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Assessing Chile's Pension System: Challenges and Reform Options

RESEARCH

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ABSTRACT

This paper takes stock of Chile's defined contribution pension system and assesses reform options aimed at increasing replacement rates. An international comparison shows that, despite being quite influential when established, it is now delivering low replacement rates relative to OECD peers, as its parameters did not adapt over time to changing demographics, declining global returns, higher-than-expected informality in the labor market, and, more recently, to legislation allowing for pension savings withdrawals to counter the effects from the COVID-19 pandemic. We find that a reform that raises contribution rates and the retirement age would significantly improve replacement rates and lower fiscal costs associated with the system, especially if accompanied by complementary policies to boost workers' contribution density.

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1. INTRODUCTION

Initially praised for its positive impact on private savings, Chile's pension system has come under scrutiny in recent years. Chile was the first country to replace a traditional pay-as-you-go (PAYG) system that offered a defined benefit with a fully funded pension system based on a defined contribution that financed individual capital accounts managed by private fund managers (AFPs). The switch was motivated by efficiency and fiscal concerns,[1] and "by a desire to reduce the role of the government in economic affairs" (OECD 1998). Early assessments linked the new pensions system with growing private savings and with the development of local financial markets (Roldos 2007). The apparent success of the Chilean experience sparked a wave of pension reform in Latin America and other emerging markets. As the system matured, however, its limitations became apparent. First, to encourage participation in the new system, mandatory contribution rates were set at relatively low levels. This, in turn, resulted in low replacement rates relative to initial expectations at the time of the transition and by international standards (Barr and Diamond 2016). In addition, informality and self-employment, together with low job tenure, resulted in relatively low contribution densities and coverage.

The system's limitations, which are expected to become even more apparent in the future, put pension reform at the center of the political debate in recent years. The introduction of the solidarity pillar in 2008, marked the beginning of a reform agenda aimed at improving the system's fairness and overall functioning, which continues to this day, as witnessed by the 50 percent increase in the minimum pension introduced in December 2019 and the establishment of the *pensión garantizada universal* (PGU) in 2022. Moreover, the extraordinary measures taken in 2020 to support households during the COVID crisis, which included allowing individuals contributing to the pension system to withdraw funds from their pension account balance, added to the challenges. The resulting three rounds of withdrawal of assets amounted to 20.6 percent of 2020 GDP and the three withdrawals resulted in about 30 percent of individuals who withdrew funds depleting their pension accounts.

This paper contributes to the debate around the adequacy of Chile's pensions system and reform options in two distinct ways. First, it provides an international comparison of the system's key outcomes prior to 2019 and quantifies the long-term impact of the COVID-related withdrawals on the same outcomes, under different scenarios. In particular, the paper assesses the impact of the COVID-related withdrawals on replacement rates of those who are currently contributing to the system and of the associated fiscal costs. The second contribution is to provide a quantitative assessment of the impact on replacement rates and fiscal costs of different reform options. To be sure, the analysis does not focus on specific reform proposals, as this is still an unsettled debate in Chile. Rather, it contributes by quantifying the potential results of different parametric changes that are informed by the current debate.

The paper shows that, prior to the COVID-related withdrawals, Chile's pension system yielded replacement rates that compared unfavorably to OECD peers, although there is a large degree of heterogeneity across cohorts and income groups. Chile's relatively low average replacement rate reflects policy parameters (contribution rates and retirement age) that were originally set to yield higher replacement rates but have not kept up with higher life expectancy, declining real interest rates, and a low contribution density, and which are expected to lead to declining replacement rates for younger cohorts. In fact, Chile has a lower effective contribution rate than most OECD countries. Furthermore, replacement rates would be even lower in absence of the solidarity pillar introduced in 2008, which sets a pension floor for those in the bottom 60 percent of the income distribution. Indeed, low-income pensioners, who benefit from the solidarity pillar, have relatively high replacement rates compared to the country average. However, replacement rates would have been significantly lower under a PAYG system, especially for men.

1 Soto (2007) highlights that in 1980 the Chilean pension system was paying more in benefits than it was receiving in contributions. Moreover, the old system, which was a collection of different pension regimes, was said to be poorly administered and inefficient (Edwards 1996).

The withdrawals are expected to further deteriorate the system's outcomes—for current affiliates, the average withdrawal is projected to result in a 7 percent decline in pension at retirement. As in many other countries, Chile passed legislation to allow workers to withdraw funds from their private pension accounts. However, Chile stands out for being the country allowing the largest withdrawals (Madeira 2022). The three rounds of withdrawals, which amounted to over 20 percent of 2020 GDP, are expected to reduce the self-financed portion of pensions of current affiliates by 21 percent, on average (i.e., in the absence of any compensating government support). However, this impact will be partly offset by an increase in the government-funded pension supplement, triggered by the reduction in self-funded pension, leading to a reduction in total pensions of about 7 percent and a decline in the average expected replacement rate, from 37 percent to 35 percent.

This buffering role of the government-funded pension supplement will lead to an additional fiscal cost estimated at a net present value of about 6 percent of GDP in 2020. The withdrawals will affect fiscal costs by increasing (i) the number of recipients of the pension supplement (to the extent that some pensioners are expected to fall into the lower 60 percent of the income distribution) and (ii) the amount received by each recipient. Under the current structure, the sum of these effects will lead to a gradual increase in the system's (additional) fiscal costs, which are expected to peak in 2060 between 0.09 and 0.17 percent of GDP depending on assumptions. The increasing profile of additional fiscal transfers into the system would be equivalent, in net present value, to a one-off fiscal contribution of between 3 and 6 percent of GDP in 2020.

Turning to reforms, our projections show that increases in contribution rates, retirement age, and contribution densities could lead to significant improvements in expected replacement rates and could help Chile's system close existing gaps with OECD peers. Moreover, many combinations of reforms that adjust several parameters in tandem can lead to sizeable increases in expected replacement rates. For example, a reform package that simultaneously increases the contribution rate to 16 percent, the retirement age for men and women to 67 and improved the contribution density to 70 percent would raise the average expected replacement rate to 50 percent from 35 percent, for the average worker; for young people (who have more time to benefit from the changes) the effect would be much larger: the expected replacement rates would increase to 70 percent for males aged 20–25 and close to 60 percent for females aged 20–25.[2] In practice, reforms may need to be phased-in to address political economy and labor market considerations.

Finally, the analysis highlights the heterogeneous consequences that could occur of different reforms across cohorts and showcases the importance of adapting the system's parameters to demographic trends and to global returns. Changes to contribution rates and policies that increase the contribution density have a large positive effect on expected replacement rates of younger cohorts, while leaving expected replacement rates of older cohorts virtually unchanged. Changes on the retirement age, on the other hand, results in non-negligible improvements in expected replacement rates for all cohorts. Importantly, the resiliency of the system can be improved by allowing periodic revisions to key parameters to reflect secular changes in life expectancy and global financial conditions.

The rest of this paper is organized as follows. Section 2 describes the data and methodology used in the paper. Section 3 benchmarks the system's outcomes prior to 2019 relative to Latin American and OECD peers and assesses the impact of COVID-related withdrawals on replacement rates and fiscal costs.[3] Section 4 studies the impact of different pension reform avenues. Finally, Section 5 concludes.

2. DATA AND METHODOLOGY

This section described the data sources and methodology used in the rest of the paper.

2 To be sure, our framework does not consider the behavioral response on the part of workers in response to changes in the parameters of the system. For example, an increase the contribution rate may lead to decrease in the contribution density by means of an increase in informality. Thus, some of the results of our policy experiments can be interpreted as upper bounds to the potential benefits.

3 For an analysis of the macroeconomic consequences of pension reform, see Santoro (2017).

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2.1 DATA

Data used for international comparisons comes from the OECD's Pension at a Glance database (OECD 2019). This includes data on pension contribution rates, fiscal expenditure in pensions, and replacement rates based on the OECD pension model.

Further details of Chile's pension system and data used for our projections come from the national pension supervisory agency (SP, *Superintendencia de Pension*). SP provides aggregate data of pension affiliates by gender, account balance and age. SP also provides data on wages by age and by account balance. This helps approximate the wage distribution of contributors in the pension system.[4] Finally, SP provides data on contribution density, the portion of months that an affiliate contributed out of the total eligible contribution periods. The average contribution density for members that retired between January 2017 and December 2020 is 60 percent for males and 46 percent for females.[5]

2.2. PROJECTING PENSIONS: METHODOLOGY AND ASSUMPTIONS

To calculate the expected evolution of replacement rates and fiscal costs, and to assess the potential impact of withdrawals, we project total pensions and wages that current affiliates will receive at retirement. This is done by combining SP data on balances and wages with assumptions on the real return of pension fund assets, real wage increases, and contribution density. Projections begin in June 2020 data, one month before the first withdrawals, so that we can create a theoretical counterfactual.

The withdrawals are incorporated in the projections as follows. We assume that individuals in each age-gender-account balance cell withdraws from their pension account the maximum amount allowed for each withdrawal. Following the rules in the law, the formula that implements the maximum withdrawal assumption is:

$$Withdrawal = \min\left\{\max\left(\min(35, Balance), \frac{Balance}{10}\right), 150\right\}$$

Where *Balance* is the individual's private account balance at the time of the withdrawals, and all numbers are expressed in *Unidades de foment* (UF).[6] Note that the maximum withdrawal amount was 150 UFs.

Given this, we construct counterfactual pension account balances that feed into the projections.

The projection of pensions at retirement is done in steps.

1) The first step is to project for each cohort a path for wages from 2020 until the retirement year. This is done by assuming a common growth rate for the wages observed in June 2020 of 1.25 percent per year. The number is based on wage growth projections from Chile's budget office (DIPRES). They project that real wage growth will be above 2 percent between 2021 and 2026, gradually decreasing to 1.1 percent by 2050. For simplicity, we opted for a constant growth rate which roughly matches DIPRES' profile. Thus, the wage distribution within cohorts will remain unchanged over time.

2) Once the path for wages is set, we use assumptions on the real return on pension funds and of contribution densities to calculate the private account balances at retirement for each cohort, where cohort is defined as age group and initial pension balance, according to the following formula:

4 This comes from a sub-sample comprising 47 percent of contributors.

5 A distribution of contribution density is assumed by age-gender-account balance to match the gender-wide averages (we achieve a gender-wide average of 59.2 percent for males and 49.2 percent for females, close to the averages found in data).

6 *Unidades de fomento*, UF, is a unit of account used in Chile. The exchange rate between the UF and the Chilean peso is constantly adjusted for inflation so that the UF value remains almost constant on a daily basis during low inflation. At end-February 2021, 1 UF was equivalent to US$41, therefore 10 UF to 15 UF is about US$410 to $620.

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$$F_{c,n} = P_c(1+r)^n + A_c\sum_{i=1}^{n}(1+w)^i(1+r)^{n-i}$$

$$A_c = W_{c,2020} * 0.1 * D_c$$

Where P_c is the initial account balance (in the current year) by cohort c, n are years until retirement for the cohort, r is the assumed (constant) return on pension funds, w is the common growth rate of wages, and A_c is a variable that subsumes the wage in 2020 ($W_{c,2020}$), the contribution density (D_c), and the mandatory contribution rate of 10 percent.

