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Abstract[*]

We study the effects of the COVID-19 pandemic and the pension policy response on the private and public pension systems of Peru. We find that the policies allowing early withdrawals from the private pension balances imply a significant reduction in expected pension wealth by about 40 people, yet there are important heterogeneous effects: the losses are larger for males, for affiliates at the bottom of the distribution of income or pension wealth, and for older people as they have less time to rebuild their pension pots. We detect that the excess of mortality due to the pandemic will reduce the actuarial net liability of the public pension system by about 2.4 percent, even after accounting for new survival pensions and a drop in contributions. The effect is largely driven by savings due to the anticipated deaths of pensioners. Moreover, a new set of reduced pension benefits implemented in the public pension system during the pandemic could cost about 4 percent of the actuarial net reserve.

JEL classifications: D31, G28, H55, J14, J32
Keywords: COVID-19, Old-age security, Peru

[*] In Latin America and The Caribbean, there is very little research to date about the impact of COVID-19 on pension systems. In this context, the Department of Research and Chief Economist (RES), through the Latin American and Caribbean Research Network, together with the Labor Market and Social Security Division (LMK), through the Network for Pensions in Latin America and the Caribbean (PLAC Network), launched a research project to evaluate the impact of COVID-19 on pension systems in the region. This project analyzes the pandemic's impact on key aspects of pension systems such as replacement rates, contribution density, intergenerational equity, financial sustainability, and pension fiscal expenditure, among others. The study was applied in four countries of the region—Argentina, Chile, El Salvador, and Peru—and it addressed both defined benefit and defined contribution pension systems.

To carry out these studies and guarantee the homogeneity of the analysis methodologies for the different countries, a standard pension projection model developed by the PLAC Network was provided for the different country studies. Since 2015, the PLAC Network supports regional efforts for improving the institutional and technical capacity of pension entities.

The specific objectives for each country study were to: i) generate country-specific evidence on the impact of COVID-19 on pension systems, addressing the effect on key indicators; ii) calculate the pre-COVID and the short and long-term fiscal pressures stemming from the crisis; and iii) evaluate political implications and policy recommendations for the region. This paper was undertaken as part of the Latin American and Caribbean Research Network project "Evaluating the Impact of COVID-19 on Pension Systems in Latin America and the Caribbean."

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1 Introduction

The first case of COVID-19 in Peru was detected on March 5, 2020. On March 15, the Peruvian Government declared a state of emergency, which implied the suspension of non-essential work activities in the public and private sectors, mandatory social distancing, and border closures. In the following days, temporary measures to contain the spread of the coronavirus were extended due to the increase in the number of infections. This extension of the restrictive measures placed the Government in a dilemma of prioritizing between the economy and health.

In order to smooth the economic shock caused by the pandemic, which forced the closure of companies and the confinement of workers, the Government enacted in April 2020 Emergency Decree DU 038-2020, which established a series of measures to protect the employment relationship and avoid job loss. This regulation allowed remote work and paid leave, and it set up a temporary scheme of special Government sponsored paid-leave called "Suspensión Perfecta de Labores (SPL)." The SPL scheme involves the suspension of obligations of both the employer and the worker (remuneration and compliance with the working day) without breaking the employment relationship. This measure was in force until October 2, 2021 (DU 087-2021).

The Government also implemented a series of cash and in-kind social transfers that responded to widespread demand for the use of social protection as a tool to strengthen the resilience of poor and vulnerable households to shocks resulting from COVID-19 (Bowen et al., 2020). The Government's response was divided into i) measures to mitigate the adverse consequences of the pandemic and ii) policies to stimulate the economy (Olivera, 2021). On the one hand, the Government's main response to mitigating the economic consequences on the living standards has been the implementation of lump sum cash and in-kind transfers for various groups of recipients such as "Bono Yo me quedo en casa," "Bono Independiente," "Bono rural," "Bono Familiar Universal," "Bono

Electricidad," "Bono Yanapay," "Bono 210 Soles," and food baskets (Olivera, 2021). On the other hand, among the policies aimed at reactivating the economy, the Government set up "Reactiva Peru," "Arranca Peru," and payroll subsidies.

Beyond the potential negative effects of the pandemic via economic downturn and job losses on the evolution of pension contributions, the Government and the Congress of Peru implemented some measures that could jeopardize the old age security of the participants in the Private Pension System (SPP, for its name in Spanish). These measures have allowed individuals to make early withdrawals of pension funds. In 2020, three withdrawal policies were set in April (two by the Government, and one by the Congress), and a fourth policy was set in November by the Congress, implying a drain of 33,723 million Soles from the pension funds (equivalent to 4.5 % of GDP in 2020). Drifting toward a dangerous trend, a fifth withdrawal policy was implemented by the Congress on May 2021, implying an amount of funds much larger than previous measures (32,219 million Soles, equivalent to 3.7% of GDP in 2021).

The main reason given by the authorities for implementing the withdrawal policies was to provide liquidity to families due to the job losses and economic crisis generated by the pandemic. (Olivera, 2021) provides at least two reasons for why this policy may be problematic and ill-designed. First, the pension funds are severely reduced or even depleted, particularly for affiliates with small pension balances, which will reduce resources to finance an adequate standard of living during old age. Unlike many other countries, Peru does not have a universal social pension that could attenuate the risk of falling into poverty in old age. Second, the withdrawal policies are not targeted to families suffering more adverse conditions, as was mentioned in the arguments for the measures. The eligibility conditions are very loose so that practically any affiliate can cash out funds, regardless of size of pension balance or income levels.

Some could argue that the funds were important to allow families to cope with income

losses, but the affiliates of the SPP are mostly salaried workers in the formal market with higher educational attainment and job quality higher than the average worker in the Peruvian labor market. SPP affiliates (particularly those contributing regularly) belong to the upper section of the distribution of income, so that they suffered less the economic consequences of the pandemic or had other resources to cope with the shocks. Thus, allowing pension fund withdrawals may not be a strictly needed policy in the Peruvian context. In any case, the Government had set up (arguably insufficient) social assistance resources for the most vulnerable households.

As mentioned in Bosch et al. (2020), social and labor policies should be prioritized to protect employment and assist families in need, but instruments with other objectives, such as pension savings, should be used as last-resort measures. As we will see in this study, the five withdrawal pension fund policies have severely compromised the old age security of the affiliates of the SPP. On average, the expected pension funds accumulated at retirement age will fall by about 40%, yet there are important heterogeneous effects.

The Congress also attempted to set up a policy to allow the affiliates of the Public Pension System (SNP, for its Spanish name) to cash out past contributions, but after months of political turmoil, it was deemed unconstitutional by the Constitutional Court of Peru. However, this conflict led the Government to re-assess the benefit rules in the SNP and, therefore, to set new regulations to facilitate the allocation of more pensions in the public system. As we will see in this study, the new rules will increase access to pensions to about 10% of the affiliates, which would not have been possible without the relaxation of the eligibility conditions triggered by the decision of Peru's Constitutional Court.

We also study the effects of the pandemic on the public pension system through the effects of the excess of mortality. This effect is captured by i) the new survival pensions generated by the death of affiliates and pensioners (increase in pension payments), ii)

the pensions that are not paid to deceased affiliates before turning 65 (drop in pension payments), and iii) the fall in contributions of deceased affiliates. All these combined effects represent a fall of 2.4% in the net actuarial reserve of 2020. It is worth noting that this reduction could finance around half of the net actuarial cost of the new SNP pension benefits mentioned above (which could cost about 4% of the net actuarial reserve).

The study proceeds as follows. Section 2 presents our review of the literature assessing the effects of the pandemic. In Section 3, we present the institutional and demographic background for our analysis. Section 4 presents the analysis of the effects of the pandemic on the private pension system, and Section 5 presents the analysis of the public pension system. Finally, we conclude with Section 6.

2 Literature Review

2.1 Effects on Labor Markets

The outbreak of COVID-19 in 2020 has affected various dimensions of society and compromised the social progress of its citizens. In economic terms, the effects of the pandemic are generally considered a sequence consisting of an initial supply shock and a subsequent demand shock (OECD, 2020). The supply shocks are related to the interruption of international supply chains (i.e., by input-producer firms' closure), prompting the reduction or closure of many downstream firms, despite unprecedented policy responses by governments, as well as the social distancing measures imposed on households. The purchasing power of households was compromised as they suffered from the public health restrictions to contain the advance of the pandemic, illness, and loss of employment. The supply shock subsequently provoked a demand shock as consumption and investment streams collapsed since households' incomes plummeted and a generalized feeling of uncertainty increased due to social isolation policies. These events led

economies and labor markets astray, resulting in a loss of about 8.8% in global working hours relative to the fourth quarter of 2019 (ILO, 2020).

A year after the onset of the pandemic, a process of economic and labor market recovery started. However, according to the International Labour Organization (ILO), "it will be uneven globally and almost certainly insufficient to close the gaps opened up by the crisis" (ILO, 2021). ILO argues that such unevenness lies in the unequal availability of vaccines, the extent of any future workplace closures and physical distancing measures, and monetary and fiscal policy (ILO, 2021).

The Peruvian Case

Before the onset of COVID-19, during 2019, Peru experienced moderate employment growth. The pre-pandemic context showed the following employment distribution among sectors: high-productivity sectors (mining, financial services, electricity, gas, and water) absorbed just 2.4% of national employment; medium-productivity sectors (manufacturing sector, construction, and transportation and storage) took 22.6% of national employment; and three-quarters of employment were clustered in low-productivity sectors (services, commerce, and agriculture) (Gamero and Perez, 2020). Moreover, the main types of work categories in the labor force are employees (46.3%) and self-employed (37.9%) (ILO, 2021).

Peru has been one of economies most affected economies by the pandemic in Latin America. Evidence reported in (ILO, 2021) and (Gamero and Perez, 2020) shows that there were 6 million jobs lost due to the pandemic in April 2020. According to Gamero and Perez (2020), there are two important factors explaining such an economic crisis: marked productivity heterogeneity and scarce diversity. The former of these two factors refer to the aforementioned unequal distribution of employment absorption by sector.

As an initial result of the pandemic impact, employment in the manufacturing and con-

struction industries of Lima Metropolitana was more strongly hit than in commerce and services. By occupational category, self-employment jobs suffered a greater contraction. The reduction of self-employment shows how, in the COVID-19 crisis, the informal sector was unable to absorb displaced workers from the formal sector as is usual in other economic crises due to sanitary restrictions (Weller, 2020). Both formal and informal employment declined due to the impact of the pandemic and the health restriction measures imposed by the government. However, this reduction in both labor markets lasted for the first few months of the pandemic, as the economies then began to relax public health measures. The second most affected work category was domestic work, which reflects the fall in family budgets that were no longer able to hire these services (Weller, 2020). Furthermore, the major increases in unemployment were registered among men aged between 25 and 44, and among people with non-university higher education.

By the end of the first semester of 2020, several labor-market-related variables had been affected. First, the unemployment rate increased. The unemployment rate raised in Metropolitan Lima during the mobile quarter of June-August by 9.7% more than in the previous-year equivalent mobile quarter, resulting in 15.6%. Moreover, about 245,000 lost their full salaries due to the paid leave policy promoted by the Government. Second, the real income of employed individuals dropped due to the reduction of economic activities (by about 10.5%). According to Gamero and Perez (2020), real income during the whole mobile quarter of June-August dropped to levels similar to those of 9 years ago. However, despite sharp negative effects on the activity of sectors such as restaurants and hotel services, transport and storage, commerce, manufacturing, and mining and hydrocarbons, some other sectors started to recover, namely the fishing industry, public administration, telecommunications, and the financial and insurance sectors (Gamero and Perez, 2020).

Regarding the most recent available information for the Peruvian labor market (see

Table 1: Labour Market Indicators

Indicators:	**2019**	**2020**	**2021**
Labor Status (thousands)			
Working-age Population	24,511.5	24,881.6	25,250.7
Labor Force	17,830.5	16,095.0	18,149.4
Inactive Population	6,681.0	8,786.6	7,101.3
Formal Employment Rate (%)			
Total	27.3	24.7	23.2
Urban	33.6	31.6	28.6
Rural	4.8	3.9	4.7
Informal Employment Rate (%)			
Total	72.7	75.3	76.8
Urban	66.4	68.4	71.4
Rural	95.2	96.1	95.3
Employment Status (thousands)			
Total	17,133.1	14,901.8	17,120.1
Employment (adequate employment)	9,558.5	6,783.6	8,532.0
Time Related Underemployment	7,574.6	8,118.2	8,588.1
Unemployment Rate (%)			
Total	3.9	7.4	5.7
Men	3.5	7.2	4.9
Female	4.5	7.7	6.7
Urban	4.8	9.4	7.0
Rural	0.7	1.1	0.7
Average Monthly Salary in Urban Area (Soles)			
Total	1,595.4	1,414.8	1,447.7
Men	1,818.6	1,558.8	1,644.7
Female	1,307.5	1,207.9	1,185.9

Note: Table uses data extracted from INEI (2022) reports as of December 2021.

INEI, 2022), the working-age population of 2021 is composed of 25.3 million people, of whom 18.2 million (71.9%) are part of the labor force, while 7.1 million (28.1%) are the non-active population. These figures show that the Peruvian labor market is recovering from the pandemic shock, because the labor force increased by 12.8% compared to 2020 and 1.8% compared to 2019. Yet, by 2021, the informal employment rate was 76.8%, 1.5 percentage points more than in 2020, and 4.1 percentage points

more than in 2019. Also, the urban informal employment rate rose 3 percentage points during the last year and is 5 percentage points higher than in 2019 (see Table 1). This means that, although the labor market is recovering, employees are working mostly in the informal labor market, particularly in the urban informal market. The national unemployment rate was 5.7% in 2021, 1.7 percentage points more than in 2020; while the urban unemployment rate was 7%, 1.8 percentage points larger than in 2019, but 2.4% percentage points less than in 2020. Finally, in 2021, the average monthly salary in the urban area was 1,448 Soles, 2.3% greater than the average monthly salary in 2020. The average monthly salary for men was 1,645 Soles, 86 Soles more than in 2020, while women earned an average monthly salary of 1,186 soles, 22 Soles less than in 2020. This means that the salary gender gap has expanded during the recovery of the labor market.

The Latin American Case

Latin America has been one of the regions most affected by the pandemic, as GDP and employment levels in the region have suffered steep declines. This is reflected in the worsening of already precarious working conditions, the reduction of household incomes, and the increase in inequality and poverty indicators.

The fall of the region's GDP (-6.8%) in 2020, double the fall of the world GDP (-3.2%), exceeds the fall of the Eurozone (-6.5%) and is the highest among all the regions. It should be noted that, behind this aggregate number, there are important differences in production variation among the countries. For example, Paraguay, Guatemala, and Nicaragua suffered small reductions, while countries such as Peru, Argentina, and Honduras recorded high reductions in production (Beccaria et al., 2021). Likewise, the reduction in aggregate production had a strong impact on employment since the employment rate in 2020 was reduced by 10% with respect to last year (Beccaria et al., 2021), which involves a drop even greater than the fall in GDP. This implies that the

employment-GDP elasticity is about 1.5; in other words, for each point of GDP contraction, employment fell by 50% more, showing that the economic crisis strongly deteriorated the labor market.

In addition, the labor market had a different pattern of behavior compared to previous crises, as people who became unemployed left the labor force instead of moving to the informal employment market because of the health restriction measures adopted by governments. Consequently, according to estimates by Beccaria et al. (2021), the employment rate in the second quarter of 2020 fell by 9 percentage points from the previous quarter, the economic participation rate in the second quarter of 2020 fell by 9 percentage points from the previous quarter, and the unemployment rate in the second quarter of 2020 increased by 2 percentage points. In other words, in the short run, the employment rate fell sharply, but at the same time, the participation rate fell, which attenuated both the increase in the unemployment rate and the fall in average labor productivity (see ILO, 2021; and Weller, 2020). The abrupt drop in the employment rate between the first and second quarter was approximately 43 million employees, and the labor market recovery up to the first quarters of 2021 has been about 29 million employees, which means that it has not yet made up for the pre-pandemic employment rate.

The deterioration of the labor market and hence the reduction in income had a heterogeneous impact on the population. The greatest negative impact occurred among individuals with less experience and fewer qualifications, such as women, young people, and migrants, while the most affected firms were small and medium-sized companies (see Gamero and Perez, 2020; and Beccaria et al., 2021).

2.2 Effects on Pension Systems

COVID-19 produced a reduction in people's income and generated a high demand for access to savings, including pension funds. Unlike other savings schemes, pension funds are part of the pension system, which has been designed to provide economic security in old age (see Alves et al., 2021; and Mesa, 2020). Individuals tend to accumulate liquid savings at the beginning of their working life until a certain time (e.g., between 35 and 40 years) and thereafter they favor non-liquid forms of savings, mainly for retirement (see Gourinchas and Parker, 2002; and Barr and Diamond, 2006) for further economic theoretical arguments). Restrictions to access to pension funds before retirement are helpful for individuals showing some behavioral biases such as present bias, procrastination, and overconfidence (OECD, 2018). Potential negative impacts of fund withdrawals are reported in (see Bosch et al., 2020; and Lorca, 2021).

Impacts on labor markets, such as job destruction, rising unemployment rates, low wages, and the growth of the informal economy, result in lower contributions and revenues to pension systems, regardless of the type of system (see Cabrita, 2020; and Mesa, 2020). OECD (2020) and Sutcliffe (2020) has identified a variety of impacts on retirement savings:

- A fall in the value of assets in retirement savings accounts;
- An increase in liabilities from falling interest rates in retirement savings arrangements with retirement income promises;
- Less ability of individuals to contribute to pension plans from individuals as they face lower wages or job loss, and less ability of employers to pay for contributions due to financial distress;
- Operational disruptions as a result of working remotely;

- Cyber-attacks, frauds, and scams directed to individuals, regulators, supervisors, and providers of retirement savings schemes;
- A tendency for individuals to prioritize present needs over long-term interest.

Additionally, in the case of a defined benefit system, the death of many pensioners could, on the one hand, imply a reduction in pension liabilities, but on the other hand, an increase in new survivor pensions given to the beneficiaries of the pensioner (Sutcliffe, 2020). It is still unclear which effect would dominate.

According to Grimm and Holzhausen (2022), the pension systems of most Latin American countries ranked in the bottom third in the international comparison of their long-term adequacy and sustainability in the last Allianz Global Pension Report. This is because of the impact of COVID-19 on labor markets and the implementation of policies that led to depleting or reducing the pension funds (pension fund withdrawal policies).

The Latin American Case

Latin American countries implemented a variety of policies to contain the effects on the labor market and pension systems, such as unemployment insurance programs, advance payment of future transfers, extension of contributions to the pension systems, additional payments (e.g., cash transfers programs, grants programs, and increase of minimum wage), financing companies, tax reduction and extraordinary withdrawals of funds. It seems reasonable that instruments designed to protect employment and sources of income should be prioritized for deployment and that instruments designed for other objectives, such as mandatory retirement savings, are used as a last resort in the absence of alternatives (Bosch et al., 2020).

