and to respond to requests from users of the system (D.L. No. 3,500 of 1980).

²⁶ Details can be found in "*Evaluación de Sustentabilidad del Fondo Integrado de Pensiones*". Budget Office, January 2023. <https://www.dipres.gob.cl/598/w3-article-302536.html>

The SIDP gathers the pension system information from all public and private institutions participants of the system. This allows the characterization of the pension system for the national population in December of 2021. It also includes individual records of people receiving old age, disability and survivor pensions from different regimes, including amount of pension, date of retirement and number of months contributed to the system.

The SIDP has the relevant information for the system affiliates such as date of affiliation and amount of contribution each month. It also provides information on the targeting of solidarity system beneficiaries, and complementary information of date of birth, death and sex of affiliates and non-affiliates.

On the other hand, data bases transmitted from the Superintendence of Pensions provide historic data of affiliates, such as affiliation date, monthly contributions and funds balances, updated in December 2021. Additionally, it has the data of pensioners.

The historic monthly contributions and fund balances information is available from January 2015 to December 2021.

3.2. Definition of replacement rate

Literature on replacement rates (RR) is generally enclosed into the analysis about pension adequacy. Usually, RR is defined as the ratio between the amount of the pension received and some measurement of labour income prior to retirement²⁷. Examples of income measurement include the average obtained during the working life cycle, the average of the last 10 years before retirement, of three years or the last year prior to retirement.²⁸ Additionally, the measurement of income can or cannot consider periods with no income, whether due to unemployment, inactivity, or remunerated employment for which no contributions were made. The variety of possibilities to consider as denominator results in the RR being an extremely sensitive indicator to the measurement of income considered.

Likewise, RR is sensitive to the population under analysis. As example, it is necessary to assess whether including employees that belatedly joined the system or those with low densities of contribution, as their RR are not easy to determine or interpret.

In short, the choice of the RR measurement used and the population to be included in the analysis shall depend on the specific goal of the study. Borella and Fornero (2009) discuss on the diverse types of RR that can be used to measure the effectiveness of a pension system to smooth consumption of individuals going from working to non-working life.

²⁷ There are alternative measures that compare the pension received to a poverty threshold such as the poverty line or the minimum wage.

²⁸ Castro (2023) mentions that even though several authors mention “recent income”, none of them specify a particular definition.

Depending on the variable to consider, it's possible to have alternative definitions of RR. RRs can be theoretical, empirical, or simulated. Methodology used by the Organization for Economic Co-operation and Development (OECD), calculate theoretical RR, that are built based on representative individuals, estimating income profiles on their working life cycle and determining the possible replacement rates under assumptions regarding returns on funds saved, age of retirement, among other aspects. The replacement rate estimated by the OECD is defined as the benefit of pension divided by pre-retirement earnings. Under simulated assumptions, employees earn the same percentage of the average income of the economy throughout their career. Thus, their final income is equal to the average income throughout their life (readjusted according to real income growth of the economy). Therefore, the replacement rate expressed as a percentage from the final income is identical to that stated as percentage of earnings throughout their life (OECD, 2023).

Simulated RR allows to consider a higher degree of heterogeneity in the subjects analysed and, also, enables to incorporate multiple features inherent to each pension scheme. However, this possibility of adapting simulated RRs to the reality of every economy makes it hard to compare results among countries.

In the case of empiric RRs, the information used is observed from actual incomes received by the subjects, so it's not necessary to resort to representative individuals. If the information employed comes from surveys, it's also possible to obtain data on education, household composition, other sources of income, etc.

Regarding time frame, RRs can be current or projected, depending on whether the information used corresponds to individuals already retired or future pensioners. Projections for the development of expected RR can be useful to predict the impact a reform on the pension system could have over their members.

Borella and Fornero (2009) also classify RRs according to the level of aggregation, differentiating between individual and average RR. A relevant aspect indicated by the authors is that, even though the use of individual RR information allows to enrich the analysis given the heterogeneity of results, summarizing this information in the form of an average RR for a group of individuals is not simple. In fact, average RRs are sensitive to extreme values within the sample.

To ensure adequate information to describe RRs from a group of people, authors suggest removing data from the subjects that remained below the level of poverty during their active life. This, on the basis that having an extremely precarious income level during their active lives, they cannot effectively prepare for old age. Indeed, it could be relevant to contemplate the inclusion of filters into the analysis, whether by income or pension level, density of contributions, or others, to estimate the RR for each subject.

Accordingly, Castro (2023) suggests that, for many individuals, to estimate their RR is questionable or just impossible, such as for those who obtain back their contributions as a lump sum or for those who never contributed to the pension system and only receive a non-contributory benefit. The author notes that in many pensions schemes some individuals are highly subsidized; thus, using the RR is not reasonable, as subsidies respond more to the aim of alleviating poverty instead of smoothing consumption. Thereof, it can be inferred that the method utilized to add information from the universe of pensioners is not something trivial.

Lastly, for every definition of RR it's possible to distinguish between gross or net regarding taxes. One of the objectives of gross replacement rates is to measure the efficiency of pension systems in turning contributions during the active working life into a pension financing their non-working life. Such efficiency is determined both by the system's elements of design (contribution rate, pension age, connection with the formal labour market, among others) and parameters determining the amount of pension (pension funds balance at retirement, annuity or programmed retirement return rate, mortality tables, among others). On the other hand, net replacement rates, in addition to capturing all the elements above, include the design of income tax and contributions to social security (pensions, healthcare, unemployment insurance, among others).

Table 3.1 sums up all the different types of replacement rates that can be estimated.

Table 3.1. Replacement rate dimensions and type of replacement rates

Variable	Type of replacement rate
Data Source	Theoretical, Empirical and Simulated
Horizon	Current and Projected
Aggregation Level	Individual and Group
Unit of Analysis	Individual and Family
Source of Income	Pension and other income sources
Taxes	Gross and Net
Type of data	Cross Section and Panel

Source: Borella and Fornero (2009)

As the authors have mentioned, there are several ways of measuring RR, and all of them can be relevant for the different elements of the pension system to be assessed. For this study, following the description by Borella and Fornero (2009), empirical RRs are analysed, to understand the situation of current pensioners, and simulated RRs, to forecast diverse scenarios on the distribution of pension contributions and the replacement rate. Individual data are processed to later estimate the median of RR.

4. Current pensioners (2015-2022). Replacement rates and other results.

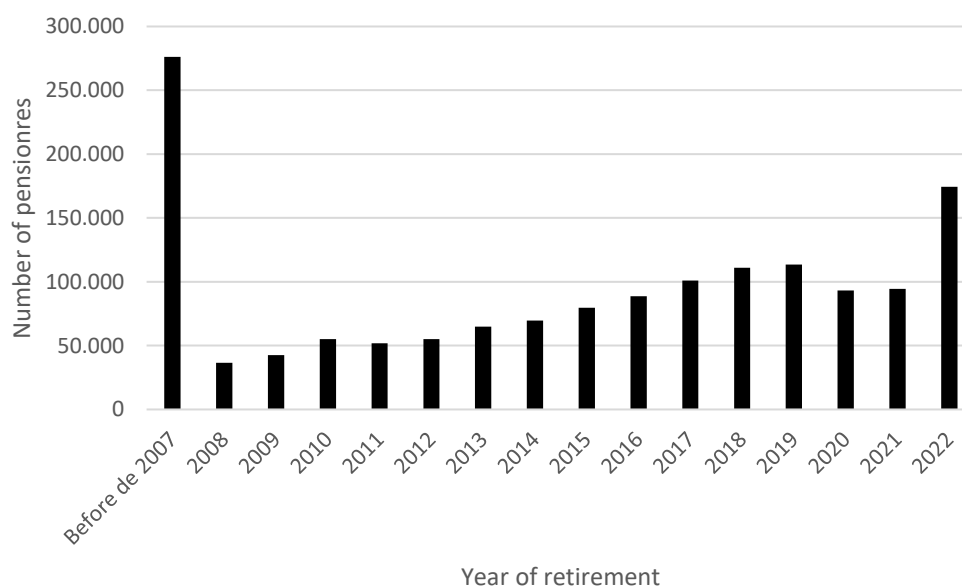
This section is divided in two parts. The first presents the analysis of the total population of pensioners and, the second, is focused on individuals retired between the years 2015 and 2022. This last group allows closer comparisons to future retirees in the short term.

4.1. Total of living retirees

Except by the year 2011, figure 4.1 shows a growing tendency over time in relation to the number of new pensioners up to 2019, to later fall in 2020 and 2021, as a result of the pandemic, pension fund withdrawals and State aids. The level of new pensioners recovered in 2022, reaching a maximum of 174,326 individuals, suggesting that a significant number of them postponed their retirement due to the aforementioned factors.

Therefore, analysing pensions and replacement rates only for the last years could lead to conclusions that does not represent tendencies in normal conditions. The foregoing is especially relevant to analyse and compare to the situation of people who will retire over the next few years and specially in the short term.

Figure 4.1: Number of people retired each year, alive as of December 31 of 2022.