We assume real returns on pension accounts of 4.15 percent per year. The value is motivated by the July 2018 edition of the projection of the pension system published by the Superintendencia de Pensiones (Granados et al. 2018b). Based on the same report, we assume a rate of 3.36 percent for the life annuity rate.

A distribution of contribution density and wages are assumed by age-gender-account balance to match the gender-wide averages. For simplicity we assume that contribution density remains constant over time.

3) Once pension account balances at retirement are calculated, we calculate a retiree's monthly private pension as the annuity of its assets at retirement evenly divided over twelve months. Thus, the monthly self-financed pension received by an individual is equal to:

$$Per\ month\ self\ financed\ pension = \frac{Balance}{CNU\ x\ 12}$$

where CNU is *Capital Necesario Unitario*, or capital unit necessary. CNU is the amount of capital that a member requires to finance one pension unit, which takes into account the life annuity rate and the life expectancy of the individual.[7] For simplicity our exercise calculates the CNU assuming that the new pensioner is single and without children. It is possible to calculate the CNU for members with a spouse, which would increase the CNU as part of the pension will go to the spouse upon death of the individual, lowering the per month self-funded pension.

To calculate CNU the paper uses the 2014 mortality tables for Chile, for men and women separately.[8] The table provides an adjustment factor that allows for the probability of survival to be calculated for each year into the future. Let l_x be the number of people that have survived at age x, which can also be understood as the probability of survival at age x and after t years of retirement. The probability of survival at T = 110 is assumed to be zero and therefore no pensioner lives beyond this age. Given this assumption, CNU is equal to:

$$CNU = \sum_{t=0}^{T}\frac{\frac{l_{x+t}}{l_x}}{(1+i)^t} - \frac{11}{24}$$

4) Having calculated the self-financed pension for each retiree, we calculate the government supplement paid to the individual, as part of the solidarity pillar introduced in 2008, which is a function of the self-financed pension at retirement. Details on the solidarity pillar are presented in Annex A.

Parameters of the solidarity pillar are chosen as follows. The values up to 2022 for the minimum pension (PBS, *pensión básica solidaria*) and the threshold to receive government support (PMAS, *pensión máxima con aporte solidario*) are set according to the announcement made in 2019. From 2022 onwards we assume that the two parameters grow at the same rate as inflation, keeping constant in real terms. In our alternative scenario we assume that the government support parameters increase following real wage growth (1.25 percent).

7 CNU is explained in detail in a technical note by the Superintendencia de Pensiones by Vega (2014).

8 New mortality tables will become effective as of July 2023 and therefore are not considered in our analysis. Compared to the previous tables the update will increase male life expectancy and decrease female life expectancy, which would lower male replacement rates and increase female replacement rates.

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Notice that our analysis follows the system's design which was in place until early 2022, when the PGU law replaced the solidarity pillar. The new law expanded coverage and increased the benefits of the solidarity pillar. Thus, as argued later in the paper, our exercise is a lower bound to fiscal costs and overstates the decline in pensions. Further details are presented later in the text.

5) The final step is to compute replacement rates using total pensions (self-financed pensions plus government supplement) and projected wages, and the fiscal costs of the systems, which amount to total supplement payments to beneficiaries of the solidarity pillar. The fiscal costs are calculated considering the expected number of pensioners surviving each year using the mortality tables.

Parameter assumptions are summarized in Table 1.

Table 1 Parameter Assumptions.

	BASELINE	ALTERNATIVE
Real wage growth	1.25%	1.25%
Real return on pension fund assets	4.15%	4.15%
Real interest rate on life annuity	3.36%	3.36%
Average male contribution density	60%	60%
Average female contribution density	50%	50%
Real increase in PBS & PMAS	**0%**	**1.25%**
Mandatory contribution rate	10%	10%
Male retirement age	65	65
Female retirement age	60	60
CPI inflation	3.00%	3.00%
Medium-run nominal GDP growth	5.50%	5.50%

3. CHILE'S PENSION SYSTEM: INSTITUTIONAL FEATURES, INTERNATIONAL COMPARISON, AND THE POTENTIAL IMPACT OF THE COVID-19 WITHDRAWALS

This section provides a description of the key features of Chile's pension system, its key institutional features, recent reform efforts, and the potential impact of the COVID-related withdrawals.

3.1 INSTITUTIONAL FEATURES AND PAST REFORM EFFORTS

Chile moved from a PAYG system to defined contribution system in the early 1980s. The system, which initially served as a template for pension reform, has presented challenges, including relatively low replacement rates (more on this below). To address this, the introduction of the solidarity pillar in the 2008 reform of the system helped to provide a minimum pension and was largely increased in 2019. This was particularly beneficial for women, who have lower contribution densities compared to men on average, retire earlier, and live longer (Barr and Diamond 2016). Moreover, the change provided incentives for women to work until age 65, as this is the age when the benefit is paid. At end-2008 the basic pension was 65,470 CLP, about 40 percent of the minimum wage at the time. Following the extraordinary real increase in the PBS level of 10 percent in January 2017, the increase by 50 percent announced at end-2019 will bring (when finalized in January 2022 for all pensioners) the minimum guaranteed pension to 50 percent of the minimum wage.

Additional support for women was provided in the 2008 reform, Grant per Child (*Bono por Hijo),* where the mother is eligible for an additional supplement once she reaches 65 years old. The supplement is equivalent to 10 percent of 18 times the minimum wage set in place at the time of birth for each child, plus the average net rate of return on defined contribution pension plans from the date of the birth until the benefit claim. However, this has been deemed insufficient to

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fully recognize the unpaid caregiving required of the mother and the gap in employment living (Pension Commission 2015). The Grant per Child paid 360,000 beneficiaries in October 2020, supplementing their monthly pension on average by 9,796 CLP or about US$12.70.

In January 2022 the solidarity pillar was replaced by a universal gauranteed pension (PGU), which increased the minimum guaranteed pension and expanding the coverage from the 60 percent poorest households to the 90 percent poorest. Through the introduction of the PGU the number of beneficiaries of the pension system and their average benefits have increased. The additional scope is expected to increase the fiscal cost of the system by 0.8 percent of GDP per year (IMF 2023).[9]

Despite these changes, replacements rates in Chile remain low and challenges are expected to increase, as an aging population will further strain the current pension system, stretching pension balances over a longer retirement, while the solidarity component will be financed by a slowing workforce. As life expectancy of men and women increases, their accumulated assets at retirement will need to support additional pension years. The population eligible for pension is expected to double from about 3 million in 2021 to 6 million in 2050, adding extra pressure on the solidarity pillar. The Marcel commission in 2006 proposed a series of parametric changes to strengthen the system and to address equity concerns. The recommendations of the commission laid the foundations for the solidarity pillar, introduced in 2008. More recently, the Bravo commission (2015) proposed further adjustments to the system to account for demographic trends and low contribution rates. The importance of many of these proposed changes has become more prominent in the aftermath of the withdrawals.

3.2 CHILE'S PENSION SYSTEM IN INTERNATIONAL LIGHT

Prior to the pandemic, replacement rates in Chile were comparatively lower than in peers.[10] Comparing replacement rates is far from a straightforward task because they are very sensitive to assumptions. Moreover, compared to the Chilean system, some systems (especially PAYG) provide pension payments only to individuals with a minimum number of years of contribution, which further complicates international comparisons as many of the people who receive a pension under the Chilean system would not in other systems. These caveats notwithstanding, both regional and global comparisons show that Chile's pension system yields relatively low replacement rates. Altamirano et al. (2018) show that, at 38 percent, the expected replacement rate for an average Chilean worker retiring in 2015 was lower than in the average Latin American and Caribbean (LAC) country.[11] A similar picture emerges from the OECD's pension model—it projects that a Chilean retiring around 2060 would have a replacement rate of about 30 percent (lower than the above one due to future demographics and possibly different assumptions about future returns), which is 20 percentage points below the OECD average (Figure 1).

In addition to highlighting lower values compared to other countries, the analysis in Altamirano et al. 2018 and in OECD shows that replacement rates are expected to decline over time due to a combination of factors related to the design of the system, the functioning of Chile's labor markets, demographic trends and global macroeconomic are behind the low replacement rates.[12] The first factor is the low contribution rate. Chile's effective contribution rate is lower than most OECD countries (Figure 2, Panel A). Contribution rates were initially set at relatively low levels to encourage workers to transition from the PAYG system to the privately funded system and have not been increased since. However, as the first cohorts under the new system started retiring, it became clear that the resulting replacement rates were much lower than anticipated.

9 As explained in the IMF Country Report No. 23/36 the "annual cost of the PGU is estimated at about 2.2 percent of GDP, which is partly financed by a rationalization of tax exemptions (0.6 percent of GDP) and the discontinuation of the solidarity pension (1.1 percent of GDP)".

10 See Annex A for a description of the system.

11 This holds even when benchmarking Chile's replacement rates relative to those in countries with defined contribution pensions systems.

12 See de la Torre and Rudolph (2018) for a discussion.

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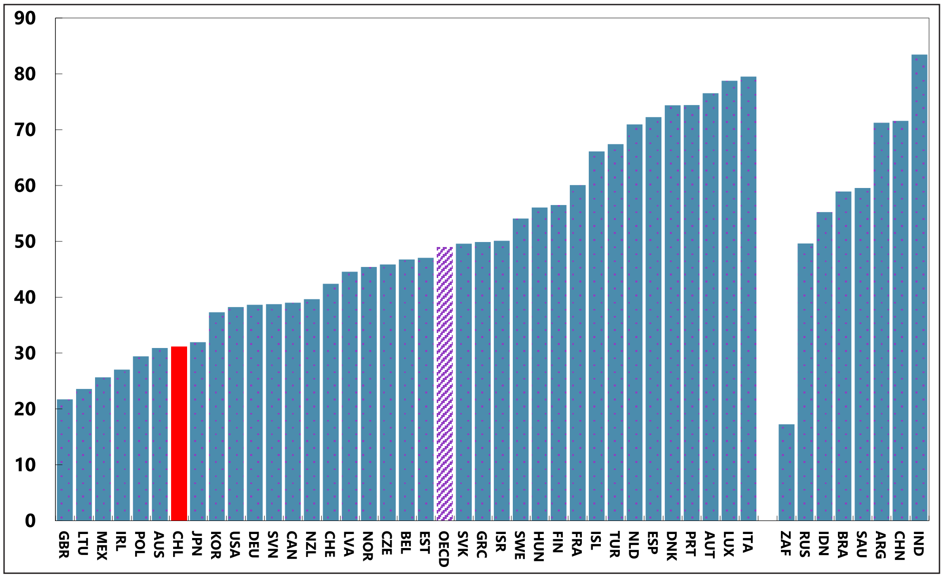

Figure 1 Projected Gross Replacement Rates in OECD Countries and Selected Comparators in 2060 (in percent).

Source: OECD Pension at a Glance (2019).