Nevertheless, as Inter-American Development Bank et al. (2016) highlights, few households in Latin America have savings to smooth their consumption to face an income

shock. In that way, individuals have few sources of savings, yet some could have retirement savings in pension funds or in other forms. A withdrawal policy directly undermines pension adequacy, and only those who have a formal job will be able to access these retirements.[1]

Lorca (2021) quantifies the effects of Chile's withdrawal policy on self-funded pension benefits and government supplements. The policy results in an average withdrawal of 22.9% from individual pension balances, which represents a drop of 8% in the whole pension fund of the country. Furthermore, Madeira (2022) uses counterfactual simulations to show that pension withdrawals could decrease the future savings rate by 1.7% in Chile. On the other hand, Bosch et al. (2020) simulate with stylized scenarios the expected changes in replacement rates caused by the withdrawal policies in Peru. For example, an individual withdrawing 25% of their pension balances at age 40 (and assuming a real interest rate of 3.5) could experience a reduction in her replacement rate by about 13.1%. It is also worth mentioning that many people who withdrew pension funds in the first half of 2020 realized temporary losses due to the stock market downturn around the onset of the pandemic (Grimm and Holzhausen, 2022).

The negative effects of the pandemic on the labor market and pension systems will last in the long run, especially in countries that allowed various fund withdrawals. There could be three negative consequences: higher pension inequality, higher prevalence of old-age poverty, and a higher share of old-age individuals depending on tax-financed welfare programs (Grimm and Holzhausen, 2022). In this way, "the demands on pension schemes will make the sustainability of pension systems (adequate coverage, adequacy of benefits and financial sustainability), understood as an integral concept, one of the main social and fiscal challenges in Latin America" (Mesa, 2 020). As highlighted by

[1]The Peruvian experience of Law 29426, "Regimen Especial de Jubilación Anticipada para Desempleados," showed that there is a high probability that most people withdraw their pension savings even if they do not need them ((Altamirano et al., 2019)).

OECD (2020), pension policies should have a better balance between short-term and long-term needs without compromising the sustainability of pension arrangements.

3 Institutional and Demographic Background

3.1 The Peruvian Pension System

The Peruvian pension system has two main schemes, which represent two alternative options for individuals. On the one hand, the Private Pension System (SPP) is a defined contribution (DC) based on individual retirement accounts, set up in 1992 and implemented in June 1993. The pension fund managers (the so-called AFPs) receive the contributions and invest individual savings in supervised and regulated investments. There are currently four AFPs managing the pension funds: Prima, Integra, Profuturo, and Habitat. On the other hand, the National Pension System (SNP) is a defined benefit (DB), which operates as a PAYG pension system with contributions and additional government transfers sustaining the payment of pensions.

The individual must choose one of these schemes when entering the labor market for the first time. If no choice is made during the first 10 days, the default option is the SPP. Furthermore, individuals can shift from the SNP to the SPP at any time, but the opposite is not possible. Even though the regulation is set up in a way to favor affiliation with the SPP, there is still a considerable number of workers currently affiliated with (and opting for) the SNP.[2]

One of the main differences shaping the preferences for one system over the other is the computation and provision of pension benefits. In the SPP, there is not a minimum pension guarantee, except for a specific cohort group of affiliates (born before 1945)

[2] As of December 2021, there are 8.25 and 4.72 million individuals affiliated with the SPP and SNP, respectively.

who shifted systems in the past. That is, during retirement, the pension savings accumulated by the individual are not topped up with government transfers, as usually occurs with low pension amounts in other pension systems. Moreover, since the reform was implemented in June 2016, the individual can withdraw up to 95.5% of her pension pot (which is untaxed) at retirement, while the remaining 4.5% is transferred to the health insurance system (ESSALUD), which provides health insurance to the retiree. The individual can still buy an annuity in the insurance market and/or withdraw just part of the funds, but the evidence shows an overwhelming preference for withdrawing all the funds.[3] Clearly, this regulation has been harmful to the annuities market and has reduced the ability of individuals to insure against the risk of old age. However, according to Olivera (2020), the massive withdrawal policy has prevented individuals from fully observing the amounts of their pensions, which would very likely be low for most affiliates reaching retirement age. In some ways, this feature has unintentionally made it difficult for individuals to learn how low their pensions actually are, which would reduce the likelihood of social protests such as the "No más AFP" movement in Chile.

In the SNP, benefits are computed following pension rules, including minimum and maximum pension amounts. Until October 2021, the requirement to obtain a pension at the legal retirement age in the SNP was completing 20 years of contributions, meaning that any personal contribution spell just short of these 240 months will not generate a pension. There is no reimbursement of contributions to individuals who did not complete this minimum spell of contributions, which could imply perverse regressive transfers from low-income earners (who are more likely to record fewer contributions) to higher-income earners. However, since November 2021, it is possible to request new "proportional" retirement pensions by showing at least 10 years of contributions. The

[3] As of December 2016, 241,200 individuals aged 62 or more were affiliated with the SPP. However, from then until December 2019, there have been 4,036 new retirement pensions. This means that only 1.7% of the individuals eligible for retirement received a pension since the reform allowed large pension savings withdrawals.

maximum and minimum retirement pensions in the SNP are 893 and 500 Soles (equivalent to 96% and 54% of minimum wage) per month when the individual is able to prove at least 20 years of contributions. The pension is 350 Soles if the individual has contributed at least 15 years and less than 20 years, and the amount is 250 Soles if the individual has contributed at least 10 years and less than 15 years. This policy eases the problem of regressive contributions and the low number of pensioners, which have been long-standing criticisms of the SNP.

In both schemes, the retirement age is 65, and the contributions are computed on labor earnings that are at least equal to the minimum wage (930 Soles). The contribution rates and fees are different in these schemes, yet they both consider 12 payments per year, meaning that the two salary bonuses (included in the labor legislation) are excluded from the income base upon which the pension contributions are computed. The total contribution rate in the SNP is 13%. In the SPP, the contribution rate feeding into the individual pension accounts is 10% of the total salary; and the insurance premium fee is 1.74% of the salary (up to a cap in the salary equivalent to 10,535 Soles). The average pension fund management fee in the SPP is 1.58% of the salary for the affiliates who are in the load factor fee scheme, and it is 1.12% of the balance for the affiliates who are in the balance fee scheme.[4] Taking into account all contributions and fees on wages, the affiliates of both systems contribute roughly similar percentages, that is, 13% in the SNP and 11.9%-13.3% in the SPP.

Employees from the formal sector who are on payroll are obligated to contribute to pensions, while the contribution is voluntary for self-employed and other workers. Given the considerable size of Peru's informal labor market, it is not surprising to observe low coverage and contribution frequency in the pension system. According to figures from

[4]In addition to the balance fee, the affiliates who are in this scheme have to pay a decreasing load factor fee from 2013 until 2023. On average, this additional fee is 0.17% of the salary as of December 2021.

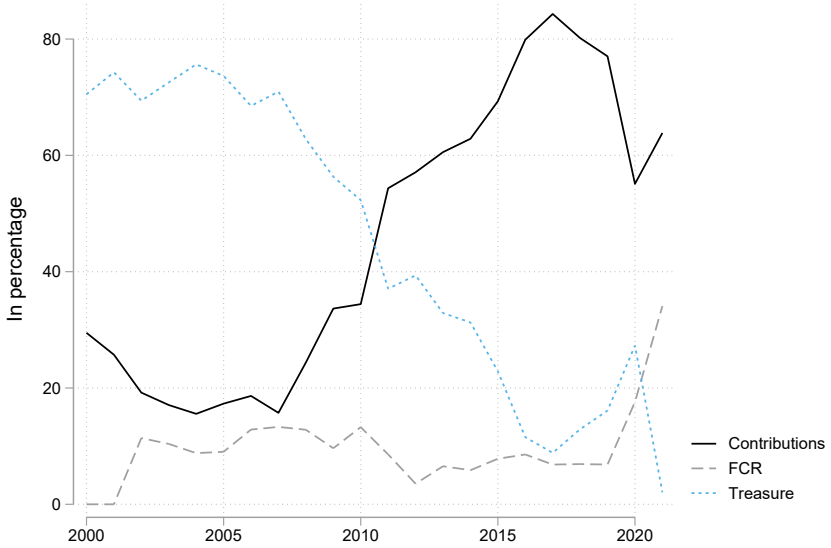
2021, about 47% and 27% of the labor force were enrolled in the SPP and SNP, respectively. However, when we only consider regular contributors, we observe respective shares of 20% and 8% in the SPP and SNP.

A key difference between the two pension schemes is their financial sustainability. By definition, SPP pensions do not require government support, but this does not mean that the scheme's implementation in 1993 and the transition to that scheme had no costs. The primary public expenditures come in the form of "Recognition Bonds" (Bonos de Reconocimiento), which imply a promised public transfer to the individuals who shifted from the public pension system to the private system. This bond is awarded around the date of the pension system shift and recognizes part of the contributions made to the public system. According to our own computations, the accumulated fiscal cost of the Recognition Bonds is about 3.1% of accumulated GDP between 1995 and 2020.

Contrary to the SPP, the SNP needs the contributions of current affiliates to pay current pensions. To this end, the government also transfers resources to help to finance these payments. In addition, this system has a reserve fund ("Fondo Consolidado de Reserva," FCR) which also supplies resources to cover pension expenditures. Figure 1 shows the evolution of these payments in the SNP. In 2020, 64% of the payroll was financed with contributions, 34% with the FCR, and the remaining 2% with Treasury transfers.

The SPP and SNP are the largest pension systems, but there are other two schemes worth mentioning. One of these is the Law 20530 pension scheme, which cannot receive new affiliates, but the government is still financing it. This system was seriously unbalanced due to low contribution rates and the automatic update of pensions mirroring the salary increases in occupations equivalent to the last one held by the retiree. The other is the pension scheme for military and police forces (Caja de Pensiones Militar Policial, CPMP). According to recent figures, the pension payments in Law 20530 sys-

Figure 1: Financing Sources in SNP, 2000 - 2021
(In percentage)



Note: This figure is computed with data provided by ONP.

tem amounted to 4,466 millions Soles in 2021, while the revenues from the affiliates totaled 11 million Soles, evidencing a severe degree of underfunding.[5] In addition, the actuarial liability is about 37,133 million Soles (4.3% of GDP).[6].

The CPMP is also problematic, as the pension payments largely exceed the contributions. Although reform in 2012 established new rules seeking to improve the financial sustainability of the CMP, there is a significant gap between contributions and pension payments (see Table 2).[7]

[5]These figures are estimated from administrative records of pensioners and affiliates as of December 2021. There are 216,717 pensioners with an average monthly pension of 1,362 Soles and 1,993 affiliates with an average monthly salary of 3,530.

[6]The actuarial pension reserve is estimated at 36,063 million Soles and the non-pension reserve at 1,050 million Soles.

[7]The CPMP includes the old scheme DL 19846 (closed to new entrants) and the new DL 1133, implemented in 2012. In 2020, the first tier had 107,614 contributors, 78,727 pensioners, 408 millions Soles in revenues, and 2,709 millions Soles in pension expenditures. The low level of the assets with respect to the actuarial reserves, which is only 1.2%, captures the severe underfunding in this scheme (equal to 13.6% of GDP). In the DL 1133 scheme, there are 83,878 contributors totaling 284 million Soles in revenues,

Finally, Peru has a non-contributory pension scheme, which is targeted at the individuals aged 65 and over who have no other pensions and live in households classified as extremely poor by the official household targeting system (SISFOH). The program, called Pension 65, was introduced in October 2011 and is administered by the Ministry of Development and Social Inclusion of Peru (MIDIS). With a population of around 570 thousand recipients (19% of people aged 65 and over) at the cost of 0.10% of GDP, this is the second-largest social program in Peru, behind the conditional cash transfer program "Juntos." In monthly terms, the transfer amounts to 125 Soles (individuals receive the payments every two months) which is equivalent to 66% of the extreme poverty line in Peru in 2020 and about USD 33. Table 2 summarizes the main indicators of the pension systems in Peru.

but there are not yet pensioners. For this tier, assets represent 37.7% of the actuarial reserve.

Table 2: Main statistics of pension schemes in Peru (2021)

Variables	SPP		SNP		Pension 65		CPMP		Law 20530	
	Million S/	% GDP	Million S/	% GDP	Million S/	% GDP	Million S/	% GDP	Million S/	% GDP
Contributions revenues	13,914	1.6	3,560	0.41	-	-	692	0.08	11	0.00
Pension payroll	-	-	5,575	0.64	838	0.1	2,709	0.31	4,466	0.51
Government transfers	-	-	115	0.01	-	-	2,306	0.27	-	-
Reserves fund	-	-	136,354	15.67	-	-	N.A.	-	37,133	4.27
SPP pension fund	131,918	15.13	-	-	-	-	-	-	-	-
Population										
Pensioners	84,652	-	590,968	-	568,599	-	78,727	-	216,717	-
Affiliates	8,251,977	-	4,716,085	-	-	-	191,492	-	-	-
Contributors	3,601,430	-	1,437,799	-	-	-	191.492	-	1,993	-
Contributors (% affiliates)	44%	-	30%	-	-	-	100%	-	-	-
Affiliates (% labour force)	51%	-	29%	-	-	-	1%	-	-	-
Contributors (% labour force)	22%	-	9%	-	-	-	1%	-	0.01%	-

3.2 Demographic Structure and Trends

This section examines these trends in Peru, starting with the evolution of the fertility rate and improvements in life expectancy. We also analyze changes in the dependency rate and the potential implications of ageing on the pension systems.

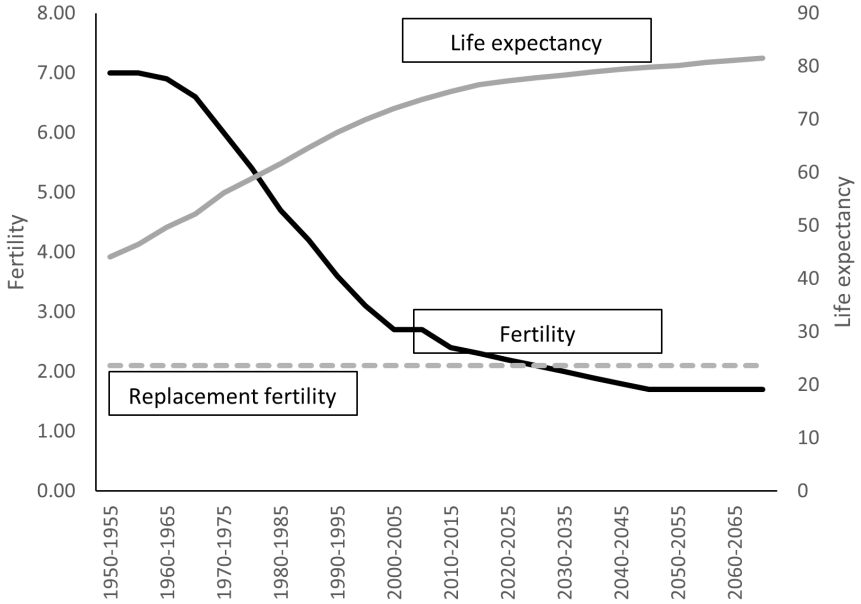
The fertility rate, defined as the average number of newborns to females of reproductive age, has decreased since records have been available, and it is projected to reach a replacement value by 2030 (see Figure 2).[8]. The decrease could be explained by variables influencing planning and decision on the number of children. Among these variables are families' social and economic improvement and policies focused on the country's vulnerable sectors, such as rural areas. This contrasts with what was observed between 1950 and 1970, when the global fertility rate remained at seven children per woman and when rural residence, high illiteracy rates, and less diffusion of family planning prevailed in the country (INEI, 2017).

On the other hand, life expectancy at birth has been increasing since 1950 and is expected to continue growing, influenced mainly by reductions in the mortality rate at all ages, at an early age (See Figure 2). Furthermore, according to the OECD (2016), improvements in the standard of living, better nutrition, more water and sanitation facilities, and greater access to quality health services play an essential role in increasing longevity.

As noted in Olivera and Iparraguirre (2019), taken together, the downward trend in the fertility rate and higher life expectancy at birth suggest that the country is undergoing an ageing phenomenon. In this way, a change in the population's age structure implies a more significant economic burden for the population between 15 and 64 years of age

[8]The replacement fertility ratio is defined as 2.1. It is the fertility rate's value to maintain the population size.

Figure 2: Total Fertility Rate and Life Expectancy at Birth (1950-1965)



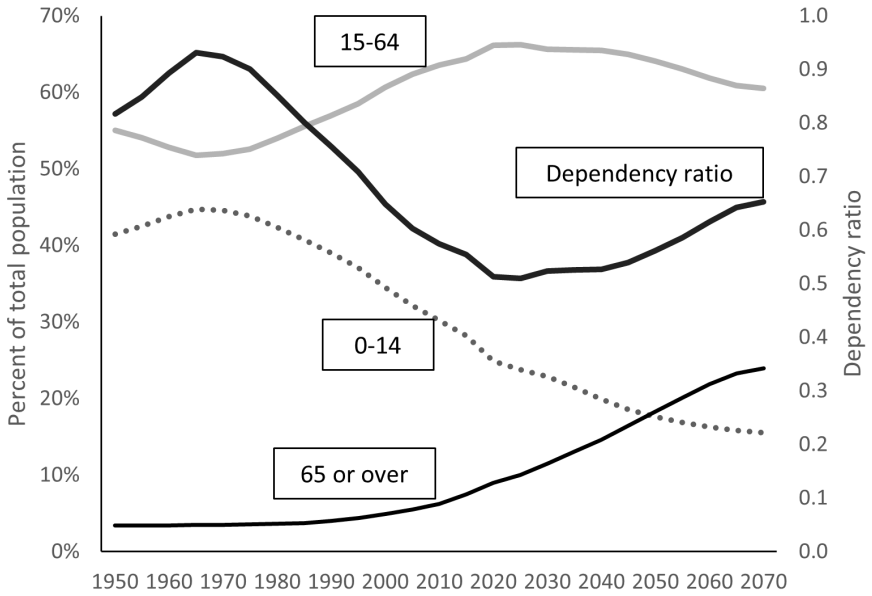
Note: This figure is computed with data drawn from Peru's Institute of Statistics (INEI).

in the coming decades. As shown in Figure 3, the number of the most productive people (15 to 64 years old) grows steadily from 1970 to 2025; from that year onwards, dependency, measured as the population under 15 along with the population over 64, divided by the population from 15 to 64, begins its increase, with which it can be concluded that the demographic bonus ends in that year. This result is consistent with what Olivera and Iparraguirre (2019) obtained using the Economic Dependency Rate (EDR) as an indicator, i.e., that the turning point is the year 2022[9]. It is worth noting that the EDR considers each age's economic contributions, differentiating whether they are net consumers or net producers. According to the authors, the most significant economic dependency was recorded in 1972, then decreased until it reached its minimum value in 2022. From that year on, the rate of growth of the consumption of the dependent

[9]Formally the EDR is defined as $EDR = \frac{\Sigma c(x)p(x)}{\Sigma y(x)p(x)}$, where $y(x)$ y $c(x)$ represent labor income and consumption per capita at age x, and $p(x)$ is the number of individuals at the age x.

population (elderly adults and children) will be greater than the rate of income growth generated by people of working age.

