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The effect of Covid pension withdrawals and the Universal Guaranteed Pension on the income of future retirees in Chile

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Abstract

Chile implemented large pension withdrawals during the Covid pandemic. Afterwards, Chile increased non-contributory benefits in a quasi-universal scheme. Simulating future pensions, I show that the average loss in contributory pension income is 27.9%, with losses of 23.9% and 31.4% for men and women, respectively. After accounting for public transfers, the average loss in total pension income is just 6.2%, with losses of 7.5% and 5.2% for men and women, respectively. Current retirees lost just 1.1% of their pension income after accounting for the government transfers. The state may end up covering 92% of the total value of the pension withdrawals through increased transfers.

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Keywords: Pension wealth; Covid pandemic; Fiscal costs.

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1 Introduction

During the Covid pandemic, at least 31 countries allowed some pension withdrawals as a measure to support distressed households (OECD 2021, Madeira 2022a, Cespedes et al 2023). Chile was among the few countries for which the pension withdrawals during the pandemic could be made without any conditions or urgency requirements. However, despite other government transfers to poor households and job retention programs (Madeira 2022b), the Chilean pension withdrawals in terms of the pre-pandemic GDP were twice as large as those of any other country (OECD 2021). The Chilean withdrawals represented a total rundown in pension assets of around 20% of GDP and reduced the contributory pensions of almost 11 million workers (Evans and Pienknagura 2021, Fuentes et al. 2021, Fuentes et al. 2023). Therefore, the economic implications of the Chilean withdrawals are significant for future retirees. The current low level of contributory pension savings may increase the demands for pension reform (Evans and Pienknagura 2021, Parada-Contzen 2022, Madeira 2022a), while reducing domestic savings and investment (Cerda et al. 2020, Parada-Contzen 2020, Madeira 2022a).

Using the most recent Chilean Household Expenditure Survey (*Encuesta de Presupuestos Familiares*, EPF) of 2017 with a sample of 15,239 households, I estimate the impact of the pension withdrawals in Chile on the future pension income of retirees and the effects of the new pension reform legislated in 2022. Projection of workers' labor path until retirement age with accumulated pension contributions, for the two counterfactuals with the pension withdrawals and without these, allow me to compare the loss in future pension income relative to the forecasted no-withdrawals pension. I show that the effect of the withdrawals on the contributory component of the pension income is large and will persist over several years. However, there was a large expansion of the public non-contributory pensions in Chile with new legislation in 2022, entitled the "Universal Guaranteed Pension" law (law 21419 of the Chilean Congress). After this 2022 law, the effect of the withdrawals is substantially reduced once the total pension income (that is, contributory and non-contributory pensions) is accounted for. Finally, I analyze the fiscal costs of higher government transfers to both the current and future retirees (i.e., those currently in the labor force population) as a result of the pension withdrawals.

This study is the first to show the implications for the pension income of the current and future cohorts of retirees in Chile of the pension policy choices taken over the last 3 years. Note that these were policy decisions with a truly large size at the international level. During 2020 and 2021, Chile allowed the social security affiliates to withdraw almost 20% of GDP from their private pension accounts as one of the pandemic support measures (besides other fiscal measures, see Madeira 2022b, 2023). Then, in 2022, the Chilean government announced a new set of publicly provided pension benefits that also had large fiscal implications for its future. The analysis in this article shows that the 2022 pension policy reform almost entirely corrected the negative consequences of the pandemic measures for the future retirement income, but at the cost of adding a future fiscal burden equivalent to 92% of the withdrawals. This set of policy decisions is therefore very significant and provides a policy experience that is rarely undertaken with such a size.

Previous research on the Chilean pension withdrawals has summarized the political attitudes and demographic characteristics of the persons preferring early retirements (Lopez and Rosas 2022, Fuentes et al. 2023). There is similar research on the demographics of the workers using the pandemic withdrawals in Australia (Bateman et al 2023, Wang-Ly and Newell 2022). Some studies characterize the likely effect of the Chilean pension withdrawals on the average pension of male and female workers (Lorca 2021, Evans and Pienknagura 2021). In the case of Fuentes et al. (2023), there is an analysis of the effect of the Chilean pension withdrawals on the future average pension income of a few selected worker profiles (such as a worker with the average wage and with a specific number of working years before retirement). However, this study goes beyond the analysis of the previous studies in three important aspects: i) it includes the important effect of the large increase in the public pensions implemented in 2022 and it shows this policy[1] significantly reduces the final impact on the future pension income of most workers; ii) it analyzes the evolution of the fiscal costs related to the withdrawals and the associated increase in public transfers until 2088; iii) it analyzes the heterogeneous effect of the pension withdrawals across a representative sample of the Chilean population (while previous studies were limited to showing the average effect on men, women or on a few example workers).

This work is also the first to analyze the effects on the long term retirement income from the Covid pension withdrawals in a country that both allowed for a large pension withdrawal of around

[1] Note that this policy was not yet implemented at the time the previous studies were published. Therefore it is a significant policy that merits new analysis.

20% of GDP[2] and implemented a large increase of its non-contributory pensions after the pandemic. It is worth noting that in relation to past studies, such as Lorca (2021), this work includes all three pension withdrawals implemented in Chile until 2021.[3] Furthermore, Lorca (2021) analyzes the fiscal costs of the Chilean pension withdrawals without accounting for the new pension legislated in 2022, which provides much more generous non-contributory pension benefits than the 2019 pension law (Madeira 2022a). Finally, this work contributes to the analysis of fiscal challenges in Chile, since the non-contributory pensions will be a heavy burden for the government in the future (OECD 2023a). The current analysis of the fiscal costs of the 2022 pension solidarity law were only made for an horizon that ends in 2030. Therefore this article shows the joint implications of the pension withdrawals and the solidarity law of 2022 until 2088, including the cohorts of new retirees.[4]

This article is organized as follows. Section 2 describes the EPF survey dataset and the income distribution of workers and retirees in Chile. Section 3 exposes the methodology for calibrating the future pension wealth accumulation of each worker, how the withdrawals reduced the pension wealth, and the effect of the increase in non-contributory benefits legislated in 2022. It also details how the withdrawals and the solidarity law of 2022 affect the current retirees. Finally, the section ends by explaining how the fiscal costs are computed as a sum of the transfers for current workers and retirees.[5] Section 4 shows the simulated estimates of the effect of the withdrawals and the 2022 solidarity law on the pension income of both current workers (and their households) and current retirees. The results show the sharp difference between considering contributory pension income only versus the total pension income after government transfers. Section 5 summarizes the fiscal costs[6] (corresponding to the current adult generation) of the pension withdrawals and solidarity

[2] Next to Chile, Peru allowed for the second largest scheme of pension withdrawals, which amounted to roughly 10% of the GDP (Olivera and Valderrama 2022, Olivera 2023). All the other countries only allowed for much more restricted pension withdrawals, which were less than 3% of the assets under management (OECD 2021).

[3] Until the end of 2021, the first, second and third pension withdrawals implied, respectively, a total amount corresponding roughly to 7.3%, 6.9% and 5.8% of the pre-pandemic GDP (Fuentes et al. 2021). Lorca 2021 only analyzes the first pension withdrawal, which is just 36.4% of the size of the pension withdrawals in this article.

[4] Note that the article's analysis is limited to the current adult generation, that is, people currently of age 25 or above. The last cohort of retirees will enter retirement around the year 2065. However, the household heads that retire after 2055 only experience a small impact of the pension withdrawals; therefore the graphical analysis ends at this point.

[5] Note that the paper does not analyze the fiscal costs of the transfers on the future generations of adults (which are still below age 25 in 2022 or yet to be born).

[6] Note that the fiscal costs measured in this article do not consider the non-contributory transfers that were already included in the pension system legislation prior to 2022. Therefore, the costs with the previous non-contributory benefits are considered as sunk costs and will be outside of the computation.

benefits' increase.[7] The results are summarized in terms of total amount (in real terms), value relative to current GDP and as a fraction of withdrawals taken. The analysis confirms that a significant share of the withdrawal costs may end up being financed by the government. Finally, section 6 concludes with a summary of the results, policy implications and suggestions for future research.

2 Data description

To analyze the implications of the Chilean pandemic pension withdrawals and the increase in public pensions of 2022, I use a representative sample of 15,239 households in the Family Expenditure Survey (EPF), which is an official Chilean survey conducted by the Office of National Statistics (*Instituto Nacional de Estadísticas* in Spanish, hence, INE). The EPF is a detailed survey of expenditures, collecting information from both memory and receipts over several visits (Madeira 2023). The major goal of the EPF is to allow for the calculation of the representative baskets of goods across the population, so that the baskets can be used to calibrate the consumer price index (CPI) that is published monthly by the INE. Surveys of expenditures are considered to be the best standard for policy simulation of savings and wealth, such as the study of retirement programs (Attanasio and Weber 2010). The EPF covers an exhaustive list of expenditures on over 1,668 types of goods from both receipts and memory reports elicited over several interviews.