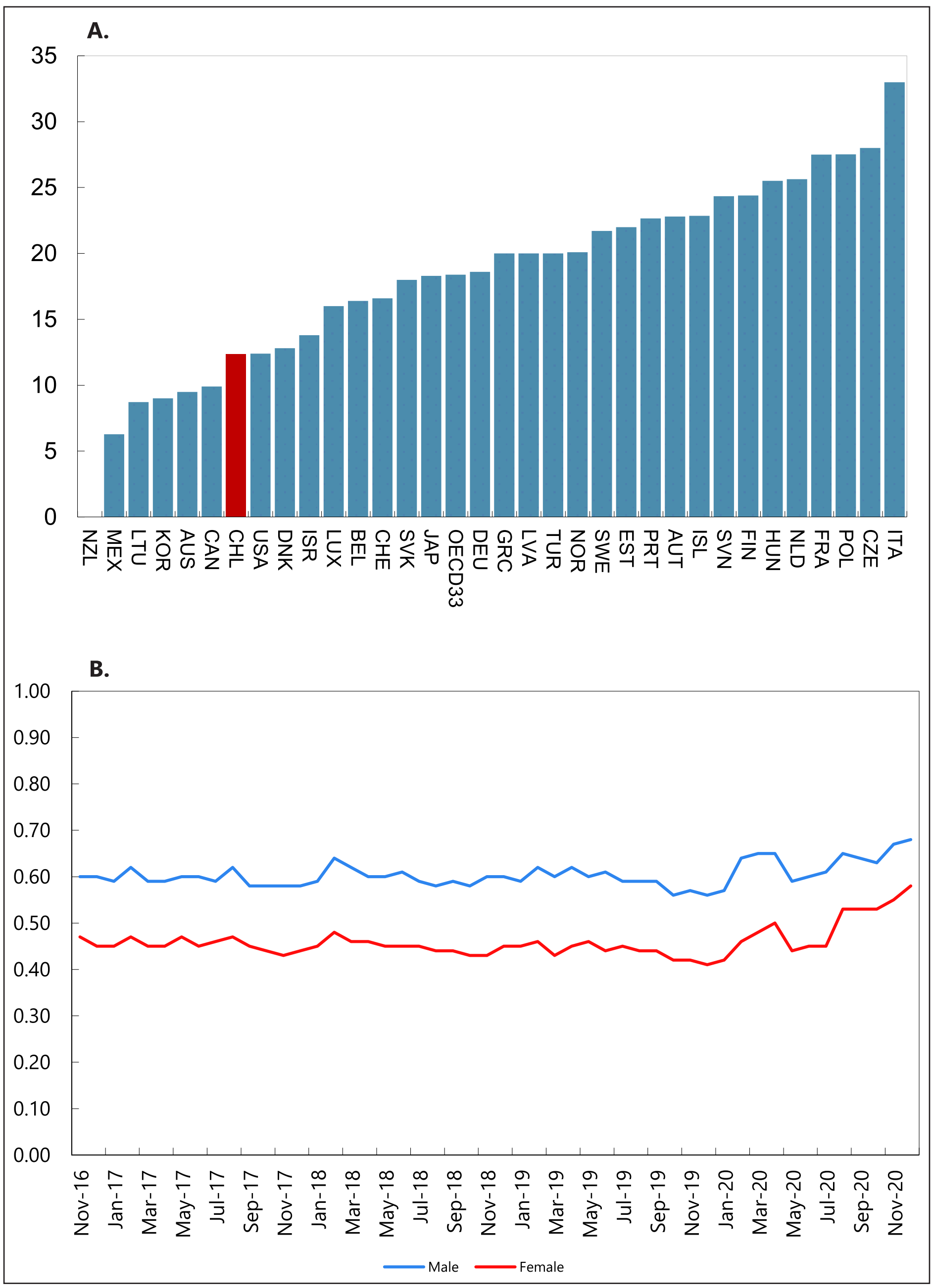

Figure 2 Factors Underlying Low Replacement Rates. **Panel A.** Pension Contribution Rates, OECD (as a percent of average wage). **Panel B.** Pension Contribution Densities in Chile (as percent of months worked).

Source: OECD Pension at a Glance (2019) and Superintendencia de Pensiones.

A second factor is the low contribution density. Self-employment and worker turnover have resulted in low contribution densities over workers' careers, especially among women (Figure 2, Panel B). On average, the probability that a male worker contributes to his pension account in a given month is 60 percent, compared to 50 percent for women.[13] Low propensity to contribute, combined with a lower mandatory retirement age (60 compared to 65 for men), result in lower pensions and replacement rates for women (Figure 3).

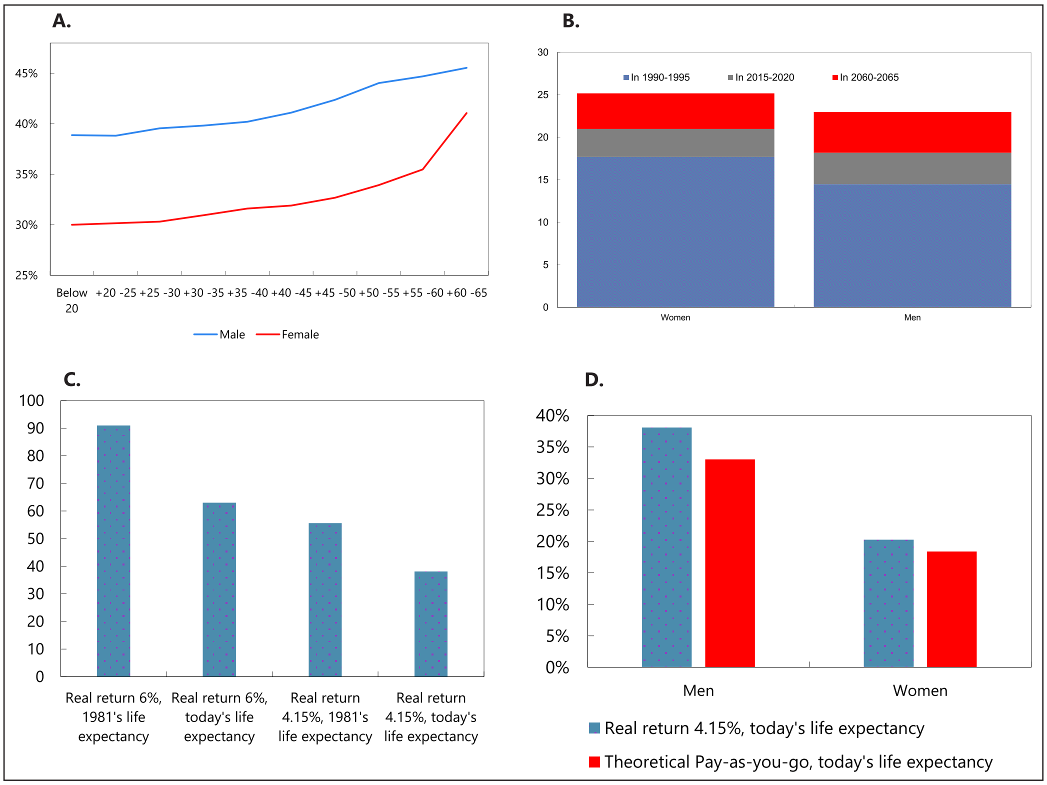

Figure 3 Replacement Rates in Chile. **Panel A.** Average Expected Replacement Rates by Cohort and Gender (pre withdrawals). **Panel B.** Remaining Life Expectancy at 65 in Chile (in years). **Panel C.** Hypothetical Self-Funded Replacement Rates in 2020 (in percent). **Panel D.** Hypothetical Self-Funded Replacement Rate for current system and Pay-As-You-Go system.

Sources: Authors' calculations based on data from *Superintendencia de Pensiones* and OECD.

Note: See text for details on the assumptions and the methodology used to project replacement rates.

A third factor is demographics. Based on data from the supervisory agency and under the assumption described in Section 2, our projection exercise suggests that, pre-withdrawal, male workers who are 60–65 years old today were expected to receive a pension of about 45 percent of their final wage prior to retirement (Figure 3, Panel A). By contrast, male workers who entered the labor market recently (those who are 20–25 years old in 2020) are expected to have replacement rates of roughly 40 percent.[14] This reduction in expected replacement rates is in part related to the fact that younger generations face the prospects of longer life horizons. Compared to those who are 65 today, estimates of increasing life expectancy imply that workers that will retire in 40 years' time will have to spread their savings over an additional five years (four years for women, Figure 3 panel B).

A fourth factor is lower future expected returns on savings. Real interest rates have gradually declined since the adoption of the defined contribution system (Figure 3, Panel C), and are expected to remain low over the medium term. This means that today's youngest cohorts will accumulate assets at a lower rate compared to what older cohorts have achieved so far.

Demographic trends and declining global returns also explain differences between expected replacement rates at the time the system was adopted and those observed when the first cohorts retired. To gauge the expected impact of these two factors we perform the same exercise as the one underlying Figure 3 Panel A, and compute the pension of a hypothetical male worker who

13 The average contribution density for males retiring between 2017 and 2020 was 60 percent and 46 percent for females.

14 A similar pattern is observed for women—the 60 to 65 age group have average projected replacement rates of roughly 40 percent, while those who are those who are 20 to 25 years old are expected to have replacement rates of 30 percent at retirement.

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entered the labor force in 1981 and calculate his replacement rate at retirement under different assumptions related to life expectancy and returns (we maintain unchanged other assumption for comparability, such as a real wage growth of 1.25 percent). Let us first consider the implicit life expectancy of a retiree in 1981 (which was about 78 years old) and a conservative real return on assets of 6 percent (which is much lower than the average return since then, see Evans and Pienknagura 2021).[15] Under these assumptions, the replacement rate would be about 90 percent (a higher return, such the one prevailing on average over the 1981–2019 period of 8 percent, would deliver even higher replacement rates, reaching 160 percent). In a second exercise we analyze the effect of an increase in life expectancy, which causes pensioners to stretch their pensions further. The increase in life expectancy of a current male retiree from the one expected in 1981 to the one expected in 2020 lowers the replacement rate from 90 percent to 62 percent. Additionally, the fall in global returns has slowed the accumulation of pension account balances and caused replacement rates to fall over time. Keeping life expectancy at its 1981 level but lowering the real return on assets to 4.15 percent causes the replacement rate to fall from 90 percent to 55 percent. Combining the increase in life expectancy with the fall in global safe interest rates lowers the replacement rate further, to 38 percent (Figure 3, Panel C), which is the one reported above for the current young male entering the workforce today and contributing the in the current pension system (as in Figure 3, Panel A).

The exercise illustrates that at its inception the system was well positioned to deliver adequate pension levels and replacement rates. However, the current system delivers replacement rates that stand above those of a hypothetical fiscally neutral PAYG system.[16] To illustrate this, we compute replacement rates for a PAYG system that is fully financed via contributions of current workers (i.e., there is no additional fiscal support) and that has parameters consistent with those of the current system (similar contribution rates as the current system and similar wage growth and demographic trends as those observed in the data). Such a system would produce replacement rates for a hypothetical male (female) worker retiring today that are 5 (2) percentage points lower compared to those of the current system (Figure 3, Panel D).

Beyond averages, there is a large degree of heterogeneity in both projected pension levels and expected replacement rates within cohorts. A large share of the population of older cohorts is found in the low end of the distribution of projected pensions. Roughly two thirds of the 55–60 cohort (600,000 people) and 50 percent of those 40–45 (approximately 600,000) were projected to retire with a pension below 10 UF prior to withdrawals (Figure 4, Panel A). By contrast, the mode of the distribution of projected pensions of those who are currently young is between 10 and 15 UF, but there is also a significant number of people falling in the 5–10 UF category. The distribution of expected replacement rates, on the other hand, presents a bimodal shape for all cohorts, and in each cohort replacement rates range from the low twenties to 100 percent (Figure 4, Panel B). The bimodal shape captures the fact that women, who account for roughly half of the population in each cohort, have lower expected replacement rates than men, and the wide range of expected replacement rates reflects the large difference in expected replacement rates between low and high wage earners.

