A Prospective Sustainability Indicator for Pension Systems

Fabrizio Culotta

1. Introduction

Nowadays, population ageing is a central topic in the political agenda of many OECD countries. It is well known that when the demographic structure of population gradually shifts towards older ages, the pressure on the financial sustainability of the welfare system raises. Health care and pension are those public systems affected the most.

Focusing on PAYG (unfunded) public pension systems, i.e. the first of the multi-pillars architecture for pension systems (Holzmann, 2005), the pressure from an older population is twofold. On the payment side, it increases the proportion of recipients and the duration. On the contribution side, instead, it decreases relative portion of contributors. This pressure can be captured by an indicator for old-age dependency ratio tracing the ratio between pension recipients and pension contributors.

From a pension system perspective, the old-age dependency ratio can be conceived as an indicator for the *extensive margin* of financial sustainability since it traces how many individuals are involved in the pension payments and contributions flow. Clearly, solely considering the extensive margin is not exhaustive. In fact, within the set of indicators for *sustainable pensions* (i.e. the second objective of the Pension strand of the Open Method of Coordination), Eurostat considers indicators for two other types of margins. In particular, the extensive margin is combined with the *intensive margin*, i.e. how much workers contribute to and pensioners receive from the public pension system (as a share of GDP). Note that, from the contribution side, the intensive margin can be further decomposed into the product between pensionable wage and pension contribution rate. Thirdly, Eurostat adopts a durational indicator for the length of post-retirement period as well as for the working life. The former traces the effective duration of pension payment, interrupted at individual level because of pensioner's death. The latter proxies the effective duration of pension contribution, often suspended in the case of unemployment (see Bravo and Herce, 2020) or even interrupted in the case of disability. These two indicators are important since they allow to trace a third dimension of the financial sustainability: for how long workers contribute and pensioners benefit. As such, they can identify a *durational margin*.

Considering all three margins not only enriches the set of dimensions to be evaluated, but it also stresses the importance of integration between labour market and pension statistics to analyse more narrowly the sustainability of public pension systems. In this sense, no sustainability indicators for pension systems follows this approach. This work tries to fill this gap by proposing a *Prospective Indicator for the Sustainability of Pension systems* (hereafter, PISP) coherent with the informative system proposed by Eurostat. A pool of European countries is considered as an application, and their ranking assessed. Finally, PISP is compared with an alternative formulation, stressing the contribution of the durational margin, as well as with a benchmark indicator.

2. Data and Methods

Data to construct PISP span over five years, namely the period 2015-2019, and they are extracted from Eurostat database. The pool of European countries is represented by Austria, Germany, Finland, France, Italy, and the Netherlands. The following statistics are selected to construct PISP for each country in the pool (Table 1).

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FUP Best Practice in Scholarly Publishing (DOI 10.36253/fup_best_practice)

Fabrizio Culotta, *A Prospective Sustainability Indicator for Pension Systems*, pp. 209-214, © 2021 Author(s), CC BY 4.0 International, DOI 10.36253/978-88-5518-461-8.39, in Bruno Bertaccini, Luigi Fabbris, Alessandra Petrucci (edited by), *ASA 2021 Statistics and Information Systems for Policy Evaluation. Book of short papers of the on-site conference*, © 2021 Author(s), content CC BY 4.0 International, metadata CC0 1.0 Universal, published by Firenze University Press (www.fupress.com), ISSN 2704-5846 (online), ISBN 978-88-5518-461-8 (PDF), DOI 10.36253/978-88-5518-461-8

Statistics	Unit of Measure	Area	Margin
Pension Contributions	% GDP	Labour Market	Extensive, Intensive
Pension Payments	% GDP	Pension System	Extensive, Intensive
Duration of Working Life	Years	Labour Market	Durational
Life Expectancy at 65	Years	Pension System	Durational

Table 1: Statistics used for the construction of ISPS. Source: Eurostat.