The EPF collects a lot of information on income, including labor income (from dependent or independent work), taxes paid, transfers made or received, inheritance, property income, income from businesses, financial assets income, pension income, the pension fund manager with which the worker or retiree is affiliated and the type of health insurance in which the individual is registered. This article will report all monetary values (whether labor income, pension income, government transfers or pension wealth) in real terms. Chile has an official real monetary unit, denominated *Unidad de Fomento* (UF) in Spanish. The UF is a real monetary unit applied in Chile, which is updated at a daily frequency according to the official CPI index. The UF value applied to the EPF

[7] Note that the methodology assumes that no further pension reform is made after 2022. This is a relevant assumption. For instance, if the government decides to postpone the retirement age, then the future retirees will get a lower amount of government transfer in present value.

survey reports is 26,798 Chilean pesos (equivalent to 40 USD), which was the average UF during December of 2017. During the period 2013 to 2019, the UF floated around an average value of 40 USD (Fuentes et al. 2023), while in the first year of the pandemic it was roughly 35 USD.

Participation in the EPF is compulsory by law and therefore non-response rates are low. The EPF survey waves are designed with population weights (expansion factors), due to a higher probability of selecting poorer urban areas. Therefore, all the population statistics in this paper are estimated with population weights. Due to the high cost of implementing this survey, the EPF is implemented in Chile once every 5 years (Madeira 2023). It is worth noting that due to the detail and high cost of these surveys, many lower income countries only implemen such a survey once every 10 years (Deaton 2018). Due to the high operational costs of this survey, Chile only increased the EPF frequency from 10 years to 5 years after 2007 (Madeira 2023).

The EPF is highly detailed in many aspects such as expenditures, but it lacks a large enough sample to estimate the labor parameters necessary to make projections of the pension savings of each worker until he or she retires. For this reason, I use the Chilean Employment Survey (ENE) of 2017 to estimate labor force participation, formal work, income growth and unemployment rates $(lfp_{k,t}(x_k), fw_{k,t}(x_k), G_{k,t}(x_k), u_{k,t}(x_k), RR_k(x_k))$. I use the methodology in Madeira (2015), with around 538 mutually exclusive worker types given by the characteristics $x_k \in$ {Santiago Metropolitan area or not, Industry (primary, secondary, tertiary sectors), Formal sector, Gender, Age (3 brackets, ≤ 35, $35-54$, ≥ 55), Education (secondary school or less, technical degree, college), and Household Income quintile}. These parameters are then matched to workers of similar characteristics in the used to calibrate the future pension wealth, which consists of contributory pension wealth $(PW_{k,t})$ and solidarity pension wealth $(SPW_{k,t})$. The permanent income of each worker k is expressed as $P_{k,t} = G_{k,t}W_{k,t}(1 - u_{k,t} + u_{k,t}RR_k)$, with the total household income summing the household's non-labor income and the permanent labor income of its members: $P_{i,t} = a_i + \sum_{k \in i} lfp_{k,t}P_{k,t}$.

Each quarter of the ENE survey has 33,850 households, which gives a sample of around 135,400 households for the entire year of 2017. Each household has more than one worker and labor force member, therefore the ENE survey of 2017 has around 185,000 employed workers and 200,000 labor force members. Participation in the ENE survey is compulsory by law and therefore non-response rates are low. The ENE survey is representative of the Chilean population and is the official source

Table 1: Characteristics of the EPF 2017 families by age of its household head (all values in %, except for income which is in UF)

Variables (mean values)	25-64	25-29	30-39	40-49	50-59	60-64
Labor variables (household head):						
Female dummy	39.2	41.7	39.2	39.9	38.3	38.4
Labor income (if positive), in UF	37.4	30.1	41.2	39.7	35.9	31.5
Female spouse employed	49.1	49.9	56.8	50.0	45.3	40.4
Informal worker (head)	22.9	12.6	18.3	24.5	25.7	27.8
Unemployment rate	5.3	9.4	6.6	4.6	4.4	3.9
Contribution probability	62.3	70.6	71.0	65.3	57.2	45.5
Ratio of income during unemployment	28.7	27.9	28.7	29.8	28.6	26.8
Education level (household head):						
Elementary education	16.0	3.6	6.4	14.6	23.1	27.6
Secondary education	42.6	34.7	38.6	44.8	47.2	38.2
Technical or Some college	12.6	16.0	12.3	14.1	11.4	11.0
College education	22.3	39.1	33.3	19.1	14.1	19.3
Post-graduate education	6.4	6.6	9.4	7.4	4.3	3.8
Household structure:						
Home ownership	61.8	19.9	46.5	62.4	75.2	82.1
Dummy for couple	80.8	76.2	77.6	80.4	85.0	79.6
Dummy for children at home	61.3	49.7	74.4	79.2	50.3	29.1
Dummy for senior (>65)	7.6	2.4	2.9	8.0	9.1	15.8
Fraction of all households (aged 25-64)	100	7.2	23.6	26.6	31.8	10.9
Number of households in the sample	11,111	806	2,386	3,074	3,419	1,426

for labor market statistics such as labor force participation and unemployment by the INE.

Table 1 summarizes the main demographic characteristics of households with a head in working age.[8] Only 39% of the heads of households are female, although this rate is a bit higher for the younger generations. Households with heads of age 25-29 have the highest education levels, with a fraction of college or post-graduate education above 45%. For heads aged 60 to 64, the rate of college or post-graduate education is less than 25%.

Young household heads have the highest unemployment rate, which is sharply decreasing in age.[9] The ratio of income while workers are unemployed is around 29% and it does not change much with age, since Chile has a very basic unemployment insurance to avoid moral hazard (Cerda

[8] Working age is here defined as age 25 to 64, similar to other empirical works of social security systems as reviewed in Attanasio and Weber 2010. The reason is that before age 25 several people may still be studying in college and therefore may have a weaker labor force attachment. Note, however, that the sample still includes a few workers that are younger than age 25. This happens in the case of families that have a household head with age 25 or more, but their partner or spouse happens to be younger than age 25. In this case I preferred the option of keeping the working partners below age 25 to avoid dropping part of the family from the sample analysis.

[9] The unemployment rate of the household heads in our sample is around 5.8% (substantially lower than the official unemployment rate of 6.5% in 2017). This is due to household heads being of higher income and education than the other household members, therefore they present a lower unemployment rate than the general population.

and Vergara 2007, Madeira 2015). Labor income is the lowest for the young (age 25 to 29), but it reaches a peak at age 30 to 39 and then declines until households reach retirement. Only around 50% of female spouses/partners are employed, which matches aggregate statistics (Santoro 2017). Female spouses are more likely to be employed for household heads between age 30 to 39. Work informality is significant in Chile, with around 23% of the heads of household having an informal job. This rate is low for the youngest (only 13% for those aged 25 to 29), but it is quite significant for older generations. For this reason, the probability of contributions is also the highest for the youngest, being above 70% for those aged 25 to 39 and then declining significantly with age.

Households of all ages are likely to be married or living with a partner, with couples representing more than 75% of each age bracket. Around 62% of the households own their homes. Home ownership rates are low at young ages, starting at 20% for the heads aged 25-29, but then increase quickly with age and reach the 82% at the pre-retirement age (heads aged 60 to 64). The presence of children is more common among ages 30 to 49, while the presence of senior aged members (those above age 65) is below 10% for most age brackets, except for those aged 60-64 (which sometimes have older spouses, as well). In terms of demographic structure, Chile has been at the front of ageing societies in Latin America (Madeira 2021). Around 32% and 11% of the household heads are aged 50-59 and 60-64. These represent 32% and 11% of the working age adult heads, respectively. Younger heads of household, aged 25-29 and 30-39, represent just 7% and 24% of the population of working age adults (that is, those aged 25 to 64).

