

FACTOR INCOME SHARES AND PENSION SUSTAINABILITY: A PRIMER

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Abstract

In this article we use an overlapping generations model economy to study the quantitative consequences of the decrease in the labour income share of output for the future sustainability of unfunded public pension systems. We find that this negative dynamic worsens the sustainability of these systems in the short and medium term, since the drop in payroll tax collections is bigger than the decrease in pension expenditure due to lower pensions, as the lower earnings are transferred to pensions with a certain time lag. Moreover, we find that longer pensionable earning references used to compute the pension may amplify this financial imbalance. Finally, we also find that the future pension imbalance increases significantly if such labour income share dynamics are also accompanied by a decrease in the capital income share, since the decrease in the wage rate is bigger when both factor income shares decrease simultaneously.

Keywords: Overlapping generations, aggregate factor income distribution, social security, dynamic analysis

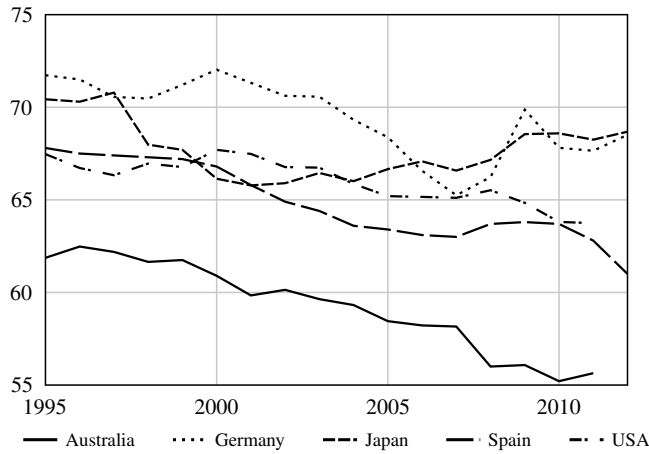
JEL classification: C63, E25, H55

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1 Introduction

One main reason for the unsustainability of some public pension systems in OECD countries over the coming decades is the failure to adapt these systems to the demographic transition. But besides this demographic trend, there is another process that could also affect the future financial sustainability of unfunded pension systems.¹ There is substantial evidence that the labour income share in national accounting data has been declining globally (see Karabarbounis and Neiman 2014). The argument is that the fall in the labour income share will reduce payroll tax contributions as a proportion of GDP, given an average payroll tax rate. Consequently, it is expected that the sustainability problems that plague some of these systems will be exacerbated by this dynamic in the labour income share.

Figure 1: The Labor Income Share of Output (%)*



*Source: OECD.

However, it is also the case that retirement pensions depend mainly on past salaries, so a fall in the labour income share should reduce the magnitude of retirement pensions and, therefore, the total pension expenditure. Thus, the final effect on the overall budget of the pension system is not clear.

This paper analyses the quantitative consequences of the labour income share drop for the future balance of unfunded pension systems. To do so, we use an updated version of the large-scale, multi-period, overlapping generations model economy populated by heterogeneous households, described in Díaz-Saavedra et al. (2023). Specifically, we extend the production function to a temporary time-varying output elasticity Cobb-Douglas production function, as per the work by Sáez (2022),

¹There are two types of unfunded pension systems. First, those called Defined Benefit, where the pension benefit is determined by the individual's previous earnings. And second, those named Defined Contribution, where the contribution rate is given and the pension benefit is endogenous. See Lindbeck and Persson (2003).

among others. This implies that our model is consistent with constant ratios and balanced growth in the long run, but it also deviates from this balanced path at times due to both transitory demographic and technological changes.

Our quantitative experiments rely on the Spanish Unfunded Defined Benefit Pension System since Spain is also a case with the aforementioned demographic and technological tendencies. Specifically, and besides its projected increase in the old-age dependency ratio, the labour income share in Spain decreased by more than 6 percentage points between 1995 and 2012, or, put another way, at an average growth rate of -0.58 percent during that same period (see Figure 1). We simulate and compare two model economies. In the first model economy, we assume that the labour income share of the Spanish economy remains constant at its 2018 value. In the second model economy, we instead assume that the labour income share decreases at a constant annual rate of 0.58 percent until 2060, by which time it becomes 0.4.

After our simulations, we find: *i)* as expected, the drop in the labour income share reduces the payroll tax collections. But we also find that pension expenditure decreases as well, because retirement pensions are also reduced as they mainly depend on past earnings; *ii)* the drop in retirement pensions strongly depends on the pensionable earnings reference used to compute them. This is so since earnings are transferred to pensions with a certain time lag. Consequently, the longer the vesting period, the lower the decrease in retirement pensions, and the bigger the increase in the financial burden of pension systems, following a drop in the labour income share; and *iii)* the future pension imbalance increases significantly in the short and medium term if such labour income share dynamics is also accompanied by a decrease in the capital income share.