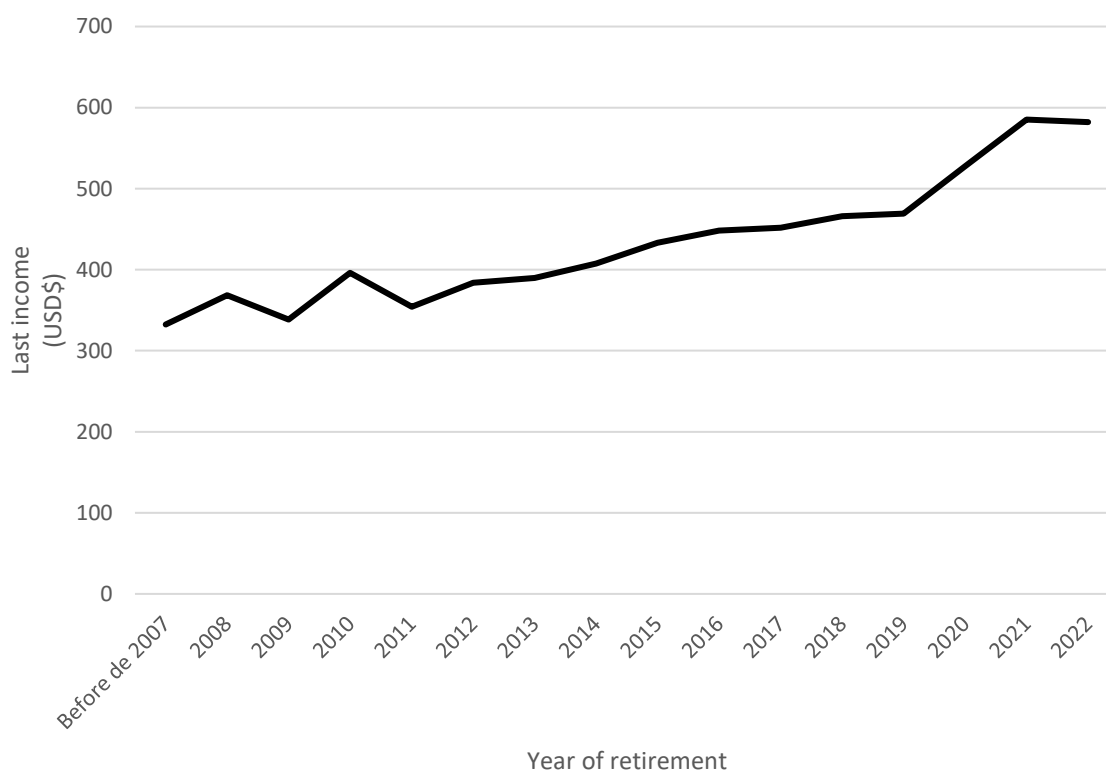


Source: Superintendencia of Pensions.

Figure 4.2 shows the median of the average wage over the last 12 months for pensioners, by year of retirement (alive as of December 2022). Annual growth of the median reached 4.2% (real) in average, with high year-to-year variations. While the average growth of the

median income over the last 12 months reached 2.4% between 2007 and 2011, between 2012 and 2019 this indicator reached 3.7%. Later, in the years 2020 and 2021, annual growth rate reaches 12.4% and 11.8%, respectively.

Graph 4.2: Median of the last income²⁹, by year of retirement

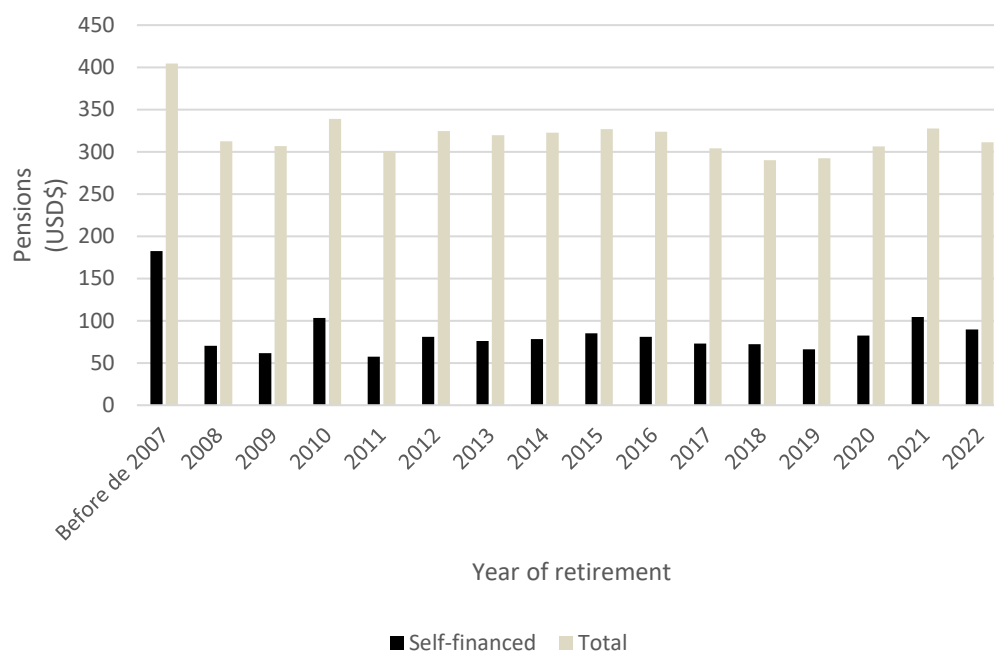


Source: Superintendence of Pensions.

On December 2022, there were 1,507,572 old-age retirees from D.L. 3,500, with a median self-financed pension of USD\$94. Figure 4.3 shows median self-financed pensions, by year of retirement, in which the lowest value corresponds to those who retired in 2011, USD \$57, and the highest for pensioners of 2021, with USD \$104 (except for people who retired before 2007, with a median self-financed pension of USD\$183). Between the years 2008 and 2022, the average growth rate of the median for self-financed pension was 4.8%, but with negative growth in several years.

²⁹ All monetary values in this report are considered in local money in august of 2023 and an exchange rate of CLP \$900 is used.

Figure 4.3: Median self-financed pension and total pension in 2022³⁰, by year of retirement



Source: Superintendence of Pensions. Total pension includes PGU.

Figure 4.3 also displays the median for total pension, corresponding to the addition of self-financed pension and the guarantee universal pension (PGU) in 2022, assuming that people who are not yet 65 years-old will be eligible for the benefit once they reach that age.³¹ This is to allow a comparison on the situation of people in the long-term, mostly women, who retire before the age of 65 and are still not entitled to PGU.

Table 4.1: Median replacement rate, pension and last income. * Total of pensioners.

Gender	Replacement rate**		Pension USD \$		Last income USD\$
	Self-fin.	Total	Self-fin.	Total	
Men	31%	73%	187	407	533
Women	12%	71%	44	278	398
Total	19%	72%	94	323	450

Source: Estimates from the Superintendence of Pensions. Living pensioners as of December of 2022.

* Last income corresponds to average income of the last 12 months.

** Median replacement rate (RR) is the median calculated over individual RRs, which is not the same as the quotient between the median of pension and the median of last income.

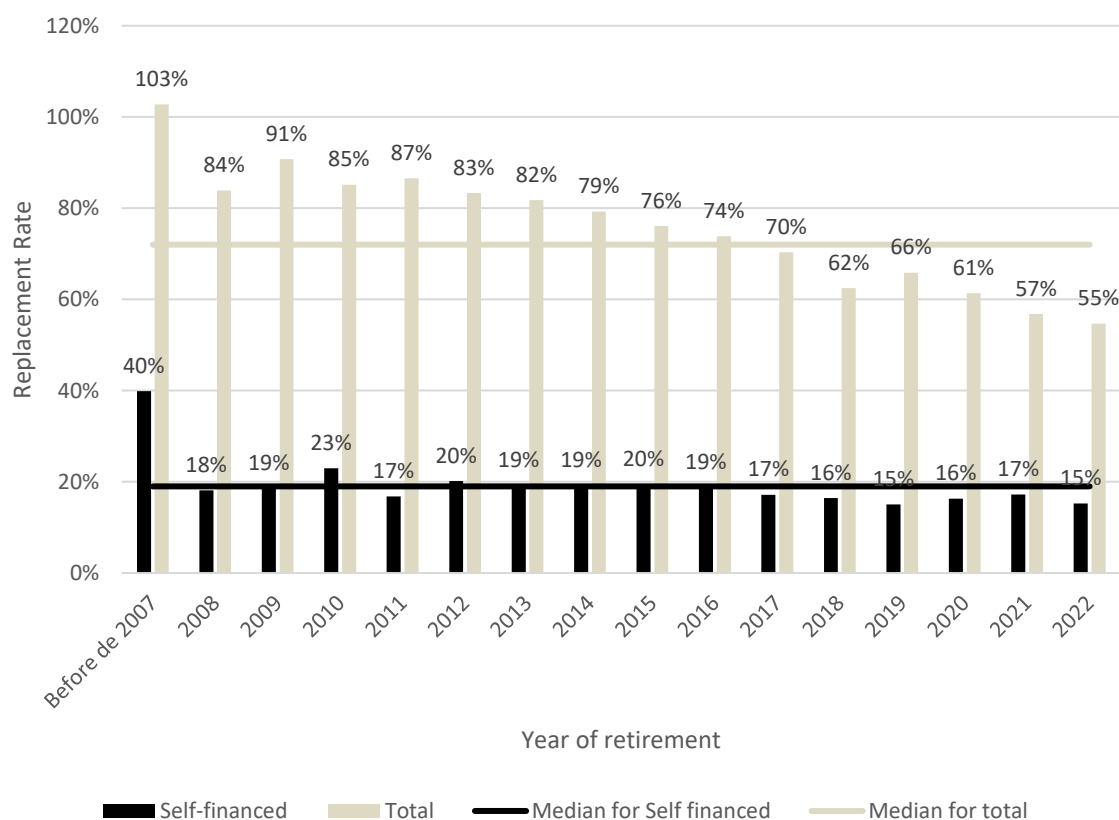
³⁰ The values of guarantee universal pension (PGU) are from December of 2022.

³¹ An approximate targeting is applied for the PGU to the 90% of lowest-income population, according to the PAPE.

The median of the total pension for all living retirees as of December of 2022 is USD \$323. This pension, as detailed in the methodology section, corresponds to the addition of self-financed pension plus the additional benefits from the PGU in 2022, assuming that people are retired and already 65 years old (Table 4.1).

The median replacement rate of self-financed pension for living pensioners on December 2022 is 19%, 31% for men and 12% for women (Table 4.1). The highest value is reached by people who retired up to 2007, 40%, followed by those retiring in 2010, 23% (Figure 4.4). In turn, those who retired in 2022 show the lowest replacement rate of the series, reaching 15%.

Figure 4.4: Replacement rates, self-financed and total in 2022, by year of retirement.