According to projections of outcomes for future retirees, average replacement rates would be significantly lower in absence of the government-funded solidarity pillar. In 2008 Chile introduced a solidarity pillar to supplement pensions of individuals with low self-financed pensions, to address poverty among retirees.[17] Benefits stemming from the solidarity pillar were (before the 2020 pension withdrawals) projected to account for approximately 35 percent of total expected

15 In the absence of exact demographic information as of 1981, the exercise uses the information implicit in the CNU (*Capital Necesario Unitario*), which is the capital that a pensioner needs in order to finance one annual unit of the life annuity pension and combines the life expectancy of the pensioner and the safe interest rate at the time of retirement. The CNU for a male retiree in 1981 increased by 46 percent to today, which mostly reflects changes in life expectancy. Notably, the implicit calculation is also in line with the OECD figure for 1990 life expectancy (78), so this exercise is not biasing the calculation of the replacement rate upwards.

16 The PAYG system assumes a higher contribution rate to make the system fiscally sustainable and an interest rate that tracks real wage increases.

17 See Annex A for a description of the different elements of the solidarity pillar.

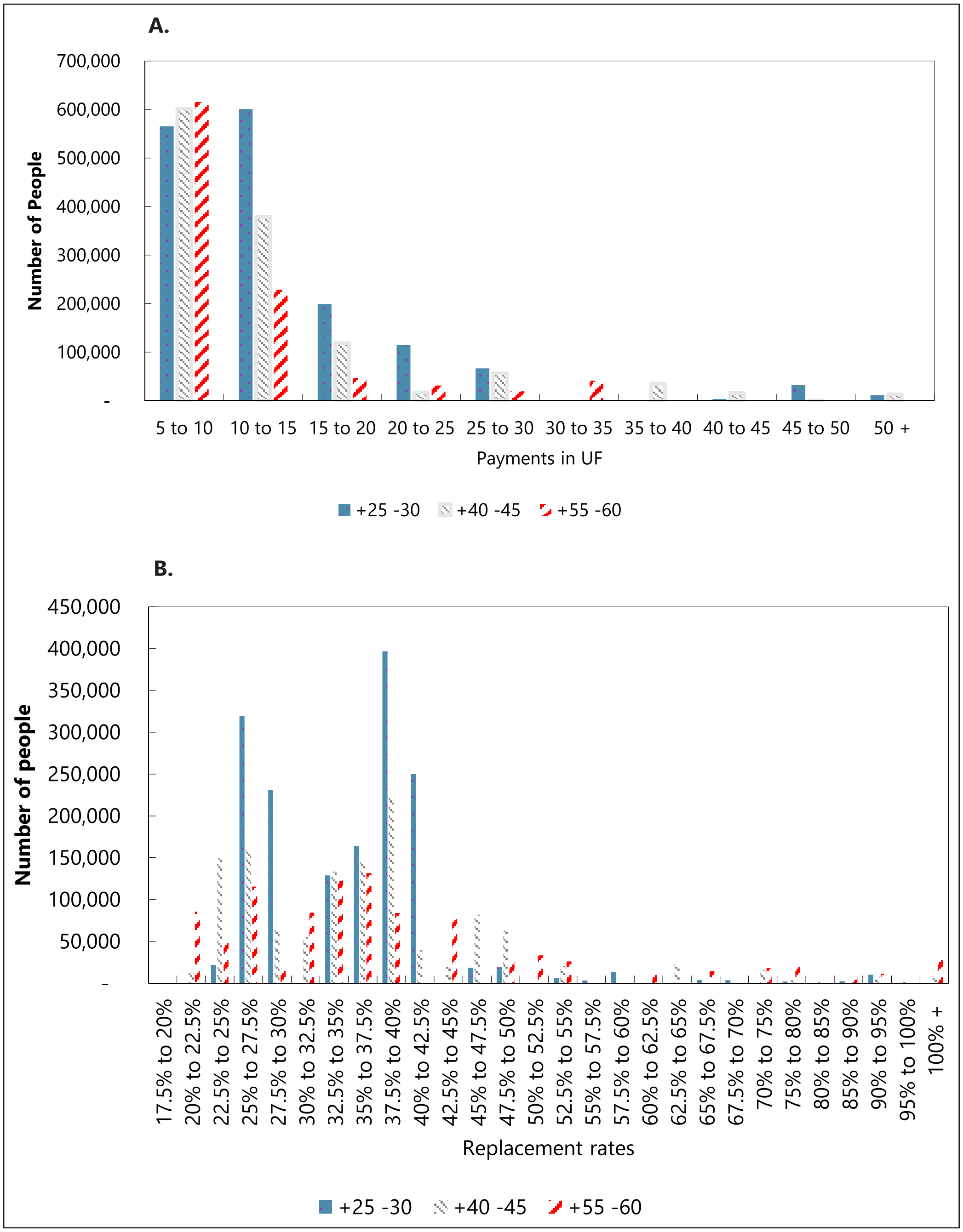

Figure 4 Distribution of Projected Pensions and Expected Replacement Rates, by Selected Cohorts. **Panel A.** Pension Payments. **Panel B.** Expected Replacement Rates.

Sources: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: See Section 2 for details on the assumptions and the methodology used to project replacement rates.

average pension at retirement for men and 60 percent for women prior to withdrawals (Figure 5).[18,19] In turn, the solidarity pillar increases the expected average replacement rate for those who contributed to the pension system in 2020 by almost 15 percentage points for men, and by close to 20 percentage points for women.

As mentioned, the solidarity pillar was recently replaced by the PGU, which expanded coverage and benefits of government-funded pensions. Thus, the analysis presented here is likely an understating fiscal costs and replacement rates.

18 The averages presented in Figure 5 reflect the fact that for some retirees in the lower 60 percent of the income distribution, the solidarity pillar can represent close to 100 percent of their pension.

19 This is consistent with Fajnzylber (2019), who argues that the solidarity pillar has provided transparent and targeted subsidy to individual who need it the most and compensates for gender differences.

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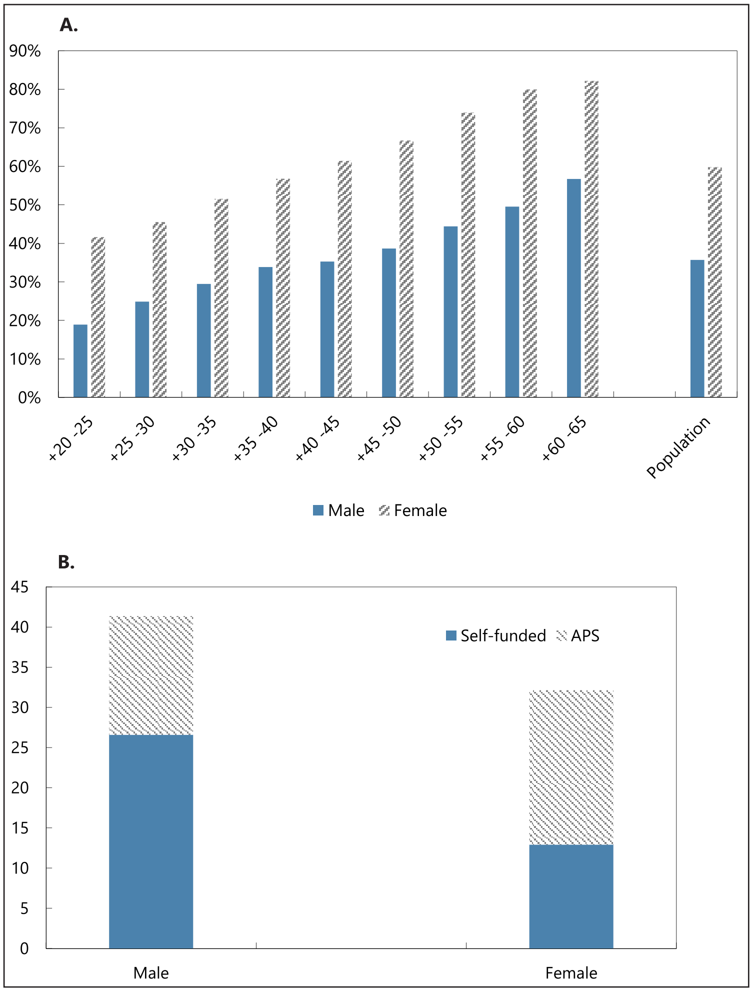

Figure 5 The Impact of the Solidarity Pillar on Pensions of Future Retirees. **Panel A.** APS as a share of Total Pensions, by Age Groups and Gender (in percent). **Panel B.** Contribution of APS and Self-funded Pensions to Replacement Rates (in percent).

Source: Authors' calculations based on data from the Superintendencia de Pensiones.

Note: Pensions and replacement rates are calculated using the methodology and assumptions described in Section 2.

The fiscal footprint of the Chilean system prior to 2020 was relatively small and was expected to decline as total costs converge to those associated with the solidarity pillar. The fiscal cost of the pensions system has been trending downward in Chile, although this mainly reflects the decline in the share of retirees receiving benefits from the old PAYG system. Compared to other countries, many of which have PAYG or hybrid systems, Chile currently devotes a relatively small share of GDP to the civilian pension system. OECD (2019) shows that in 2015 fiscal costs associated with old-age and survivors benefits were smaller in Chile than in other OECD countries, except for Iceland and Mexico (Figure 6, panel A). By 2020, the fiscal costs were approximately 2.2 percent of GDP, of which 1.1 percent stem from the solidarity pillar. Total fiscal costs are expected to converge to the costs of the solidarity pillar, which prior to withdrawals were projected to increase gradually to 1.6 percent of GDP by 2060,[20] assuming that the parameters of the solidarity pillar related to a minimum pension to individuals with no self-funded pension (PBS, *pensión básica solidaria*) and a government supplement to individuals with low self-funded pensions (APS, *Aporte previsional solidario*) remain unchanged (Figure 6, Panel B). However, in an alternative scenario where the parameters of the solidarity pillar, PBS and APS, are assumed to grow at the same rate as wages (1.25 percent per year in real terms), then the fiscal costs can be expected to reach 3 percent of GDP in 2060.

20 Fiscal costs reflect the authorities' projections of future costs associated with the old PAYG system up to 2050. This estimation does not include the fiscal cost changes due to the PGU, which is discussed further in Section 4 and detailed in IMF Country Report No. 23/36.