Figure 3: Population by Age Group and Dependency Ratio
(1950-1970)



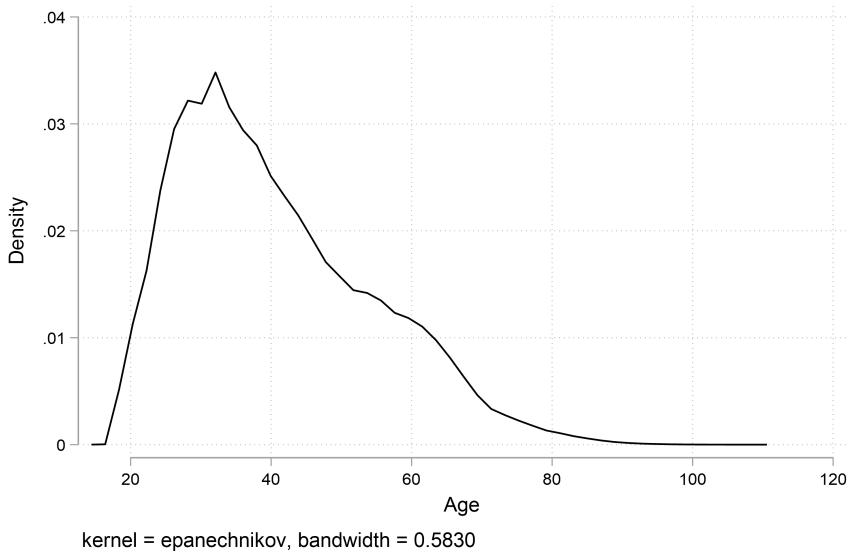
Note: This figure is computed with data drawn from Peru's Institute of Statistics (INEI).

One of the key challenges of population ageing is the demand for greater resources to financial pensions, which is established by Mesa (2020) as one of the main factors that determine public spending on pensions. The author finds a correlation between spending and ageing in a sample of 17 Latin American countries. In this way, the countries classified as having "advanced" or "moderate advanced" ageing and with the highest level of coverage are those with the highest spending as a percentage of GDP. In that same analysis, Peru is considered a country with moderate ageing and medium coverage. As a consequence of this, spending on pensions in 2020 represented 1.6% of GDP, with the average in the region being 4.2%. Likewise, as a result of ageing, it is estimated that in 2030, public spending on pensions in the analyzed sample will

represent 5.1% of GDP. This means that the growth rate of pension spending will be higher than the growth of the product.

In the case of the SNP system, in addition to the greater expected survival of its current and future pensioners, it is likely that in approximately 30 years, the number of new pensioners will have its maximum value. This conclusion is supported by the current age distribution of affiliates since the age of active affiliates accumulates more frequently at age 34 (See Figure 4).

Figure 4: Distribution of Affiliates According to Age in 2021



Note: Figure is computed with data provided by the ONP.

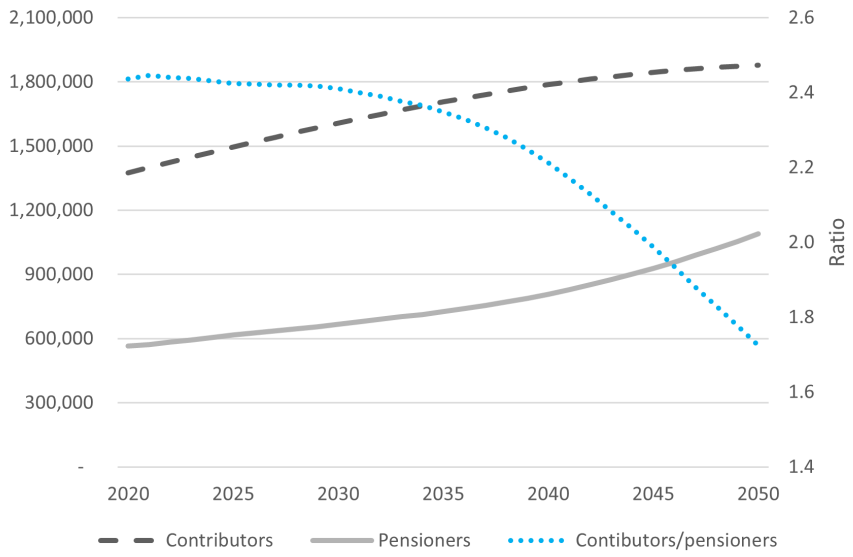
3.3 Macro Pension Projections

According to the IDB projection model, by 2050, the number of pensioners will almost double the quantity observed in 2020, but the number of contributors will grow by around 40%. As a consequence, the ratio of contributors to pensioners will reduce

significantly, going from 2.4 in 2020 to 1.7 in 2050 (See Figure 5).[10]

Considering the previous projections and assuming that both the pension and the average salary grow at a rate of 2% per year, the cost of the payroll and the value of the contributions are estimated by multiplying these average values by the number of people. Figure 6 shows the evolution of these financial flows, which are consistent with the evolution of populations. Thus, while in 2020 the pension payroll is 1.2 times more than what is collected, it is estimated that towards 2050 this gap will widen to 1.8.

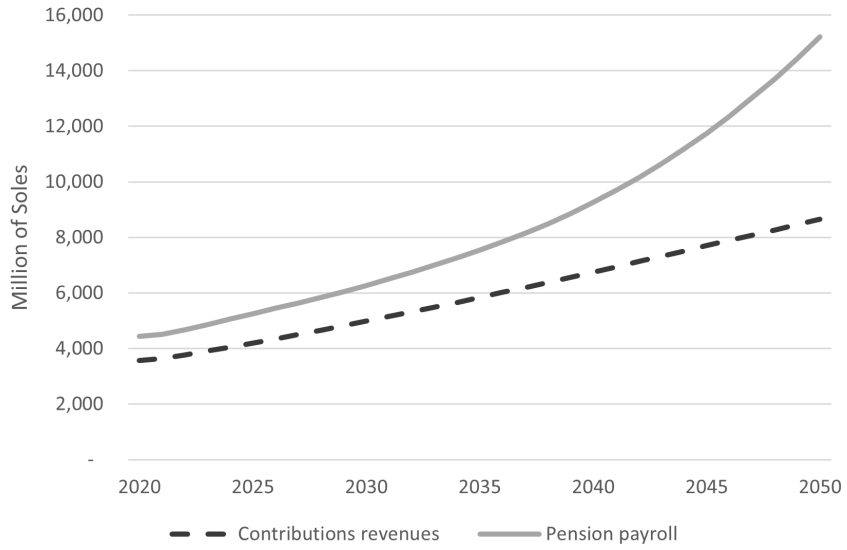
Figure 5: Contributors and Pensioners



Note: Adapted from the IDB's model.

[10]The parameters used in the model can be consulted in Table A–3 in the Appendix.

Figure 6: Revenues and Pension Payroll
(In million Soles at 2020 prices)



Note: Adapted from the IDB's model.

4 Expected Effects of Private Pension Fund Withdrawals

4.1 Description of Withdrawal Policies

Between 2020 and 2021, the Peruvian government and Congress authorized five policies of withdrawals from the pension funds of the affiliates, arguing that they were needed to mitigate the economic effects of the COVID-19 pandemic and boost the Peruvian economy. On April 1, 2020, the Emergency Decree DU 034-2020 authorized withdrawals from pension funds of up to 2,000 Soles for affiliates who did not contribute between September 2019 and February 2020.[11] A second Emergency Decree (DU 038-2020)

[11] 2,000 Soles were equivalent to about USD 526, that is about 2.2 minimum wages.

was enacted on April 13 to allow the withdrawal of up to 2,000 Soles for the affiliates who were placed under a new paid-leave scheme sponsored by the Government (that is, the "Suspensión Perfecta de Labores"regime, known as SPL). Other affiliates who could cash out funds were those who did not contribute on February or on March 2020, and those whose wages were lower than 2,400 Soles and contributed on February or March. In any case, the individuals could not accumulate benefits simultaneously from the two Emergency Decrees.

The Congress of Peru continued with these policies by passing three other withdrawal schemes. On April 6, 2020, the Congress enacted Law 31017 authorizing withdrawals equivalent to 25% of individual pension funds, setting minimum and maximum amounts of 4,300 and 12,900 Soles for the total withdrawal. All affiliates were eligible for this third policy, regardless of other governmental policies. The fourth policy, passed on November 4, 2020 (Law 31068), authorized withdrawals of up to 17,200 Soles for the affiliates with no contributions made between October 2019 and September 2020. That Law also allowed withdrawals of up to 4,300 Soles for the affiliates who did not contribute on October 2020. Finally, the fifth policy (Law 31192) was passed by the Congress on May 6, 2021, allowing withdrawals of up to 17,600 Soles for all affiliates with no distinction.

A recent report by Peru's Superintendent of Banking, Insurance, and Pension Funds (SBS, 2022) details the main characteristics of the withdrawal policies. In total, these policies represent a drain of 65,942 million Soles, implying 5,691,473 affiliates partially or totally withdrawing their funds (39% were women and 61% were men). The total amount withdrawn as of December 2021 represents about 7.6% of the estimated GDP in 2021.

Table 3 shows the withdrawal amounts for each policy. The Emergency Decree DU 034-2020 involved a total amount of 2,966 million Soles, representing 4.5% of the total

Table 3: Distribution of Withdrawals by Policy

Policies:	Affiliates		Million Soles	
	Number	**%**	**Amount**	**%**
(1) DU 34-2020	1,935,164	34.0	2,966	4.5
(2) DU 38-2020	1,305,719	22.9	2,094	3.2
(3) Law 31017	3,775,066	66.3	19,647	29.8
(4) Law 31068	1,256,676	22.1	9,016	13.7
(5) Law 31192	3,218,211	56.5	32,219	48.9
Total	5,691,478	100.0	65,942	100.0

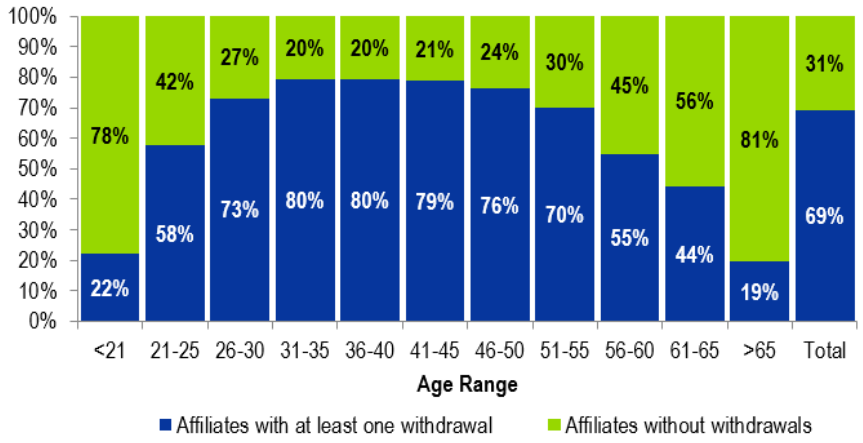
Withdrawals:	Affiliates		Million Soles		Average
	Number	**%**	**Amount**	**%**	**(Soles)**
less than 2,000 Soles	1,500,484	26.4	1,277	1.9	851
2,000-5,000	1,091,777	19.2	3,647	5.5	3,341
5,000-10,000	725,244	12.7	5,254	8.0	7,245
10,000-20,000	942,435	16.6	14,061	21.3	14,920
20,000-30,000	768,813	13.5	19,187	29.1	24,956
more than 30,000	662,725	11.6	22,516	34.1	33,975
Total	5,691,478	100.0	65,942	100.0	11,586

Notes: The table use data extracted from (SBS, 2022) and reports data as of December 2021. The withdrawal brackets indicate the accumulated withdrawals for each individual.

withdrawals, while the DU 038-2020 allowed withdrawals of 2,094 million Soles, representing 3.2% of the total. The other three policies promoted by the Congress involved much larger amounts of resources drained from the pension funds. Law 31017 implied a drain of 19,647 million Soles (30%), Law 31068 allowed a withdrawal of 9,016 million Soles (14%), and Law 31192 triggered the largest drain of funds by a total 32,200 million Soles, representing 49% of total withdrawals.

The withdrawals are concentrated in small amounts. For example, 46% of individual withdrawals (accumulated across the five policies) are lower than 5,000 Soles, representing 7.5% of the total amount of withdrawn funds (see bottom panel of Table 3). Likewise, 25% of withdrawals are larger than 20,000 Soles, explaining 63% of the total amount drained from the pension funds.

Figure 7: Affiliates by Withdrawal Status and Age Group
(In percentage)

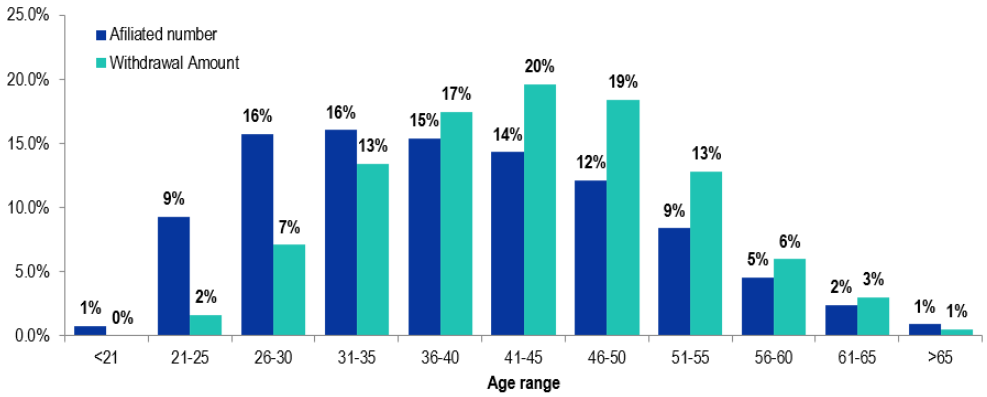


Notes: The figure is drawn from SBS (2022) and plots data as of December 2021.

Moreover, 69% of affiliates withdrew savings from their accounts at least once, and the 31% remaining did not withdraw (see Figure 7). Of the affiliates who withdrew, 35% made one withdrawal, 37% made two withdrawals, 19% made three withdrawals, and 9% made four withdrawals. The withdrawn funds of older affiliates are over-represented

in the distribution of withdrawal amounts, which is explained by the fact that older affiliates have contributed and capitalized more resources in their pension funds (see Figure 8).

Figure 8: Distribution of Affiliates with Withdrawals and Their Amounts by Age Group
(In percentage)



Notes: The figure is drawn from SBS (2022) and plots data as of December 2021.

It is not only actions of the Government and Congress that have effects on the pension funds. The economic crisis and recession triggered by the pandemic and social distancing measures have also impacted the ability of affiliates to keep up their pension contributions.[12] We could observe the potential impact of the COVID-19 crisis by exploring how pension contributions have changed around the period of the pandemic's outbreak. Figure 9 plots the contribution density between January 2018 and December 2021 of various age groups and by gender. As expected, the drop in this indicator was sharp between the first and second quarters of 2020. This fall has been around 30 and 40 percentage points and has affected all age groups and genders.[13] It is worth noting that,

[12]Figures B-10 and B-11 show the decrease of pension contribution density for May 2020 compared to its values in December 2019 and October 2021 by region. It is observed that all regions were affected by the economic crisis and the pandemic.

[13]Figures B-6 and B-8 show the gender gap and gender ratio of pension contribution density for May

even if a drop in contributions reduces pension wealth, its magnitude is perhaps much lower than the impact of withdrawals. For example, four months of no contributions at the average wage in the SPP implies a drop of 915 Soles, but the average total amount withdrawn across all withdrawal policies is 11,586 Soles–13 times higher.

2020 compared to its values in December 2019 and October 2021 by region. The gender gap in December 2019 and October 2021 was not very wide, although it is observed that the gender gap is greater in the coastal regions. By 2020, however, the gender gap increased in more regions of Peru.

Figure 9: Pension Contribution Density by Age Group and Gender

Notes: The figures are computed with data extracted from statistical bulletins of SBS (2018-2021)

4.2 Simulation of the Effects of Withdrawals

In this section, we assess the potential effects of the withdrawal policies on the level of expected pension balances. We do not use expected pensions as our main outcome because the SPP has practically ceased to provide pensions since 2016 due to a regulation abolishing the obligation to buy an annuity. Instead, the individuals can cash out until 95.5% of their pension funds at retirement age. However, by construction, the final pension balance is a measure directly linked with the level of a pension (which is equal to the pension balance divided by the annuity price).

For our simulations, we use a sample of the non-retired SPP population drawn from SBS administrative registers as of December 2019. This is a random sample, stratified and representative of the following strata: 5-year age groups, sex and year of enrollment in the SPP. This unique dataset includes information about individuals' pension balances, management fees, income, and various demographic variables. The sample represents 2% of the total non-retired SPP population. [14] The initial sample size is composed of 138,020 observations, which corresponds to individuals older than 18 and younger than 65. We do not consider individuals older than 65, as this is the legal retirement age. We drop observations with no information on residence region or living abroad (178), those who enrolled in the SPP before 18 years old (160), and those who are allocated in pension risk fund 0 (this type of fund is allocated to people in the process of retiring). The final sample size is 137,651 individuals.

The data include information on age, gender, employment condition, and income at the individual level. The data also include information about the pension account, such as enrollment date in the SPP, AFP firm, last contribution date, pension balance, balance affected and unaffected by the management fees reform, type of fee, type of pension risk fund, contribution density, and information about recognition bonds. This bond is

[14] At a confidence level of 99%, the sample size has a margin of error of 0.34%.

an amount of money, based on past contributions, guaranteed by the government to those who were previously affiliated with the SNP. Olivera (2020) has used these micro-data to study the ex ante effects of the proposed multi-pillar pension reform, while Bernal and Olivera (2020) have used a similar sample (as of December 2016) to study the effects of the 2013 management pension fees reform.

We simulate the accumulation of pension funds for each individual of the sample from Jan-2020 until reaching retirement. Our sample was taken just before the onset of the pandemic (December 2019), and therefore it does not include information on whether the individual withdrew funds or on the size of each withdrawal. However, the available evidence (e.g., see SBS, 2022) and press releases from SBS during 2020-2021 point out that majority of individuals decided to withdraw the maximum permitted amounts, even fully depleting their pension balance. Thus, we assume in our simulations that the selected and eligible individuals withdrew the maximum possible amount permitted by the policy, taking into account their own eligibility circumstances (pension fund size, wage, and contribution requisites).

As we do not know exactly which individuals decided to take up the withdrawal, we randomly select these people from the universe of affiliates fulfilling the eligibility conditions of a given policy. We use the available information about the number of affiliates withdrawing per age group and policy (in the report by SBS (2022)) to randomly select individuals within each age group in our sample in order to obtain a proportion of affiliates withdrawing within each age group that is similar to the actual one. For the selected individuals, we compute a withdrawal value that is the maximum allowed by the policy and her own pension fund circumstances.

We set monthly periods for our simulation from t=1 to t=564, with t=1 equivalent to January 2020. The five withdrawal policies occurred between t=4 and t=20 with varying time windows to effectively claim and cash out the pension funds. In order to facilitate

the simulations of pension fund accumulation and amounts withdrawn, we assume a unique period to compute the withdrawal for each policy. These periods are t=4 for policy 1; t=5 for policy 2; t=6 for policy 3; t=12 for policy 4; and t=20 for policy 5.

The following equations allow us to compute the future streams of pension balance:

$$S_{t+1} = S_t(1+r_t) + p_{t+1}c_{t+1}w_{t+1} \qquad if\ load\ factor\ fee \tag{1}$$

$$S_{t+1} = S_t^a(1+r_t)(1-a_{t+1}) + S_0(1+r_t) + p_{t+1}c_{t+1}w_{t+1} \qquad if\ mixed\ fee \tag{2}$$

We denote S_t as the pension balance accumulated at period t, w_t is the real monthly salary, r_t is the real monthly return rate of pension funds, c_t is the contribution rate from the salary, and p_t is the probability of making pension contributions, which is proxied by the density of contributions observed for the individuals in our sample. The contribution density is the number of months with contributions over the total number of months participating in the SPP.[15] Depending on the type of fees assigned to individuals, their fund accumulation process will be different. The equation 1 shows the pension balance for the affiliates who pay load factor fees, which are charged on salaries and not on the balance. The equation 2 shows the pension balance for the affiliates who pay mixed fees, that is, paying both load factor fees and balance fees (a_t) over the pension balance accumulated since February 2013, which is the date of the pension fees reform. Thus, S_0 is the pension balance that is not charged with balance fees.[16]

The long-term value of the return rate of pension funds is a key variable affecting the accumulation of pension savings. We assume a real annual interest rate of 4.2%, which is

[15] The individual contribution densities are adjusted to take into account that their registration has been available since May 2006. Moreover, the densities are also adjusted to take into account the lack of contributions between the last date of the contribution and December 2019.