Once statistics are collected, the PISP is constructed as the difference of the product among margins for each flow. Let *i* and *t* index country and time, the $PISP_{i,t}$ can be defined as:

$$PISP_{i,t} = PC_{i,t} \cdot WL_{i,t} - PP_{i,t} \cdot LE_{i,t} \quad (1)$$

where $PC_{i,t}$ and $PP_{i,t}$ refer to the pension contributions and payments, as share of GDP, respectively. $WL_{i,t}$ and $LE_{i,t}$ represent the duration, in years of working life and life expectancy at retirement (age 65) respectively. Values of statistics for each country and year are reported in Appendix A (Table 3). Note that to construct PISP there is no need to explicitly consider country-specific pension parameters of pension systems (e.g. contribution rates, pension formulas).

3. Results

The computed scores of PISP are depicted below and reported for each country (Fig. 1).

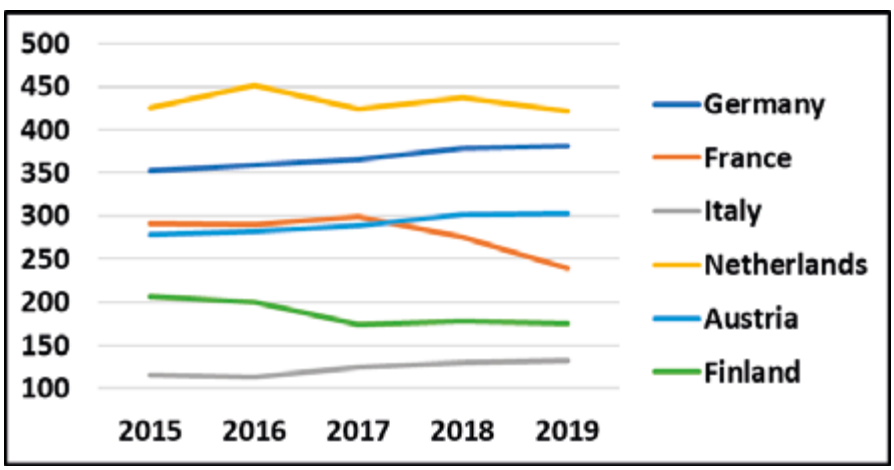

Figure 1: PISP scores across countries and time.
Source: author's own elaborations on Eurostat data.

The Netherlands shows the highest profile in terms of PISP, despite it has decreased in the last years. Germany and Austria report an increasing profile, while those of France and Finland are decreasing. Furthermore, France profile is penalized by a decreasing GDP share of pension contributions ($PC_{i,t}$). Italy shows the lowest profile, despite it slightly increases after 2016.

The PISP, as defined by equation 1, is now compared to an alternative version that excludes the durational margins from PISP (CISP, standing for Current ISP). Thus, CISP is defined as:

$$CISP_{i,t} = PC_{i,t} - PP_{i,t} \quad (2)$$

For each country in the pool, the time profile of $CISP_{i,t}$ is depicted in figure 3.

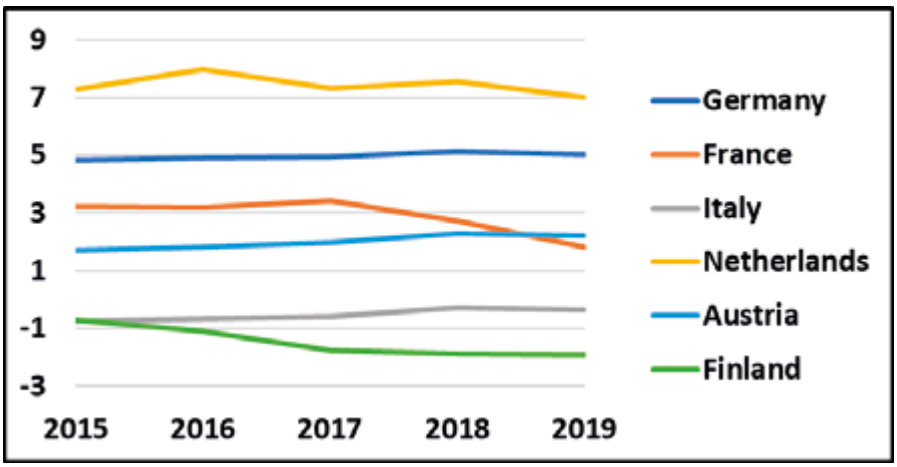

Figure 3: CISP scores across countries and time.
Source: author's own elaborations on Eurostat data.