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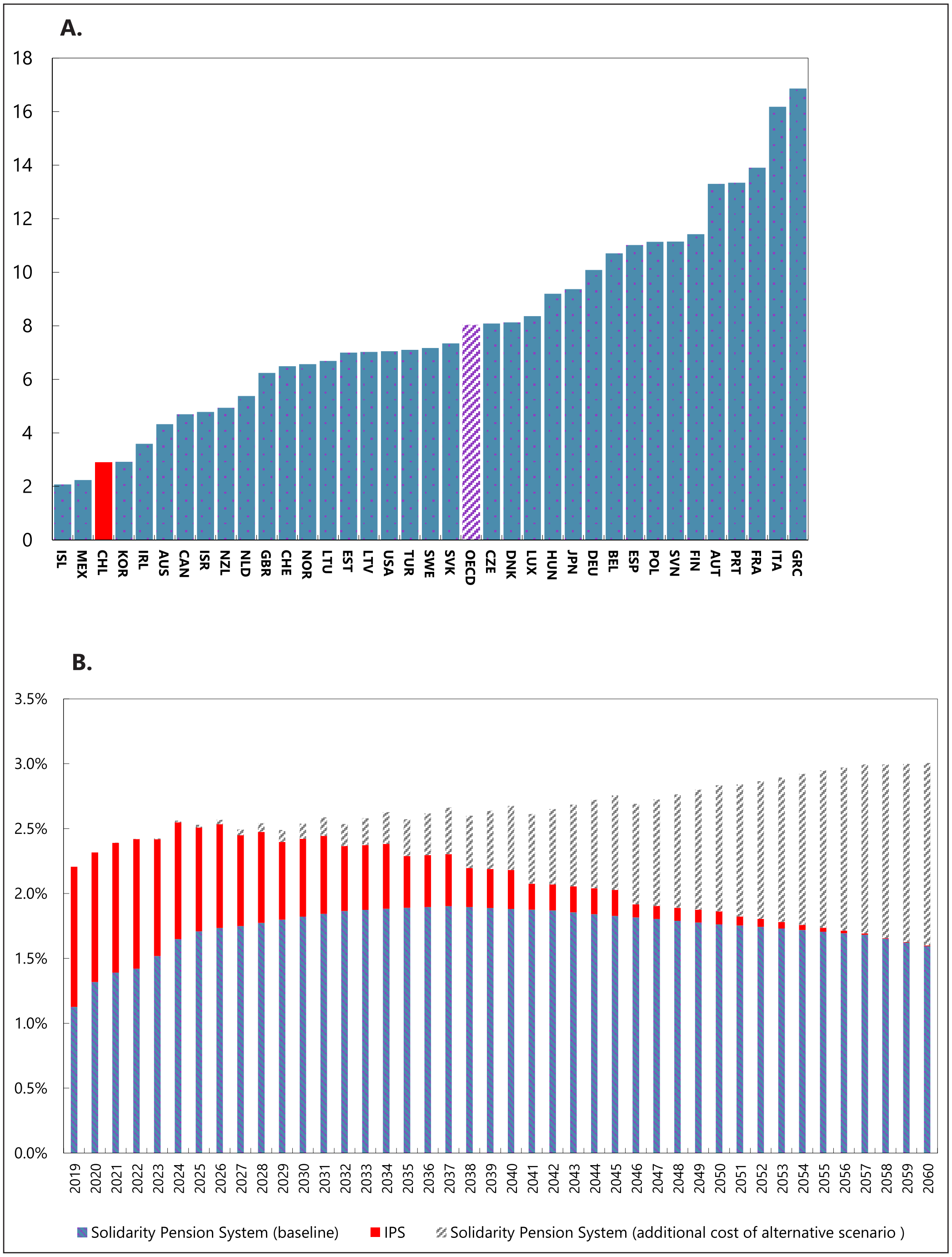

Figure 6 Fiscal Costs Associated with the Pension System—Pre-Withdrawal. **Panel A.** Cross-Country Comparison of Fiscal Costs—2015 *(% of GDP)*. **Panel B.** Fiscal Costs in Chile, *Baseline and Alternative Scenario (% of GDP)*.

Sources: Authors' calculations based on OECD (2019) and *Superintendencia de Pensiones*.

Note: Fiscal costs in panel B are calculated using the methodology and assumptions described in Section 2.

3.3 THE PENSION SYSTEM IN THE AFTERMATH OF WITHDRAWALS

Chile joined a number of countries (such as Chile, Peru, Mexico, Australia, New Zealand, Portugal, Spain, and Iceland) in allowing individuals to access their private pension funds (Madeira 2022; OECD Pensions Outlook 2020). Compared to other OECD countries, withdrawals in Chile, which are described in detail in Evans and Pienknagura (2021), were significantly larger. This implies that it is reasonable to expect withdrawals to further accentuate concerns about the outcomes of Chile's pension system. The rest of this section provides a quantitative exploration of the potential impact of the withdrawals on pension outcomes,[21] which, in turn, could offer lessons to countries that pursued similar polices.

21 The broad macroeconomic impact of withdrawals has been documented in other work. For example, Madeira (2022) quantifies the impact of withdrawals on savings. Barrero et al. (2020) show that pension fund withdrawals mitigated falling household income and, as shown in Central Bank of Chile (2020), they were associated with a boost in retail sales and consumption of durables. However, Barrero et al. (2020) also show that the measure was not well targeted (especially the second withdrawal) as it reached the upper quintiles of the income distribution, who actually saw labor income gains in the first nine months of the pandemic.

The self-funded portion of pensions (i.e., excluding the transfers stemming from the solidarity pillar) is projected to decline on average by 19 percent for men and by almost 23 percent for women, with larger effects among older cohorts (Figure 7). Males in their twenties are projected to experience average reductions in self-funded pensions of 5 to 12 percent after withdrawals.[22] By contrast, older cohorts are projected to experience reductions that can go up to over 60 percent, with higher numbers for elderly with lower balances that withdrew proportionally more. Women exhibit a similar pattern, but the reductions tend to be larger. This is due to lower wages and contribution densities, and a lower mandatory retirement age. The reduction in self-funded pensions is smaller when we weight by assets. This is due to the fact that, by design, the share of individual assets that were withdrawn declined with the individual pension account balance and that a large share of the population has low pension balances.

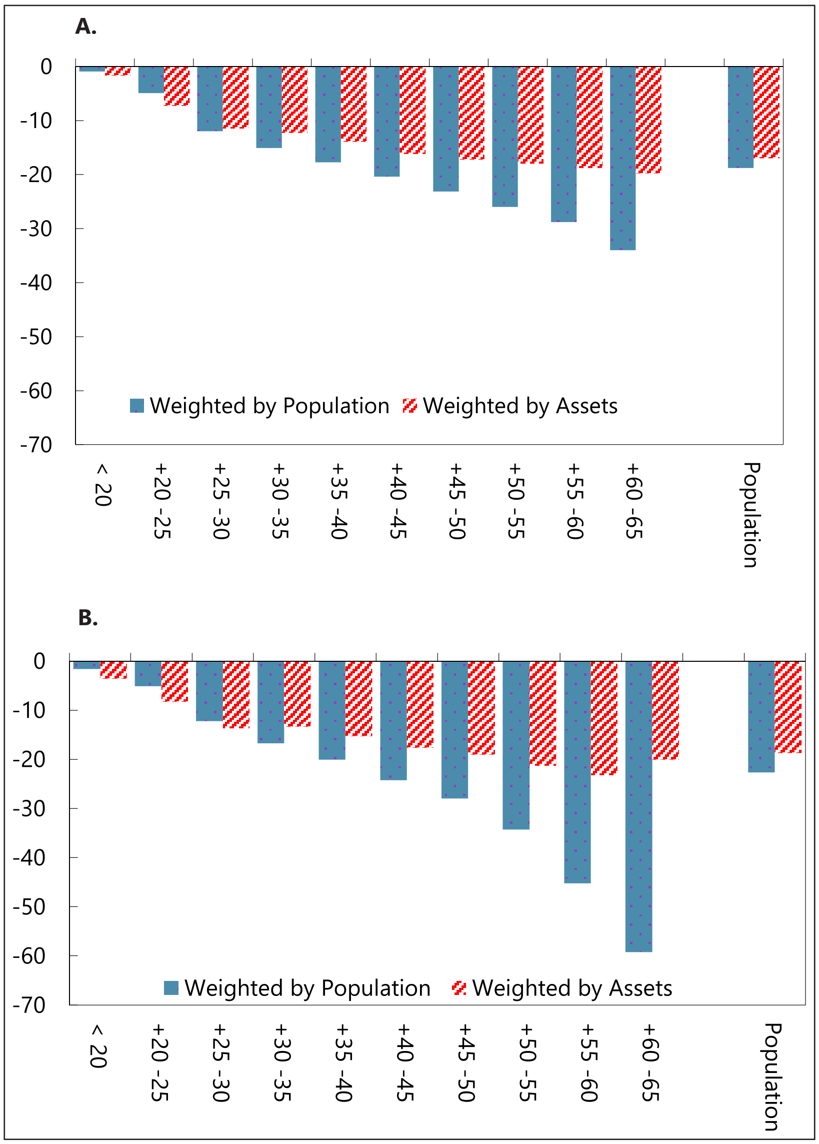

Figure 7 Reduction in Projected Self-Funded Pensions After Withdrawals, by Gender and Age. **Panel A.** Male (in percent). **Panel B.** Female (in percent).

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: Changes in pensions are calculated using the methodology and assumptions described in Section 2.

A consequence of the projected reductions in self-funded pensions is an expected increase in fiscal costs associated with government-financed pensions, which would automatically buffer the impact of withdrawals on pensions and expected replacement rates. Replacement rates are projected to decline by about 3 percentage points after withdrawals for the average male worker, and by 1.5 percentage points for female workers (Figure 8, Panel A). The smaller impact on women's expected replacement rates is due to the fact that, on average, PBS and APS account for a large share of their pension, which makes pensions less sensitive to self-funded account

22 Lorca (2021) also studies the impact of withdrawals on pensions. However, the author focuses exclusively on the first round of withdrawals.

balances. The adverse impact of withdrawals on expected replacement rates is partly mitigated by the increase in government support due to the decline in self-funded pensions. The projection exercise shows that, in absence of additional government support, replacement rates would fall by over 4 percentage points for men and by over 2 percentage points for women (Evans and Pienknagura 2021). For men, the mitigating effect of government support is largest for the 50–55 age group—APS dampens the adverse effect of withdrawals on expected replacement rate by 1.5 percentage points (Figure 8, Panel B). For women, the additional impact of APS is largest for the 40–45 age group (Figure 8, Panel C).