Source: Superintendencia of Pensiones. Total pension includes PGU. Values of PGU used are from December of 2022.

The median replacement rate for the total pension of living retirees as of December of 2022 was 72%. Replacement rate for living pensioners retired before 2007 is 103% and it is decreasing with generations who have been retiring in the following years, reaching 55% for pensioners in 2022, resulting in a decrease of 35% between the years 2008 and 2022. The most important fall in the median for total replacement rate occurs in 2018, dropping 11.1% for pensioners from the previous year, followed by people that retired the year 2021,

with a decrease of 7.5% in relation to the year before. This rate falls for people retiring between the years 2010 – 2011 (-2.4%), and for those who retired between the years 2019 and 2018 (-6.5%).

4.2. Pensioners from the 2015 - 2022 period.

In this section the analysis focuses on retirees between the years 2015 and 2022, as they better describe current pensioners and those who will retire in the coming years. The level of self-financed pension is analysed in relation to their average wage for the last 12 months (last work income).

A total of 856,028 people started old-age retirement in this period, of which 54,5% are women, 466,127, and 45,5% are men, 389,901, (Table 4.2).

The median average wage for the last 12 months is USD \$440 for women and USD \$596 for men, a difference of 35.5% in favour of men. The median self-financed pension of men is USD \$177 and of women, USD \$42, men's being 4.2 times larger. The pension gap is determined both by differences observed in the labour market during the accumulation phase (contribution density, temporary-nature of contributions and taxable income) and differences caused by the design of the pension system and demography (age of retirement and life expectancy).³²

Differences in self-financed pensions and in the median for average income from the last 12 months result in replacement rates of 27% for men and 11% for women.

Table 4.2: Median for replacement rate, pension and last income*. Pensioners 2015-2022.

Gender	Replacement rate		Pension USD \$		Last income USD \$*	N°
	Self-fin.	Total	Self-fin.	Total		
Women	11%	62%	42	271	440	466,127
Men	27%	65%	177	393	596	389,901
Total	17%	63%	82	309	505	856,028

Source: Estimates by the Superintendence of Pensions. Living pensioners as of December 2022.

*Last income corresponds to the average income of the last 12 months.

The gap of 4.2 times between men and women for self-financed pension is reduced to 1.45 when analysing the total pension, demonstrating the impact of the PGU in reducing gender gaps. The median replacement rate for the total pension reaches 62% and 65% for women and men, respectively. The gender gap in self-financed replacement rates (2.45 times in

³² For more details, review '*Informe de Género sobre el Sistema de Pensiones y el Seguro de Cesantía*' [Gender Report on the Pension Scheme and Unemployment Insurance] (2023) and Granados, Quintanilla and Toledo (2022).

favour of men) is reduced almost completely (1.05 times in favour of men) when looking at replacement rates of the total pension.

Analysing indicators by quintile on the last work income, allows to understand the heterogeneity of pension levels and replacement rates, to assess in which groups there are still challenges to improve the system's sufficiency levels (Table 4.3).

First quintile, the most vulnerable group, is made up by 71% of women and displays a median for the last income of USD \$156. The replacement rate for self-financed pension is 15% and replacement rate for the total pension reaches 172%.

The higher the quintile, the lower the percentage of women, from 71% in quantile 1 to 42% in quintile 5, which covers the highest incomes. Likewise, self-financed pension monotonically grows, up to USD \$492 in the last quintile, and the replacement rate for self-financed pension rises with income. On the other hand, the replacement rate of the total pension decreases with the income quintile, reaching 34% for people in the last quintile.

Table 4.3: Level of pension and replacement rate by quintile of last income. *

Quintile last income	Replacement rate		Pension USD \$		Last income USD \$*	N°	% Women
	Self-fin.	Total	Self-fin.	Total			
Quintile 1	15%	172%	18	246	156	171,389	71%
Quintile 2	12%	80%	43	276	367	171,023	61%
Quintile 3	13%	60%	67	298	505	171,205	53%
Quintile 4	16%	45%	130	350	782	171,206	46%
Quintile 5	24%	34%	492	654	2044	171,205	42%
Total	17%	63%	82	309	505	856,028	54%

Source: Estimates by the Superintendence of Pensions. Quintile 1 is for lowest income.

* Last income corresponds to the average income of the last 12 months.

The median for self-financed pension and total pension grows with years of contribution from USD\$10 and USD\$238, respectively, for people with less than 5 years of contributions, to USD\$554 to USD\$741 for those with more than 40 years of contributions. The same pattern is shown for the median of last income, increasing from USD \$252 to USD \$1,425 (Table 4.4).

It should be noted that the proportion of women decreases by segment of years of contribution, from 73% of women in the group with less than 6 years of contributions, to 13% in the segment of people with more than 40 years of contribution. This tendency shows that one of the factors explaining the low level of pension and replacement rate for women is the few years of contributions. Whereas women are more than a half for the groups of contributions up to 25 years, men dominate groups with 26 or more years of contribution.

Table 4.4: Median for pension and replacement rate by years of contribution.

Years of contribution	Replacement rate		Pension USD \$		Last income USD \$*	N°	% Women
	Self-fin.	Total	Self-fin.	Total			
0-5	4%	94%	10	238	252	171,609	73%
6-10	7%	67%	28	258	387	109,874	69%
11-15	10%	63%	46	279	440	96,740	65%
16-20	14%	61%	71	303	485	85,717	60%
21-25	18%	60%	110	337	556	82,307	53%
26-30	23%	57%	173	390	662	81,985	45%
31-35	28%	52%	279	488	894	90,877	40%
36-40	34%	51%	426	613	1,265	84,763	32%
>40	42%	57%	554	741	1,425	52,156	13%
Total	17%	63%	82	309	505	856,028	54%

Source: Superintendence of Pensions

* Last income corresponds to the average income of the last 12 months.

Besides gender gaps, attention is drawn to the fact that just over one quarter (26.6%) of retirees between 2015 and 2022 paid contributions for more than 30 years. In the case of women, only 15% contributed more than 30 years, and 41% in the case of men. This group receives a pension capable of replacing nearly one third of their income (more than 40% for people with more than 40 years of contribution). However, the other 73.4% of the population studied paid contributions for 30 or less years in the pension system, which results in self-financed replacement rates considerably inferior to 30% for most of them.

As might be expected, the median for self-financed replacement rate increases with the years of contribution, from 4% for those with less than 6 years of contributions to 42% for those with more than 40 years of contributions. In turn, the evolution of the median for total replacement rate falls along the years of contribution, from 94% in the group with less contributions, to 57% in the group with more contributions. The only segment where replacement rate for the total pension increases is between the last two groups, going from 51% to 57%. A gender-based analysis shows that this tendency in the last groups is also observed in men and women.

Finally, it's striking the low level of the median self-financed pension of USD \$82, reflecting the result of insufficient retirement savings to face the old-age period. This is product of the combination between a low mandatory rate of contribution and the high number of periods without contributing to the pension system. It reflects the urgent need to increase such savings through a higher mandatory contribution rate and through the design of mechanisms to foster paying contributions more frequently and for longer periods. Likewise, the important role played by the PGU is noted, both to alleviate poverty and smooth income trajectory from the active working life to retirement. Considering the PGU is financed by State funds, this component of the pension system acts as a significant complement to the contributory pillar.

5. Future pensioners. Replacement rates and other results.

In this section, results of the projection and evaluation of different scenarios are presented, under the two methodologies described in section 2.

5.1. Synthetic cases.

Tables 5.1 and 5.2 display the results for men and women, respectively, earning minimum wage. It can be noted that contributory RR (self-financed plus benefits from Social Insurance, when applicable) are similar between reform scenarios with Social Insurance and are higher than the setting in which the 6% is assigned exclusively to individual accounts, for the first two generations and for the generation of women under new regime. On the other hand, the generation of men to retire in 2070 has similar contributory RR among scenarios.

Table 5.1. Synthetic case of man, wage of USD \$511, density of 30%.

	Current pensioners (2022)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$145	\$145	\$145	\$145	\$96
Total pension (with PGU)	\$423	\$423	\$423	\$423	\$374
Contributory RR (without PGU)	28%	28%	28%	28%	19%
Total RR (with PGU)	82%	82%	82%	82%	72%
	Affiliates in transition (2044)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$128	\$127	\$127	\$127	\$92
Total pension (with PGU)	\$405	\$405	\$405	\$405	\$370
Contributory RR (without PGU)	19%	19%	19%	19%	14%
Total RR (with PGU)	62%	62%	62%	62%	56%
	New regime (2070)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$164	\$158	\$158	\$168	\$167
Total pension (with PGU)	\$442	\$436	\$436	\$445	\$444
Contributory RR (without PGU)	18%	17%	18%	19%	18%
Total RR (with PGU)	49%	48%	48%	49%	49%

Source: Superintendencia of Pensions

Table 5.2. Synthetic case of woman, wage of USD \$511, density of 30%.

	Current pensioners (2022) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$143	\$143	\$143	\$143	\$82
Total pension (with PGU)	\$420	\$420	\$420	\$420	\$360
Contributory RR (without PGU)	28%	28%	28%	28%	16%
Total RR (with PGU)	81%	81%	81%	81%	70%
	Affiliates in transition (2044) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$138	\$138	\$138	\$139	\$82
Total pension (with PGU)	\$415	\$415	\$416	\$416	\$360
Contributory RR (without PGU)	21%	21%	21%	21%	13%
Total RR (with PGU)	63%	63%	63%	63%	55%
	New regime (2070) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$204	\$196	\$195	\$195	\$151
Total pension (with PGU)	\$482	\$474	\$473	\$472	\$429
Contributory RR (without PGU)	22%	21%	21%	21%	17%
Total RR (with PGU)	53%	52%	52%	52%	47%

Source: Superintendence of Pensions

Examples of people with median wage (USD \$956), presented in tables 5.3 and 5.4, show similar results to those of people with minimum wages for the generation of current pensioners and for pensioners in transition: contributory RRs in settings with Social Insurance are similar to each other and higher than when the 6% is assigned to individual capitalization. However, allocating the additional 6% on individual capitalization dominates alternative scenarios for the generation of younger men simulated and is marginally inferior for the case of women.