CISP profiles, being simply defined as the current balance of pension system expressed in terms of share of GDP, show the direct impact of pension contribution and payment flows. All countries but Italy and Finland report positive values, with Finland having the lowest. Overall, three features emerge. Firstly, Italy and Finland maintain the lowest profile across indicators. Secondly, the Netherlands remains at the top positions followed by Germany. Thirdly, from 2017 onwards the financial sustainability of the French public pension system decreases. Explanations rely on the dynamics of each component forming the contribution and payment side.

Finally, the Mercer-Melbourne Global Pension Index - Sustainability ($GPI_{i,t}$) is taken as a benchmark (Mercer-Melbourne, 2015-2019). Countries profiles are reported in Figure 4.

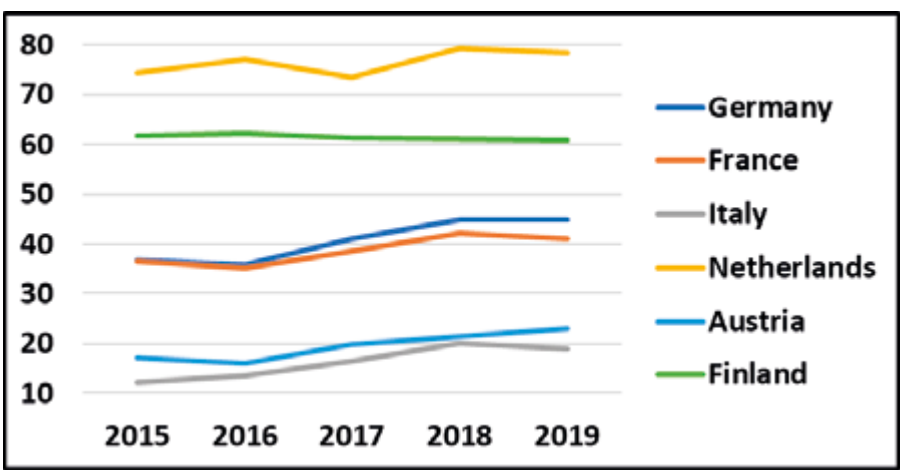

Figure 4: GPI scores across countries and time.
Source: Mercer-Melbourne (2015, 2016, 2017, 2018, 2019).

Despite GPI is an index for the sustainability of the whole (i.e. all pillars of) pension systems, it is possible to note that the Netherlands are confirmed to be ranked first throughout the considered period. Finland, ranked second, shows a stable pattern. Germany and France, placed third and fourth respectively, evolve along the same trend. Lastly, Austria and Italy show a positive trend, with the latter country having the lowest profile for the whole period.

PISP and CISP are then compared each other as well as to the benchmark indicator GPI. For each pair of indicators, their (Pearson) correlation coefficient ρ is measured. Results are reported below (Table 2).

COUNTRY	ρ(PISP, CISP)	ρ(PISP,GPI)	ρ(CISP,GPI)
Germany	0.85	0.96	0.83
France	1.00	-0.60	-0.63
Italy	0.92	0.94	0.98
Netherlands	0.97	0.35	0.15
Austria	0.99	0.94	0.91
Finland	0.98	0.85	0.85
Average	**0.95**	**0.57**	**0.51**
St. Dev.	**0.06**	**0.62**	**0.64**

Table 2: Correlation (Pearson) across pair of indicators: PISP, CISP and GPI. Source: author's own elaboration.