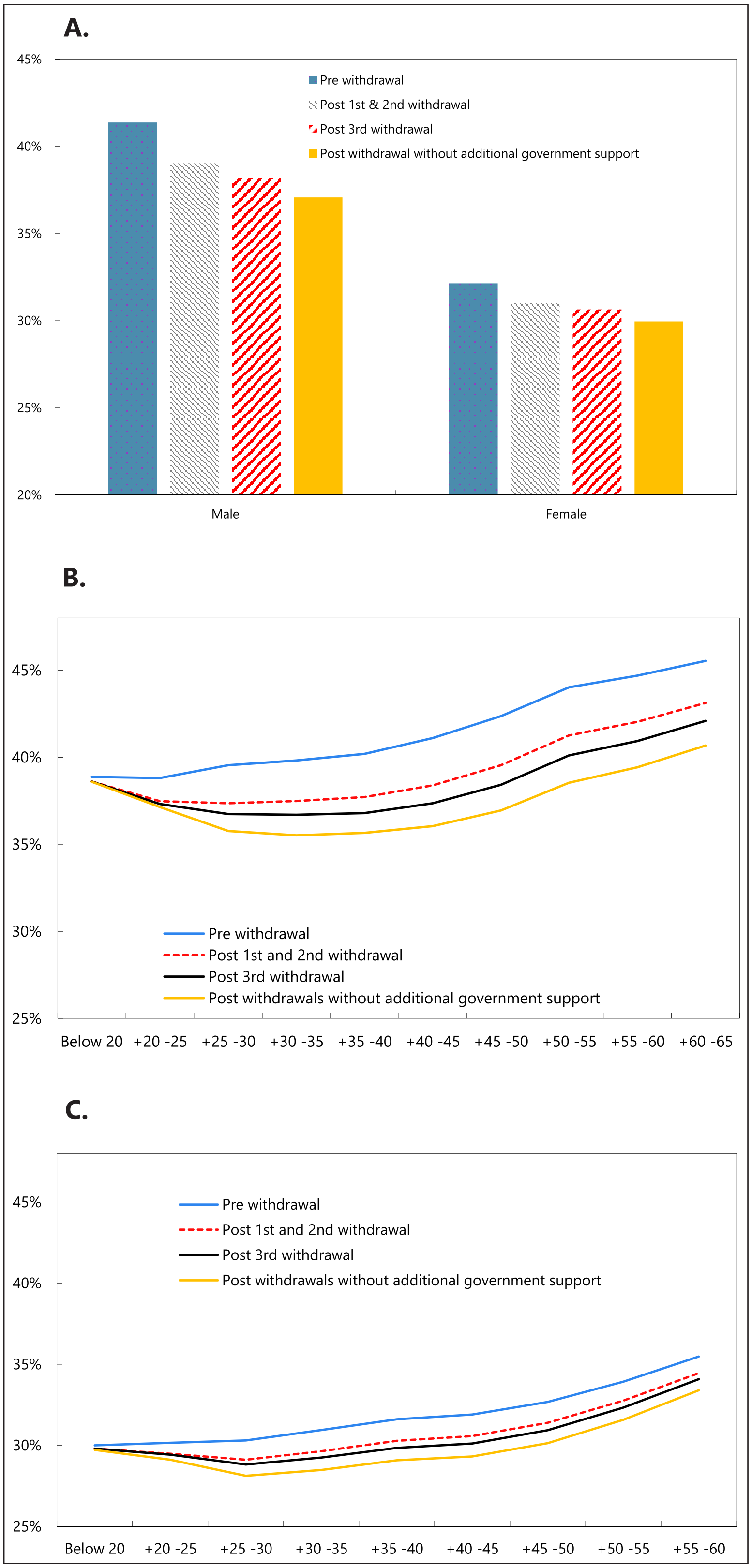

Figure 8 Change in Expected Replacement Rates due to Withdrawals. **Panel A.** Expected Replacement Rates in total Population, by Gender. **Panel B.** Expected Replacement Rates, Pre and Post Withdrawals, Men. **Panel C.** Expected Replacement Rates, Pre and Post Withdrawals, Women.

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: See Section 2 for details on the assumptions and the methodology used to project replacement rates.

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The increase in the number of people receiving government supplements (PBS and APS) and in the average amount received are expected to increase fiscal costs over time. Under the baseline scenario, which keeps APS and PBS as currently set, close to 270,000 additional people are projected to receive self-funded pensions below PMAS at retirement (Figure 9, Panel A), making them eligible to APS after the withdrawals if they fall into the lower 60 percent of the income distribution (240,000 under the alternative scenario described in Section 2, Figure 9, Panel B).[23] In addition, current recipients are expected to see an increase in APS due to the adverse effect of withdrawals on the self-funded portion of pensions. This leads to an expected increase of 13 percent in the average supplement received by males and a 7 percent increase for females (10 and 5 percent, respectively, in the alternative scenario).

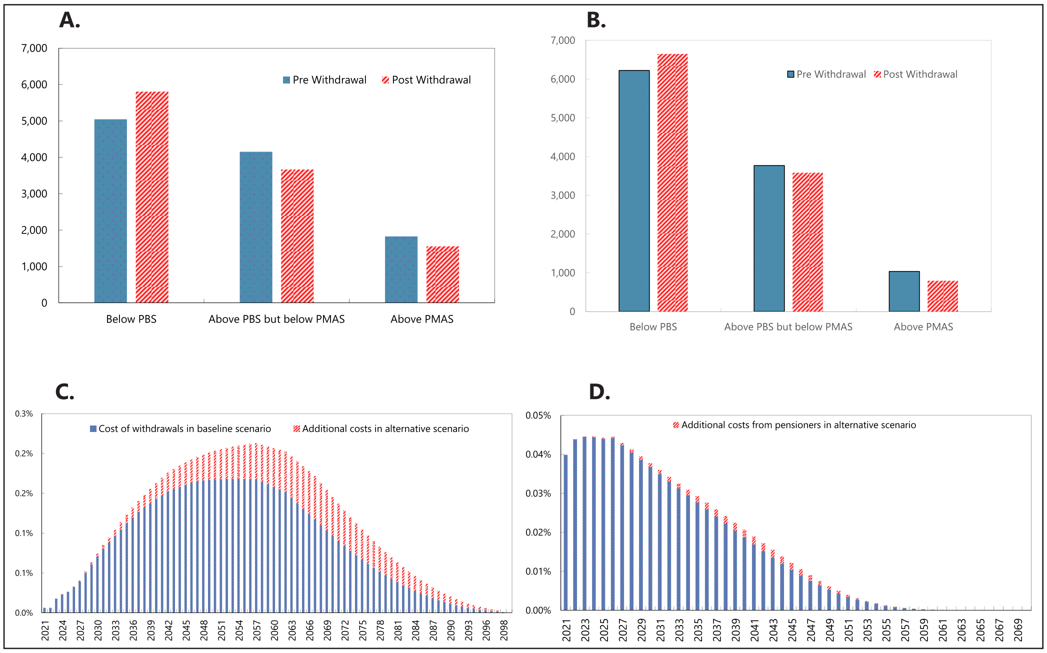

Figure 9 Fiscal Impact of Withdrawals. **Panel A.** People with Self-Funded Pensions Between and Above PBS and PMAS (*Baseline*, in Thousands). **Panel B.** People with Self-Funded Pensions Between and Above PBS and PMAS (*Alternative*, in Thousands). **Panel C.** Additional APS Costs from Withdrawals from current affiliates, *Baseline and Alternative (% of GDP)*. **Panel D.** Additional APS Costs from Withdrawals by Pensioners, *Baseline and Alternative (% of GDP)*.

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: Panel A and B are calculated using the methodology in Section 2 to estimate the number of people currently contributing to the pension system whose self-funded pension will be below PBS, between PBS and PMAS or above PMAS at retirement. Fiscal costs in panel C and D are calculated using the methodology and assumptions described in Section 2.

The sum of these effects leads to a gradual increase in the fiscal costs, as new cohorts with lower pension account balances retire and get access to additional APS payments. Additional fiscal costs stemming from the solidarity pillar peak around 2060 (Figure 9, Panel C), with additional payments of close to 0.17 percent of GDP (0.21 percent in the alternative scenario). The net present value of the additional fiscal costs stands at about 6 percent of 2020 GDP. Notice that these fiscal costs represent an upper bound on the actual costs of withdrawals as some of the individuals that fall below the PMAS line will not fall into the lower 60 percent of the income distribution, and thus will not be eligible to receive benefits stemming from the solidarity pillar. For example, if we assume that withdrawals do not affect the income distribution, such that beneficiaries of the solidarity pillar remain unchanged after withdrawals, fiscal cost would peak at about 0.09 percent of GDP under the baseline and would amount to a net present value of 3 percent of GDP in 2020. The fiscal cost derived from withdrawals by current pensioners is expected to peak at 0.045 percent of 2020 GDP in the next few years (Figure 9, Panel D), or if we assume that government support is only provided to pensioners in the lower 60 percent of the income distribution this cost would be 0.025 percent of 2020 GDP.[24]

23 In the alternative scenario the number of additional people is lower than in the baseline scenario because in the former the higher PMAS results in a larger number of people receiving a government supplement pre-withdrawal, making the change post-withdrawal smaller. A higher PBS, however, implies that the post-withdrawal amount received by beneficiaries (people who cross the PMAS threshold post-withdrawal as well those who received a supplement pre-withdrawal) is larger. The overall effect is a slight increase in fiscal cost relative to the baseline scenario, as visible in Figure 9 Panel C and Panel D.

24 Pensioners with life annuities were excluded from the first and second pension withdrawals while pensioners with programmed withdrawals were allowed to access all three withdrawals.

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The three rounds of withdrawals may also impact fiscal accounts by lowering tax revenue. Self-funded pensions in Chile are taxable. Thus, the reduction in self-funded pensions is expected to affect tax collection in the future. To quantify foregone revenue, we match current tax brackets to the self-funded pensions pre- and post-withdrawals. The implicit assumption is that the structure of income tax in Chile will remain constant over the next 40 years. Under this assumption, the government would lose over USD 1.6 billion over 40 years, expressed in net present value 2020 terms. Foregone revenue would peak around 2060, at approximately 0.008 percent of GDP. An alternative way to quantify loss revenue due to withdrawals is to compute tax losses resulting from the tax exemptions included in the law and gives similar results. If the three withdrawals would have been fully taxable, the tax collection would have increased by over USD 1.8 billion, or 0.7 percent of GDP.

4. POTENTIAL IMPACT OF DIFFERENT REFORM OPTIONS

The forces dampening pensions for many Chileans, including the recent withdrawals, put a premium on policies to strengthen the system. Several actions have been taken over the years, but they may not be sufficient to address the weak pensions, especially going forward.

We explore the potential impact of different reform scenarios, related to key parameters, on the adequacy of pensions and the reduction of fiscal cost which would arise from a decline in necessary government support. It begins by showing how different combination of parameters can achieve similar outcomes and how other policies affecting participation in the system (and as a result contribution densities) could decrease/increase the size of changes in pension parameters. Finally, it quantifies the impact of an increase in the contribution rate (with benefits accruing to the private component of pensions) and of a simultaneous increase of the contribution rate, the retirement age, and the contribution density.

Importantly, the exercise takes as starting point the state of Chile's pension system as of June 2020, which means it considers a hybrid system with a private pillar and universal pension, and takes into account the estimated impact of the three rounds of pension withdrawals. Further, this exercise uses parametric assumptions of the pension system to create a theoretical counterfactual, which is detailed in Section 2, for comparison. Note that the exercise presented below is an ex-ante evaluation using simulated scenarios and does not establish a causal link between parameter changes and outcomes. In addition, it makes two important assumptions. The first is that our projection exercise does not take into behavioral responses as a response of parameter changes nor general equilibrium effects on wages and interest rates. The second assumption is that the exercises presented in this section assume immediate implementation of reforms. In practice, reforms may need to be phased in to address political economic considerations and to account for differences in the political and legislative process of each country. For example, increases in retirement age have been recently attempted in some PAYG systems (e.g., France), and have been met with resistance. Thus, our results should be taken as upper bounds of the potential benefits of reforms.[25]

Note that pension reform has been at the center of Chile's political debate for many years, and many options have been under consideration. For example, in 2021, the government of president Piñera proposed increasing the contribution rate to 16 percent, with the additional 6 percent contribution being paid by the employer and managed by a public autonomous body.[26] The reform also proposed increasing coverage from 60 percent to 80 percent of the population. Alternative pension reforms are currently being discussed and new changes have been recently introduced.

25 For further analysis on how different components determine the pension level see Granados et al. (2018a).

26 Half of this increase was proposed to go to employees' individual pension savings and the other half to a collective saving fund aimed at incentivizing contributions by increasing payments as a function of years of contributions.

Given the fact that this remains a live debate, this paper does not study the impact of specific reforms. Rather, it assesses the potential impact on pension outcomes of different parameter configurations which are chosen in line with recent proposals.