Finally, when considering people with high wages, represented by USD\$2,222 monthly in simulations, only current pensioners (both men and women) get better replacement rates in scenarios with Social Insurance versus individual capitalization. For the transition generation, results are slightly reversed in the case of men and, for the generation under new regime, individual capitalization dominates all alternative scenarios, especially for men (table 5.5 and table 5.6).

It's important to note that intermediate settings 4%-2% and 3%-3% that would be sustainable as it is shown further on, produce extremely similar results among each other for each simulated gender-generation-wage case. Also, these scenarios allow to shorten the gender gap existing in the pension system.

Table 5.3. Synthetic case of man, wage of USD \$956, density of 58%.

	Current pensioners (2022) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$442	\$442	\$442	\$442	\$347
Total pension (with PGU)	\$720	\$720	\$720	\$720	\$624
Contributory RR (without PGU)	46%	46%	46%	46%	36%
Total RR (with PGU)	74%	74%	74%	74%	65%
	Affiliates in transition (2044) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$375	\$374	\$375	\$375	\$333
Total pension (with PGU)	\$653	\$652	\$652	\$653	\$611
Contributory RR (without PGU)	31%	31%	31%	31%	27%
Total RR (with PGU)	53%	53%	53%	53%	50%
	New regime (2070) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$541	\$484	\$509	\$550	\$602
Total pension (with PGU)	\$819	\$762	\$787	\$828	\$880
Contributory RR (without PGU)	32%	29%	30%	32%	36%
Total RR (with PGU)	48%	45%	47%	49%	52%

Source: Superintendence of Pensions

Table 5.4. Synthetic case of woman, wage of USD \$956, density 49%.

	Current pensioners (2022) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$366	\$366	\$366	\$366	\$250
Total pension (with PGU)	\$643	\$643	\$643	\$643	\$528
Contributory RR (without PGU)	38%	38%	38%	38%	26%
Total RR (with PGU)	67%	67%	67%	67%	55%
	Affiliates in transition (2044) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$331	\$335	\$338	\$341	\$251
Total pension (with PGU)	\$609	\$613	\$616	\$619	\$528
Contributory RR (without PGU)	27%	27%	27%	27%	20%
Total RR (with PGU)	49%	50%	50%	50%	43%
	New regime (2070) Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$502	\$466	\$472	\$487	\$462
Total pension (with PGU)	\$780	\$744	\$750	\$765	\$739
Contributory RR (without PGU)	29%	27%	27%	28%	27%
Total RR (with PGU)	46%	43%	44%	45%	44%

Source: Superintendence of Pensions

Table 5.5. Synthetic case of man, wage of USD \$2,222, density of 81%.

	Current pensioners (2022)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,246	\$1,246	\$1,246	\$1,246	\$1,125
Total pension (with PGU)	\$1,246	\$1,246	\$1,246	\$1,246	\$1,194
Contributory RR (without PGU)	55%	55%	55%	55%	50%
Total RR (with PGU)	55%	55%	55%	55%	53%
	Affiliates in transition (2044)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,026	\$1,024	\$1,025	\$1,025	\$1,081
Total pension (with PGU)	\$1,155	\$1,154	\$1,154	\$1,154	\$1,176
Contributory RR (without PGU)	36%	36%	36%	36%	38%
Total RR (with PGU)	41%	41%	41%	41%	41%
	New regime (2070)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,650	\$1,464	\$1,568	\$1,672	\$1,956
Total pension (with PGU)	\$1,650	\$1,464	\$1,568	\$1,672	\$1,956
Contributory RR (without PGU)	42%	37%	40%	42%	50%
Total RR (with PGU)	42%	37%	40%	42%	50%

Source: Superintendence of Pensions

Table 5.6. Synthetic case of woman, wage of USD \$2,222, density 81%.

	Current pensioners (2022)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,183	\$1,183	\$1,183	\$1,183	\$962
Total pension (with PGU)	\$1,397	\$1,397	\$1,397	\$1,397	\$1,239
Contributory RR (without PGU)	53%	53%	53%	53%	43%
Total RR (with PGU)	62%	62%	62%	62%	55%
	Affiliates in transition (2044)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,042	\$1,055	\$1,063	\$1,071	\$964
Total pension (with PGU)	\$1,300	\$1,315	\$1,323	\$1,332	\$1,241
Contributory RR (without PGU)	36%	36%	37%	37%	34%
Total RR (with PGU)	45%	46%	46%	47%	44%
	New regime (2070)				
	Scenarios				
	1	2	3	4	5
Contributory pension (without PGU)	\$1,661	\$1,443	\$1,531	\$1,620	\$1,774
Total pension (with PGU)	\$1,661	\$1,540	\$1,590	\$1,641	\$1,774
Contributory RR (without PGU)	42%	36%	38%	41%	45%
Total RR (with PGU)	42%	39%	40%	42%	45%

Source: Superintendence of Pensions

5.2. Projections of the pension model.

5.2.1. Projections' Result

Table 5.7 presents forecasts of the median replacement rate for three horizons and the five scenarios analysed, depending on the proportion of the additional 6% contribution destined to Social Insurance (SI) or Individuals Accounts (IND) (see section 2.2.3. for details of each scenario).³³ For each year, it displays the median replacement rates of people retiring that year. The scenarios are compared with the current situation, where changes in the contribution rates are not implemented, to better understand what the increase in contribution and their different benefits involves in contrast to the current state of the system. Table 5.8 shows these effects in addition to the increase in the PGU.

Replacement rate from contributory saving in the current situation rises from 17% for people retiring the year 2024, to 23% for those retiring the year 2070.

Table 5.7: Projections of the median Replacement Rates (%) for people retiring from the contributory pillar, by year of pension.

Scenarios	2024	2044	2070
Current	17%	17%	23%
(1) 6% SI	29%	28%	34%
(2) 2% SI-4%IND	29%	27%	31%
(3) 3% SI-3%IND 3	29%	27%	32%
(4) 4% SI-2%IND	29%	27%	33%
(5) 6% IND	17%	24%	35%

Source: Budget Office

In the year 2024, scenarios 1 to 4 increase the replacement rate for people retiring that year to 29%, while for scenario 5 remains unchanged, basically because the increase in the contribution rate does not rise pensions of current pensioners, whereas in all other settings, due to the guarantee, they do receive greater benefits. For the year 2070, it's observed that in scenario 5, with all additional resources assigned to the individual account, replacement rate reaches 35% for people retiring that year, compared to the 31%-33% in scenarios 2 to 4. In scenario 1, the median replacement rate reaches 34%. For the year 2044, however, the median replacement rate of settings 2 to 4 for individuals retiring that year, falls to 27%; in scenario 1 drops to 28%; whereas, in scenario 5, the replacement rate reaches 24%.

There are at least 5 factors influencing the projected evolution of the replacement rate:

- Yield rate of the funds where savings are invested.

³³ Estimates on medians RR do not include people with disability. With respect to the people with early retirement, only those in the stock appear, not future projections.

- Growth of contributors' wages.
- Pension fund withdrawals authorized during the pandemic.
- Variation in years of contribution.
- Changes in life expectancy.

The decline in the funds return rate reduces replacement rate, as also do transitory withdrawals and the increase in life expectancy, whereas a reduced growth in wages and the continuous increase of the years of contribution assumed in the model, trigger a rise in replacement rates.

These five factors are captured by the model and their interaction leads to a rise of the replacement rate for the base scenario over time. This is a topic that requires more study and analysis, especially if this tendency of increasing years of contribution remains.

When changes are analysed including the PGU (Table 5.8), the median replacement rate for people retiring in 2024 increases in settings 1 to 4, from 56% in current scenario, to 73%, while in scenario 5, with all assigned to individual accounts, the median replacement rate increases to 61%.

The median replacement rate with the PGU of a 56% for people retiring in 2024 is consistent with what is reported in section 4.1, in which the median replacement rate with the PGU on pensioners from the year 2022, was of 55% (Figure 4.4). Observed over time, however, the median replacement rate in the current scenario falls from 56% to 43% between the years 2024 and 2070, respectively, for people retiring on each year. In settings 1 to 4 a similar tendency is observed, replacement rates decreasing between the same periods of time, reaching ranges of 60-62% the year 2070, while in scenario 5, it rises to 63%.

The median replacement rate of pensioners each year drops in scenarios 1 to 4 in relation to what was observed the year 2024, mostly because the PGU is readjusted by prices in the model and, given that wages grow in real terms, the replacement rate falls.

Table 5.8: Projections of the median Replacement Rates (%) for people retiring from the Contributory Pillar plus PGU reform, by year of pension.

Scenarios	2024	2044	2070
Current	56%	49%	43%
(1) 6% SI	73%	70%	62%
(2) 2% SI-4%IND	73%	69%	60%
(3) 3% SI-3%IND 3	73%	69%	61%
(4) 4% SI-2%IND	73%	69%	62%
(5) 6% IND	61%	65%	63%

Source: Budget Office

Table 5.9 presents an analysis by gender, where in the current scenario for the year 2070, median replacement rate for men retiring that year would reach 50%, whereas for women, 36%. In scenarios 1 to 5, for the year 2070, the replacement rate of women would be 54% for scenarios 2, 3 and 5, and 55% in scenarios 1 and 4. In men, the replacement rate for the year 2070 would reach 67% in scenario 2 and 3, and 74% in scenario 5.

Table 5.9: Projections of the median Replacement Rates (%) for people retiring from the Contributory Pillar plus PGU reform under the scenarios forecasted by gender, per year of pension.