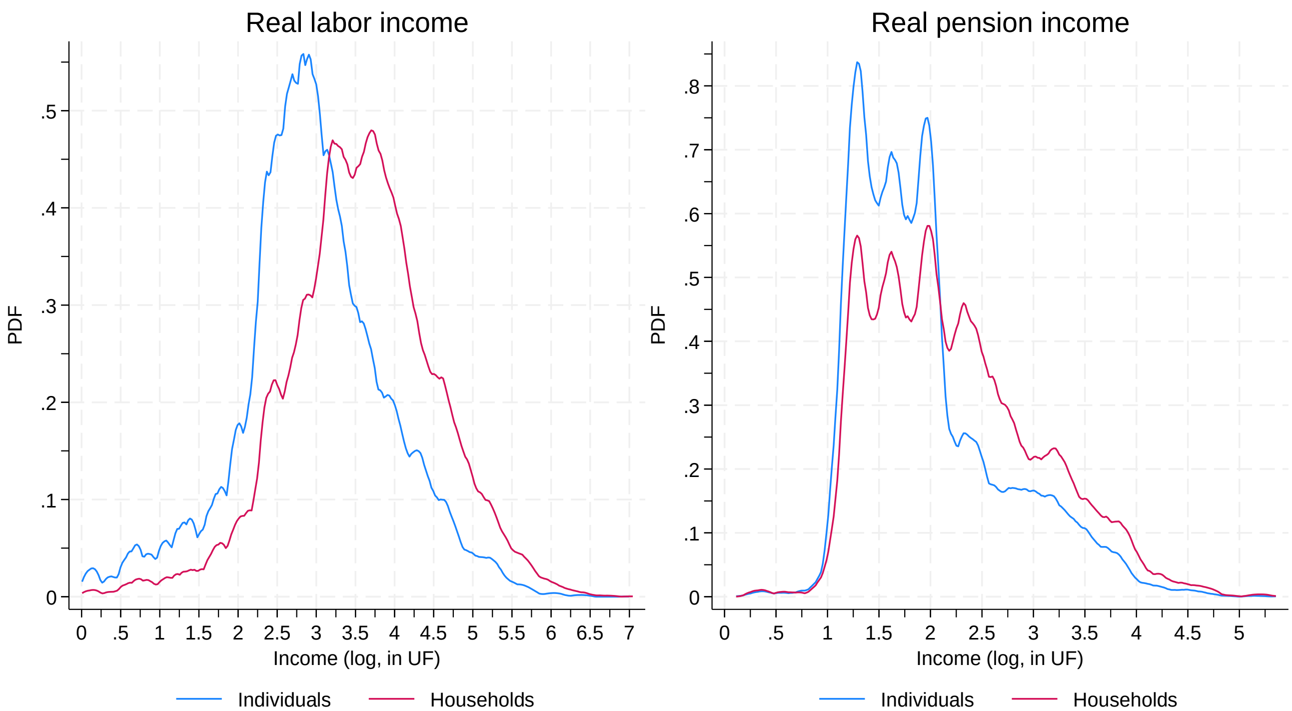

Figure 1: Real labor income and pension income distributions (heterogeneity shown by the probability density function (PDF))

Figure 1 summarizes probability density functions (pdf) of the labor and pension income distribution distributions of individuals and households in the EPF survey. It shows that the logarithm of labor income for the individuals has a mode around 3 UF (around 120 USD), but the highest income workers reach values of 6 UF (around 240 USD) and above (which is about 20 times the income of the mode worker, as given by $\frac{\exp(6)}{\exp(3)}$). The real labor income across households, however, shows much less inequality, as seen by a much denser probability at the center of the distribution and a much lower probability of very low income values. This makes sense, because the labor income of the household members is not perfectly correlated (for instance, a high income worker could have a non-working spouse or a spouse with less education and which works in lower paying jobs).

There is both substantial labor market and pension inequality in Chile. This result makes sense, because pension income in Chile is highly dependent on the worker's own contributions and therefore inequality throughout the labor life also translated into inequality in retirement (Berstein and Morales 2021, Lorca 2021). For instance, there are workers with pension incomes above 4 UF (around 160 USD) in logarithm, which is around 12 times the income of the mode retiree (as measured by the ratio of $\frac{\exp(4)}{\exp(1.5)}$). Again, there is much less inequality across households than individuals, since some households may combine members with high pensions after contributing over a long labor life with other members that either had sparse working lives of just a few years or low incomes.

3 Calibrating the Covid pension withdrawals and the "Universal Guaranteed Pension" law of 2022

3.1 Current workers

To calculate representative population statistics for future years, I adjust the population weights of each household i as follows: $w_{i,t} = w_i^{EPF} \dfrac{Pop_t(s_i, age_i)}{Pop_{2017}(s_i, age_i)}$, with w_i^{EPF} denoting the original EPF weights and $Pop_t(s_i, age_i)$ being the number of people in each sex-age bracket. Life expectancy $T_{k,t}$ for each worker k and population by sex-age $Pop_t(s_i, age_i)$ for each year t are obtained from United Nations projections (ECLAC 2020).

Contributory pension wealth for each worker k is obtained as the sum of the value of past pension contributions since joining the labor force at age 25 until his or her current age ($S(t,k)$) plus the present value of the future pension contributions until retirement age R_k (which is age 65 for men and 60 for women). The contributory rate from formal labor income[10] in each period

[10] The model in this article only describes the behavior of the compulsory contributors in Chile, that is those with a formal employment contract. Formal employment contracts can correspond to either dependent employees or independent workers (self-employed). However, in September of 2023 the dependent workers represented 98.8% of the total contributory workers.

Note also that in Chile it is possible to become a voluntary contributor to the pension system by making a voluntary contribution of 10% for an amount equal or higher than the minimum wage. However, the number of voluntary contributors in Chile is quite small. The Pension Authority (*Superintendencia de Pensiones*, in Spanish) has published the number of contributors by type (dependent worker, independent worker, voluntary contributor) since October of 2002. The fraction of voluntary workers (in some selected dates) in terms of the total contributors were 0% on October of 2002, 0.121% in January of 2010, 0.025% in January of 2012, 0.031% in January of 2015, 0.028% in January of 2019, and 0.014% in September of 2023 (the most recent date available). The modelling of this section, therefore, describes adequately the contribution process of between 99.88% to 99.99% of the pension is cr, with mc being the top value of income considered for social security contributions. The probability of the worker k making a pension discount at time t, $pc_{k,t}$, is equal to the probability of being in the labor force times the probability of doing formal work[11], $pc_{k,t} = lfp_{k,t} \times fw_{k,t}$, with $lfp_{k,t} = \Pr(LFP_{k,t} = 1 \mid x_{k,t})$ and $fw_{k,t} = \Pr(FW_{k,t} = 1 \mid x_{k,t})$. The individual k members' wealth $PWI_{k,t}$ is given by:

$$1)\ PWI_{k,t} = 12 \times cr\Big(\sum_{h=25}^{S(t,k)-1} \bar{r}_h pc_{k,t} \min(mc, P_{k,h}) + \sum_{h=0}^{R_k - S(t,k)} \beta^h pc_{k,t} \min(mc, P_{k,h})\Big).$$

Note that in expression 1) the contribution values are multiplied by 12 to take into account that the EPF survey reports a monthly income value.

This work does not consider inflation, therefore all the analysis is done in real terms. This article uses the following values to translate all income and pension benefits to real terms: i) the 2017 EPF survey values use an UF value of 26,798 pesos; ii) the solidarity pension law of 2019 values use an UF value of 28,309 pesos; iii) the values of the solidarity law of 2022 use an UF value of 31,212 pesos.[12] These values are obtained from the average values of the UF during December 2017, December 2019 and January 2022, which correspond to the last month of the EPF survey and the respective months of the 2019 and 2022 laws. Note that the 2019 and 2022 laws were written in Chilean nominal pesos, but adjustments to pension benefits are regularly made to account for inflation in a similar way as the UF. This article uses all values in UF for simplicity of exposition.

The calibration considers the current parameters of the pension system: $cr = 0.10$, mc=78.3 UF. $\bar{r}_h = \prod_{l=t+h-S(t,i)}^{t-1} (1+r_l)$ is the accumulated real asset returns of the Chilean pension system between the past period $t+h-S(t,i)$ when the worker made its pension contribution and the current time t. Future accumulated pension contributions earn the riskless interest rate, $r = \beta^{-1} - 1 = 0.04$. If member k from the household i retires at age R_k in year t, its accumulated pension turns into a

contributors in Chile. Due to the increase in non-contributory pension benefits in 2022, it seems likely that the number of voluntary contributors will keep diminishing in the future. Therefore, in this article I prefer to ignore the effect of the voluntary contributors, since they are a small fraction of the population and do not represent much for the aggregate economy.

[11] I count independent workers with a contract or self-employed workers that provide receipts as formal workers. These workers are in general obliged to make contributions to the pension system, except for women above age 50 and men above age 55 or workers with less than 4 minimum wages of annual income. In Chile the informal labor is around 22% of the labor force. These workers do not provide pension contributions during their periods of informal labor (Madeira 2022a).

[12] Note that the 2022 law predicts that the value of the non-contributory pension benefits will be readjusted in February of each year according to the variation of the CPI.

monthly annuity for their life, $\tilde{pa}_{k,t}(R_k) = \dfrac{rPWI_{k,t}(1/\beta)^{R_k - S(t,k)}}{1-(1/\beta)^{-12\times(T_{k,t}-R_k)}}$.