[16] According to this reform, the load factor fee component of the mixed fee regime will gradually reduce down to zero by January 2023, leaving the balance fee as the only fee for people under the mixed fee regime (see more details of this reform in Bernal and Olivera (2020).

the value used by an International Monetary Fund report (see Freudenberg and Toscani, 2019) to estimate future pensions in Peru. Among the arguments mentioned there for the choice of the return rate value are: i) the return rate should be close to real GDP growth in the long term, which is approximately between 3.5% and 4% according to IMF estimations before the COVID-19 pandemic; ii) the return should approach the performance of other pension funds with the best practices, such as the Norwegian Government Pension Fund Global which has a real long-term return of about 3.8%; iii) pension funds around the world have moderated their expectations of return rates as the new normal, that is, lower than what was expected before the financial crisis of 2008; and iv) other studies such as the one by OECD/IDB/World Bank (2014) have used net real rates of return of 3.5%.[17]

Data from the statistics of SBS indicate that the average real return rate observed across monthly periods between 1994 and 2021 is 7.5%, yet this value is 6.1% for the last 5 years, and 4.1% for the last 10 years. The Figure A–12 in the Appendix reports the evolution of the variation in the average SPP share price from December 1994 to December 2022. It clearly shows a declining trend in the long term. The trend indicates that the nominal monthly rate is about 0.5%, i.e., about 6% yearly. Note that in our simulations we include the actual values of return rates observed for each AFP and type of pension between January 2020 and December 2021, while the assumed yearly return rate of 4.2% starts from January 2022 onward.

The individuals also pay an insurance premium to private firms, but we do not include it in the simulation of pension balances as this is charged on the salary independently

[17] the Inter-American Development Bank's report (see Altamirano et al., 2018) estimates pensions and replacement rates for countries in Latin America and the Caribbean by using a real rate of return of 3.5%. Studies by Altamirano et al. (2019), OECD (2019) and Álvarez et al. (2020), dedicated to studying the Peruvian case, also use a real rate of 3.5% net of managing fees, yet the first study includes a sensitivity analysis with more optimistic rates of 5.5% and 8%, while the study by Freudenberg and Toscani (2019) includes a sensitivity analysis with a rate of 5.2%.

of pension contributions. The relevant fees for our simulation are the ones charged over the balance. We use the actual values of balance fees between January 2020 and May 2022, and then we assume the values of May 2022 for the next periods. These values are 1.25 % for Habitat, 0.79 % for Integra, 1.25 % for Prima, and 1.20 % for Profuturo.

The initial value of the salary is the last salary recorded in the sample. In case this does not correspond to the date of the sample draw (December 2019), we update the last recorded salary by inflation and salary premiums per cohort (5-year groups), sex, and contribution behavior; see Table A–1 in the Appendix reporting these values. We also impute salaries for 7.3% of individuals in the sample who do not have this information.[18] We assume in the simulations that the salaries grow according to the previously estimated premiums.

In the simulation of equations 1 and 2, we also evaluate if the eligible individual has been randomly selected to cash out the funds involved in each policy at the periods in which the withdrawal must be computed (t = 4, 5, 6, 12, and 20). Equations 3 to 7 indicate that the withdrawal amount W_j is subtracted from the balance at the evaluation periods for each policy j. This amount is computed according to the rules of the policy and the available funds in the balance of the individual. The indicator functions I_j describe whether a given individual withdraws or not under policy j, that is I_j takes value one if $P_j = 1$, and zero otherwise. Note that policies 1 and 2 are mutually exclusive, while policies 3 and 5 are open for everyone. Thus, an individual could be eligible for more than one policy and make various withdrawals.[19]

[18]The salary premiums are estimated with the median salaries by sex, birth cohorts, and contribution behavior (i.e., whether the individual contributed in the sample year or not) in samples taken in 2015 (n=93,057), 2016 (n=97,562), and 2019 (n=117,941). The imputation uses the predicted values from the regression of the logarithm of salary against sex, recognition bond, decile of contribution density, type of administrative fee, AFP, type of pension risk fund, affiliation duration in the SPP, percentile of pension balance, age, age squared, and region.

[19]Note that the Recognition Bonds cannot be paid out as part of the withdrawals; these bonds are only paid by the Government when the individual retires or turns 65. Thus, the withdrawal policies do not produce major disturbances in fiscal expenditures.

$$S_{t+1} = S_t - I_1(P_1 = 1)W_1 \qquad evaluate\,at\,t = 4 \tag{3}$$

$$S_{t+1} = S_t - I_2(P_2 = 1)W_2 \qquad evaluate\,at\,t = 5 \tag{4}$$

$$S_{t+1} = S_t - I_3(P_3 = 1)W_3 \qquad evaluate\,at\,t = 6 \tag{5}$$

$$S_{t+1} = S_t - I_4(P_4 = 1)W_4 \qquad evaluate\,at\,t = 12 \tag{6}$$

$$S_{t+1} = S_t - I_5(P_5 = 1)W_5 \qquad evaluate\,at\,t = 20 \tag{7}$$

The baseline final balance S_b is computed solely with equations 1 and 2; that is, we obtain the balance assuming that no withdrawals take place. The estimated final balance after the policies, S_p, is computed with equations 1-7. We replicate 100 times the procedure of computing S_p and take averages of the results for each individual.[20] This could help to attenuate possible bias arising from our random selection draw of withdrawing individuals. We estimate the final effect of the policies as the percentage change in pension balances due to the policies (see equation 8).

$$D = 100 \times (S_b - S_p)/S_b \tag{8}$$

Table 4 reports our overall simulations. We see that, in general, our results on the total amount of withdrawals and number of individuals cashing out funds are very close to the actual ones. For policies 1-4, the difference between the simulated and actual values of the withdrawn funds is about 4.1%-5.4%, yet for policy 5 this difference is 16.1%. Overall, the difference between the simulated and actual values of the total amount of funds implied by the five policies is 7.4%, and the difference is 2.7% for the number of

[20] Figure A–13 in the Appendix shows the total withdrawn amounts computed in all the 100 simulations for each policy and indicates low variation across the simulations.

affiliates cashing out funds.

Our estimations indicate that the withdrawal policies will reduce the expected pension balances at retirement by 40% (40.25% on average, with 95% confidence intervals of 40.09 and 40.42). We can also obtain different variations of D for each policy. Policy 1 reduces pension savings by 10.5%, and policy 2 adds 5% of loss. Thus, the two policies designed by the Government account for 15.5% of the loss in future pension funds. Policy 3 adds 11.3% of loss, policy 4 adds 4.6%, and policy 5 adds 8.8%. This implies that the withdrawal policies passed by Congress increased the losses from 15.5% to 40.3% (i.e., 24.7 percentage points). The next section deals with the assessment of these effects across various groups of individuals.

Table 4: Overall Results of Simulations

Policy	**Total amount of withdrawals (millions of Soles)**		**Number of affiliates with at least one withdrawal**	
	Actual	**Simulation**	**Actual**	**Simulation**
(1) DU 34-2020	2,966	2,806	1,910,843	1,898,050
(2) DU 38-2020	2,094	2,140	1,296,323	1,296,050
(3) Law 31017	19,647	19,712	3,746,482	3,746,350
(4) Law 31068	9,016	9,389	1,250,250	1,250,050
(5) Law 31192	32,219	27,029	3,206,818	3,206,550
Total	65,942	61,076	5,636,965	5,787,726

Notes: the actual amounts and number of affiliates correspond to individuals younger than 65.

Table 5 reports our estimates about how many affiliates could have ended with a pension balance equal to zero after each withdrawal policy. The results indicate that the number of pension pots exhausted is considerable. For example, about 2 million affiliates could have a zero pension balance after the last policy (policy 5), which represents 30% of the total number of affiliates. Note that these pension accounts will still grow due to future contributions and capital returns, in particular for younger individuals. However, there is capital that will never be recovered, so that the levels of pension wealth will be lower

in the future. A possible danger in the long run is a stronger demand for social pensions, but it is difficult to determine how strong this demand will be and how much could cost these social pensions. Considering the current level of the social pension in Peru of the "Pension 65" program (125 Soles a month targeted to extremely poor individuals with no pensions) we calculate that 62.5% of SPP affiliates could have saved for a pension of at least the level of the social pension if no withdrawal policies would have been in place, but this percentage drops to 53.3% after the policies.[21]

Table 5: Affiliates with zero pension balance after withdrawing

Policy	Affiliates	Percentage
(1) DU 34-2020	764,172	11.1
(2) DU 38-2020	386,658	5.6
(3) Law 31017	1,380,079	20.1
(4) Law 31068	890,682	12.9
(5) Law 31192	2,0914,88	30.4

Notes: the percentages are computed with respect to the total number of affiliates younger than 65 as of December 2019.

4.3 Heterogeneous Effects of Early Withdrawals

We are interested in assessing the effects of the policy withdrawals across different groups and characteristics of the affiliates. An overall reduction of 40% in the expected pension balance is already large enough to compromise old age security, but this statistic could be larger or lower for some groups. The Table 6 and Figures 10 to 13 report the heterogeneous expected effects of the withdrawal policies.

We observe in Table 6 that the policies reduce more, yet slightly, the pension balances of men than those of women. The pension funds of men drop by 41.1% while the pension

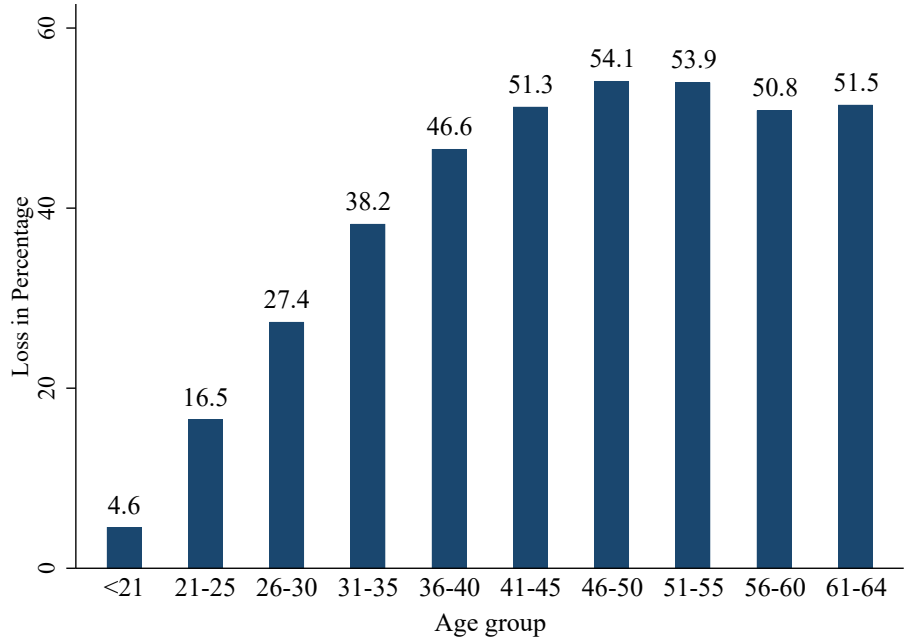
[21] We use SPP's official life tables and an interest rate of 3% to compute annuity prices for women and men at age 65. The annuity price is multiplied by the social pension amount, which results in the value of capital needed to finance a social p ension. The, we compare this amount with the final balance accrued by the individual

Table 6: Loss in Final Pension Balance Due to Withdrawal policies (%)

	Mean	SE	[95% conf. interval]	
Overall	40.25	0.08	40.09	40.42
Men	41.12	0.11	40.91	41.33
Women	38.91	0.13	38.66	39.17
Lima	37.99	0.12	37.75	38.23
Other region	42.12	0.11	41.90	42.34
AFP Habitat	28.58	0.18	28.23	28.93
AFP Integra	44.90	0.15	44.60	45.19
AFP Prima	32.51	0.14	32.23	32.78
AFP Profuturo	53.03	0.17	52.71	53.35
Load factor fee	32.43	0.11	32.22	32.64
Balance fee ("Mixed")	43.14	0.10	42.93	43.34

funds of women drop by 38.9%. When we compare women and men across ages, we observe that larger differences in fund losses (with men losing more than women do) occur at older ages. For example, women lose 0.5% more than men in the age group 20-29, but men lose 3.4% more than women in the group 50-59 (results not reported).

Figure 10: Loss in Final Pension Balance Due to Withdrawal Policies by Age Group (%)

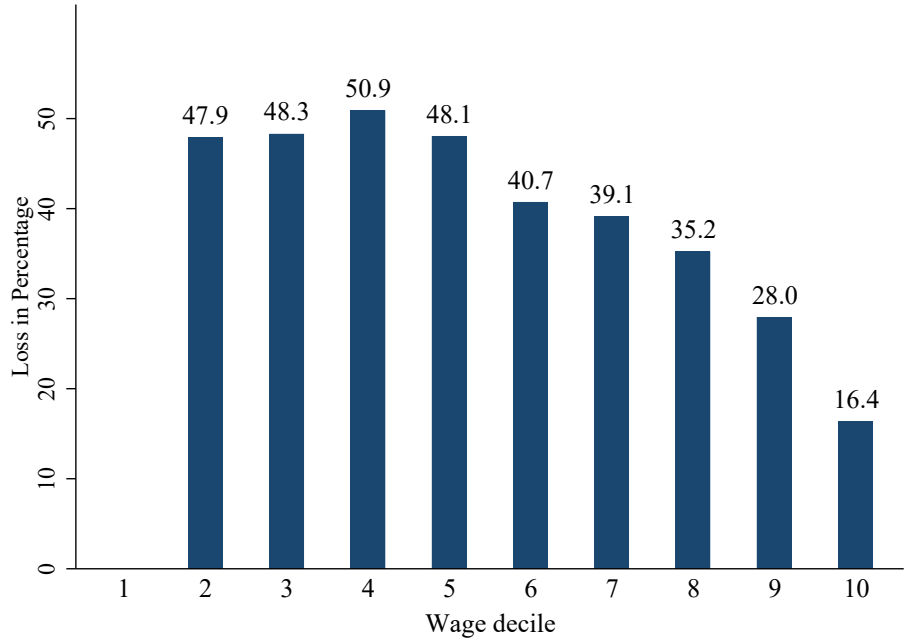


Note: The age groups correspond to the distribution as of December 2019.

Figure 10 shows the impact of the withdrawals by age group. The loss of future funds is larger for older individuals and lower for younger individuals. The loss could be very high at 54.1% for people aged between 46 and 55, but for the 21-25 age group, this is 16.5%. The reason for these results is that older people have, on average, larger pension pots from which they can cash out more funds, and at the same time, they have less time to contribute, capitalize, and rebuild their pension funds. Our results also indicate that people close to retirement will experience a large drop in their expected funds. People aged between 60 and 64 will face a loss of 51.5% in their pension balances. Of course, it is still possible that individuals withdrawing funds could make meaningful and well-informed investments and at least match the returns of the SPP, but anecdotal evidence suggests that the withdrawals increased conspicuous consumption (Olivera, 2021). Fur-

thermore, the hypothesis that most people made savvy investments with the withdrawn funds is difficult to accept in a country where only 28% of its adult population has the correct knowledge of simple financial questions about the interest rate, inflation, and risk diversification (Klapper et al. (2015)).

Figure 11: Loss in Final Pension Balance Due to Withdrawal Policies by Wage Deciles (%)



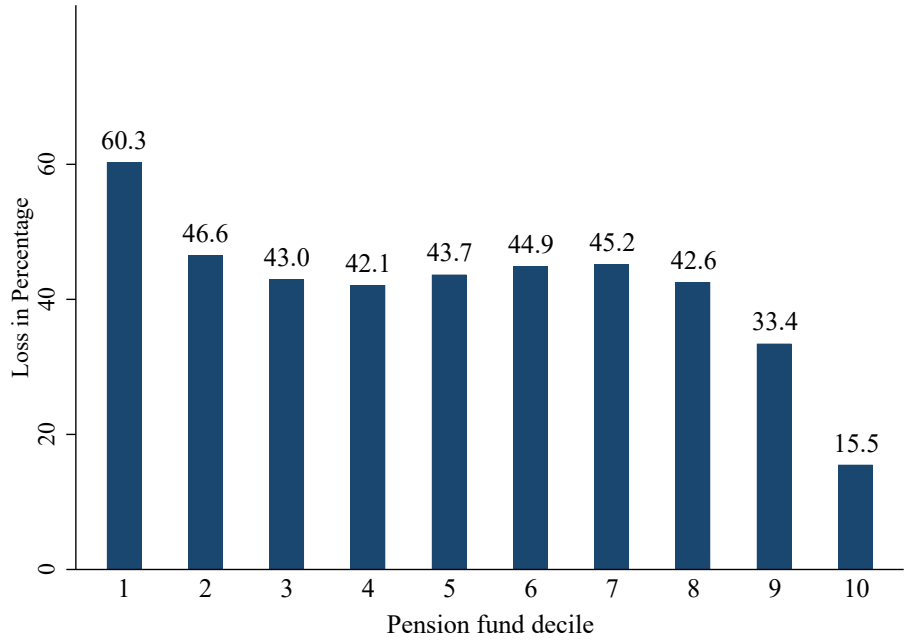
Note: The wage deciles correspond to the distribution as of December 2019.

Figure 11 shows the losses in expected pension balances across the distribution of wages observed at the sampling draw (December, 2019). We observe that the lower deciles (poorer affiliates) experience, in general, larger losses than the higher deciles (richer affiliates), which indicates a clear socioeconomic gradient in the effects of the withdrawals. For example, while the individuals in the poorest decile lose 47.9% of their funds, the individuals of the richest decile lose 16.4%.[22]. This implies a disadvantage

[22]The two first percentiles are merged as there is a large number of individuals earning the minimum

for the poorer affiliates, who more likely will face more difficulties in building enough resources to obtain economic security in old age. The reasons for these results are related to the fact that the policies include maximum limits for the withdrawals, so that the withdrawn funds tend to represent lower shares of the pension pots of richer individuals and larger shares for poorer individuals. In addition, it is likely that poorer affiliates were eager to cash out more frequently and at the maximum possible amounts from their available funds because they are more liquidity constrained than richer affiliates.