Scenario	2024		2044		2070	
	Men	Women	Men	Women	Men	Women
Current	61%	50%	54%	44%	50%	36%
(1) 6% SI	74%	71%	75%	65%	69%	55%
(2) 2% SI-4%IND	74%	71%	75%	65%	67%	54%
(3) 3% SI-3%IND 3	74%	71%	75%	65%	67%	54%
(4) 4% SI-2%IND	74%	71%	75%	64%	69%	55%
(5) 6% IND	62%	61%	71%	60%	74%	54%

Source: Budget Office

A difference by gender is observed in the evolution of median replacement rates. While for men the median for retirees in 2024 and 2044 is 74% and 75%, respectively, in scenarios 1 to 4, and 62% to 71% in scenario 5; for women it falls from 71% to 65% in scenarios 1 to 4 and drops from 61% to 60% in scenario 5 on that same period.

Table 5.10: Median of replacement rate (%) for people retiring the year 2024 from the Contributory Pillar plus PGU reform, by balance quintiles

Scenarios	Quintiles per balance*				
	1	2	3	4	5
Current	66%	56%	57%	55%	42%
(1) 6% SI	79%	77%	79%	72%	49%
(2) 2% SI-4%IND	79%	77%	79%	72%	49%
(3) 3% SI-3%IND 3	79%	77%	79%	72%	49%
(4) 4% SI-2%IND	79%	77%	79%	72%	49%
(5) 6% IND	73%	64%	62%	58%	43%

Source: Budget Office. Quintile 1 is for lowest balance and 5 for highest balance.

*Corresponds to accumulated balance at the age of 59.

Median replacement rates by balance quintile are displayed in table 5.10.³⁴ Unlike estimates shown in section 4.2, with quintiles according to last income, in the projection model balance presents more heterogeneity than income, allowing a better classification of people.

³⁴ Balance for each person is estimated at 59 years old.

In the current setting and in year 2024, the median replacement rate by quintiles varies between 66% in quintile 1, and 42% in quintile 5 for pensioners of that year. In scenarios 1 to 4, replacement year by quintiles varies from 79% in quintile 1, to 49% in quintile 5. In scenario 5, in which there are no benefits from Social Insurance but only an increase due to the PGU, replacement rate goes from 73% in quintile 1, to 43% in quintile 5 (Table 4.10).

Different scenarios of the reform in the long-term have an impact over the diverse levels of balance accumulated by people before retiring. Setting 5 provides a replacement rate of 70%, 74% and 55% for quintiles 3, 4 and 5, respectively (Table 5.11). These rates are higher for the same quintiles in the other scenarios. For instance, in scenario 4, the replacement rate for quintile 3 is 3 percentage points (pp) lower than in scenario 5. This variation rises to 6 pp when comparing quintiles 4 and 5. This increase in the difference is because of the savings in the individual account. As resources in the individual account diminish, this variation increases, mainly because the guarantee reaches fewer people; specially, in segments with higher balance.

However, in quintile 1, the difference among scenarios is much smaller. It's higher in scenario 1, 3 and 4, with a 61%, and lower in scenario 5, with a 59%. In quintile 2, the scenario 3 yields the highest replacement rate, 63%, while in other scenarios it's a 61%-62%. Scenario 1 has higher replacement rates in quintiles 4 and 5 than in scenario 4, mainly because of the effect of the guarantee.

Table 5.11: Median replacement rate (%) for people retiring the year 2070 from the Contributory Pillar plus PGU reform by quintiles.

Scenarios	Quintiles per balance				
	1	2	3	4	5
Current	44%	42%	47%	47%	35%
(1) 6% SI	61%	61%	67%	69%	52%
(2) 2% SI-4%IND	60%	61%	65%	64%	45%
(3) 3% SI-3%IND 3	61%	63%	66%	67%	46%
(4) 4% SI-2%IND	61%	62%	67%	68%	49%
(5) 6% IND	59%	61%	70%	74%	55%

Source: Budget Office. Quintile 1 is for lowest balance and 5 for highest balance.

In the long term, scenario 5 yields higher replacement rates than other scenarios, except for quintile 1, presenting the lowest replacement rate, and quintile 2, which on scenario 4 has a replacement rate 1 pp higher. The reason of this difference is the guarantee. People in quintile 1 in scenario 5 receive the PGU and additionally receive their 6% savings. However, that same person in scenario 1 receives a guarantee per years of contribution, assuring them a minimum base per years of contribution. The guarantee makes that individual in scenario 1 to have higher replacement rate in the long term than under scenario 5.

In all scenarios, quintiles 3 and 4 have higher replacement rates than quintiles 1 and 2. This is because the contribution's growth, whether through the guarantee in scenarios 1 to 4 or through the contribution's increase into individual accounts in scenario 5, more than compensates the fall in the relative importance of the PGU, only readjusted by prices, which plays a major role in quintiles 1 and 2.

5.2.2. Sustainability

To assess sustainability, it is assumed that fund expenses correspond to the Social Insurance benefits described in section 2.2.3.

From the 5 scenarios studied, the sustainability analysis is only done for scenarios 1 to 4. In these, part of the additional contribution goes to a common fund, named FIP, paying benefits. It's on that fund that the sustainability analysis is done. In scenario 5, the whole individual contribution goes to the individual account and, by definition, it complies with financial sustainability.

In scenario 1, resources from the FIP show sustained growth, reaching 35% from the GDP on the year 2100 (Figure 5.1). Accumulation of the FIP seems to indicate that this fund is sustainable, however, the necessary return rate to keep benefits and notional return of 2% from scenario 1, is 3.9% after generating the endowment, the year 2045. This higher return rate is necessary because in scenario 1 the FIP has higher obligations, mostly notional pension, than in other settings.³⁵ This difference makes scenario 1 not strictly comparable to the others.

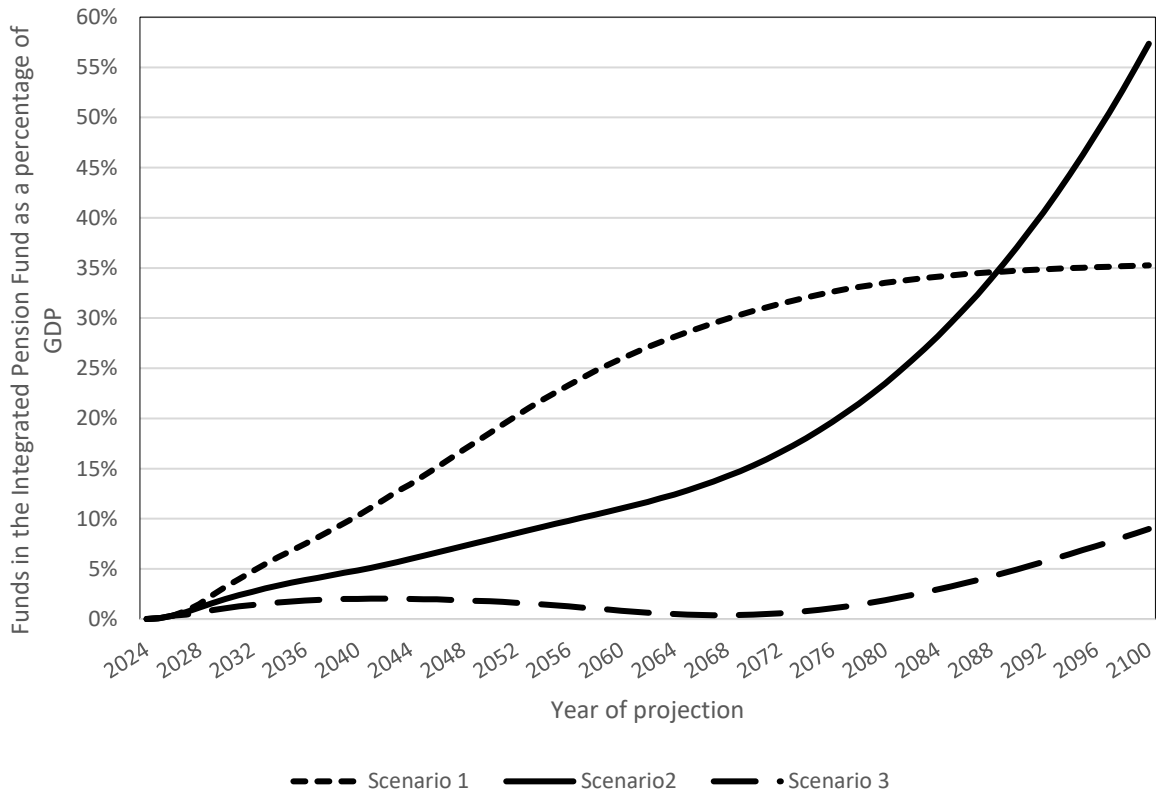
Scenarios 2 and 3 have a different development in terms of sustainability, even though they produce the same benefits. In scenario 2, accumulation from the FIP slowly rises from 0% of GDP in 2024, to end up at 58% of GDP in 2100. It is also observed that around year 2067 the accumulation rate increases, as the curve becomes steeper. It can be concluded that after year 2100 accumulation of resources in the FIP should continue, unlike scenario 1 in which FIP accumulation steadies in 35% of the GDP. In scenario 2, given that the FIP keeps on accumulating resources, benefits could be increased, or a higher contribution could be destined to individual account.

The difference in the accumulation of resources from the FIP between scenarios 1 and 2 comes from the effects of the accumulation of the 2% in individual accounts in scenario 2. Since the 2% going to the individual account is deduced from the guarantee, and given the accumulation in individual accounts has a return rate of 3.38%, higher than the notional

³⁵ Between the years 2024 and 2031, the assumed rate is 1.5%, later it declines to 0.8% between the years 2032 and 2037, to rise afterwards each year in 0.44 pp except for the last one, in which it rises 0.3pp, to reach a return of 3.91% in 2045.

return of 2% in the FIP, discount is higher in scenario 2 than in 1, resulting in higher accumulation of resources in scenario 2.

Graph 5.1: Evolution of FIP accumulation, % GDP, scenario 1, 2 and 3.