In July 2020, the Congress implemented an exceptional measure that allowed all workers to withdraw a significant amount of their accumulated pension contributory wealth.[13] A second and a third withdrawal were legislated in December 2020 and April 2021. All withdrawals were structured in the same way. Each withdrawal legislation allowed every individual worker to withdraw an amount up to 150 UF of their accumulated individual pension account. Any account member of the defined contribution pension system (that is, anyone who has held a formal job in the past) could withdraw up to 100% of his or her funds for accounts with a value below 35 UF, up to 35 UF for accounts between 35 and 350 UF, up to 10% of the funds for accounts between 350 and 1,500 UF, and 150 UF for accounts above 1,500 UF.

There were 10.6 million workers making use of the first withdrawal, 7.9 million using the second withdrawal and 5.6 million using the third withdrawal. This corresponds to roughly 97%, 81% and 57% of the account holders before the Covid pandemic early in 2020 (Fuentes et al. 2021, Evans and Pienknagura 2021). However, the estimate of 5.6 million workers making use of the third withdrawal does not take into account that 3.8 million people had already exhausted their pension wealth. Accounting for just the workers with positive pension balances, around 86% of the workers with positive pension balances made use of all the three pension withdrawals. For simplicity, the analysis in this article assumes that all the workers with positive pension balances made use of all the pension withdrawals (or until their pension balances were entirely depleted).

Let $pw^{d=1}_{k,i,t=2020}$, $pw^{d=2}_{k,i,t=2020}$ and $pw^{d=3}_{k,i,t=2021}$ denote the amount of the first, second and third pension withdrawals, respectively. Let with $PWI^{d=1}_{k,t=2020} = PWI_{k,t=2020}$, $PWI^{d=2}_{k,t=2020} = PWI_{k,t=2020} - pw^{d=1}_{k,i}$ and $PWI^{d=3}_{k,t=2021} = PWI_{k,t=2021} - pw^{d=1}_{k,i} - pw^{d=2}_{k,i}$ denote the contributory wealth of worker k from household i before the first, second and third pension withdrawal. The counterfactual pension wealth in 2021 corresponds to the value of 2020 plus an additional year of contributions: $PWI_{k,t=2021} = PWI_{k,t=2020} + cr\min(mc, P_{k,t=2021})pc_{k,t=2021}$. The value of each pension withdrawal is given by $pw^d_{k,i,t} = \min(PWI^d_{k,t}, 35UF)1(PWI^d_{k,t} \leq 35UF) + 35UF \times 1(35UF < PWI^d_{k,t} \leq 350UF) + 0.10 \times 1(350UF < PWI^d_{k,t} \leq 1500UF) + 150UF \times 1(PWI^d_{k,t} > 1500UF)$. The accumulated contributory pension wealth of worker k ($PWI^{d=1+2+3}_{k,t}$) and household i ($PW_{i,t}$)

[13] Many countries already had established pension withdrawal schemes even before the pandemic, for reasons as diverse as ill health, necessary expenditure such as homes or weddings, or even funding a new business (Xiang 2021). However, the Chilean pandemic pension withdrawals required new legislation to be implemented.

after the three withdrawals is given by:

2) $PW_{i,t} = \sum_k PWI_{k,t}^{d=1+2+3}$, with $PWI_{k,t}^{d=1+2+3} = PWI_{k,t} - pw_{k,i,2020}^{d=1} - pw_{k,i,2020}^{d=2} - pw_{k,i,2021}^{d=3}$.

The expected contributory pension value of each worker k after the three pension withdrawals is $\tilde{pa}_{k,t}^{d=1+2+3}(R_k) = \dfrac{rPWI_{k,t}^{d=1+2+3}(1/\beta)^{R_k - S(t,k)}}{1-(1/\beta)^{-12\times(T_{k,t}-R_k)}}$.

The Chilean government had established in December 2019 a minimum pension of 5.99 UF (around 240 USD) for any retired member above 65 years of age[14] from a family within the three lowest income quintiles. Each retiree k would receive as non-contributory ("solidarity") benefits of $B_{k,t}^{2019} = SB_i^{2019}\max(a_1 - \tilde{pa}_{k,t}(R_k), B(\tilde{pa}_{k,t}(R_k)))$, with $a_1 = 6.61$ UF and SB_i^{2019} denoting a household within the lowest 3 quintiles of income. $B(\tilde{pa}_{k,t}(R_k))$ is the "Solidarity Pension" scheme that existed in Chile until 2019, which gives each member k one basic pension BP which is the lowest value for all pensions and then reduces this payment at the rate of $\frac{BP}{MP}$ until it reaches a maximum pension equal to MP: $pa_{k,t}(R_k) = \tilde{pa}_{k,t}(R_k) + B(\tilde{pa}_{k,t}(R_k))$, with $B(\tilde{pa}_{k,t}(R_k)) = (BP - \frac{BP}{MP}\tilde{pa}_{k,t}(R_k)) \times 1(MP > \tilde{pa}_{k,t}(R_k))$, with $BP = 3.88$ UF and $MP = 12.62$ UF.

The "Universal Guaranteed Pension" law of January 2022 gave all retirees in households within the lowest 9 income deciles a solidarity monthly pension. This pension was 5.93 UF (around 237 USD) for retirees with monthly pensions below 20.18 UF (around 807 USD) and then a decreasing linear amount until the benefit reaches zero benefits for pensions equal or above 32.04 UF (around 1,282 USD). The new solidarity benefits of each retiree k can therefore be expressed as $B_{k,t}^{2022} = SB_i^{2022}(b_1 1(\tilde{pa}_{k,t}(R_k) \leq b_2) + b_1(1 - \frac{\tilde{pa}_{k,t}(R_k) - b_2}{b_3 - b_2})1(b_2 < \tilde{pa}_{k,t}(R_k) < b_3))$, with $b_1 = 5.93$ UF, $b_2 = 20.18$ UF, $b_3 = 32.04$ UF, and SB_i^{2022} being a dummy for whether the household i is within the lowest 9 income deciles. Therefore, the new law created generous non-contributory pension benefits with almost universal coverage, except for the richest 10% of the population.

The loss in the contributory pensions of each worker k is therefore obtained as:

3) $Contributory - Pension - Loss_{k,t^*} = \dfrac{\tilde{pa}_{k,t^*} - \tilde{pa}_{k,t^*}^{d=1+2+3}}{\tilde{pa}_{k,t^*}}$, with $t^* = 2022 + 65 - S(t,k)$ denoting the year in which worker k reaches age 65 and becomes eligible for solidarity benefits.

[14] Due to government budget constraints, the 2019 minimum pension law was implemented gradually. At first the minimum pension of 5.99 UF (or 169,649 pesos) applied only to those above 80 on July of 2020. Then on January of 2021 the minimum pension of the law applied to all retirees above age 75. On January 1st 2022 the minimum pension of the 2019 law already applied to all retirees above age 65. This work focuses on the period between 2022 and 2055 in order to compare the retirement income under the new 2022 law and the previous 2019 law. Therefore for the purposes of this comparison, the minimum pension of 5.99 UF of the 2019 law would apply to all retirees above the age of 65 for 2022 and later years.

The total pension value is equal to the sum of the contributory pension and solidarity transfers. The total pension income in the scenario before the pension withdrawals and the solidarity pension law of 2022 is expressed as: $tp_{k,t^*} = \tilde{pa}_{k,t^*} + B^{2019}_{k,t^*}$. After the pension withdrawals and the solidarity pension law of 2022, the new projected total pension income is obtained as: $tp^{d=1+2+3}_{k,t^*} = \tilde{pa}^{d=1+2+3}_{k,t^*} + B^{2022}_{k,t^*}$. The total pension income loss[15] is, therefore, given by:

$$4)\ Total - Pension - Loss_{k,t^*} = \frac{tp_{k,t^*} - tp^{d=1+2+3}_{k,t^*}}{tp_{k,t^*}}, \text{ with } t^* = 2022 + 65 - S(t,k).$$

3.2 Current retirees

The analysis also includes the effects of the pension withdrawals and the increase in non-contributory benefits on current retirees. The methodology for this population is easier because it does not require the simulation of the workers' future employment and income paths. The EPF survey reports the pension income for each retiree, $\tilde{pa}_{k,t}$. This income is taken to be the contributory pension income before either the 2019 or the 2022 laws were implemented. The contributory pension wealth of each retiree is therefore calculated with an annuity formula based on its current age and the life expectancy in 2022 after surviving to age 60 (ECLAC 2020):

$$5)\ PWI_{k,t} = 12 \times \tilde{pa}_{k,t} \frac{1 - (1/\beta)^{-12\times(T_{k,t} - S(t,k))}}{r}.$$

For retirees with a life annuity (about 53.4% of the retirees), it is assumed that they used all the three withdrawals, therefore their post-withdrawals pension wealth is:

$$6)\ PWI^{d=1+2+3}_{k,t} = PWI_{k,t} - pw^{d=1}_{k,i,2020} - pw^{d=2}_{k,i,2020} - pw^{d=3}_{k,i,2021},$$

where again the withdrawal amount is given by $pw^d_{k,i,t} = \min(PWI^d_{k,t}, 35UF)1(PWI^d_{k,t} \leq 35UF) + 35UF \times 1(35UF < PWI^d_{k,t} \leq 350UF) + 0.10 \times 1(350UF < PWI^d_{k,t} \leq 1500UF) + 150UF \times 1(PWI^d_{k,t} > 1500UF)$. For retirees under the programmed retirement modality (about 46.6% of the retirees), the law only allowed them to use the third withdrawal. Therefore, their

[15] Note that to obtain the implied losses of the contributory pension and the total pension, it is not necessary to account for the purpose of the pension withdrawals expenditures. That is, households could have used the pension withdrawal money to pay down their debts, buy additional consumption, or keep a part of their withdrawal as cash or as a deposit in a checking or savings account. The reason is because the final pension income only depends on the compulsory pension contributions and the solidarity pension transfers.

post-withdrawal contributory wealth is still given by expression 6, but under the assumption that $pw^{d=1}_{k,i,2020} = pw^{d=2}_{k,i,2020} = 0$.