Figure 12: Loss in Final Pension Balance Due to Withdrawal Policies by Pension Fund Deciles (%)



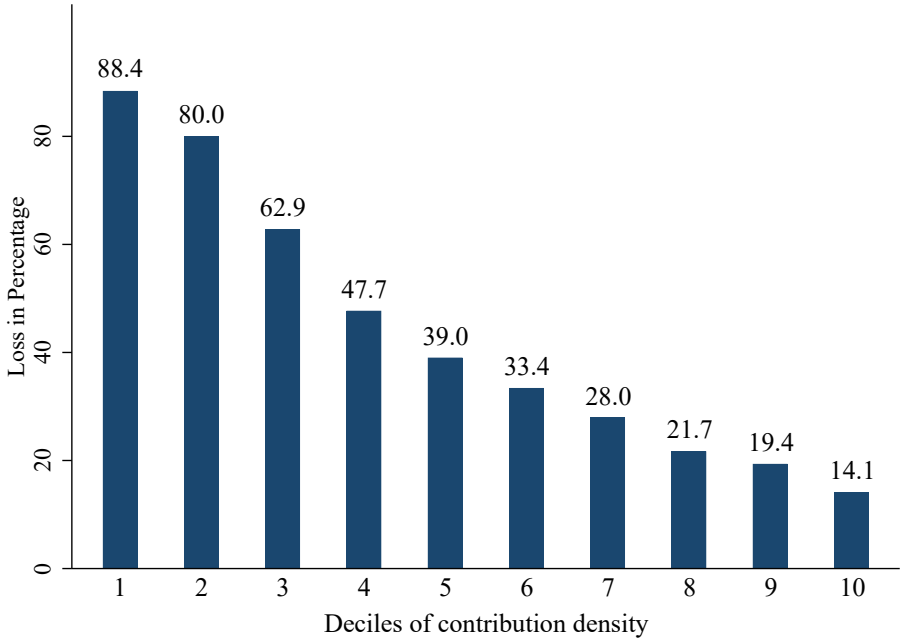
Note: The pension fund deciles correspond to the distribution as of December 2019.

Figure 12 shows a socio-economic gradient in the loss of expected pension funds across the initial distribution of pension funds. The poorest decile of the distribution of pension funds experiences an average loss of about 60.3%, while the richest decile experiences

wage at the bottom of the wage distribution.

a loss of about 15.5%. In between, there are not many differences in the losses of individuals distributed between the third and eighth deciles, the average loss for them being about 43.6%. Therefore, either we use the distribution of pension savings or wages, the impact of the withdrawal policies is stronger among the poorest groups.

Figure 13: Loss in Final Pension Balance Due to Withdrawal Policies by Deciles of Contribution Density (%)



Note: The deciles of contribution densities correspond to the distribution as of December 2019.

The frequency of contributions made by the individual (captured by the individual contribution density indicator) is also a key factor in determining the final value of the pension balance. There are sharp differences in this indicator among the affiliates, also implying a socio-economic gradient. Individuals with more stable jobs and higher wages tend to have higher levels of contribution density. On the contrary, individuals with various and longer spells of unemployment and/or transiting more frequently between the formal and informal sectors are more likely to show low levels of contribution density.

Figure 13 shows the losses of expected pension savings according to the distribution of individual contribution densities. The individuals in the first and second decile of contribution densities will suffer a loss in pension funds of about 88% and 80%, respectively. The reason is that the affiliates with low contribution density will not be able to rebuild their pension savings over their labor lifespan, and therefore the withdrawals will have a sharper impact on their future pension savings. This situation is markedly different from that of individuals who contribute regularly. We observe that individuals in the highest decile of contribution density will lose about 14% of their pension funds, which is much lower than the losses of the individuals in the first three deciles.

Other results are reported in Table 6. People residing in regions other than Lima tend to experience higher losses (42.1% against 38.0%). There are also important differences across AFPs. The affiliates of Profuturo are the ones facing the largest losses at 53.4% on average, while the affiliates of Habitat experience the smallest losses at 28.6% on average. The reason is that Profuturo's affiliates tend to be the oldest, earning lower incomes and showing the lowest levels of contribution density. In contrast, Habitat's affiliates are the youngest in the sample. Thus, the withdrawal policies will hit this AFP harder, which has a relatively more vulnerable population. Finally, a potential unintended effect of the early withdrawals could be that the SNP affiliates may shift to the SPP in order to benefit from the withdrawal policies. However, note that this change does not entail monetary recognition for the contributions made to the SNP, and hence the individual shifting to the SPP will lose all previous contributions and would start with a pension balance equal to zero. Thus, the incentive to transit to the SPP is low. We provide statistical evidence that there are not jumps in the evolution of individuals shifting pension schemes since the onset of the pandemic (see Figure A–15 in the Appendix). On the contrary, we observe a decrease in this flow during 2020.

5 Expected Effects of the Pandemic on Public Pensions

The economic effects of the COVID-19 pandemic – and subsequent policy responses – on the public pension system (SNP) are markedly different from the effects and policies observed in the SPP. On the one hand, the adverse labor market effects triggered by the pandemic can affect the frequency of pension contributions of affiliates of SNP and SPP, and on the other hand, the public policy response was very different. Congress passed a law to allow SNP affiliates to cash out past contributions, as was the case with the withdrawal policies applied to the SPP, but after lengthy political struggles between the Government and the Congress, the Constitutional Court of Peru ruled this law unconstitutional by the end of 2020. Nevertheless, this conflict led to a rethinking of the SNP benefits scheme. In this framework, the Government set up a series of new regulations (e.g., reducing the amount of contributions to pensions) to change the stringent eligibility rules to receive a pension, and then facilitate the allocation of more pensions.

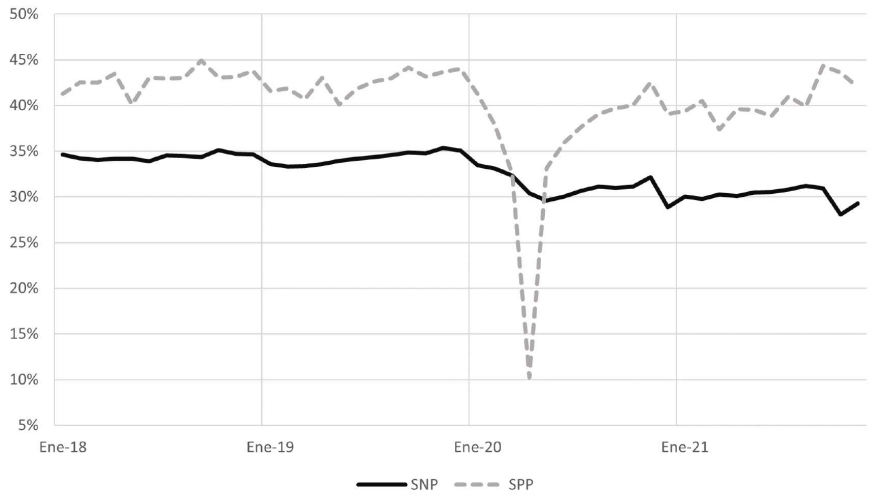
These policies will improve the old age security of the SNP affiliates and simultaneously attenuate the adverse effects of the drop in contributions experienced during the COVID-19 pandemic. In this section, we first assess the potential impact of the pandemic on SNP contributions, and then we evaluate possible effects of the new pension rules on access to future benefits. Finally, we focus on the number of contributions, as this is a crucial determinant of the value and eligibility assessment of benefits of a DB system like the SNP.

5.1 Effects on Contributions

We assess the effects of the pandemic on SNP contributions by exploiting a sample of affiliates from the SNP registers as of December 2021. The sample includes longitudinal data on 78,152 individuals randomly selected from a universe of 4.7 million affiliates.

The sample implies a margin error of 0.46% at a confidence level of 99%. The data allow us to compare the contributions made by the individuals in 2018-2019 with their contributions made in 2020-2021. In this way, we could obtain a possible effect of the pandemic on the frequency of contributions. Figure 14 shows a drop in SNP contributions around the onset of the pandemic, although it was not as sharp as in the case of the SPP (in which the Government permitted affiliates to refrain from making contributions in April 2020).

Figure 14: Pension Contribution Density by Regime



Note: The figures are computed with data provided by ONP and SBS.

We summarize the comparison of contribution behaviour before and after the pandemic using a transition matrix reported in Table 7. We consider three groups of individuals making transitions: individuals with zero contributions, individuals always contributing, and individuals between both categories, meaning sometimes contributing in the analyzed period. The reason for this is that the distribution of contributions is bimodal

(see Figure A–14 in the Appendix).

Table 7: Transitions According to Contribution Density Level

Overall	**Observed in 2020-2021**			
Observed in 2018-2019	**Density=0**	**Between 0 and 1**	**Density=1**	**Total**
Density=0	88.58	11.23	0.19	100.00
Between 0 and 1	36.25	45.95	17.81	100.00
Density=1	0.62	28.20	71.18	100.00

Age in 2021: 30 to 35	**Observed in 2020-2021**			
Observed in 2018-2019	**Density=0**	**Between 0 and 1**	**Density=1**	**Total**
Density=0	84.88	14.97	0.14	100.00
Between 0 and 1	36.21	49.21	14.58	100.00
Density=1	1.01	39.43	59.56	100.00

Age in 2021: 36 to 45	**Observed in 2020-2021**			
Observed in 2018-2019	**Density=0**	**Between 0 and 1**	**Density=1**	**Total**
Density=0	87.64	12.16	0.20	100.00
Between 0 and 1	34.64	47.02	18.34	100.00
Density=1	0.54	31.03	68.43	100.00

Age in 2021: 46 to 55	**Observed in 2020-2021**			
Observed in 2018-2019	**Density=0**	**Between 0 and 1**	**Density=1**	**Total**
Density=0	90.19	9.6	0.21	100.00
Between 0 and 1	37.27	43.74	18.99	100.00
Density=1	0.72	25.79	73.50	100.00

Age in 2021: 56 to 65	**Observed in 2020-2021**			
Observed in 2018-2019	**Density=0**	**Between 0 and 1**	**Density=1**	**Total**
Density=0	93.47	6.34	0.19	100.00
Between 0 and 1	39.50	37.62	22.88	100.00
Density=1	0.43	20.11	79.46	100.00

Note: The table is computed with a sample of SNP registers in December 2021 provided by ONP. Only is considered the population between 30 and 65 years of age.

We observe in Table 7 the transitions between states. Among the main results, we observe a certain persistence because people maintain their level of contributions in most cases, especially those with zero contributions. Thus, of the total individuals who did not make any contributions between 2018 and 2019, 86.5% maintain this condition,

while 75.7% of those who always contributed continued to do so. We observe that this persistence increases with age. For example, among individuals aged 56-65, 92% of those who did not make contributions before the pandemic retained this condition during the pandemic, while 82% of those who always contributed continued to do so.[23]

Another result from the same table is that the most important transition occurs in the group of people who, having some contributions during 2018 and 2019, did not contribute during the pandemic. Thus, 39% of affiliates who contributed in the first period analyzed stopped doing so in the second period.

Table 8: Impact on Contributions (in months)

	Observed in 2020-2021	Simulated in 2020-2021	Gap	SE	[95% conf.	Interval]
Overall	7.63	8.13	-0.51	0.01	-0.51	-0.48
Men	8.27	8.73	-0.46	0.02	-0.46	-0.42
Women	7.15	7.69	-0.54	0.02	-0.54	-0.51
Observed in 2018-2019						
Density=0	0.80	0.05	0.75	0.01	0.75	0.77
Between 0 and 1	9.61	11.02	-1.41	0.03	-1.41	-1.35
Density=1	21.61	23.91	-2.30	0.03	-2.30	-2.24
Age in 2021:						
30 to 34	6.59	7.04	-0.45	0.03	-0.45	-0.39
35 to 40	7.42	7.87	-0.45	0.03	-0.45	-0.40
41 to 45	7.74	8.17	-0.43	0.03	-0.43	-0.36
46 to 50	7.58	8.12	-0.54	0.04	-0.54	-0.47
51 to 55	7.82	8.45	-0.63	0.04	-0.64	-0.56
56 to 60	8.71	9.31	-0.59	0.04	-0.60	-0.52
61 to 65	9.42	10.10	-0.67	0.04	-0.67	-0.59

We can assume that the contribution behavior observed in 2018-2019 for each individ-

[23] We obtain a similar result when we model the probability of contributing. That is, younger people are more likely to change status, and there is more inertia when the pre-pandemic contribution density is zero.

ual is the level that she would have had in 2020-2021 if the pandemic had not occurred. Thus, we can compare the 2018-2019 contribution density values (i.e., the counterfactual) with the actual values observed in 2020-2021 and determine the potential impact of the pandemic on the probability of contributing. Table **??** reports these impacts. Under this strategy, we estimate that affiliates who were always contributing before the pandemic suffered an average drop of 2.2 months of contributions, while those who were contributing less regularly experienced a drop of 1.4 months of contributions. Furthermore, older affiliates tend to experience larger reductions in months of contributions than younger affiliates. There are no significant differences between men and women.

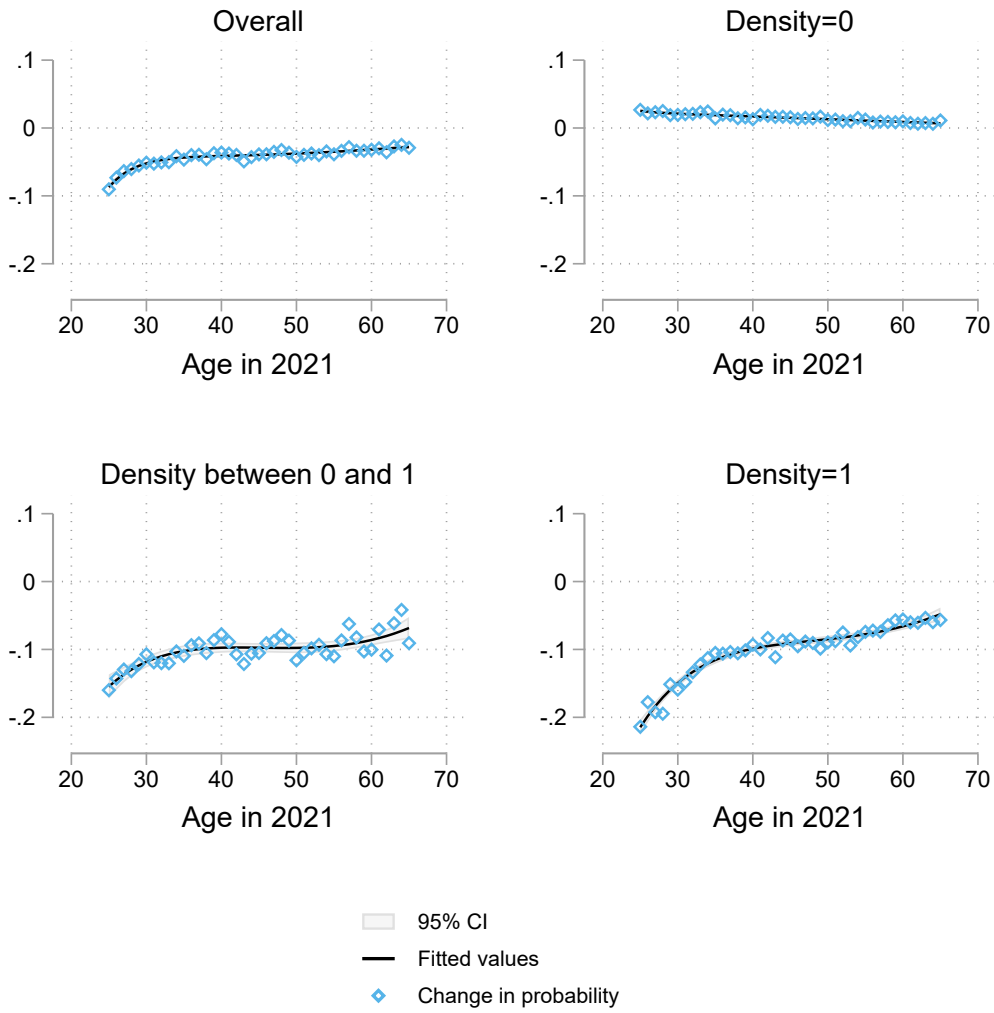
Finally, in Figure 15, we show estimates of the changes in the probability of contributing in the period, from April 2020 onward. For this purpose, we estimate the following linear probability model:

$$y_{it} = \beta_0 + \beta_1 T + \beta_2 Change + \varepsilon_{it} \tag{9}$$

where y_{it} indicates whether or not the individual i contributed in the month t, T is a linear trend, *Change* is a dummy that takes the value one in the period from April 2020 to December 2021, and zero otherwise.

We estimate the effect for each cohort (age in 2021) and according to its contribution density level observed in 2018 and 2019. We found differentiated effects according to the pre-pandemic contribution history and the cohort of the affiliates. Thus, people who made some contribution experienced a reduction in the probability of contributing by an average of 8%, while those who did not contribute anything experienced average growth of 2%. These impacts are more pronounced among the youngest individuals. For example, for people who were 25 years old in 2021 and made some contributions in 2018-2019, the reduction is estimated at 18% (see Figure 15).

Figure 15: Change in Probability According to Density Level Observed in 2018 and 2019



Notes: (1) The figures are computed with a sample of SNP registers provided by ONP. (2) The change in probability of contribution is estimated from a linear probability model that uses information from a random sample of affiliates as of December 2021 and their contribution history since 2018. The estimation model is $y_{it} = \beta_0 + \beta_1 T + \beta_2 Change + \varepsilon_{it}$*, where* y_{it} *indicates whether or not the individual contributed in the month* t*,* T *is a lineal trend, Change is the dummy that takes value one in the period from April 2020 to December 2021, and zero otherwise.*

5.2 Effects of the New pension Policies

In October 2021, the Government established a series of new rules to facilitate the fulfillment of the eligibility conditions for receiving a pension in the SNP. Before this change, the only way to obtain a retirement pension was to prove 20 years of contributions, which also ensures the right to receive a guaranteed minimum pension. The affiliates who could not prove this number of contributions would not receive any pension or any return of contributions, as occurs in pension systems of other countries. The Government launched the so-called proportional pensions: i) a pension equivalent to 50% of the minimum pension for the individuals who contribute between 10 and 15 years (pension of 250 Soles); and ii) a pension equivalent to 70% for those who contribute more than 15 years and less than 20 (pension of 350 Soles). The Government also implemented a sort of pension loan scheme with the goal to permit obtaining at least a minimum pension to the affiliates who contribute more than 17 years and less than 20 (this is Law 31301). The mechanism embedded in this policy is that the "pension loans" can finance the missing contributions and be repaid from future pensions, provided the repayment does not exceed 30% of the pension value.[24]

One way to know the effects of the new policies is to estimate the contributions accumulated at age 65. The available data allow us to know up to 22 years of historical contributions, starting in 2000 and ending in 2021. Since employment histories are incomplete, we need to compute the number of contributions made before 2000 and after 2021 accordingly. To facilitate the estimations, we assume that the contribution density observed five years before the pandemic is the same as the u nobserved. The choice of five years guarantees the same time horizon of contributions for a wide range of ages. Thus, we can estimate the impact of the SNP pension policies on affiliates aged 30-65

[24] In December of 2021, the Government enacted Law 31365 to give a transfer equivalent to 350 soles to SNP pensioners, with the exception of the affiliates who received other COVID-19 related social transfers ("Yanapay Bonus" and "210 Soles Bonus").

years (as of December 2021). Furthermore, we assume that the first contribution in the SNP occurs at age 20.

Table 9 reports the results of our estimations. We find that about 10% of the sample could benefit from the new policies, with no significant differences between men and women. Specifically, 5.5% could receive a pension equivalent to 50% of the minimum pension, 1.8% could receive a pension equal to 70% of the minimum pension, and the remaining 2.6% could receive a pension thanks to the pension loan. Furthermore, the results practically do not change whether we use the simulated contributions for 2020-2021 that we estimated for the exercise of the previous section. Table 10 quantifies the actuarial cost of the new policies. The impact is estimated to be almost 5,900 million Soles, which represents just over 4% of the net actuarial reserve for 2020.[25]

[25]The official net actuarial liability was 134,616 million soles in 2020.