Source: Budget Office

In scenario 3, resource accumulation in the FIP is lower than in scenario 2. For example, in 2040, whereas in scenario 2 the FIP has already accumulated 4.9% of the GDP, in scenario 3 is 2% of the GDP. In 2060, accumulation is 11% and 0.8% of the GDP for scenarios 2 and 3, respectively, and between 2065 and 2070, although in scenario 3 the FIP keeps around 0.4% of the GDP (the lower period of accumulation), in scenario 2 the FIP increases its accumulation from 12.8% to 15.3% in that same period. After 2070, the FIP increases its volume in both scenarios and margins are greater. For the year 2100, under scenario 2, the FIP accumulates 57.4% of GDP and, under scenario 3, 9.0% of GDP.

The comparison in terms of sustainability shows scenario 2 is in more surplus than scenario 3 because, even though the FIP from scenario 3 always has a positive balance, for a period of 5 years its size is near 0% of GDP.

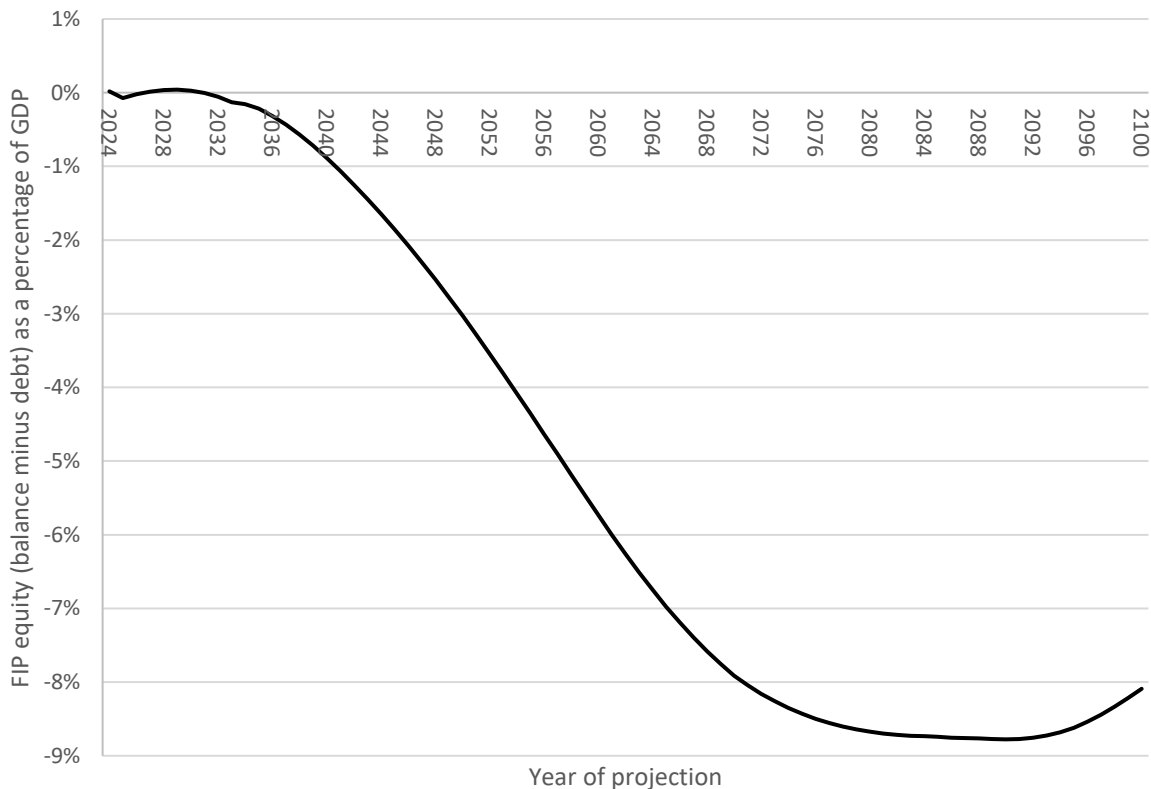
Secondly, we can conclude that going from 2pp to 3pp of the extra 6% contribution into individual account, the effect of reducing resources for the FIP is much greater than the

effect of diminishing obligations from the guarantee. Therefore, accumulation of the FIP is much smaller than in scenario 3, though it is still positive.

Other way of analysing the sustainability of the scenarios is calculating the present value of the fund (*Valor Presente del Fondo*, VPF), updating the flow of the Fund to today's value. If present value is positive, then income and expenses trajectory can be financed (although it may imply a debt for the institution administrating it on some period). If it's negative, additional resources would be required to finance it and, therefore, it would not be sustainable. VPF for scenario 2 is US\$102,190 million, while the VPF for scenario 3 is US\$15,165.³⁶ This figure confirms that scenario 2 is in more surplus than scenario 3.

The previous analysis suggests that scenario 4 is not sustainable because effects are exacerbated. As appreciated in Figure 5.2. that shows FIP's equity, balance minus debt, it can be noted it is slightly positive the first years but then it becomes negative as of 2030, stabilizing in the years 2086-2092 in -8,8% of the GDP to later start reverting such a tendency.

Graph 5.2: Evolution of FIP's balance, GDP%, under scenario 4.



Source: Budget Office

³⁶ For this exercise, an exchange rate of CLP \$900 was used and a discount rate of 2.3%.

To provide the same benefits than in scenarios 1 to 3, scenario 4 would require additional support from the State. This is coherent with the VPF of the FIP in this scenario (US\$ -7,105 million).

5.2.3. Risk factors on FIP sustainability.

Another relevant aspect to consider when assessing sustainability is that all simulations have uncertainty, as they are based on assumptions over events in the future. What these simulations try to prove is that, under reasonable parameters, the Social Insurance system is sustainable over time, but since reality it's likely to be different than the assumptions included in the model, it's important to understand how these differences impact on the commitments adopted today to afford benefits in the future. This is more relevant in a component which purpose is sharing risks among generations, but also among individuals within the same generation.

Sharing risks among generations allows to provide stability and intertemporally smooth shocks that cannot be mitigated with risk pooling (ex. systemic risk of longevity such as greater survival rate of a certain cohort) and increases investment capacity in risky assets. On this matter, the legal framework must ensure a fair and sustainable risk redistribution to enhance welfare. To be able to sustain this it is important to understand sustainability risks for the FIP. This implies, among other things, to take each of the variables from the model and incorporate variability or different possible settings in future forecasts and see how these impact on the fund's sustainability. Thus, it is important to analyse future uncertainties and to quantify their repercussions in the fund.³⁷ From that quantification is possible to incorporate potential adjusted scenarios to ensure the sustainability of the system.

On this regard, for example, guidelines on Actuarial Work for Social Security, from the International Social Security Association, state that: *“The valuation of a social security scheme includes analysis of future uncertainties and their impacts on the scheme. An actuary identifies and, if possible, quantifies risks stemming from future uncertainties. Uncertainty is intrinsic to the valuation since it addresses future events, and users of an actuarial valuation must be aware of this fact. The actuarial analysis of social security schemes is based on models as well as on a number of assumptions. Social security schemes are very complex, and their future income and outgo depend on many economic and demographic factors, so the models will not be a perfect representation of future reality. Moreover, the projection of cash flows of social security schemes is performed over an*

³⁷ For example, with the Solidarity Fund from the Unemployment Insurance if a sustainability analysis is performed, that exercise includes a scenario of hardship, in which unemployment rapidly increases, causing a quick growth of beneficiaries, thus having an impact in the fund.

extended future timeline. With the passage of time, the emerging picture will almost certainly differ from the projections of any actuarial valuation.” (Guideline 9).

Accordingly, it suggests developing institutional capabilities so that the analysis of adequacy indicators -measuring adequacy of incomes during retirement- and the assessment of system sustainability, consider uncertainties present in forecasts (stochastic models/scenarios), including relevant risks coming from financial market, demographics, labour market and agents’ behaviour. To do so, distributions can be generated for the risks from historic data, include hypotheses on the future and/or scenarios can be tested. This is particularly relevant for evaluating the sustainability of funds, which can be compromised under stressed scenarios.

6. Effects of pension funds withdrawals, short and long term. Replacement rates and other results.

As a result of the pandemic, the Chilean Congress approved three pension funds withdrawals that affiliates could make from their individual accounts.³⁸ Each of these withdrawals permitted to retire 10% of the total balance of the pension's savings, with a limit of 150 UF (USD \$6,021.72). If the balance was less than 35 UF (USD \$ 1,405.07), the person could withdraw the total of their pension savings.^{39,40}

This section analyses the impact of withdrawals on replacement rates in the short, medium- and long-term. Consequently, three relevant groups are identified for the analysis: (a) short-term: people that made withdrawals and retired before January of 2023; (b) medium-term: individuals currently at retirement age that made withdrawals but have not retired as of December 31 of 2022; and (c) long-term: current affiliates that have not yet reached the retirement age.

6.1. Impact of withdrawals on replacement rates: short term⁴¹

Analysis of the impact from withdrawals in the short term is carried out, calculating indicators for affiliates that made at least one withdrawal and retired between June of 2020 and December of 2022, a total of 279,485 people. This group represents 85% of total new pensioners in that period.

For the analysis group, pensions and replacement rates are estimated with and without withdrawals. The median replacement rates for people who resorted to withdrawals and retired in the period indicated is of 16%. With withdrawals, the median self-financed pension is USD\$98 (Table 6.1). If withdrawals had not been made, self-financed pension and replacement rate for these people would have been USD\$129 and 22%, respectively. This

³⁸ First withdrawal authorized by Law 21,248, enacted on July 30 of 2020 in *Diario Oficial*. Second, was permitted by Law 21,295, enacted on December 10 of 2020. Third withdrawal was authorized by Law 21,330, enacted on April 27 of 2021.

³⁹ Second withdrawal also authorized partial withdrawal by retirees through life annuities. The impact of the latter is not assessed on this section.

⁴⁰ For detailed statistics on withdrawals, see Statistical Sheets for the first (<https://www.spensiones.cl/portal/institucional/594/w3-propertyvalue-10398.html>), second (<https://www.spensiones.cl/portal/institucional/594/w3-propertyvalue-10402.html>) and third (<https://www.spensiones.cl/portal/institucional/594/w3-propertyvalue-10421.html>) withdrawal.