The expected contributory pension value of each retiree k after the three pension withdrawals is then:

$$7)\ \tilde{pa}^{d=1+2+3}_{k,t} = \frac{rPWI^{d=1+2+3}_{k,t}}{1-(1/\beta)^{-12\times(T_{k,t}-S(t,k))}}.$$

Finally, the contributory pension loss and the total pension loss are still given by equations 3) and 4), but specifying $t^* = 2022$.

3.3 Fiscal costs

The pension withdrawals imply a large burden for the Chilean fiscal authorities. This section specifies how this burden is calculated, given the current generation of workers and retirees. The fiscal cost of the pension withdrawals and the 2022 solidarity law for the current adult generation is then obtained in present value as a fraction of the total pension withdrawals:

$$8)\ FC_P = \frac{\sum_{k\in P} 12\times(B^{2022}_{k,t^*} - B^{2019}_{k,t^*})\dfrac{1-(1/\beta)^{-12\times(T_{k,t}-R_k)}}{r(1/\beta)^{R_k - S(t,k)}}}{\sum_{k\in P} pw^{d=1}_{k,i,2020} + pw^{d=2}_{k,i,2020} + pw^{d=3}_{k,i,2021}},$$

where for the population of current retirees the calculation applies their current age, that is $R_k = S(t,k)$ and $R_k - S(t,k) = 0$. The fiscal cost is measured as an opportunity cost, not as a budget item. Therefore, it deduces the payments that would have been made under the 2019 solidarity benefits formula. The population P can be either the population of all current workers (age 25 to 64), the current retirees (all people above age 65 and some women between age 60 and 64), or all the current affiliates (that is, the sum of current workers and retirees). Furthermore, we also consider the fiscal costs in each period with all the retirees still living in each period:

$$9)\ F_{t,P} = \frac{1}{W}\sum_{k\in P} 12\times(B^{2022}_{k,t} - B^{2019}_{k,t})1(R_k \le S(t,k) \le T_{k,t}),$$

where W is taken to be a standardizing amount to make the fiscal costs easier to interpret. This article shows the results with either W being one million UF or the value of GDP in 2022 (measured in UF).

Note that these measures only correspond to the fiscal costs to the government given the current generation of adults. The simulation does not consider the current people that are below age 25 and which will become working adults in the future. It also does not consider the fiscal costs given by generations born in the future.

4 Effects of the withdrawals and non-contributory benefits on future pension income

4.1 Pension losses of individual workers and households

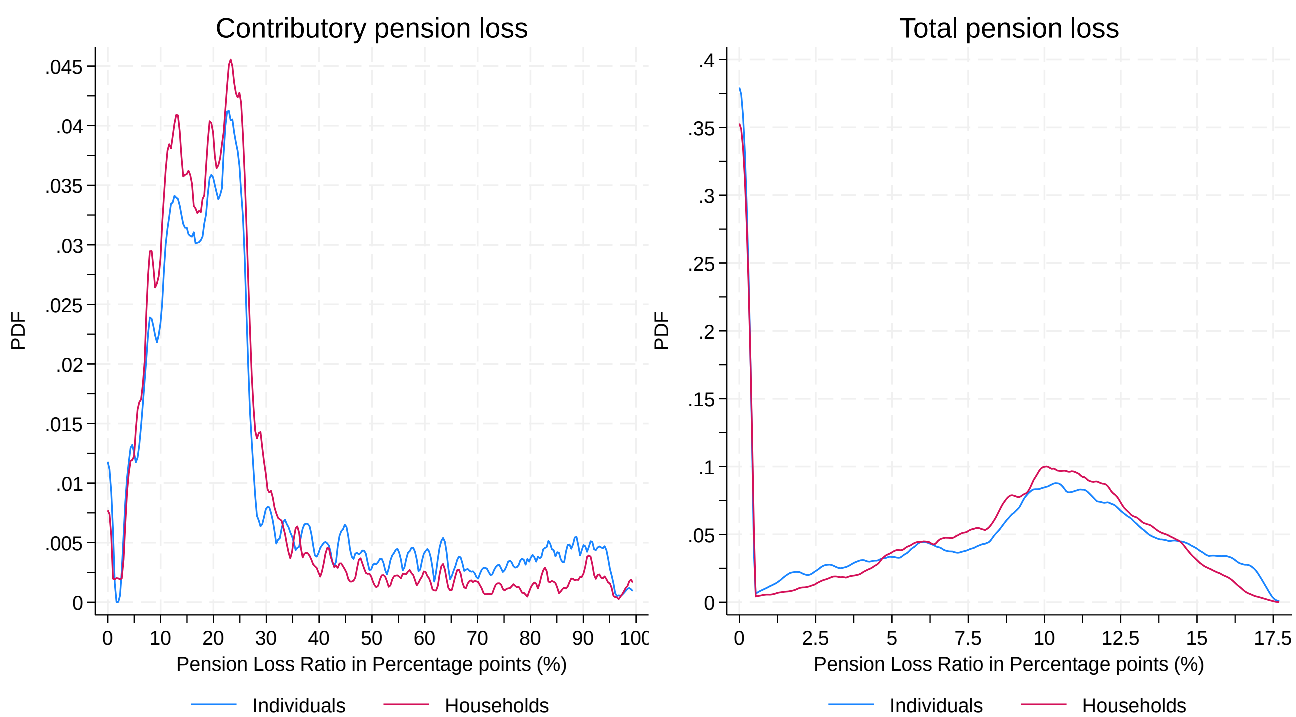

Figure 2: Losses implied by the account withdrawals for the contributory and total pension income (heterogeneity shown by the probability density function (PDF)): people living in households with a head currently aged between 25 and 64 years

Figure 2 shows the dispersion in the future pension losses of current Chilean workers and their households. It does not consider a specific cohort or year. Rather, it considers all workers currently aged 25 to 64 at the moment of their retirement. Losses are expressed as a percentage of the contributory pension or in terms of the total pension (which considers contributory plus non-contributory public benefits). The results show that the losses in contributory pensions for both individuals and households (which can include more than one retiree) can range between 0% and 100%, although most of the contributory losses are concentrated between 5% and 25%. However, almost 35% of individuals and households do not have any loss in total retirement income due to the more generous government benefits. Furthermore, there are no individuals and families experiencing total losses above 18%. Note that the dispersion of effects on households is slightly smaller than for individuals, with fewer households experiencing either a zero loss in pension or a high loss. This effect of a smaller dispersion of losses among households than for individuals happens for both contributory and total pensions.

Figure 3 shows the losses implied by the account withdrawals, according to the cohort of future retirees, that is cohorts retiring in 2022 (right after the withdrawals and the expansion in government benefits implemented by the government), and so on, until the year 2055.[16] It shows how the withdrawals affect the pension income of all retirees versus retirees across different income quintiles (from the poorest 20% in quintile 1 to the richest 20% in quintile 5). For the oldest cohort (those retiring in 2022) the average loss in the contributory pensions of the individuals ranges from 60% for the poor (quintile 1) to 20% for the richest (quintile 5). The contributory pension losses are almost always strictly monotonic in income, with the richest (quintile 5) experiencing the lowest losses and with the contributory losses increasing significantly for the lowest income, especially for the very poor (quintile 1). However, the average losses of the total pensions are much more similar across income quintiles and there is no monotonic loss in income. The average total pension loss is between 8.5% and 12% for all income quintiles for all cohorts until 2035. Until 2030, middle-income retirees (quintiles 2, 3 and 4) show somewhat higher total pension losses.

Contributory losses start declining significantly even before 2035, while total pension losses only decline significantly after 2040. Afterwards, the withdrawals effect declines at a fast rate and reaches almost zero effect after 2052. The reason why this happens is that the cohorts retiring after

[16] Few current workers retire after 2055 and the withdrawal effects on them are small, so Figure 3 ends here.