Table 9: Accumulated Contributions at the End of Working Life and New Pension Policies (%)

	Observed and projected contributions			Simulated and projected contributions		
	Female	**Male**	**Total**	**Female**	**Male**	**Total**
No pension (Less than 10 years of contributions)	56.25	60.38	58.64	56.26	60.38	58.64
Receive 50% minimum pension (From 10 to less than 15 years of contributions)	5.22	5.32	5.28	5.11	5.23	5.18
Receive 75% minimum pension (From 15 to less than 17 years of contributions)	1.8	1.73	1.76	1.82	1.73	1.77
Receive 75% minimum pension or pension loans (From 17 to less than 20 years of contributions)	2.51	2.45	2.47	2.46	2.42	2.44
Receive at least the minimum pension (20 or more years of contributions)	34.22	30.11	31.85	34.35	30.23	31.97
Relative total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Total Affiliates	**1,456,560**	**1,990,340**	**3,446,900**	**1,990,340**	**3,446,900**	**3,446,900**

Note: The table is computed with a sample of SNP registers in December 2021 provided by ONP. Only is considered the population between 30 and 65 years of age.

Table 10: Actuarial Cost of New Pension Policies (in millions of soles)

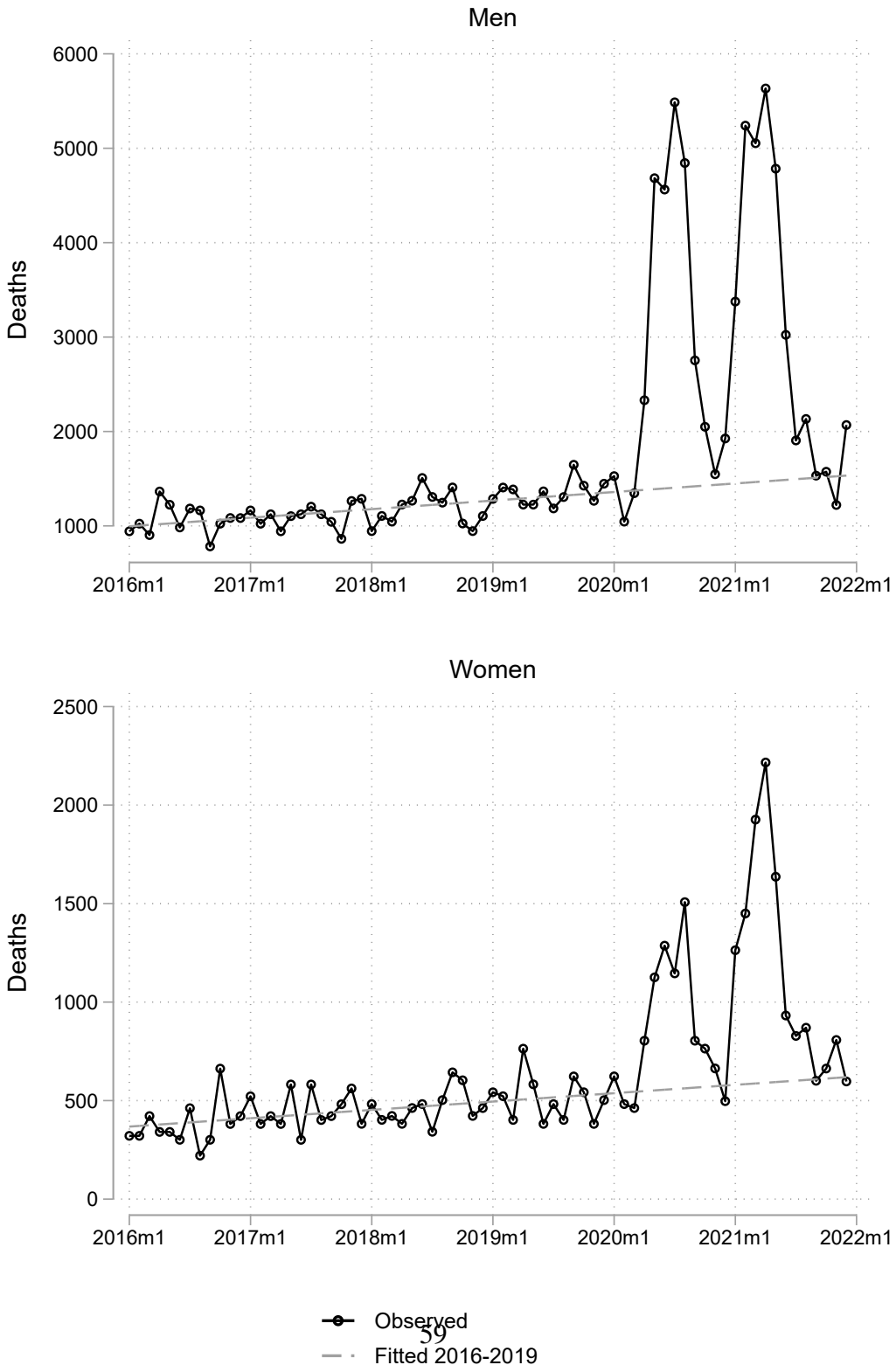
	Female	Male	Total
Receive 50% minimum pension (From 10 to less than 15 years of contributions)	1,156	1,638	2,794
Receive 75% minimum pension (From 15 to less than 17 years of contributions)	547	728	1,275
Receive 75% minimum pension or pension loans) (From 17 to less than 20 years of contributions)	785	1,044	1,829
Total	**2,488**	**3,410**	**5,899**

Note: The figures are computed with a sample of SNP registers provided by ONP.

5.3 Effects of Pandemic Deaths on Pension Liability

This section studies the actuarial impact due to the excess of deaths observed among the SNP affiliates and p ensioners. Figure 16 plots the evolution of deaths among the non-retired population of the SNP, while Figure 17 reports this evolution among the pensioners. Both figures show a sharp increase in the number of deaths during the pandemic period, that increase being more acute among pensioners due to their age composition. During 2016-2019, the estimated deaths of SNP affiliates were on average 1,521 people (18,260 annually), but this average has risen to 3,884 people (46,618 annually) during 2020-2021. This implies a monthly excess of deaths estimated at 2,363 (28,359 annually). Thus, we could attribute that about 56,717 deaths in the SNP were due to the pandemic.

Figure 16: Monthly Deaths of Non-Retired Affiliates in the SNP (2016-2021)



Note: The graph is computed with samples of SNP registers provided by ONP. Deaths include all causes.

Figure 17: Monthly Deaths of Pensioners in the SNP (2016-2021)

Note: The graph is computed with a sample of SNP registers provided by ONP. Deaths include all causes.

We can compute the effect of the pandemic deaths on the SNP financial flows by estimating the contributions that will not be collected and the retirement pensions that will not be entitled. We also need to consider the increase in survival pensions (for the widow or widower) due to the death of married affiliates. We use average observed numbers due to the unavailability of comprehensive micro-data on SNP mortality, as well as the official parameters for computing actuarial liabilities in the SNP, i.e., official life tables and discount rates. Our estimations are summarized in Table 11. We find that pandemic deaths may imply an improvement in the net actuarial liability, driven by a fall in the amount of future retirement pensions (4,302 million Soles). Yet, the amount of widow pensions increase in 1,058 million Soles, while the flow of contributions drop by 87 million Soles. All in all, we estimate a reduction of 3,158 million Soles in the net actuarial liability, which is equivalent to 2.4% of the net actuarial reserve of 2020. It is worth noting that this reduction could finance around half of the net actuarial cost of the new SNP pension benefits studied in the previous section.

5.4 Permanent Effects on SNP Financial Flows Using the IDB Model

In this section we utilize the IDB model of pension projections to obtain macro estimates about the long-tern impact of the COVID-19 pandemic on SNP financial flows. The main mechanism we study is the temporary increase in the probability of death during the pandemic and its permanent effects. The effects resulting from deaths can be modeled via two sources: i) the increase in the probability of dying observed during 2020-2021 (on average 2.6 times higher than previous years), and ii) the permanent effect caused by the increase in deaths. Peru has been one of the countries most severely hit by the pandemic regarding the number of deaths. Excess mortality in Peru was about 250 thousand people (see Table A–2 in the Appendix). The main equations of the IDB

Table 11: Effects of Pandemic Deaths on Actuarial Net Liability (in millions of soles)

	Pensioner	**Widow(er)**	**Contributions**	**Net result**
Countra-factual (A)	***1,600***	***304***	***87***	***1,818***
Male	1,355	304	74	1,585
Female	245	0	12	233
Observed (B)	***0***	***615***	***0***	***615***
Male	0	615	0	615
Female	0	0	0	0
Effect (A)-(B)	***1,600***	***-311***	***87***	***1,203***
Male	1,355	-311	74	970
Female	245	0	12	233
		Passive affiliates		
Countra-factual (A)	***2,702***	***913***		***3,615***
Male	2,092	913		3,005
Female	610	0		610
Observed (B)	***0***	***1,660***		***1,660***
Male	0	1,660		1,660
Female	0	0		0
Effect (A)-(B)	***2,702***	***-747***		***1,955***
Male	2,092	-747		1,345
Female	610	0		610
Overall effect	***4,302***	***-1,058***	***87***	***3,158***

Note: The figures are computed with a sample of SNP registers provided by ONP.

model for our interest are the following[26]:

$$
\begin{aligned}
Vej_x &= Vej_{x-1} - q_{x-1}Vej_{x-1} + NewVej_x && (10)\\
NewVej_x &= \alpha_{x-1}(Afil_{x-1} - q_{x-1}Afil_{x-1} - \gamma_{x-1}Afil_{x-1}) && (11)\\
Afil_x &= Afil_{x-1} + NewAfil_x - q_{x-1}Afil_{x-1} - NewVej_x - NewInv_x && (12)\\
NewAfil_x &= \beta_{x-1}(Pob_{x-1} - Afil_{x-1} - Vej_{x-1} - Inv_{x-1}) && (13)
\end{aligned}
$$

where Vej_x is the number of pensioners of age x, q_x is the probability of dying between x and $x+1$ year of age, $NewVej_x$ is the number of new pensioners at age x, α is the probability of becoming pensioner, γ is the probability of becoming disable, $NewAfil_x$ is the percentage β of the population enrolled in the public pension system, and Pob_x is the population projection at age x at some point in time. In this way, the impacts are modeled by the temporary increase in q_x and the permanent effect on Pob_x in equations (10) to (13).

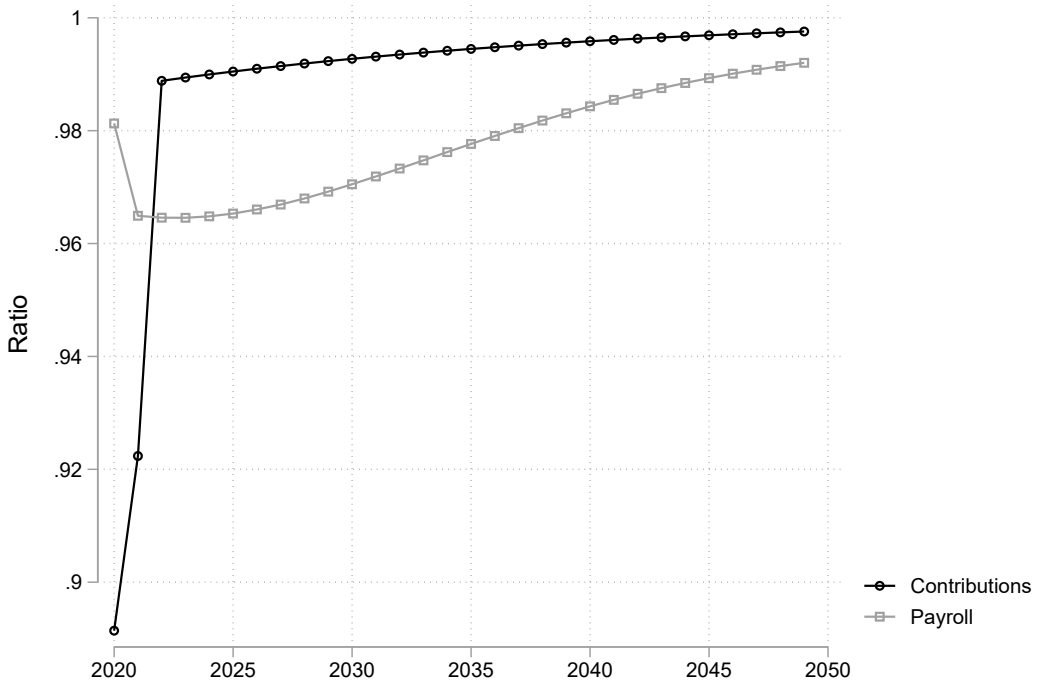
Figure 18 shows the main financial flows in the SNP based on the previous equations. The "Contributions" series indicate the ratio between the contributions collected considering the pandemic and the contributions that had been collected if the pandemic had not existed. The "Payroll" series indicate the ratio between the pension expenses considering the pandemic and the pensions that had been paid if the pandemic had not existed. The impact in the first two years is explained by the increase in the probability of death documented in Figure **??**, and the change observed after is the long-term effect caused by pandemic deaths.

We observe that the higher incidence of deaths in 2020-2021 may have caused a re-

[26]The Appendix provides details on all the equations that allow estimating the number of affiliates and pensioners.

duction in both collected contributions and pension payments. In the first year, the contributions decreased by 10 percentage points (p.p.) due to the pandemic, while the pension payments decreased by 2 p.p. in the first year and almost 4 p.p. in the second year. In the long term, we observe that pension payments recover quicker than collected contributions, so that the gap between pensions and contributions will close after 2050.

Figure 18: Effect of Pandemic Deaths on SNP Financial Flows



Notes: Adapted from the IDB's model. The 'Contributions' series indicate the ratio between the contributions collected considering the pandemic and the contributions that had been collected if the pandemic had not existed. The 'Payroll' series indicate the ratio between the pension expenses considering the pandemic and the pensions that had been paid if the pandemic had not existed.

6 Conclusions

This is one of the first studies to exhaustively document and assess the potential effects of the COVID-19 pandemic on pension systems in Latin America. We study the case

of the private and public pension systems of Peru. Beyond the negative impacts of the pandemic, transmitted via labor market effects, on variables such as frequency of contributions, we observe that the pension policy responses could have much more important and everlasting effects. This is the case for the freedoms given to withdraw from private pension pots before retirement. In a perverse tandem between the Government and the Congress of Peru, five withdrawal policies were set up between 2020 and 2021.

The main reason given for these withdrawal policies was to provide liquidity to families due to the job losses and economic crisis generated by the pandemic, but these policies are problematic and ill-designed. The pension funds have been severely reduced or even depleted, particularly for the affiliates with small pension balances. As Peru does not have a universal social pension that could attenuate the risk of falling into poverty in old age, the withdrawals will compromise the economic security of individuals in old age. Moreover, the withdrawal policies are not targeted to families facing more adverse conditions, as was mentioned among the arguments for the measures. The eligibility conditions are very loose, so that practically any affiliate can cash out funds, regardless of the size of the pension balance and income levels.

By means of simulations performed with registered data, we identify that individuals will experience, on average, an expected fall of about 40% in their pension funds accumulated at retirement age, yet there are important heterogeneous effects. Among these effects, we find a socio-economic gradient in the distribution of pension fund losses. The losses are larger for the affiliates at the bottom of the distribution of income or pension wealth. Furthermore, older people experience larger losses than younger people, as they have less time to rebuild their pension pots.

There were attempts to set up a policy to allow the affiliates of the public pension system to withdraw past contributions, but after months of political turmoil between political actors, this policy was dismissed on constitutional legal grounds. However, this conflict

led the Government to re-assess the benefit rules in the SNP, and to set new regulations to facilitate the allocation of more pensions in the public system.

Based on a longitudinal sample of SNP affiliates, we identify that almost 10% of our sample will benefit from the new policies: 5.5% could be entitled to pensions equivalent to 50% of the minimum pension, 1.8% could receive pensions equal to 75% of the minimum pension, and 2.6% could access a pension thanks to a scheme of pension loans. This dataset also allows us to estimate a small drop in pension contributions due to the pandemic, but this is largely attenuated by the new SNP pension rules.

We detect that the excess of mortality due to the pandemic among SNP affiliates may lead to a reduction in the actuarial net liability of the public pension system. Moreover, an adapted version of the IDB pension projection model allows us to gauge the short-term and long-term effects of the pandemic deaths on contribution revenues and pension payments. The results confirm that these deaths may reduce the actuarial net liability in the long-run.

Overall, we find a tale of two interventions. On the one hand, the withdrawal policies jeopardize security in old age, leaving SPP affiliates with reduced or no pension savings to secure an income later in life; and on the other hand, the SNP's new pension rules SNP improve pension coverage among its affiliates. This is a clear example of how the design of pension policies must be undertaken with sound technical expertise and be less influenced by short-term political gains.