⁴¹ For an analysis on the effect of withdrawals in the pension scheme, see Documento de Trabajo N° 67: Retiro de fondos de pensiones: Resultados y efectos <https://www.spensiones.cl/portal/institucional/594/w3-article-15164.html>

means that median self-financed pension decreased USD\$32 as a result of withdrawals, reducing replacement rate in 6 percentage points, a fall of 27%.

Table 6.1: Effect of withdrawals on self-financed pensions and self-financed replacement rates: Short-term analysis (Medians)

Year	Self-financed replacement rate		Self-financed pension USD \$		Last income \$	N°	% Women
	With withdrawal	Without withdrawal	With withdrawal	Without withdrawal			
2020	16%	18%	84	93	536	24,611	48
2021	17%	22%	104	135	584	87,251	46
2022	16%	22%	97	132	586	167,623	50
Total	16%	22%	98	129	580	279,485	48
Men	24%	31%	165	215	634	144,543	
Women	10%	14%	52	70	539	134,942	

Source: Superintendence of Pensions

Replacement rate falls further for those retired in 2021 and 2022 than for people retired during 2020, among other reasons, because for this last group most people requested only one withdrawal⁴². For people retiring on the second semester of 2020, self-financed pension without withdrawals would have been USD\$9 higher. For those retiring in 2021, USD\$31 higher and USD\$35 higher for people retiring in 2022.

Replacement rate for men would have been 31% without rescues, instead of 24%. Whereas, in the case of women, it would have been 14% instead of 10%. Women's self-financed pension would have been a 34.6% higher than without withdrawals, USD \$70 instead of USD \$52, and men's would have been 30.1% higher, USD \$215 instead of USD \$165.

The effect of withdrawals also reduced the total pension (Table 6.2). The median of this indicator fell 8.9%, from USD \$352 without withdrawals, to USD \$321 with rescues, reducing the median replacement rate from 61% to 56%.

For men, the median total pension fell 11.2%, with a decline in replacement rate from 66% without withdrawals to 60% with them. In women, the median total pension decreased 6.1%, with a decline in replacement rate from 57% without withdrawals to 53% with them.

The decline in replacement rate for the total pension is less than the fall of replacement rate when only self-financed saving is analysed, mostly due to the importance of PGU in total pension. Nonetheless, the greater decline in the total pension for men compared to women's is explained because of the higher relative importance of the self-financed component for men.

⁴² Laws from withdrawals were published on July 30 of 2020, December 10 of 2021 and April 27 of 2022.

**Table 6.2: Effect of withdrawals on total pensions and total pension replacement rates:
Analysis in the short-term (Medians)**

Year	Replacement rate		Pension (USD \$)	
	With withdrawal	Without withdrawal	With withdrawal	Without withdrawal
2020	61%	63%	309	318
2021	57%	61%	328	358
2022	55%	61%	319	354
Total	56%	61%	321	352
Men	60%	66%	382	430
Women	53%	57%	280	298

Source: Superintendence of Pension

6.2. People who made withdrawals and have not yet retired.

The analysis above is focused on people who made withdrawals and retired on the period from June 2020 to December 2022. However, a total of 325,229 people (Table 6.3) alive as of December of 2022 made withdrawals on that period and, though complying with the minimum age of retirement, have not done so up to the cutoff date. From that group, 73.1% are women and 48% of them withdrawn 100% of the balance they had in their individual account. In the case of men, 27% withdrawn 100%. Nearly 60% of men and women fulfilled the legal age requirement to retire in that period, whereas the remaining 40% reached the legal age for retirement before June of 2020.

Table 6.3: People who made withdrawals and did not retire.

Gender	Number	Average age	Median age	% withdrawing 100%	% Comply with legal pension age between 06/2020 and 12/2022
Women	237,644	63	62	48%	59%
Men	87,585	68	66	27%	60%
Total	325,229	64	63	42%	59%

Source: Superintendence of Pensions

The aforementioned impact of withdrawals on replacement rate is a preliminary estimation of the effect over the group of people who made these withdrawals and fulfilled the age for retirement, where part did retire and other did not by December of 2022. To better understand, this group of the 325,229 people was classified into 4 subgroups (Table 6.4), depending on two factors: if they reached the age for retirement before or after June of 2020; and if they withdraw 100% of their funds or less with the last withdrawal.

Table 6.4: Classification of groups.

Legal Age for Pension	Last Withdrawal	
	100%	<100%
6/2020-12/2022	Group 2	Group 3
<6/2020	Group 4	Group 5

Source: Own elaboration

The first group (group 1) is the one that made withdrawals, complied with the age of pension between June of 2020 and December of 2022 and did retire. This group was analysed in section 6.1 and represents 46.2% of the total.

Table 6.5: Amount of people in each group.

Group	N°	%
1	279,485	46.2
2	80,129	13.3
3	111,190	18.4
4	56,847	9.4
5	77,063	12.7
Total	604,714	100

Source: Superintendencia of Pensions

The second largest is Group 3, those who rescued less than 100%, comply with requirements for retirement between June of 2020 and December of 2022, but did not retire. Groups 2 and 4, representing together 22.7% of the universe, ended up with nothing left on their individual accounts after withdrawals (table 6.5). Unless they pay contributions again, these people will not have access to a self-financed pension, so it could be inferred that their self-financed replacement rate post withdrawals, it's zero. These groups could thus be added to group 1 in terms of the negative effect from withdrawals on replacement rates, increasing the effect over the 6 percentage points inferred for the self-finance replacement rate (table 6.1) and/or 5 pp for the total pension case (table 6.2).

Group 1 had a median in their individual account of USD\$20,674 when they retired, compared to USD\$21,277 from Group 3 and USD \$23,886 from Group 5. Groups 3 and 5 have not yet retired, even though they have a higher median balance than those who already have, possibly because they have greater incentive to keep paying contributions. These groups (3 and 5) represent 31.1% of the analysed universe.

Table 6.6: Median Balance (USD\$) of groups analysed.

Gender	Groups				
	1	2	3	4	5
Women	12,284	0	15,255	0	23,163
Men	32,758	0	35,046	0	25,411
Total	20,674	0	21,277	0	23,886

Source: Superintendence of Pensions

In effect, if we analyse the behaviour on contributions from these groups, the information available shows that 42% of the subjects that have not retire (groups 2 to 5) made some contribution between June of 2020 and December of 2022 (Table 6.7). This proportion is higher for group 3, followed by group 5, while from those who ran out of savings, only 20% made any contribution in the period of the study.

Table 6.7. Contributors between June of 2020 and December of 2022 from the groups analysed.

Group	N° of people	With contributions (06/2020-12/2022)	
		N°	%
2	80,129	16,413	20%
3	111,190	73,730	66%
4	56,847	11,455	20%
5	77,063	36,235	47%
Total	325,229	137,833	42%

Source: Superintendence of Pensions

Among those who paid any contribution, we note (table 6.8) that groups 2 and 4 did contribute 42% and 40% of the period 06/2020-12/2022, in contrast to groups 3 and 5, with 80% density. Likewise, the average income in the last 12 months (counting from the last contribution paid), is higher for groups 3 and 5 compared to groups 2 and 4. This would indicate that, even though the four groups who have not retired have made contributions in the period studied, groups 3 and 5 seem to have greater incentives to remain in the formal labour market, and when they do retire the effect of withdrawals should be partially reversed.

Table 6.8. Average density on period June 2020 – December 2022 and taxable income (average for the last 12 months) of groups analyzed.

Group	Density	Taxable income (average 12 months)	Number of people
2	42%	531,111	16,413
3	80%	1,246,485	73,730
4	40%	682,857	11,455
5	80%	1,448,813	36,235
Total	72%	1,166,999	137,833

Source: Superintendencia of Pensions

6.3. Impact of withdrawals on replacement rates: long-term

This subsection displays estimations on the effect of withdrawals over pensioners for the next years and decades.

The difference in the median replacement rate for men in 2024, with and without withdrawal, is 8.5 percentage points, calculated over people who made withdrawals. This difference increases in the short-term to 9.1 percentage points between the years 2029 and 2030 to later begin declining and reaching 1.8 percentage points in 2070. This rise in the short-term is explained by the sum withdrawn by people who retired over those years.

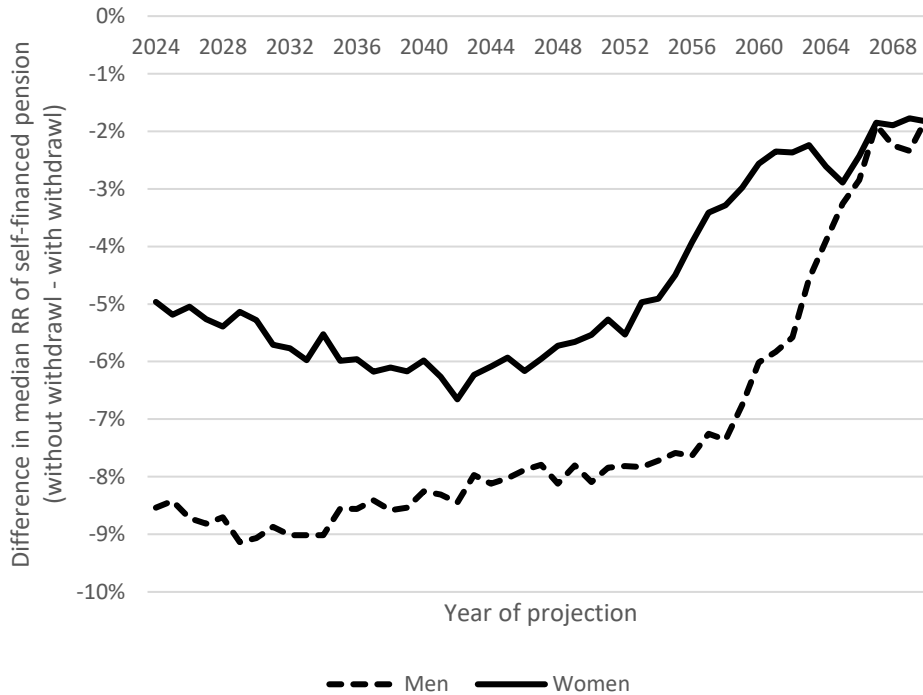
For women, that difference starts in 5 percentage points the year 2024, increasing up to reach 6.7 percentage points the year 2042 to later decline until reaching 1.8 percentage points in 2070.