2030 have fewer contributory pension losses, because younger workers were less able to withdraw high amounts (since the young have fewer pension wealth accumulated). Also, they had more years of work left to recover their pension wealth after the withdrawals. However, younger cohorts will receive gradually lower government solidarity transfers. Therefore, their lower contributory losses do not change total pension losses much in the beginning years.

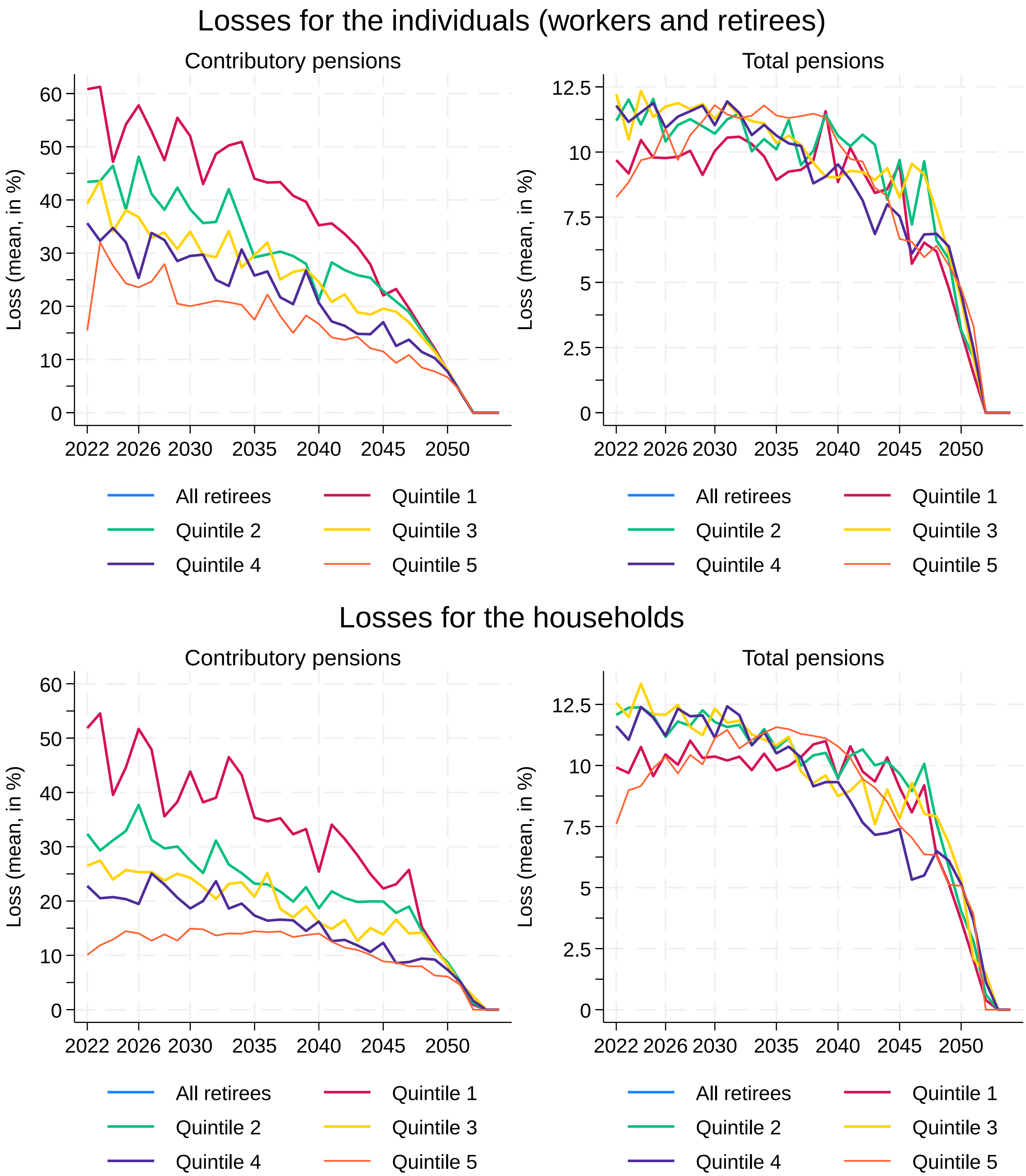

Figure 3: Losses (in % of the pre-withdrawal projections for the individual pensions) implied by account withdrawals, according to cohort year of the future retirees

The reason why total pension losses are so similar across different income quintiles is due to two opposing factors that balance each other. The first factor is that each withdrawal was capped at 150 UF (roughly, 5,250 USD) and therefore the withdrawals represented a smaller amount of the private pension savings of richer households. The second reason is that government benefits decline sharply for retirees of higher income. Therefore, the poorest retirees receive a higher amount of non-contributory income and suffer limited losses in their total pensions. Due to the balancing effect of these two factors, the overall loss in the total pension is similar across all income levels. The effect of the withdrawals on the total pensions is strong until 2035 and then declines sharply. It reaches almost zero after 2052. This is due to younger cohorts having several years to accumulate pension savings before retirement.

For households, Figure 3 shows a similar pattern as for individuals. Losses of retirees' household contributory pension income in 2022 range between 15% for the richest (the quintile 5) and 50% for the poorest (the quintile 1) of the families. This level remains high until 2040, then declines sharply for the youngest cohorts. The losses for the total pension income are much lower, ranging between 8.5% and 12.5% for the cohorts between 2022 and 2040. These losses decline sharply afterwards and show almost zero effects after 2052.

4.2 Pension losses of current retirees

Figure 4 shows the contributory and total pension losses for the population of current retirees, whether individuals or households. It shows that a significant fraction of retirees had small contributory pension losses, because these were in the controlled retirement program (which was not allowed to use the first and the second pension withdrawals). However, the modal retiree experiences a contributory pension loss of 25%. Furthermore, a significant fraction of retirees experience contributory losses above 95%. However, the total pension losses of current retirees are very limited due to government transfers. None of the current retirees experiences a total pension income loss above 35%. It is also clear that almost all retirees experience total pension losses below 2.5%. Therefore, the government increase in non-contributory benefits was extremely effective in shielding current retirees from the effects of their Covid pension withdrawals.

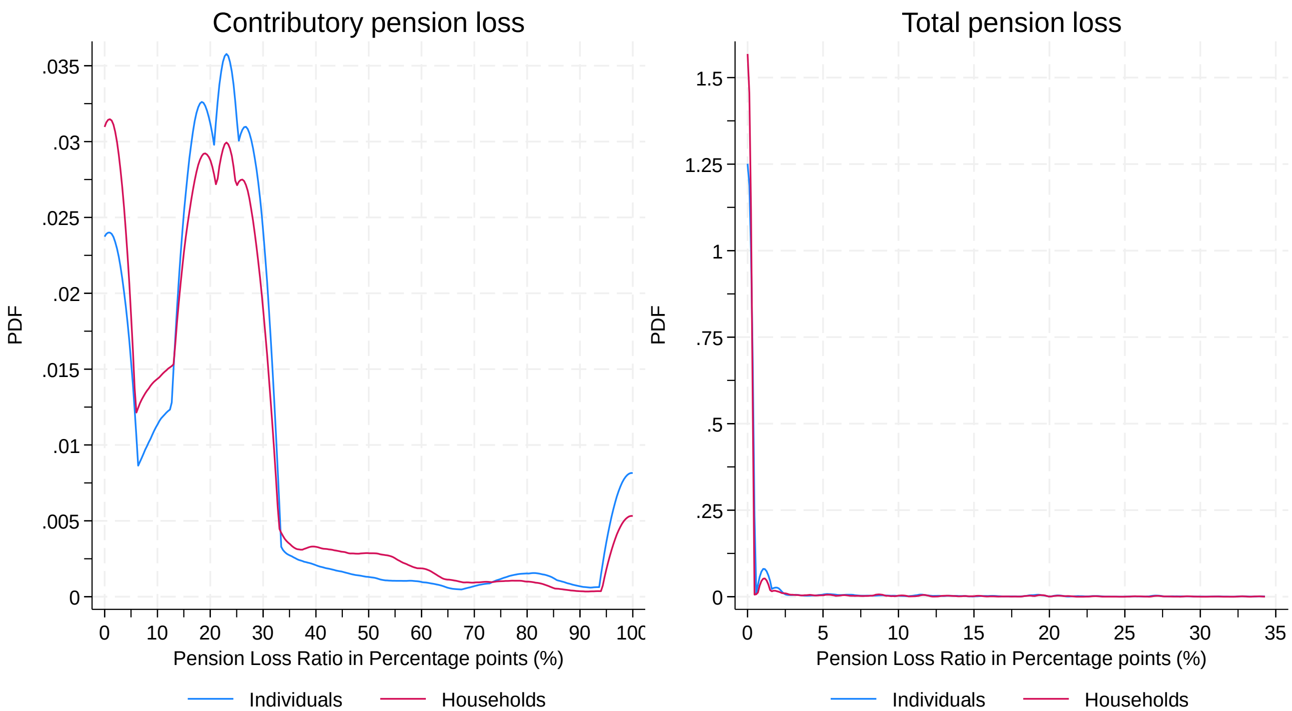

Figure 4: Losses implied by the account withdrawals for the contributory and total pension income (heterogeneity shown by the probability density function (PDF)): current population of retirees (people above age 65, some women above age 60)