We are not interested in analysing the reasons behind the drop in factor income shares. This literature is vast and we refer the reader to, for example, Boldrin et al. (2024) for a detailed review. The emphasis of this work, however, is mainly on the quantitative consequences of the negative dynamics of labour income share for the future sustainability of defined benefit unfunded pension systems, and, to the best of our knowledge, this paper is the first attempt to carry out a quantitative analysis of this kind.

The model economy

We study an overlapping generations open model economy with heterogeneous households, a representative firm, and a government. Our model economy is an updated version of the model economy used in Díaz-Saavedra et al. (2023), and a detailed description of this economic model is available at <http://www.ugr.es/julianalbertodiaz/research/research.html>.

2 The Experiments

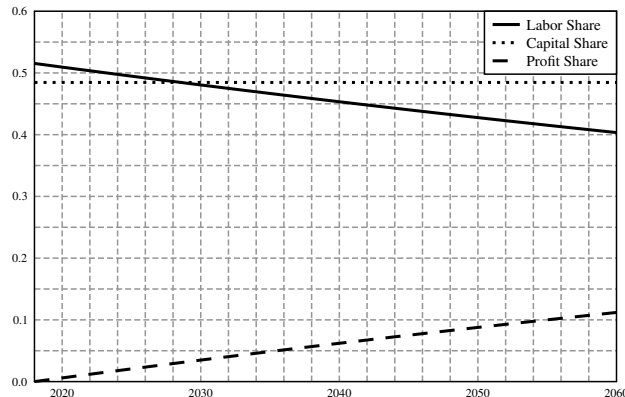
This paper simulates two versions of our overlapping generations model economy. First, a *benchmark* economy where we assume a constant returns to scale production function where the elasticities of output with respect to capital and effective labour remain constant during the transitional path, at their initial steady state values.

Differently to the previous model, an *alternative* model assumes that the output elasticity of labour decreases from its initial value at an annual constant rate of 0.58 percent until 2060, and remains constant thereafter. This means that the output production function becomes:

$$Y_t = K_t^\alpha L_t^{\gamma_t}$$

where $\alpha + \gamma_t \leq 1 \forall t$.² ³ Moreover, following Cassou and Lansing (1998), we assume that firms earn positive profits equal to the difference between the value of output and the rental cost of private factors, and that households, the owners of the firms, receive these profits.

Figure 2: The Income Shares of Output in the Alternative Economy



3 Results

We simulate the two model economies and the results are shown in Figures 3 and 4, and in Table 1 in the Appendix.

In Panel A of Figure 3, we show the time series for the wage rate and the average pension. This figure shows a steady decrease in the wage rate during the next decades. However, the decrease

²Note that in the *benchmark* model economy, $\alpha + \gamma = 1$

³Both model economies share the population dynamics given by the latest demographic forecast from the Spanish National Institute of Statistics (INE).

in the average pension is less pronounced during this same period, and this is due to two main reasons. First, the average pension changes mainly because new pensions are incorporated (the new retirees) to replace the pensions that are extinguished (the deceased beneficiaries). Yet, second, it also changes because the current lower wages are transferred to new pensions with a certain time lag, since pensions depend on past earnings – in the case of Spain, those earned during the last 25 years before retirement.

The consequences are straightforward. Payroll tax collection decreases almost proportionally to the fall in the wage rate, while pension payments decrease more slowly, and mainly in line with the drop in the average pension, so that the financial burden of the public pension system increases (see Table 1).

Using the 25 last years before retirement to compute the pension, as is the case in Spain, sets a short vesting period. In fact, the use of such a short period tends to be an exception in public pension systems.⁴ This is mainly because a longer vesting period, which usually considers past earnings during the entire working lifetime, guarantees more intragenerational solidarity, thus reducing pension income inequality. Consequently, in our next exercise, we study whether the pensionable earnings reference might play an important role in shaping the pension system imbalance when labour income share decreases. To do so, we continue to simulate both previous model economies, but this time assuming a longer vesting period: the main component of the retirement pension is the average labour income over the last 40 years before retirement.

Panel B of Figure 3 shows that the dynamics of the wage rate is similar to the previous case. However, the decreasing dynamics in the average pension is smaller in this case, and is mainly due to the longer vesting period. That is, the longer the averaging period the lower the decrease in the average pension (compared to the constant labour income share case), so the lower the decrease in the pension expenditure when labour income share falls. And this is because the longer the vesting period, the longer the time lag where lower wages are transferred to new pensions. Consequently, the pension imbalance is larger (see Figure 4).

4 Conclusions

This paper confirms that the drop in the labour income share could aggravate the sustainability problems that plague some defined benefit unfunded public pension systems in the short and medium term.^{5 6} Our results also show that longer pensionable earnings references used to compute

⁴For instance, in Europe, and besides Spain, only the pension schemes in France, Malta and Slovenia are also based on a comparatively small fraction of career earnings to calculate benefits.