The previous analysis only considers people who requested withdrawals, but not the effect among all pensioners⁴³. This will be more relevant in the future, when retirees who made withdrawals begin diminishing and start being pensioners who have not made withdrawals the relatively most important. The total effect from withdrawals in the decline of the replacement rate is 3 percentage points the year 2024, rising up to 6.3% the year 2053, to later fall down to 0 on 2063. Between the years 2035 and 2050, the decline in the replacement rate grows very little (Figure 6.2).

From this analysis, it follows that withdrawals shall affect for almost four decades the decline on replacement rates and that, just as of the year 2053, the system's replacement rate should start to recover.

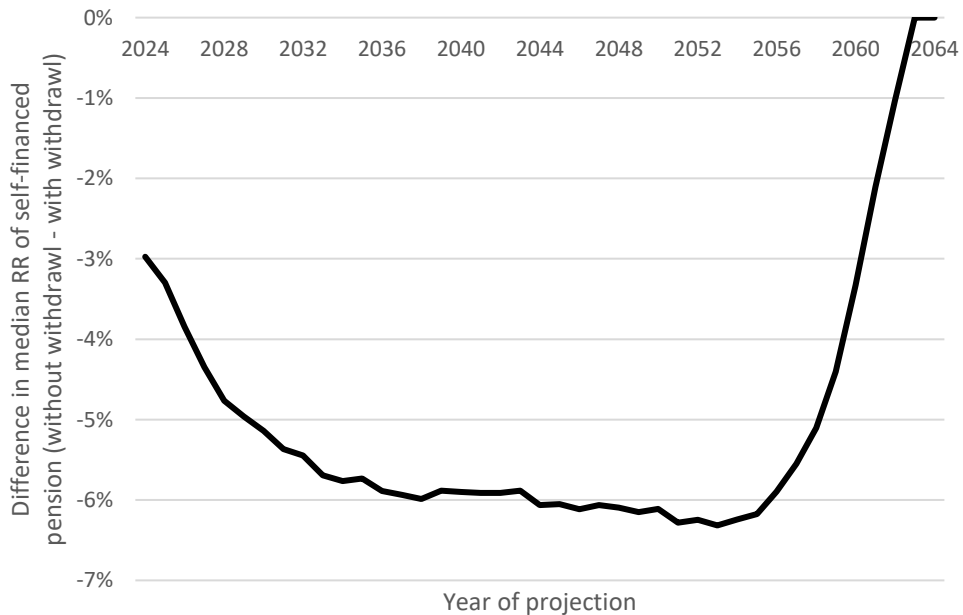
⁴³ Only pensioners in "programmed withdrawal" modality could initially withdraw funds. Pensioners with annuities were only allowed "withdrawals" with the second law (subject to tax payment).

Figure 6.1: Evolution of the difference in median replacement rates of self-financed pension with and without withdrawals of the 10% (people who made withdrawals)



Source: Budget Office

Graph 6.2: Average decline in replacement rate caused by pension fund withdrawals.



Source: Budget Office

7. Conclusion

This study's main goal is to calculate current replacement rates for the pension scheme and project them under different settings. Regarding current replacement rates, living old-age pensioners as of December of 2022, a total of 1,507,572 people, are analysed. For this group, the median replacement rate for self-financed pension was 19% (31% for men and 12% for women). If the Guaranteed Universal Pension (PGU) is added, replacement rate reaches 72% (73% for men and 71% for women). The median self-financed pension is USD\$94 and if the PGU is included, it reaches USD\$323.

The analysis also follows people starting old-age retirement between the years 2015 and 2022, still alive as of December of the year 2022, group of people that would better reflect the situation of those retiring in the future. For this group, the median replacement rate for self-financed pension savings is 17% (11% for women and 27% for men), and a 63% with the PGU (62% for women and 65% for men). Median self-financed pension is USD\$82 and if the PGU is added, USD\$309. The effect of the PGU is crucial for the most vulnerable population, with median replacement rate for the first quintile of last salary being 172%, falling to 45% in the fourth quintile and to 34% in the fifth quintile.

To analyse the impact of eventual reforms to the pension system, the current and five alternative scenarios, including the reform in Congress since November 2022, were micro-simulated until the year 2070. The five scenarios vary in the destination of the additional 6% contribution: (1) all contribution to Social Insurance; (2) 4% to Social Insurance and 2% to individual account; (3) 3% to Social Insurance and 3% to individual account; (4) 2% to Social Insurance and 4% to individual account; and (5) all to individual account. In the long run (2070), there is not much variation among the scenarios in terms of the projected replacement rate, with 1 percentage point difference favourable to the scenario where all the 6% goes to individual accounts versus all 6% to solidarity. With respect to current situation, the scenarios improve replacement rates by 10-12 percentage points. However, those scenarios including inter and intra generational solidarity exhibit an important improvement with respect to the current design for short-term pensioners (2024), 12 percentage points higher replacement rates compared to current situation, whereas no improvement is observed when the additional 6% goes exclusively to individual accounts.

Financial sustainability of these scenarios is also analysed, defined as not needing additional resources for the system to operate in the future, although it may have deficit in some period (that is, expenses greater than income), provided that the same system can finance it. Under this plan, the only simulated setting that would not be sustainable up to 2100 without additional resources is the scenario in which 2% is assigned to Social Insurance and 4% to the individual account. The one with more margins in terms of sustainability is the scenario with 4% sent to Social Insurance and 2% to individual accounts.

Finally, the evaluation of changes in replacement rates after the large-scale withdrawal of pension funds by the affiliates during the COVID-19 pandemic quantified the damage of such an initiative, that significantly undermined social protection at least for the next four decades.

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Appendix. Replacement rates over mean income in the last 5 and 10 years.

Table A.1: Median for self-financed and total replacement rate using the mean income of the last 12, 60 and 120 months. By gender.

Gender	Self-financed replacement rate			Total replacement rate		
	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income
Women	11%	11%	12%	54%	55%	58%
Men	28%	28%	29%	61%	61%	63%
Total	18%	18%	19%	57%	58%	60%

Source: Superintendencia of Pensions

Table A.2: Median for pension, median for last 12, 60 and 120 months mean income and number of pensioners. By gender.

Gender	Mean income (median)			Self-financed pension	Total pension	Number of pensioners
	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income			
Women	522	508	480	56	285	342.168
Men	674	686	667	206	422	330.611
Total	585	583	558	114	336	672.779

Source: Superintendencia of Pensions

Tabla A.3: Median for self-financed and total replacement rate using the mean income of the last 12, 60 and 120 months. By quintile of last income*.

Quintile last income	Self-financed replacement rate			Total replacement rate		
	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income
Quintile 1	13%	12%	12%	107%	96%	95%
Quintile 2	14%	14%	15%	68%	70%	72%
Quintile 3	14%	15%	16%	54%	56%	60%
Quintile 4	19%	19%	21%	42%	45%	48%
Quintile 5	26%	27%	28%	33%	35%	37%
Total	18%	18%	19%	57%	58%	60%

Source: Superintendencia of Pensions

* Last income corresponds to the average income of the last 12 months.

Tabla A.4: Median for pension, median for last 12, 60 and 120 months mean income and number of pensioners. By quintile of last income*.

Quintile last income	Mean income (median)			Self-financed pension	Total pension	Number of pensioners
	Last 12 month mean income	Last 12 month mean income	Last 120 month mean income			
Quintile 1	279	301	303	33	264	134.556
Quintile 2	434	420	401	60	293	134.556
Quintile 3	585	561	529	84	313	134.556
Quintile 4	924	885	825	177	392	134.556
Quintile 5	2.346	2.282	2.162	578	721	134.555
Total	585	583	558	114	336	672.779

Source: Superintendencia de Pensiones

* Last income corresponds to the average income of the last 12 months.

Table A.5: Median for self-financed and total replacement rate using the mean income of the last 12, 60 and 120 months. By years of contribution.

Years of contribution	Self-financed replacement rate			Total replacement rate		
	Last 12 month mean income	Last 60 month mean income	Last 120 month mean income	Last 60 month mean income	Last 12 month mean income	Last 120 month mean income
0-5	3%	3%	3%	66%	67%	69%
6-10	5%	5%	6%	59%	60%	63%
11-15	9%	9%	9%	58%	60%	63%
16-20	13%	13%	13%	59%	59%	63%
21-25	17%	17%	18%	58%	58%	61%
26-30	22%	23%	24%	56%	56%	59%
31-35	28%	28%	29%	52%	52%	54%
36-40	34%	34%	35%	50%	51%	53%
>40	42%	43%	45%	57%	58%	61%
Total	18%	18%	19%	57%	58%	60%

Source: Superintendencia de Pensiones

Table A.5: Median for pension, median for last 12, 60 and 120 months mean income and number of pensioners. By years of contribution.

Years of contribution	Mean income (median)			Self-financed pension	Total pension	Number of pensioners
	Last 12 month mean income	Last 12 month mean income	Last 120 month mean income			
0-5	363	354	346	9	238	63.576
6-10	431	419	402	23	253	74.456
11-15	464	454	431	41	273	77.770
16-20	503	496	469	67	299	75.407
21-25	565	561	535	106	334	77.095
26-30	671	680	655	170	388	79.428
31-35	899	934	918	278	487	89.337
36-40	1.266	1.311	1.282	425	612	83.859
>40	1.426	1.429	1.363	554	741	51.851
Total	585	583	558	114	336	672.779

Source: Superintendence of Pensions