4.1 INCREASING EXPECTED REPLACEMENT RATES THROUGH PARAMETRIC CHANGES

An increase in expected replacement rates can be achieved by increasing contribution rates, the retirement age,[27,28] or the contribution density.[29] The interaction of these three components on replacement rates is highlighted below in the isoquant exercise of Figure 10. Panel A outlines the possible combinations of contribution rate and retirement age for both male and female workers that allow to obtain a given population average expected replacement rate—that is, the expected replacement rate of all cohorts that are currently contributing to the system. For example, the isoquants show that a population average 40 percent expected replacement rate can be achieved by either increasing the female retirement age to 65 and increasing the contribution rate to 14.5 percent, or by keeping the current contribution rate but increasing the retirement age to 69.5 for all. In addition, Figure 10 shows that an increase in the expected replacement rate can be achieved by either larger changes in one parameter and keeping the other constant, or by changing both parameters incrementally.

The relationship between parameters is, however, affected by the contribution density. Indeed, an increase in the contribution density can help ease the necessary increase in contribution rates and retirement age to reach a 40 percent population average expected replacement rate. For example, if contribution density increases to 70 percent (from 60 for males and 50 for females) then a population average 40 percent expected replacement rate can be reached with an increase in the retirement age to 67. For the younger cohorts, those aged 20–25 shown in Panel B, who benefit most from an increase in the contribution rate and contribution density it is possible to reach an expected replacement rate of 70 percent, through an increase in the contribution rate to 18.5 percent and retirement to 70. If contribution density increases to 70 percent, then the same expected replacement rate (70 percent) can be reached assuming an 18.5 percent contribution rate and a retirement age of 66.5, three and half years earlier than if contribution density did not increase.

4.2 POTENTIAL CONSEQUENCES OF INCREASING THE CONTRIBUTION RATE

Increasing the mandatory contribution from 10 percent to 13 percent will increase the average expected replacement rate from 35 to 37 percent and lower the fiscal cost of the system. The average expected replacement rate for young affiliates, those aged between 20 and 25, increases from 37 to 45 percent for males and 29 to 33 percent for females after a 3 percentage point increase in the contribution rate (Figure 11). This increase benefits the younger cohorts more as they have more working years ahead of them to contribute at a higher rate and they can benefit from the interest earned on a larger pension balance. This rise in the mandatory contribution rate lowers the support needed by the government (through the PGU) and therefore reduces the

27 The baseline assumption is that females retire at 60 and males at 65, which is close to the effective retirement age for females (61.2) and males (65.3) for those that retired in January 2021.

28 As shown in Figure 3 Panel B, remaining life expectancy at 65 has increased for males and females, whilst the retirement age has remained constant. For example, in 1990–1995 males at age 65 were expected to live 14.5 more years on average after retirement, which increased to 18.2 more years in 2015–2020. If retirement age increased proportionally to life expectancy from 1990–1995 to 2015–2020, we would expect to see an increase in the retirement age of 3.3 years for women and 3.7 years for men.

29 The policy analysis abstracts from potential unintended consequences of a change in the system's parameters and, therefore, interpretation of the results should be mindful of these limitations. For example, informality, which can create low contribution densities, could be exacerbated if workers are required to contribute a larger share of their wage to the pension system or contribute to a system with retirement income transfers, weakening the direct link between contributions and final benefits (Piggot et al. 2009). Using data on Chilean households linked with administrative pension system data in a life-cycle model Joubert (2015) finds that raising contribution rates by 5 percentage points increases the size of the informal sector by 12.5 percent for men and 9.3 percent for women. This evidence suggests that when interpreting our results, the reader must be aware of the uncertainty surrounding the exercise.

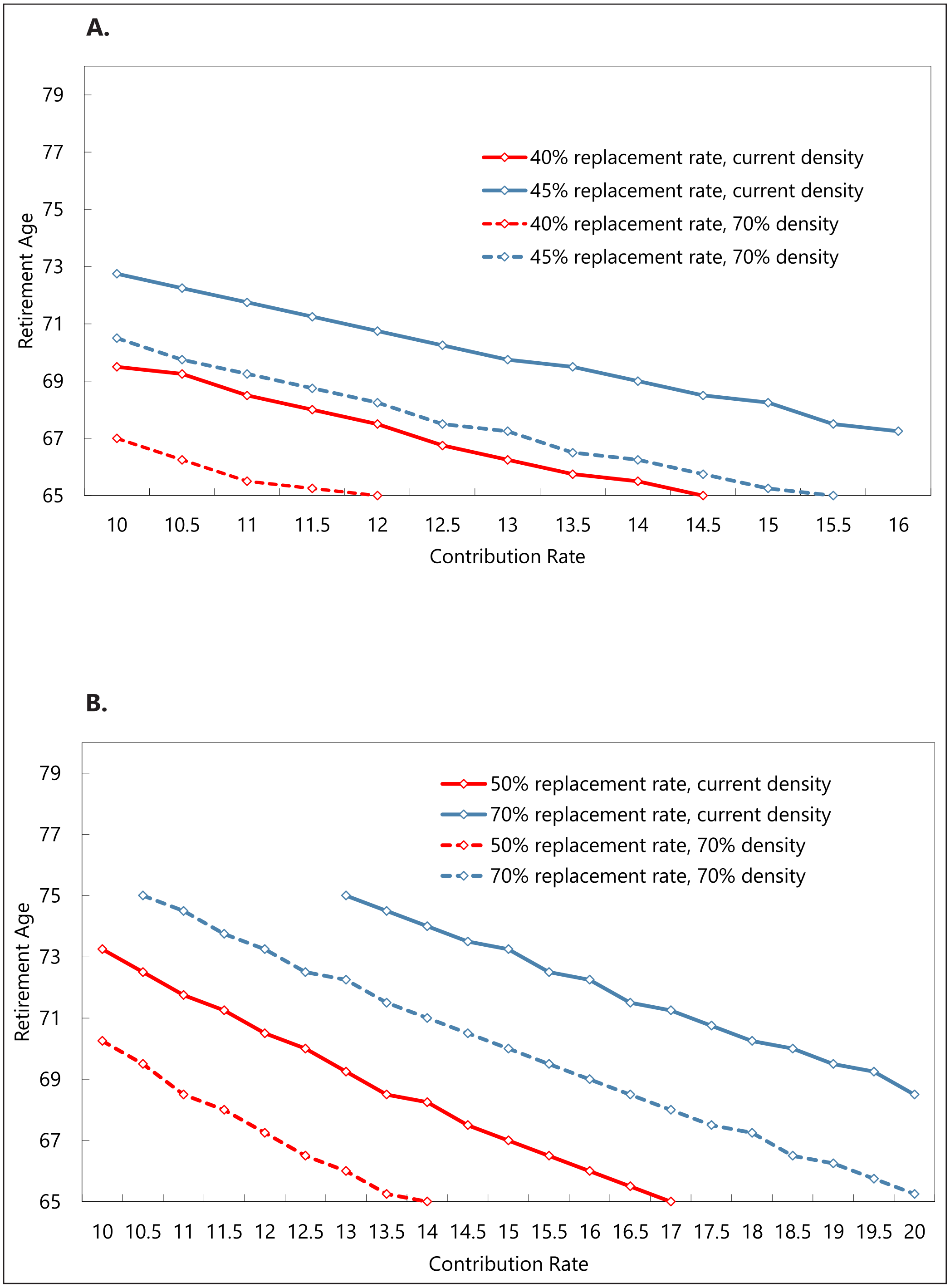

Figure 10 Isoquant of Expected Replacement Rate by Age of Retirement, Contribution Rate and Contribution Density. **Panel A.** Contribution rate and retirement age targeting 40% and 45% replacement rate, average for the current population. **Panel B.** Contribution rate and retirement age targeting 50% and 70% replacement rate at retirement for the 20–25 year old cohort.

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: See Section 2 for details on the assumptions and the methodology used to project replacement rates.

fiscal cost of the system (note that due to data constraints the analysis does not account for the additional fiscal costs for the government as an employer associated with its higher contribution to public pensions). However, even for the youngest cohorts an increase in the contribution rate to 13 percent will not bring expected replacement rates above 50 percent, which is the OECD average.

4.3 POTENTIAL CONSEQUENCES OF INCREASING THE CONTRIBUTION RATE, RETIREMENT AGE AND CONTRIBUTION DENSITY

To bring Chile's replacement rates closer to the OECD average, a bigger change in parameters is needed. As an example of possible combinations of parameters and reforms, increasing the contribution rate from 10 percent to 16 percent, the retirement age to 67 (from 65 for men and 60 for women), and reaching a contribution density of 70 percent (from 60 percent for men and 50 percent for female) would bring the expected replacement rate above 60 percent for the young cohorts (59 for women and 66 for men, Figure 12, panel A), while the expected replacement rate

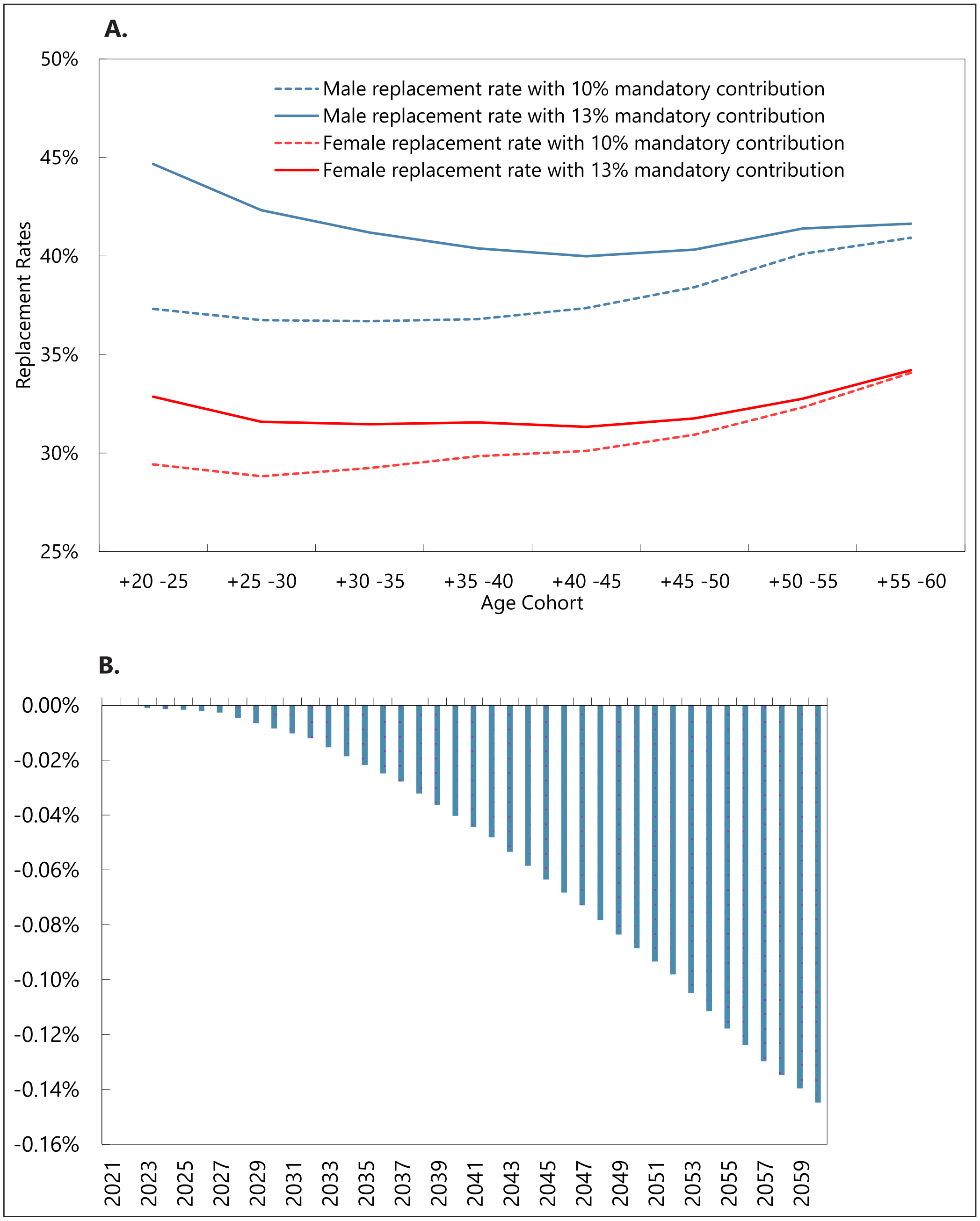

Figure 11 Potential Impact of Increase in Contribution Rate to 13% on the Pension System. **Panel A.** Replacement rate at retirement by current age, increasing contribution rate from 10% to 13%. **Panel B.** Fiscal cost in % of GDP of increasing contribution rate from 10% to 13% (smoothed).