⁵In fact, a fall in labor income in absolute terms is enough to obtain the results we report in this paper.

⁶It is not clear, however, that this decreasing trend will persist in the long run, as the demographic transition and its associated shortage of labour could lead to the opposite dynamic in the future. Consequently, if this is the case, the sustainability problems of some unfunded pension systems could be alleviated somewhat. See d’Albis et al.

the pension may amplify this financial imbalance. And that things would turn worse should such a tendency be accompanied by a decrease in the capital income share. Finally, our results can also be extrapolated to other countries apart from Spain. That is, those countries that run unfunded pay-as-you-go pension systems, regardless of whether these systems are based on a Defined Benefit scheme, or designed according to Defined Contribution rules.

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Appendix

Decrease in the labour and capital income shares

In our previous simulations, we have assumed that the decline in the labour income share was exactly compensated by the increase in the profits share of output, and the capital income share remained constant along the transition path. However, Burkai (2020) shows that the shares of both labour and capital are declining and are jointly offset by a large increase in the share of pure profits. Therefore, in our final exercises we assume that, besides the drop in the labour income share, the capital income share also decreases until 2060 at a constant annual rate of 0.82 percent, a figure similar to the one found by Burkai (2020) for the US economy between 1984 and 2014 (see Figure 5).⁷

Table 1 shows our main results. First, the decrease in the wage rate is bigger when factor income shares decrease simultaneously. And second, we continue to observe a less pronounced drop in the average pension in comparison to the wage rate. Lastly, the pension imbalance increases in

(2021).
⁷In these final exercises, we continue to assume that the vesting period is given by the last 25 years before retirement.

the short and medium term when both the labour and the capital income shares decrease at the expense of an increase in the profit share of output.

Table 1: Differences in the wage rate, the average pension, and the pension deficit (%)*

	2020	2030	2040	2050
Wage rate				
Labor	-0.70	-4.07	-6.95	-9.77
Labor and capital	-5.06	-24.32	-36.86	-45.75
Average pension				
Labor	-0.01	-0.29	-1.69	-4.05
Labor and capital	-0.03	-1.30	-7.23	-16.33
Pension deficit				
Labor	7.66	10.49	6.08	2.89
Labor and capital	23.82	44.61	23.38	7.07

* Differences with respect to the constant factor income shares environment.

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No potential conflict of interest was reported by the authors.

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Figure 3: The Differences in the wage rate and the average pension (%)

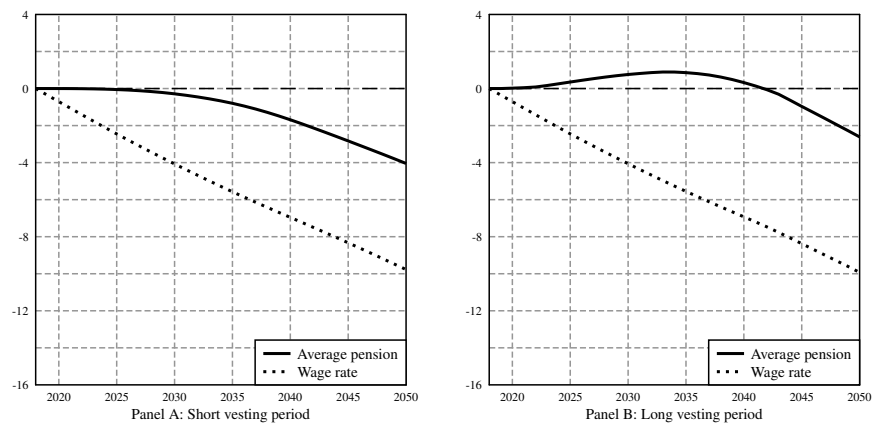
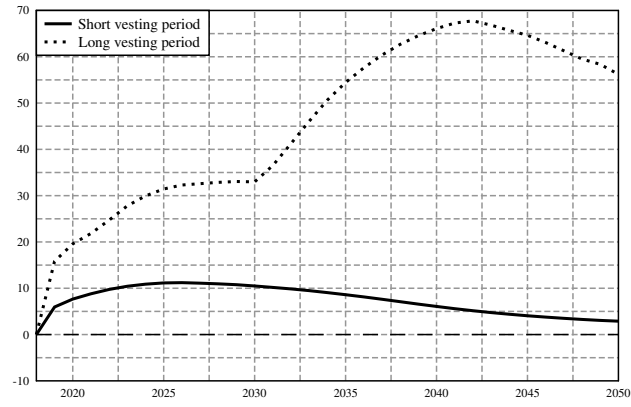


Figure 4: The Differences in the pension deficit (%)



* Differences with respect to the constant factor income shares environment.

Figure 5: The Shares of Output in the Alternative Economy (2)