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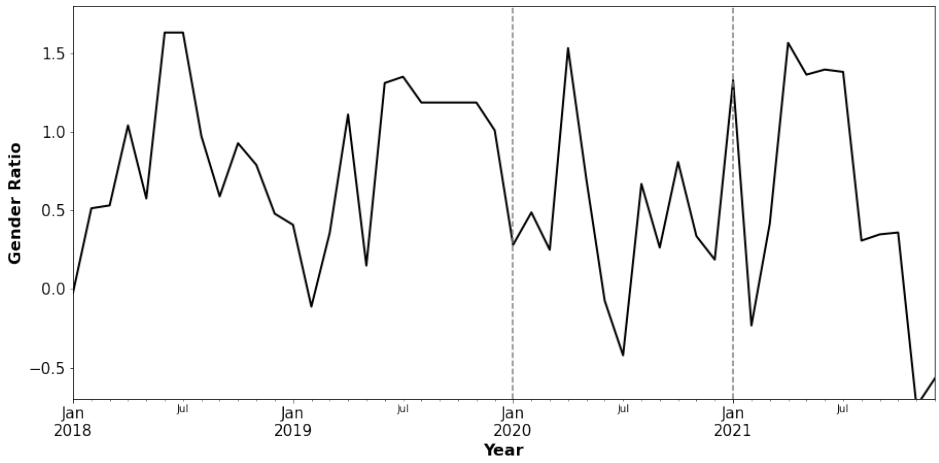
Appendix

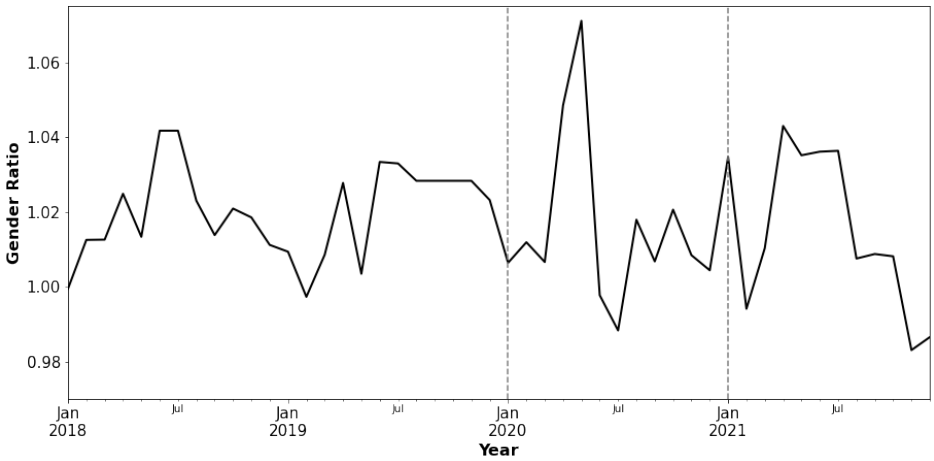
A Additional Figures and Tables

Figure A–1: SPP: Gender Gap of Pension Contribution Density (PCD)



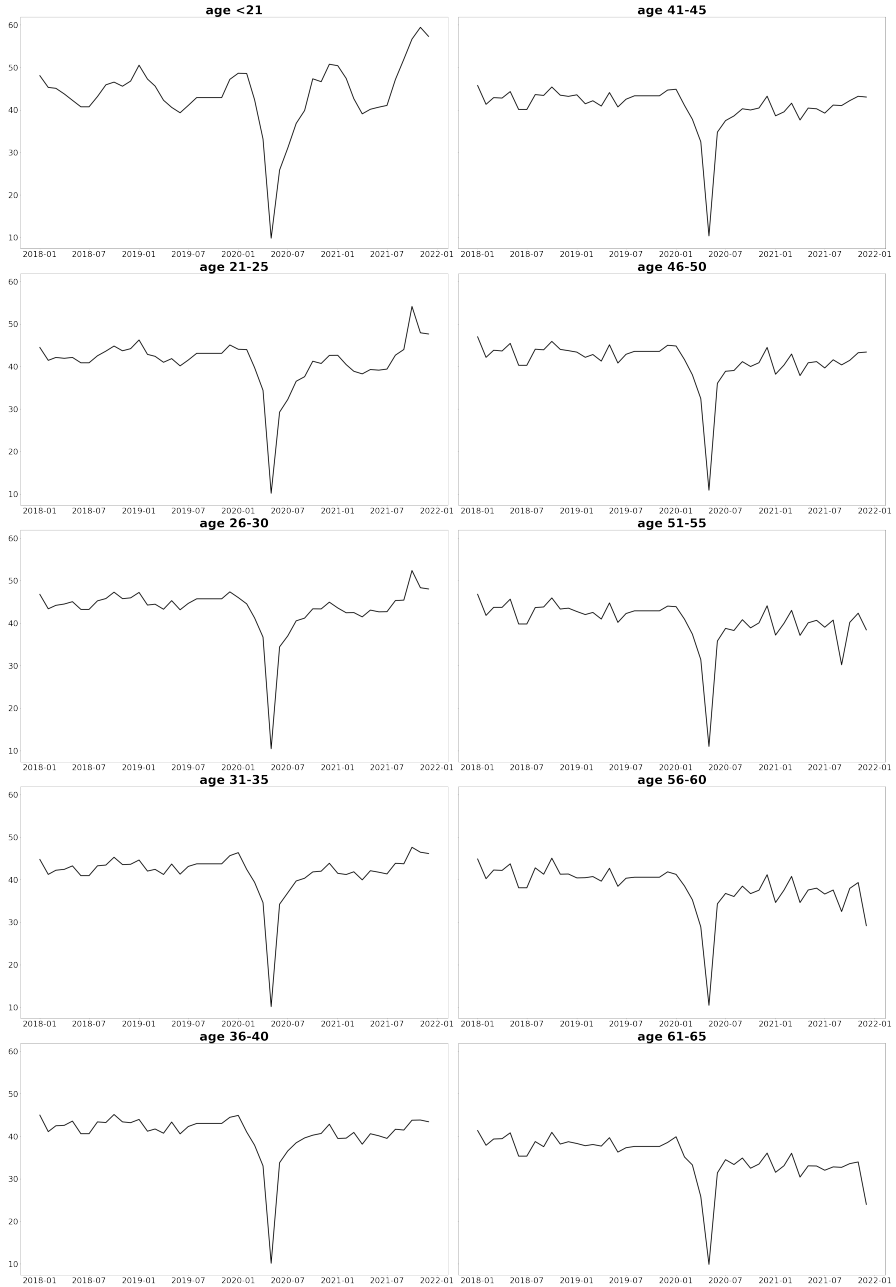
Source: SBS, open data, own elaboration
Note: Gender Gap = Men PCD - Women PCD

Figure A–2: SPP: Gender Ratio of Pension Contribution Density (PCD)



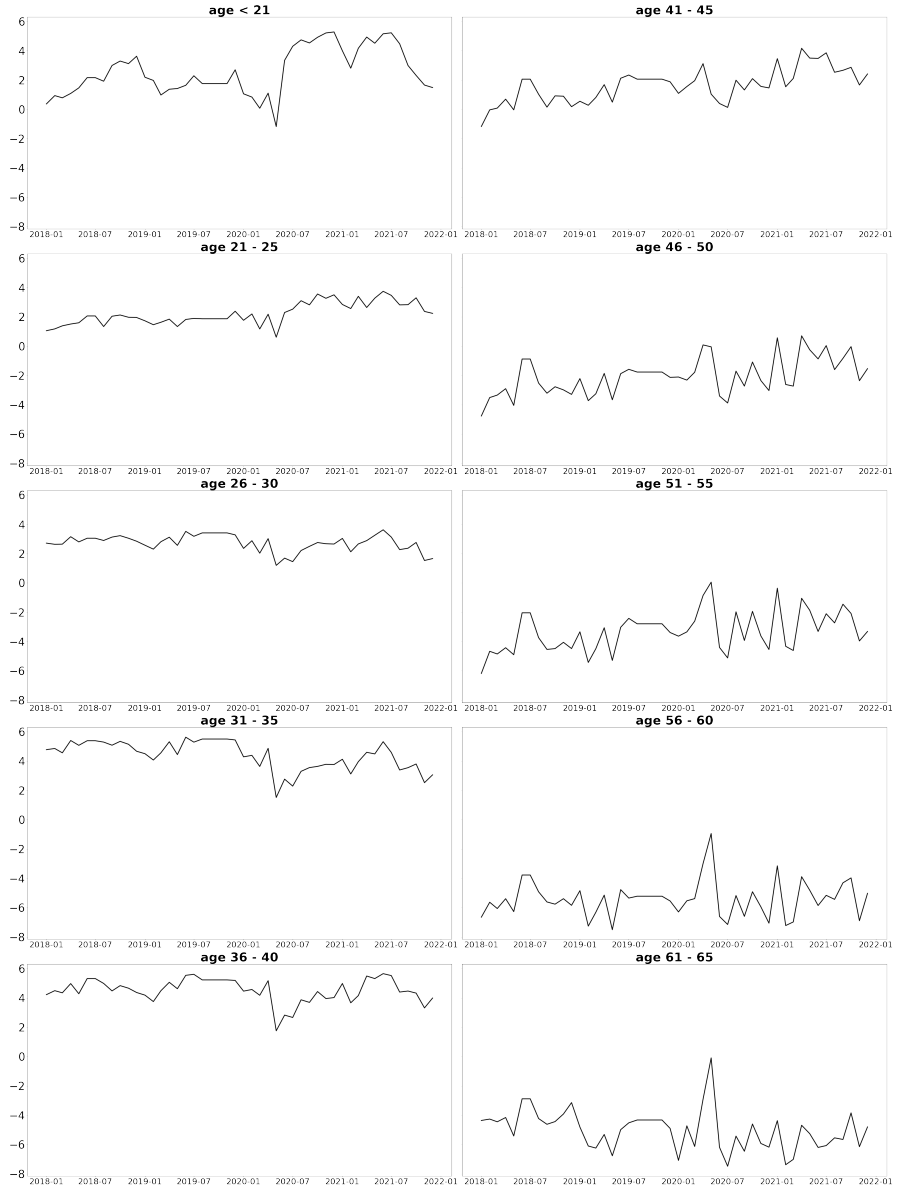
Source: SBS, open data, own elaboration
Note: Gender Gap = Men PCD / Women PCD

Figure A–3: SPP: Pension Contribution Density by Age Range



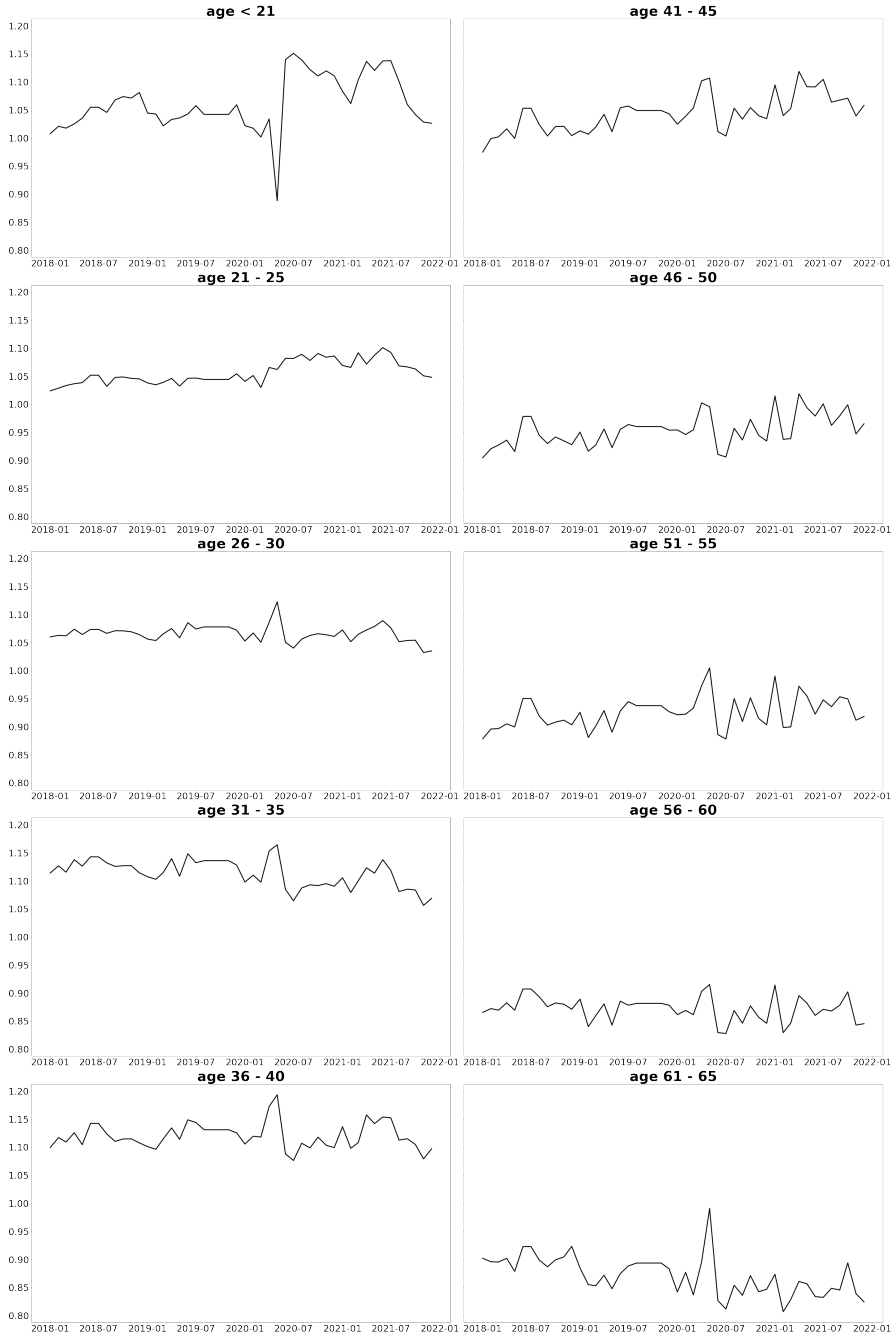
Source: SBS, open data, own elaboration

Figure A–4: SPP: Gender Gap of Pension Contribution Density by Age Range



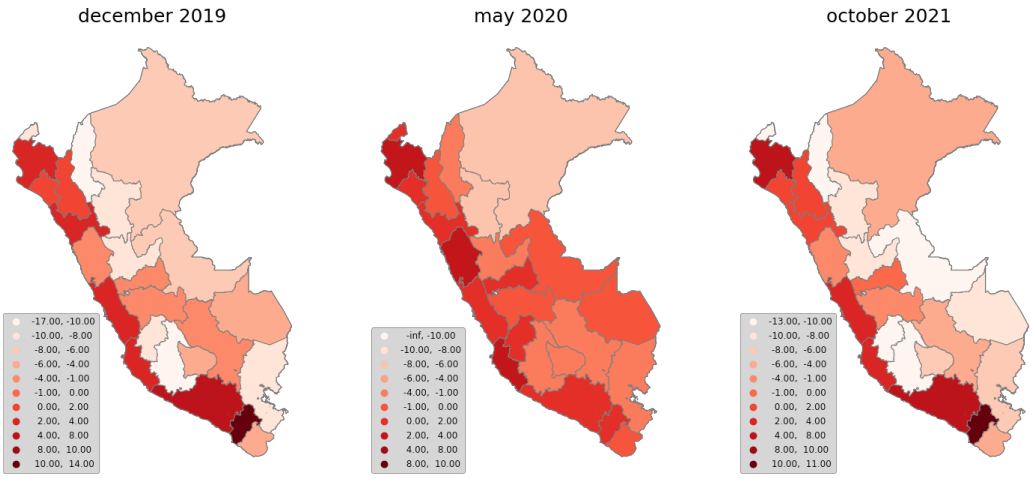
Source: SBS, open data, own elaboration

Figure A–5: SPP: Gender Gap of Pension Contribution Density by Age Range



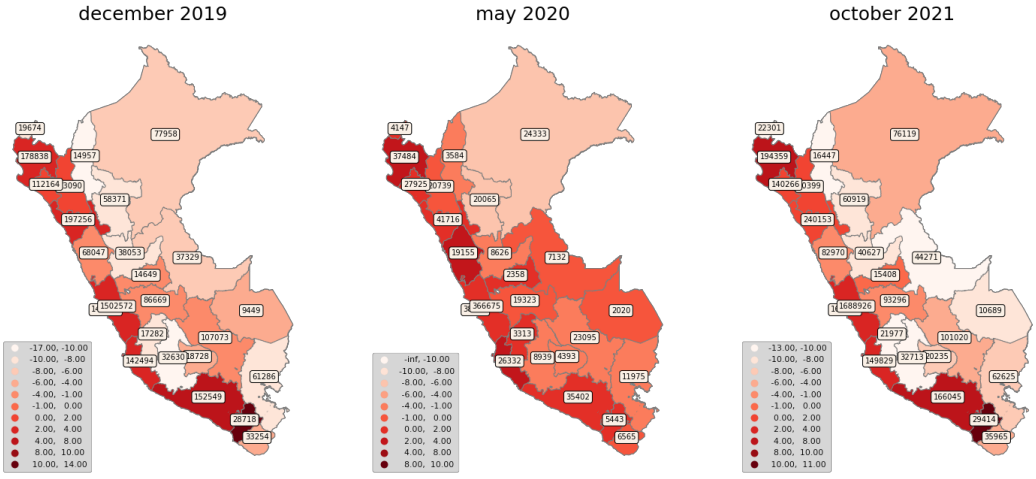
Source: SBS, open data, own elaboration

Figure A–6: SPP: Gender Gap of Pension Contribution Density by Region



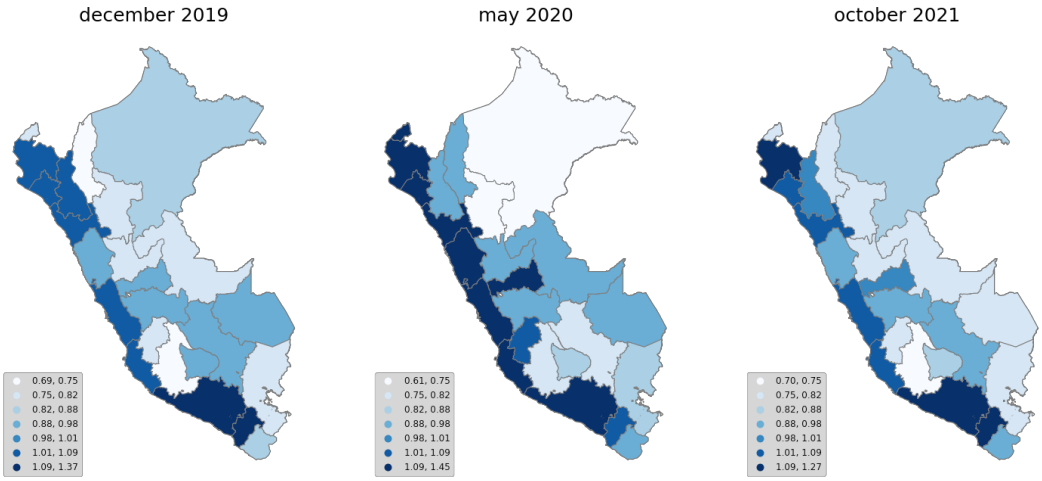
Source: SBS, open data, own elaboration

Figure A–7: SPP: Gender Gap and Number of Affiliates of Pension Contribution Density by Region



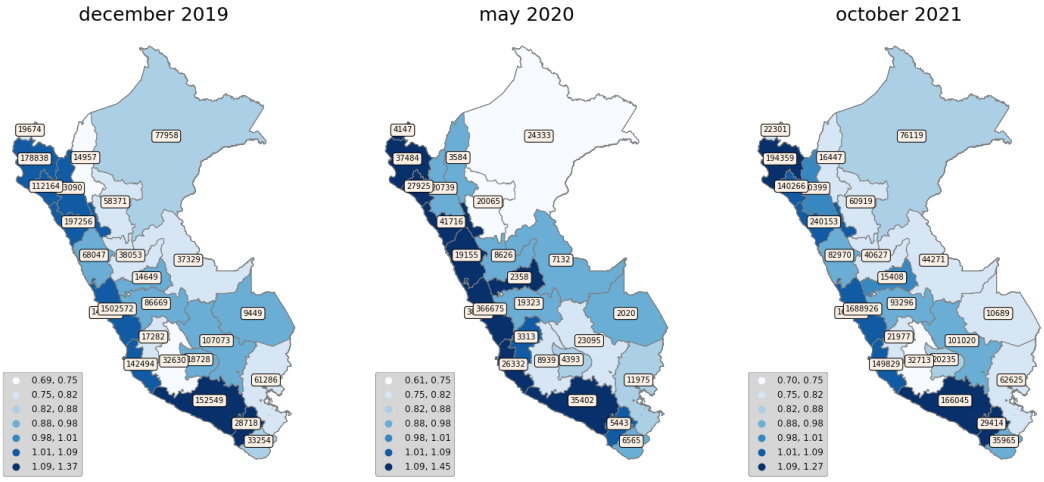
Source: SBS, open data, own elaboration

Figure A–8: SPP: Gender Ratio of Pension Contribution Density by Region



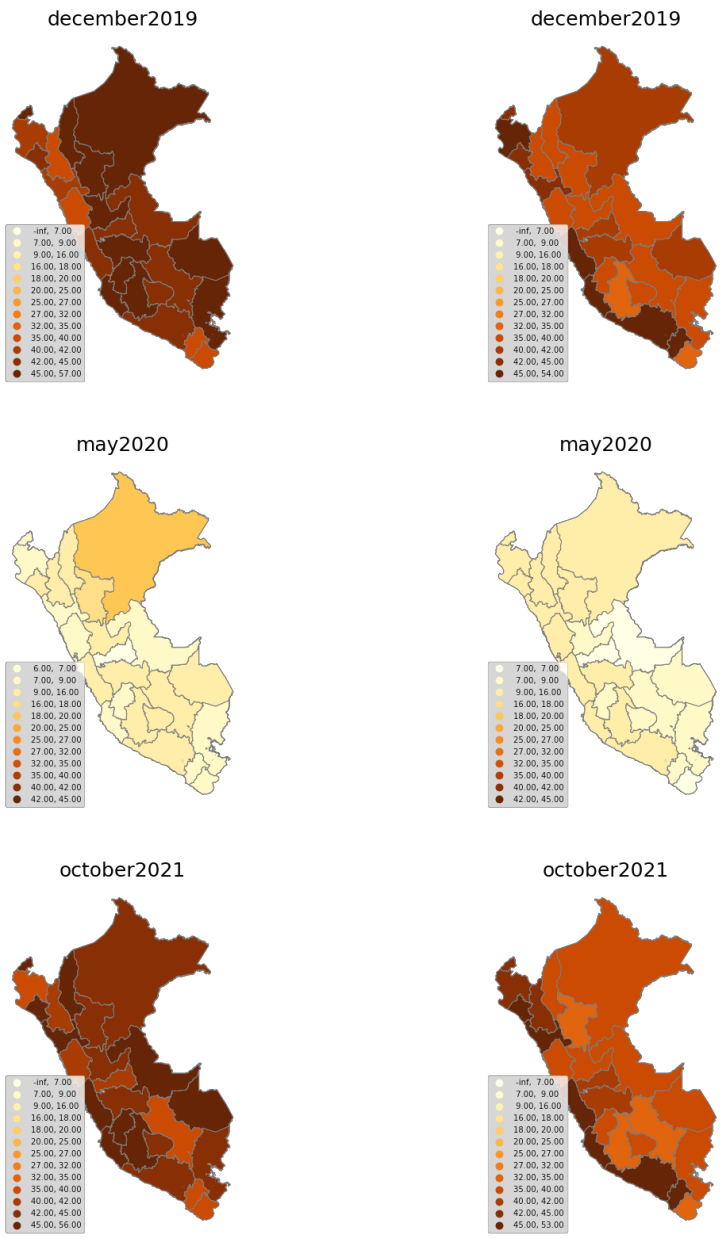
Source: SBS, open data, own elaboration

Figure A–9: SPP: Gender Ratio and Number of Affiliates of Pension Contribution Density by Region