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: See Section 2 for details on the assumptions and the methodology used to project replacement rates.

for the average person currently contributing would reach about 50 percent. The combination of measures reduces support needed through the solidarity pillar, lowering the fiscal cost of the pension system, which is expected to be 0.8 percent of GDP lower in 2060 (Figure 12, Panel B). Such fiscal space could be used to strengthen the solidarity component of pension in a targeted way. Even after equalizing retirement age and contribution density, inequality in expected replacement rates between genders still exists due to differences in life expectancy, which is the principal driver of the difference between young men and women, and current accumulated assets, which causes a larger difference for the older generations.

Notice that the three policies implemented in isolation would have a significantly lower impact on expected replacement rates. Out of the three independent exercises the largest increase in the expected replacement rate at retirement for current affiliates, and particularly the younger cohorts, is due to an increase in the contribution rate from 10 to 16 percent (Figure 12, Panel C). This change causes the expected replacement rate to increase from 34 percent to 45 percent for those aged between 20 and 25, and the population average increases from 35 percent to 40 percent. Increasing the contribution density to 70 percent raises the expected replacement rate

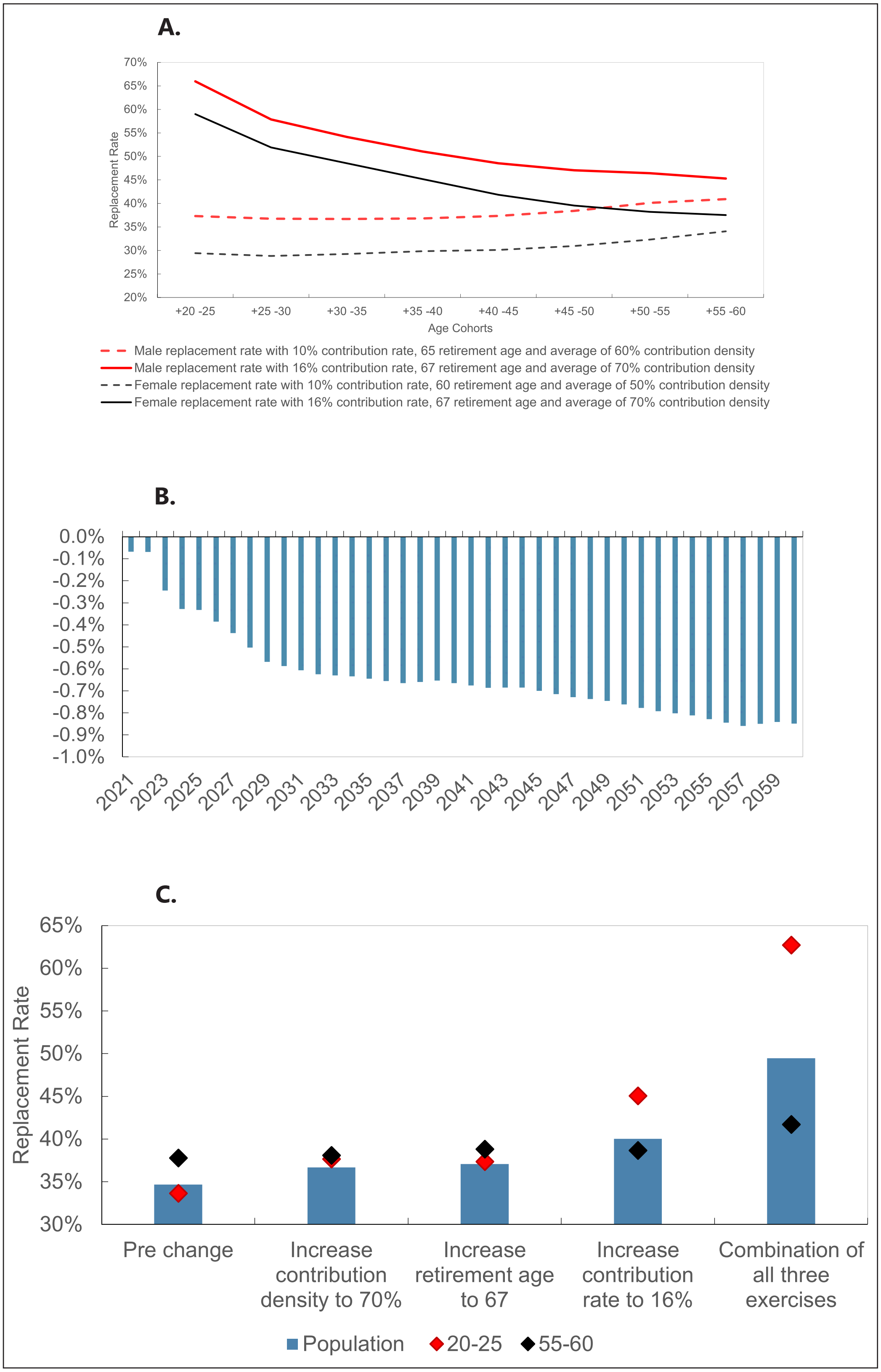

Figure 12 Potential Impact of Increasing Contribution Rate, Retirement Age and Contribution Density. **Panel A.** Replacement rate at retirement by current age, increasing contribution rate, retirement age and contribution density. **Panel B.** Fiscal cost in % of GDP of 16% contribution rate, 67 retirement age and contribution density to 70% *(smoothed)*. **Panel C.** Impact of changing parameters of pension system on replacement rates.

Source: Authors' calculations based on data from *Superintendencia de Pensiones*.

Note: See Section 2 for details on the assumptions and the methodology used to project replacement rates and fiscal costs.

for the current pension affiliates from 35 percent to 37 percent, with a larger increase (from 34 percent to 38 percent) for those between the age of 20 and 25. Changing the retirement age to 67 would increase pensions in three ways: allowing contributors to build more assets and accumulate additional returns on past assets, while reducing the number of years the pension is expected to cover. This boosts the expected self-financed portion of the pension at retirement; however, this does not fully pass through into an equivalent increase in expected replacement rates. In our exercise the increase in real wage, assumed at 1.25 percent, dampens the response in the expected replacement rate, since their pension (self-financed plus additional government support) increases but so does their final wage. The increase in retirement age to 67 increases the expected average replacement rate by 2 percentage points (from 35 percent to 37 percent).

In sum, our analysis highlights how individual changes in key parameters of Chile's pension system can increase replacement rates. In particular, for a given target replacement rate, there is a specific change in each parameter that can meet the target. Moreover, our analysis stresses the complementarity between different parameters—a simultaneous change in parameters can have a larger impact on replacement rates compared to individual changes. The appropriate reform package will ultimately depend on political economy and implementability considerations.

5. CONCLUSIONS

Chile's pension system served as a blueprint for reform because of its virtues but needs to adapt to changing circumstances. The pension system would have delivered outcomes in line with other OECD countries, if demographics and global returns had not changed since its inception and participation in the system would be higher. The pension system has also contributed to macroeconomic stability more broadly, by channeling savings into domestic investment and growth, and to developing domestic financial markets. However, the challenges posed by demographic changes—common to many countries—highlight the need for reforms. The system's initial focus on efficiency has been gradually broadened to bring equity into the mix, addressing challenges for poorer people or those that have not been able to contribute regularly. Our analysis shows that, in addition, changes to its parameters should be updated regularly over time to adapt them to changing demographics and global returns.

Replacement rates are low by international standards and are expected to fall further, especially after the three rounds of withdrawals in response to the pandemic. Using internationally comparable data, the paper shows that expected replacement rates in Chile compare poorly to other countries, which is mostly explained by low contribution rates. Moreover, demographic trends, global international conditions, and a system that has not adapted its parameters to keep up with these changes, are expected to contribute to a further decline in the projected replacement rates of future retirees. These problems will likely be compounded by the recent pension withdrawals which exhausted the pension accounts of a large share of participants in the system.

The paper shows that a reform agenda that increases contribution rates and the retirement age and that improves the contribution density would strengthen the system by improving the adequacy of pensions. Considering the potential impact of the three rounds of withdrawals and assumed pension system parameterization, we show that an increase in the contribution rate of 6 percentage points devoted to the self-funded pension would increase the expected replacement rate for the average of all current affiliates to 40 percent from 35 percent, and it would increase it to 45 from 34 percent for the 20–25 years old group. However, reforms that tackle multiple parameters could achieve similar results with more gradual changes, could have a broader impact across cohorts compared to reforms that focus on a single parameter of the system, and could ease the political economy of reform. For instance, an increase in contribution rates to 16 percent, the retirement age increased to 67 and contribution density to 70 percent will cause expected replacement rates for young people to increase to 59 percent for females and 66 percent for males. It is worth pointing that the contribution density is not a policy parameter per se—increasing it will require implementing policies (labor market, structural and fiscal) that encourage labor market participation and boost job creation in the formal sector. The analysis does not discuss the role of future returns of pension fund investments, which can be influenced not only by global developments, but also by policies affecting competition and portfolio allocations, or imposing performance-related penalties.

Strengthening the self-funded portion of the pension would also open fiscal space to enhance the solidarity component. Indeed, our simulation shows that increasing expected replacement rates implies less people in need of the public solidarity pillar at current parameters. For example, the combination of measures highlighted in the previous paragraph will entail a reduction in the fiscal cost of the system by 0.8 percent of GDP in 2060. Such fiscal space could be used to strengthen the solidarity component of pension in a targeted way.

More broadly, our analysis and Chile's experience yield lessons that apply to other countries. It highlights the importance of establishing a periodic review process whereby the parameters of systems are adapted to changes in life expectancy, global returns, and the labor market, preferably though an automated, technical, process that is not subject to political influence.

ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Annex A.** The Structure of the Chilean Pension System. DOI: https://doi.org/10.31389/eco.420.s1

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COMPETING INTERESTS

The authors have no competing interests to declare.

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