4.3 Summary of the pension losses across groups

Table 2 summarizes the median and average pension losses across individuals and households for the populations of current workers, retirees and affiliates. The average loss in contributory pension income is 28.6% for the individual workers, with losses of 23.2% and 33.6% for men and women, respectively. However, after accounting for the non-contributory solidarity transfers, the average loss in total pension income is just 7.4% for individual workers, with losses of 8.6% and 6.4% for men and women, respectively. The median losses in contributory pensions for individuals are always below the average. This is explained by a big tail of people with a 100% contributory pension loss due to withdrawing their entire accounts. However, for the total pension losses of workers, the

Table 2: Contributory and total pension losses across the population of individuals and households (all values in % of the pre-pandemic pension projections)

Measure of the pension loss	Individuals						Households	
	Median			Mean			Median	Mean
	Male	Female	Both	Male	Female	Both	Both genders	
Current workers								
Contributory pension	18.9	23.3	21.2	23.2	33.6	28.6	19.6	23.5
Total pension	9.9	6.8	8.6	8.6	6.4	7.4	8.8	7.5
Current retirees								
Contributory pension	19.4	19	19	27.5	23.3	25.0	19	20.2
Total pension	0	0	0	1.9	0.5	1.1	0	0.9
All affiliates (workers and retirees)								
Contributory pension	19	22.8	20.7	23.9	31.4	27.9	19	22.9
Total pension	8.7	3.7	6.1	7.5	5.2	6.2	7.0	6.3

average is always below the median. This is due to a big tail of workers with zero total pension losses after receiving government transfers. The contributory and total pension losses of households are somewhat in the middle of the gender values, which is explained by most households including both an adult man and woman. The household values are slightly closer to the males, because men have higher pensions and therefore a higher weight in household pension income.

Across all workers of either gender and across households, the contributory pension losses of retirees are slightly lower than for workers (either in median or average). The median and mean contributory pension losses for individual retirees are 19% and 25%, respectively. For households, the median and mean contributory pension losses are 19% and 20.2%, respectively. These are slightly lower than the values for current workers.

However, total pension losses of retirees are much lower than those of workers. This is because the retirees do not have any more years to accumulate contributory pension savings and therefore will receive a higher amount of government transfers. The median and mean total pension losses for the individual retirees are 0% and 1.1%, respectively. Total pension losses are slightly higher for men than for women, as women benefit more from the public transfer due to their lower past wages and fewer years of formal employment. For households, the median and mean total pension losses are 0% and 0.9%, respectively. Therefore, total pension losses are much lower for current retirees than for workers.

Finally, this section also reports the contributory and total pension losses for all current affiliates (both workers and retirees). The numbers for all affiliates can be seen as a sort of weighted average between workers and retirees; it is much closer to the value for workers because these represent a much bigger share of the total population. The median and mean contributory pension losses are 20.7% and 27.9% for all individual affiliates, with losses being substantially higher for women (22.8% in median and 31.4% in average). For all households, the contributory pension losses are 19% in median and 22.9% in average. However, total pension losses are much smaller, at 7% in median and 6.3% in average for households. For individuals, both the median and average total pension loss are close to 6.1%, but with lower values for women (who benefit from more transfers) than men.

5 Fiscal costs of the withdrawals and non-contributory benefits

Figure 5 shows the fiscal costs of the withdrawals and the associated increase in government transfers from the 2022 pension law. These fiscal costs are only for the current generation of workers and retirees (those aged 25 and above). Therefore, the analysis does not include future unborn generations or the current children. I show the total fiscal costs from 2022 until 2088 for current retirees, workers and total affiliates (that is, the sum of both workers and retirees). The graphs are similar both in Chilean real currency (the UF) and as a fraction of the GDP. The fiscal expenses of the withdrawals and the 2022 pension law will increase to almost 2% of GDP in 2030. After 2035, the fiscal costs start decreasing sharply as the current generation of retirees ends their life expectancy in 2049. However, the fiscal expenses with the population of current workers (those aged 25 to 64) will keep increasing until reaching 1.5% of GDP around 2047. After 2055, the fiscal costs due to the current generation of workers decline sharply. These fiscal costs end in 2088 as the youngest current workers reach the end of their life expectancy.

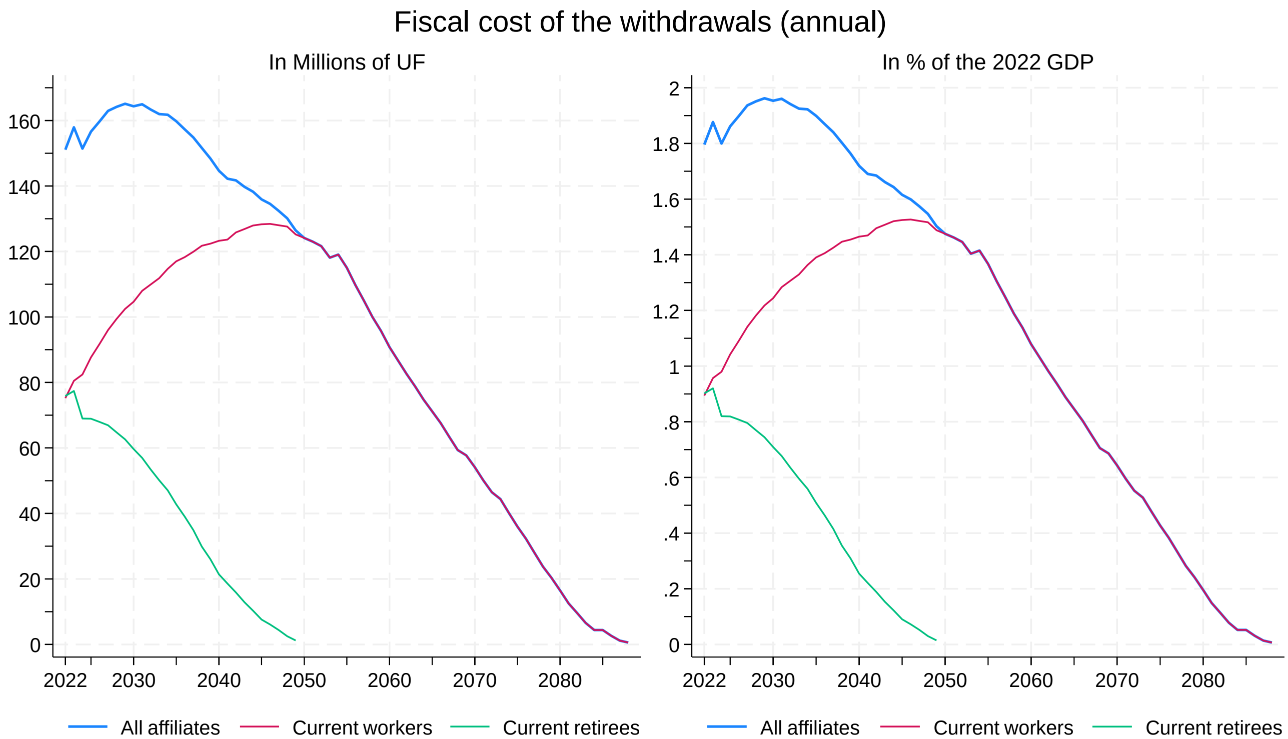

Figure 5: Fiscal costs of the higher non-contributory benefits payments (due to the pension withdrawals and the 2022 solidarity law) for the current generation of workers and retirees

Table 3 shows the fraction of withdrawals that are covered by government transfers. Under the baseline of a risk free neutral rate of 4%, the government may end up covering 92% of the total withdrawals. In the case of current retirees, this fraction is around 98%, while it is just around 90% for current workers. As a robustness check, I also computed the share of the pension withdrawals covered under different values of the risk-neutral rate. The range of values considered, between a low of 3% and up to 5%, is consistent both with the economic literature (Attanasio and Weber 2010) and different scenario assumptions for Chile (Berstein and Morales 2021). The share of withdrawals funded by the government increases with lower interest rates. This makes sense, since older cohorts (which will retire earlier) are the strongest recipients of both withdrawals and government transfers. Therefore, these fiscal costs in present value increase with lower interest rates. For low risk free rates of 3%, the fraction of withdrawals funded by the government is 97%, 98% and 96% for current affiliates, retirees and workers, respectively. At higher interest rates of 5%,

Table 3: Fraction of the withdrawals covered by the solidarity transfers (all values in %)

Annual risk free rate	3.0	3.5	4.0 (baseline)	4.5	5.0
Current workers	96.4	93.3	89.5	85.0	80.2
Current retirees	98.0	97.9	97.8	97.8	97.7
All affiliates	96.8	94.7	92.1	89.3	86.2

the fiscal costs are lower, being just 86%, 98% and 80% for current affiliates, retirees and workers, respectively.

