

How to measure and compare the adequacy of pension systems in cross-country analyses? Some methodological remarks

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The aim:

- to evaluate the replacement rate as a measure of pension adequacy in cross-country analyses that require the data to meet the specific criteria of such analyses, which are less important in the case of single-country analyses

The thesis:

- the replacement rate is not a sufficient measure of pension adequacy

Contribution to:

- the overall discussion on the problem of comparing pension systems in cross-national analyses

Definition of pension system:

- **In the macro scale:** a tool dividing the current GDP between the working generation and the pensioners (Góra; Barr and Diamond; Blake).
- **In the micro scale:** a tool of income allocation in the life cycle, a tool of consumption smoothing in the life cycle or a tool of income distribution over time - from the period of economic activity to the period of old age (Barr and Diamond, Blake; Góra).
- The adequacy of pension system refers mainly to the micro scale.

Pension adequacy: definitions

- World Bank defines an adequate pension system as one that guarantees people, despite the level or form of their economic activity, such a level of benefits as to protect them from poverty and at the same time enable a vast majority of the society to smooth consumption over the life cycle.
- The European Commission defines an adequate pension system as one that "prevents poverty among the elderly; allows people to maintain, to a reasonable degree, their living standard after retirement; and promotes solidarity within and between generations".
- The International Labour Organization (ILO) claims that the goal of a pensions system is to guarantee an adequate living standard above the poverty threshold for the rest of a pensioner's life. Moreover, a pension system should be general and non-discriminatory between genders
- The Organization for Economic Cooperation and Development (OECD) considers an adequate pension system to be one that "replaces a worker's earnings at a level which enables him or her to maintain a standard of living in retirement comparable to that enjoyed in working life – even though retirement income often do not just replace earnings"

Pension adequacy: our definition

- pension system adequacy as a multi-dimensional category consisting of the following three dimensions:
- Dimension I: Protecting against poverty
- Dimension II: Consumption smoothing
- Dimension III: Differences in adequacy between the genders.

However, it should be emphasised that the most important for adequacy evaluation are the 1st and 2nd dimensions, whereas the 3rd dimension is secondary to them, as it concerns disproportions between men and women in the context of the first two dimensions: poverty and consumption smoothing.

How to measure pension adequacy: what does the literature say?

One-dimensional approach:

- Income replacement rates (Biggs and Springstead 2008; Holzman and Guven 2009)
- Consumption replacement rates (Rohwedder 2008)
- Income and consumption replacement rates (Cole and Liebenberg 2008)
- Comprehensive replacement rates CORE (Borella and Fornero 2009)

How to measure pension adequacy: what does the literature say?

Multi-dimensional approach:

- Portfolio Overarching Indicators (European Commission 2006)
- Synthetic indicator of pension adequacy APS (Chybalski 2012)

Our study

Adequacy indicators used in the analysis:

- At-risk-of -poverty rate for pensioners (ARP)
- Aggregated replacement ratio (ARR)
- Relative median income ratio (RMI)
- gender differences in the at-risk-of-poverty rate of elderly people 65+ (ARP_GD),
- gender differences in the aggregate replacement ratio (ARR_GD),
- gender differences in the relative median income ratio of elderly people 65+ (RMI_GD).

Our study

Data

- Panel data for 29 European countries in the years 2007-2012

Our study

Methodology:

- Correlation analysis based on the Spearman's rank correlation coefficient (table 1)
- Panel regression models (table 2)

Our study: results

Table 1. Spearman's rank correlation coefficient between variables characterising pension adequacy

| Variables | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2007-2012 |
|-------------------------|--------|--------|--------|--------|--------|--------|-----------|
| ARR_total & RMI_total | 0.614 | 0.620 | 0.636 | 0.617 | 0.709 | 0.807 | 0.700 |
| ARR_total & ARP_total | -0.727 | -0.727 | -0.691 | -0.661 | -0.611 | -0.628 | -0.719 |
| ARR_male & RMI_male | 0.807 | 0.668 | 0.799 | 0.719 | 0.826 | 0.834 | 0.776 |
| ARR_male & ARP_male | -0.662 | -0.554 | -0.665 | -0.508 | -0.395 | -0.426 | -0.560 |
| ARR_female & RMI_female | 0.455 | 0.511 | 0.510 | 0.475 | 0.527 | 0.583 | 0.544 |
| ARR_female & ARP_female | -0.612 | -0.654 | -0.446 | -0.556 | -0.594 | -0.424 | -0.585 |
| ARR_GD & ARR_total | 0.335 | 0.031 | 0.450 | 0.201 | 0.154 | 0.191 | 0.230 |
| ARR_GD & RMI_total | 0.463 | 0.225 | 0.546 | 0.279 | 0.299 | 0.235 | 0.336 |
| ARR_GD & ARP_total | -0.276 | 0.113 | -0.420 | 0.043 | 0.252 | 0.103 | -0.013 |
| RMI_GD & ARR_total | 0.230 | 0.267 | 0.251 | 0.264 | 0.292 | 0.321 | 0.319 |
| RMI_GD & RMI_total | 0.442 | 0.325 | 0.318 | 0.387 | 0.375 | 0.395 | 0.407 |
| RMI_GD & ARP_total | -0.160 | 0.060 | 0.034 | 0.042 | -0.043 | -0.077 | -0.077 |
| ARP_GD & ARR_total | 0.043 | 0.105 | -0.114 | -0.010 | 0.070 | -0.076 | 0.055 |
| ARP_GD & RMI_total | 0.020 | 0.242 | 0.072 | 0.080 | 0.167 | 0.010 | 0.138 |
| ARP_GD & ARP_total | -0.059 | -0.352 | -0.108 | -0.274 | -0.430 | -0.233 | -0.297 |