The first column shows that the correlation between PISP and CISP is quite high for all countries (on average 0.95), with the lowest dispersion across countries (0.06) if compared to the other two columns. This result can be interesting if one considers that countries have different pension regimes, namely different rules determining pensions contribution and payment flows. The last two columns of Table 2 report the correlation between PISP and CISP with the benchmark GPI. Firstly, note that in the case of France it is negative in both cases. This means that GPI may underestimate the impact of current imbalances on the overall sustainability of public pension systems. Secondly, correlation is very high for countries like Germany, Austria, Finland and Italy. On the other side, the proposed indicators are not informative about the overall sustainability of France and the Netherlands as measured by GPI. Overall, PISP reveals some desirable properties. In fact, not only the average correlation with current imbalances is higher for PISP (0.95) than for GPI (0.51), but it is also the least dispersed across countries (0.06 and 0.64, respectively).

4. Conclusions

This work proposes an indicator for the financial sustainability of public pension systems. The novel lies in the consideration of durational margin for pension contribution and payment sides, namely the duration of working life and the life expectancy at retirement. In doing so, it explicitly combines both labour market and pension statistics in a unifying indicator, thus stressing their interplay. These novels are coherent with the recent focus posed by Eurostat within the set of indicators selected to monitor the sustainability of pension systems.

The proposed indicator PISP satisfies some properties which are desirable in the context of financial sustainability of public pension systems: highly correlates with current imbalances and the benchmark GPI and it is the least dispersed across countries. On the contrary, GPI shows a weaker correlation with current imbalances and negatively correlates in the case of France. This

consideration opens the need towards a solid and reliable indicator which meaningfully track the financial performances of pension systems. The structure of PISP can be conceived as a first step to be further developed towards an informative system reliable and comprehensive for policymakers (Whitehouse, 2012). The challenge becomes of utmost importance in a context of an ageing society, where the proportion of retired people increases and accordingly the importance of pensions.

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APPENDIX A: Dataset

	PENSION CONTRIBUTION (% GDP)				
COUNTRY	**2015**	**2016**	**2017**	**2018**	**2019**
Germany	14.04	14.21	14.33	14.54	14.70
France	16.72	16.68	16.74	16.03	14.91
Italy	12.95	12.73	12.70	13.00	13.26
Netherlands	13.98	14.67	13.81	13.96	13.49
Austria	14.49	14.51	14.56	14.68	14.82
Finland	12.60	12.70	11.95	11.83	11.76
	WORKING LIFE DURATION (years)				
COUNTRY	**2015**	**2016**	**2017**	**2018**	**2019**
Germany	37.9	38.2	38.4	38.7	39.1
France	34.9	35	35.2	35.4	35.4
Italy	30.7	31.3	31.7	31.8	32
Netherlands	39.9	39.9	40.1	40.5	41
Austria	36.7	37.1	37.2	37.5	37.7
Finland	37.7	37.7	38	38.7	38.9
	PENSION EXPENDITURE (% GDP)				
COUNTRY	**2015**	**2016**	**2017**	**2018**	**2019**
Germany	9.2	9.3	9.4	9.4	9.7
France	13.5	13.5	13.3	13.3	13.1
Italy	13.7	13.4	13.3	13.3	13.6
Netherlands	6.7	6.7	6.5	6.4	6.5
Austria	12.8	12.7	12.6	12.4	12.6
Finland	13.3	13.8	13.7	13.7	13.7
	LIFE EXPECTANCY AT AGE 65 (years)				
COUNTRY	**2015**	**2016**	**2017**	**2018**	**2019**
Germany	19.5	19.8	19.7	19.6	19.9
France	21.6	21.8	21.8	21.9	22
Italy	20.6	21.3	20.9	21.3	21.4
Netherlands	19.8	19.9	20	20	20.3
Austria	19.8	20.2	20.1	20.1	20.3
Finland	20.2	20.2	20.4	20.4	20.6

Table 3: Dataset for the construct PISP and CISP. Source: Eurostat.