Overall, this section shows a substantial burden from the Covid pension withdrawals. The present value of the fiscal burden with the Covid pandemic pension withdrawals in Chile may be between 86% to 97% of the total amount of the withdrawals, with the value depending on the interest rate applied to the fiscal flows. As a percentage of GDP, it is expected that the annual fiscal costs of the withdrawals may reach almost 2% by 2030. Obviously, these values depend on the assumptions of the model. One important assumption is that there are no further significant social security reforms in the future. This obviously affects the assumptions. For instance, if future governments delay the retirement age to 67 or even later (as is done already in several OECD countries, OECD 2021), this would reduce the fiscal expenses for future retirees.

6 Conclusions

The results show that the increased public transfers limit the negative effects for individuals from their contributory pension withdrawals. This comes at the expense of greater fiscal costs, which may cover 92% of the total withdrawals value. The results of this article are even more relevant now. In January 2023, Chile further expanded the coverage of the non-contributory benefits of the 2022 pension law.[17] This update in the pension law increased the number of beneficiaries by 4% (OECD 2023b). This can be a sign that future non-contributory benefits may increase even more.

The results of this article have implications for general pension reform. Previous research shows that allowing for some liquidity in pension savings can increase its acceptance among workers (Xiang 2021, Briere et al. 2022). However, the population may misunderstand the government and

[17] In February of 2023, Chile expanded the definition of the households that could benefit from the public pension transfers by covering all retirees that belong to the 90% poorest of the entire population of households. In 2022 the coverage was limited to the 90% poorest households among those above age 65 (which are poorer than the general population).

make excessive use of pension withdrawals by perceiving that there is government approval of this measure (Bateman et al. 2022). This could lead to insufficient pensions in the future (Xiang 2021, Bekbossinova et al. 2022). This article shows that in Chile, the generalized withdrawals ended up putting pressure on the government to increase its fiscal burden.[18] To reduce an excessive use of the pension withdrawals it is essential to limit withdrawals to workers that have a proven urgent need for the liquidity of their pension savings. It is also prudent to create mechanisms for workers to restore their pension account balances in the future (Agarwal et al. 2020, Bekbossinova et al. 2022).

Future research avenues on this topic remain unexplored. This article is limited to evaluating the effects of the pension withdrawals and increase in public pensions on retirees' income. It then analyzes the fiscal costs of these pension measures. However, it is possible that these pension withdrawals and the "Universal Guaranteed Pension" law also had other effects on well-being, such as making it easier for households to repay their debts and improve their well-being through lower stress and better mental health (Galiani et al. 2016). Therefore, future research can study the non-economic effects of the Chilean pension reforms. Finally, the Chilean Congress is still debating significant changes to the pension system. This article shows that it is relevant to study both the redistribution effects and the fiscal burden of a potential pension reform.

References

[1] Agarwal, S., Pan, J., & Qian, W. (2020), "Age of decision: Pension savings withdrawal and consumption and debt response," *Management Science*, 66(1), 43-69.

[2] Attanasio, O. and G. Weber (2010), "Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy," *Journal of Economic Literature*, 48(3), 693-751.

[3] Bateman, H., L. Dobrescu, J. Liu, B. Newell and S. Thorp (2023), "Determinants of early-access to retirement savings: Lessons from the COVID-19 pandemic," *Journal of the Economics of Ageing*, 24, 100441.

[18] Olivera and Valderrama 2022 also document that in Peru there was a pension reform as an attempt to compensate the large pandemic pension withdrawals.

[4] Bekbossinova, A. S., Oshanova, K. Y., Khassenova, K. K., Alpysbayeva, A. K., & Moldasheva, A. B. (2022), "Advantages and Disadvantages of Early Withdrawal of Pension Savings: an Expert Assessment," *Economics: the strategy and practice*, 17(3), 242-258.

[5] Berstein, S. and M. Morales (2021), "The role of a longevity insurance for defined contribution pension systems," *Insurance: Mathematics and Economics*, 99, 233-240.

[6] Briere, M., J. Poterba and A. Szafarz (2022), "Precautionary Liquidity and Retirement Saving," *AEA Papers and Proceedings*, 112, 147-50.

[7] Cerda, R., R. Fuentes, G. García and J. Llodrá (2020), "Understanding domestic savings: an empirical approach," *Applied Economics*, 52(9), 905-928.

[8] Cerda, R. and R. Vergara (2007), "Unemployment insurance in Chile: Does it stabilize the business cycle?," *Journal of Policy Modeling*, 29(3), 473-488.

[9] Cespedes, J., B. Larrain, M. Larrain, C. Parra and M. Vera (2023), "Household Debt and Early Access to Retirement Savings: Evidence from the COVID Crisis," mimeo.

[10] Deaton, A. (2018), "The Analysis of Household Surveys: A Microeconometric Approach to Development Policy," Washington, D.C.: World Bank Group.

[11] ECLAC (2020), "Long Term Population Estimates and Projections 1950-2100," Economic Commission for Latin America and the Caribbean, Population Division, United Nations.

[12] Evans, C. and S. Pienknagura (2021), "Assessing Chile's Pension System: Challenges and Reform Options," IMF Working Papers 2021/232.

[13] Fuentes, O., X. Quintanilla, A. Rueda, E. Salvo, Diego Herrera and M. Toledo (2021), "Retiro de Fondos de Pensiones: Resultados y efectos," Superintendencia de Pensiones.

[14] Fuentes, O., O. Mitchell and F. Villatoro (2023), "Early pension withdrawals in Chile during the pandemic," *Journal of Pension Economics & Finance*, 2023:1-26. doi:10.1017/S1474747223000112.

[15] Galiani, S., P. Gertler and R. Bando (2016), "Non-contributory pensions," *Labour Economics*, 38, 47-58.

[16] Lopez, F. and G. Rosas (2022), "Covid-19 and attitudes toward early withdrawal of pension funds: the role of trust and political ideology," *Journal of the Economics of Ageing*, 23, 100420.

[17] Lorca, M. (2021), "Effects of Covid-19 early release of pension funds: the case of Chile," *Journal of Risk and Insurance*, 88, 903–936.

[18] Madeira, C. (2015), "Identification of Earnings Dynamics Using Rotating Samples over Short Periods: The Case of Chile", Central Bank of Chile Working Paper 754.

[19] Madeira, C. (2021), "The long term impact of policy reforms on Chilean savings and pensions", *Journal of the Economics of Ageing*, 2021, 19, 100326.

[20] Madeira, C. (2022a), "The impact of the Chilean pension withdrawals during the Covid pandemic on the future savings rate", *Journal of International Money and Finance*, 126, 102650.

[21] Madeira, C. (2022b), "The double impact of deep social unrest and a pandemic: Evidence from Chile", *Canadian Journal of Economics*, 55(S1), 135-171.

[22] Madeira, C. (2023), "The impact of the Covid pandemic public policies in Chile on consumption", *Economía LACEA Journal*, 22(1), 71–95.

[23] OECD (2021), "Pension markets in focus 2021," OECD.

[24] OECD (2023a), "Selective Spending Reviews in Chile," OECD.

[25] OECD (2023b), "Pensions at a glance 2023," OECD.

[26] Olivera, J. and J. Valderrama (2022), "The impact of the COVID-19 pandemic on the future pensions of the Peruvian pension system," IDB Working Paper 1392.

[27] Olivera J. (2023), "The long-term scars of Peru's COVID-19 policy response on pension security," *Glob Soc Policy*, 23(2), 369–72.

[28] Parada-Contzen, M. (2020), "Crowding-out in savings decisions, portfolio default adoption and home ownership: Evidence from the Chilean retirement system." *Review of Economics of the Household*, 18(2), 543-569.

[29] Parada-Contzen, M. (2022), "Default Behavior and Risk Aversion in Defined Contribution Retirement Systems: Evidence from Chile," *B.E. Journal of Economic Analysis and Policy*, 22(4), 655-714.

[30] Santoro, M. (2017), "Pension Reform Options in Chile: Some Tradeoffs," IMF WP/17/53.

[31] Wang-Ly, N. and B. Newell (2022), "Allowing early access to retirement savings: Lessons from Australia," *Econ Anal Policy*, 75, 716-733.

[32] Xiang, J. (2021), "Study on the Advantages and Disadvantages of Early Access to Pension Funds and Its Enlightenment to China," *Social Security and Administration Management*, 2(1), 1-7.

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