Source: own computations

Table 2. Panel regression models for variables characterising pension adequacy

| Dependent variable | Control variables | Parameter | Standard error | p-value | FE/RE |
|--------------------|-------------------|---------------|----------------|--------------------|-------|
| ARR_total | const | 0.991 | 6.568 | 0.880 | RE |
| | RMI_total | 0.601 | 0.067 | <0.00001 | |
| | ARP_total | -0.042 | 0.060 | 0.485 | |
| ARR_male | const | 2.849 | 7.395 | 0.701 | RE |
| | RMI_male | 0.575 | 0.073 | <0.00001 | |
| | ARP_male | -0.077 | 0.081 | 0.341 | |
| ARR_female | const | 11.522 | 9.655 | 0.234 | RE |
| | RMI_female | 0.498 | 0.102 | <0.00001 | |
| | ARP_female | -0.052 | 0.081 | 0.525 | |
| RMI_total | const | 65.093 | 3.669 | <0.00001 | RE |
| | ARR_total | 0.536 | 0.059 | <0.00001 | |
| | ARP_total | -0.492 | 0.042 | <0.00001 | |
| RMI_male | const | 78.512 | 3.712 | <0.00001 | FE |
| | ARR_male | 0.356 | 0.060 | <0.00001 | |
| | ARP_male | -0.669 | 0.059 | <0.00001 | |
| RMI_female | const | 79.531 | 3.048 | <0.00001 | RE |
| | ARR_female | 0.242 | 0.048 | <0.00001 | |
| | ARP_female | -0.555 | 0.035 | <0.00001 | |
| ARP_total | const | 98.818 | 4.103 | <0.00001 | FE |
| | ARR_total | -0.006 | 0.108 | 0.958 | |
| | RMI_total | -0.968 | 0.085 | <0.00001 | |
| ARP_male | const | 77.580 | 3.930 | <0.00001 | RE |
| | ARR_male | -0.066 | 0.067 | 0.326 | |
| | RMI_male | -0.684 | 0.060 | <0.00001 | |
| ARP_female | const | 104.979 | 4.542 | <0.00001 | FE |
| | ARR_female | -0.038 | 0.072 | 0.599 | |
| | RMI_female | -1.028 | 0.067 | <0.00001 | |

Source: own computations

Our study: results

- The aggregated replacement ratio, at least as calculated by Eurostat based on EU_SILC data, is not the best measure of pension adequacy, considering two of its dimensions: protecting against poverty and consumption smoothing.
- A better measure is the relative median income, as it better explains, with respect to the first two dimensions of adequacy, the variables `ARR_total` and `ARP_total`, and at the same time it is itself explained by the two variables.

Our proposition:

Synthetic pension adequacy indicator SPAI:

$$SPAI = \frac{RMI}{ARP}$$

This indicator may be calculated both for the total pensioner population and for men and women separately. It is an uninterpretable measure and it only serves the purpose of comparing pension adequacy. However, with this indicator, it is possible to simultaneously evaluate the first two dimensions of adequacy as well as its third dimension, when calculated separately and compared for men and women.

Our proposition:

Table 3. Spearman's rank correlation coefficient between the proposed synthetic pension adequacy indicator and the selected sub-indicators of pension adequacy.

| Variables | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2007-2012 |
|--------------------------|--------|--------|--------|--------|--------|--------|-----------|
| SPAI_total & ARR_total | 0.750 | 0.721 | 0.686 | 0.676 | 0.637 | 0.681 | 0.740 |
| SPAI_total & RMI_total | 0.785 | 0.782 | 0.836 | 0.776 | 0.743 | 0.778 | 0.802 |
| SPAI_total & ARP_total | -0.994 | -0.989 | -0.982 | -0.986 | -0.983 | -0.979 | -0.989 |
| SPAI_male & ARR_male | 0.681 | 0.609 | 0.699 | 0.558 | 0.467 | 0.549 | 0.609 |
| SPAI_male & RMI_male | 0.713 | 0.712 | 0.723 | 0.661 | 0.660 | 0.646 | 0.704 |
| SPAI_male & ARP_male | -0.995 | -0.987 | -0.992 | -0.989 | -0.989 | -0.972 | -0.993 |
| SPAI_female & ARR_female | 0.619 | 0.650 | 0.457 | 0.554 | 0.597 | 0.513 | 0.601 |
| SPAI_female & RMI_female | 0.782 | 0.788 | 0.805 | 0.771 | 0.722 | 0.761 | 0.804 |
| SPAI_female & ARP_female | -0.992 | -0.996 | -0.988 | -0.990 | -0.982 | -0.959 | -0.991 |

Source: own computations

Conclusion:

- There are many obstacles to cross-country analyses of pension adequacy, the most important of them undoubtedly being the need to apply internationally comparable statistical data. Thus, when using the data of, for example, Eurostat, it is necessary to use measures of quite a large degree of generality. Another limitation is associated with the requirement to apply income-based rather than expense-based measures of consumption, which is supposed to be smoothed by a pension system.
- An alternative to the replacement rate in analyses based on one indicator may be the synthetic pension adequacy indicator (SPAI) proposed in this article. An important advantage of this indicator is the fact that it provides for two dimensions of pension adequacy: both protecting against poverty and consumption smoothing, and that it adequately reflects them, as was proven by the statistical analysis.