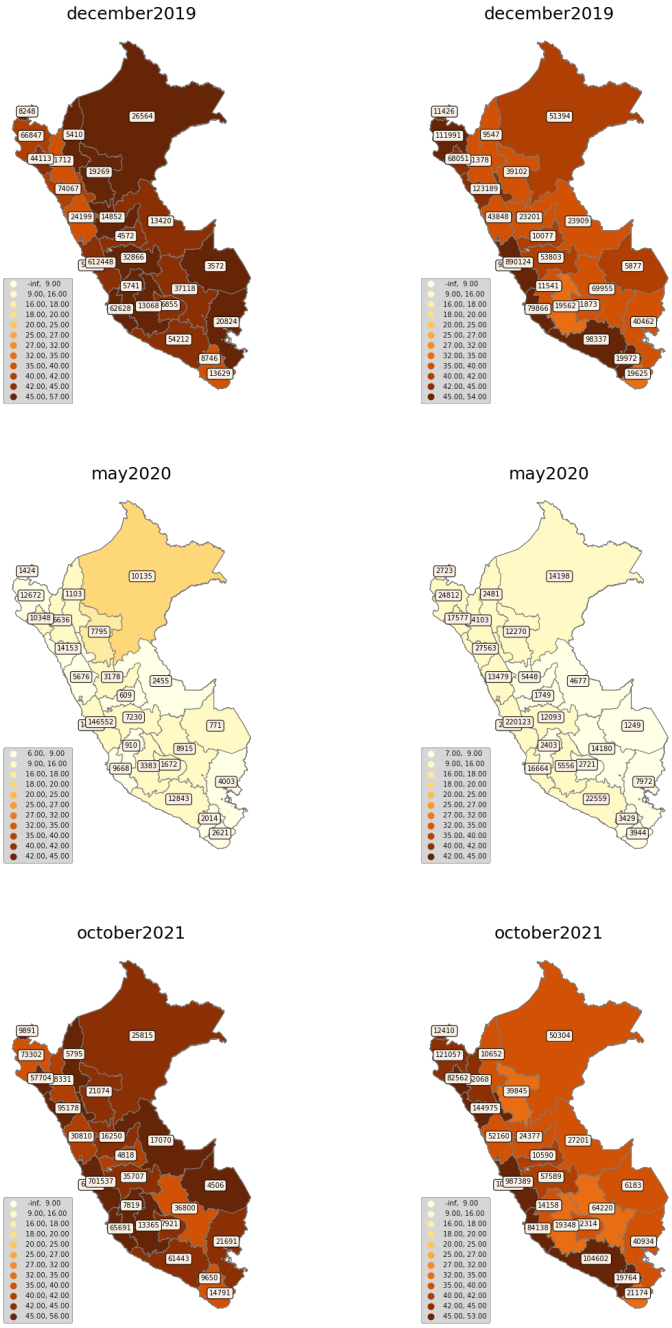
Source: SBS, open data, own elaboration

Figure A–10: SPP: Pension Contribution Density by Region



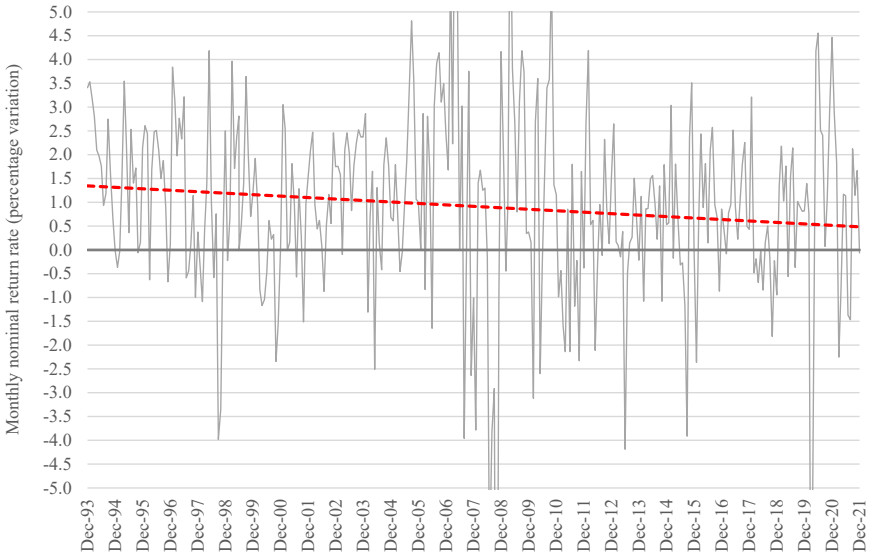
Source: SBS, open data, own elaboration

Figure A–11: SPP: Pension Contribution Density and Number of Affiliates by Region



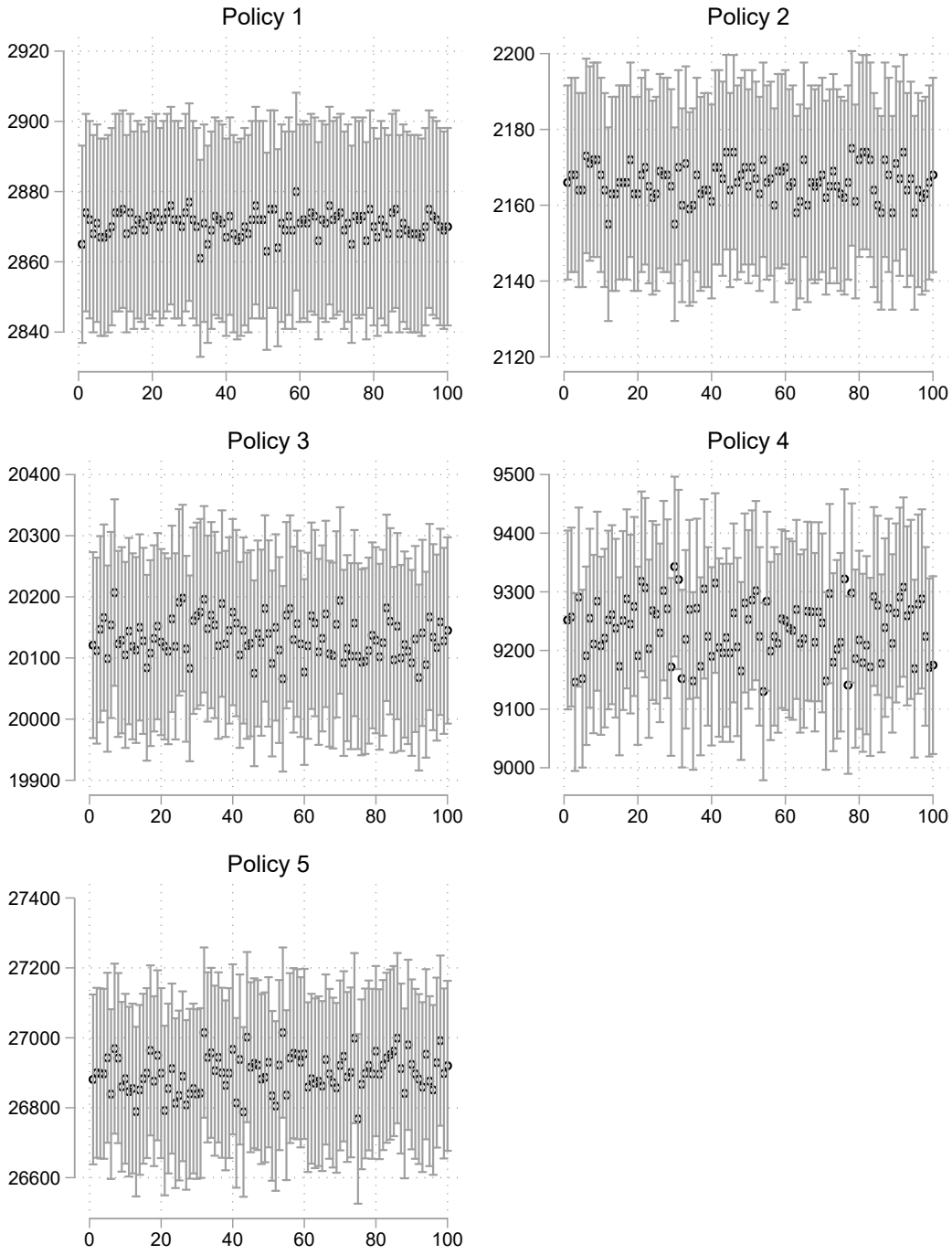
Source: SBS, open data, own elaboration

Figure A–12: Nominal Monthly Return Rate in the SPP



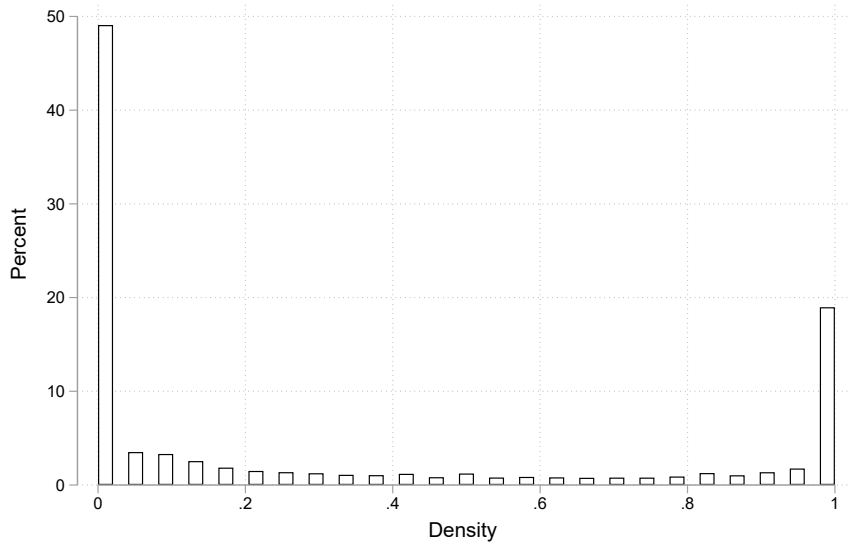
Note: The figure is computed with data from SBS statistics. Each data point shows the simple average of the variation in the monthly average AFP's share price ("valor cuota") of pension fund type 2.

Figure A–13: Simulations of Total Withdrawal Amounts (Million Soles)



Note: Each figure plots the 100 simulations of the total estimated amount withdrawn in each policy for the whole analytical sample. The graphs include 95% confidence intervals.

Figure A–14: Percentage of Contributions Between 2018 and 2019 in the SNP



Note: Figure is computed with data provided by the ONP.

Table A–1: Salary premiums by cohort, sex and contribution

Cohort	Female	Male	Female	Male
	Regular contributor		No regular contributor	
1955-1960	1.7%	1.9%	0.0%	0.0%
1961-1966	0.8%	0.8%	0.0%	0.0%
1967-1972	0.3%	0.0%	0.0%	0.0%
1973-1978	0.0%	0.3%	0.0%	0.0%
1979-1984	0.1%	1.1%	0.4%	0.1%
1985-1990	2.8%	2.8%	3.3%	2.2%
1991-1996	5.9%	4.3%	2.7%	1.7%

Notes: Regular contributors are the individuals who contributed at least one time during 2019 (the sample year), while the no regular contributors are those individuals who did not contributed during 2019.

Table A–2: Peru: Annual number of deaths from all causes and excess deaths (2016-2021)

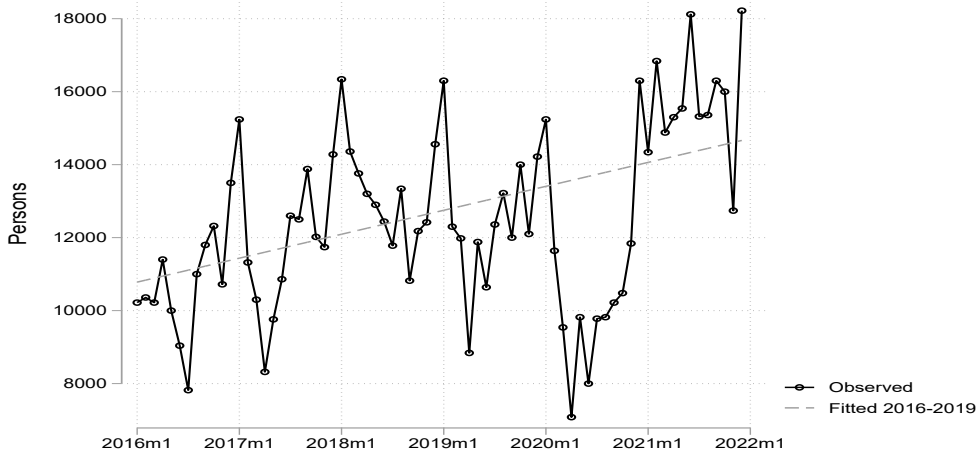
Age	Year				Average	Excess Death		
Range	**2018**	**2019**	**2020**	**2021**	**2018-2019**	**2020**	**2021**	**Total**
Not Available	5,193	4,838	4,390	4,564	5016	-626	-452	-1,077
0 - 11	2,255	1,938	2,265	2,209	2097	169	113	281
12 - 17	1,177	1,168	1,369	1,557	1173	197	385	581
18 - 29	4,706	4,851	5,638	6,654	4779	860	1,876	2,735
30 - 59	22,755	22,589	49,013	60,045	22672	26,341	37,373	63,714
60 years or older	76,723	79,558	163,948	173,342	78141	85,808	95,202	181,009
Total	**112,809**	**114,942**	**226,623**	**248,371**	**113876**	**112,748**	**134,496**	**247,243**

Note: Table is computed with official data taken from SINADEF. Excess death is estimated as the difference between the deaths observed in 2020 and 2021 minus the average for the years 2016 to 2019.

Table A–3: Parameters used in IDB's model

Average male density	27%
Average female density	31%
Average salary men in 2020	S/ 1,716
Average salary women in 2020	S/ 1,599
Pensions paid per year	14
Annual salary growth rate	3%
Contribution rate	13%
% of deceased affiliates who generate a pension (men)	2%
% of deceased retirees who generate pension (men)	70%
% of deceased invalids who generate pension (men)	70%
% of deceased affiliates who generate a pension (women)	0
% of deceased retirees who generate pension (women)	0
% of deceased invalids who generate pension (women)	0
% of the population affiliated with the SNP (men)	1.05%
% of the population affiliated with the SNP (women)	0.68%
% of affiliates that retire with 20 years of contributions (men)	33%
% of affiliates that retire with 20 years of contributions (women)	29%
% of affiliates that retire with 15 years of contributions (men)	38%
% of affiliates that retire with 15 years of contributions (women)	34%
% of affiliates that retire with 10 years of contributions (men)	43%
% of affiliates that retire with 10 years of contributions (women)	39%
Tasa de Crec. Anual nominal pensiones	2.0%
% of members who become disabled (men)	0.03%
% of members who become disabled (women)	0.01%
Expected inflation	2%

Figure A–15: Number of Affiliates Canging from SNP to SPP



Note: Figure is computed with data provided by the ONP.

B IDB Model

B.1 Dynamics of Affiliates and Pensioners

$$
\begin{aligned}
P_x &= NP_x + P_{x-1} \cdot [1 - q_{x-1}] && (14)\\
NP_x &= \theta^{np}_{x-1} \cdot [A_{x-1} \cdot (1 - q_{x-1}) - NI_x] && (15)\\
A_x &= NA_x + A_{x-1} \cdot [1 - q_{x-1}] - NP_x - NI_x && (16)\\
NA_x &= \theta^{na}_{x-1} \cdot [Pob_{x-1} - A_{x-1} - P_{x-1} - I_{x-1}] && (17)\\
I_x &= NI_x + I_{x-1} \cdot [1 - q_{x-1}] && (18)\\
NI_x &= \theta^{ni}_{x-1} \cdot A_{x-1} \cdot [1 - q_{x-1}] && (19)\\
VA_x &= NVA_x + VA_{x-1} \cdot [1 - q_{x-1}] && (20)\\
NVA_{x-2} &= \theta^{nva}_{x} \cdot A_x && (21)\\
VP_x &= NVP_x + VP_{x-1} \cdot [1 - q_{x-1}] && (22)\\
NVP_{x-2} &= \theta^{nvp}_{x} \cdot P_x && (23)\\
VI_x &= NVI_x + VI_{x-1} \cdot [1 - q_{x-1}] && (24)\\
NVI_{x-2} &= \theta^{nvi}_{x} \cdot I_x && (25)
\end{aligned}
$$

- q_x is the probability of dying between x and $x+1$ year of age.
- θ^{np}_{x-1} is the probability of becoming pensioner.
- θ^{ni}_{x-1} is the probability of becoming disable.
- θ^{na}_{x-1} is the percentage of the population enrolling into the public pension system.
- θ^{nvi}_{x-1}

- θ^{VA} (Proporcion que genera el derecho)
- θ^{NVP} (Proporcion que genera el derecho)

Where P_x is the number of pensioners of age x, q_x is the probability of dying between x and $x+1$ year of age, NP_x is the number of new pensioners at age x, α is the probability of becoming pensioner, γ is the probability of becoming disable, NA_x is the percentage β of the population enrolled in the public pension system, and Pob_x is the population projection at age x at some point in time. In this way, the impacts are modeled by the temporary increase in q_x and the permanent effect on Pob_x.