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POVERTY ALLEVIATION AND CONSUMPTION SMOOTHING IN EUROPEAN PENSION SYSTEMS: CONVERGENCE OR DIVERGENCE?

Since pension systems have undergone reforms due to ageing populations, some changes linked to the relations between the objectives of pensions may also be expected. The two main social goals of pensions are poverty relief and consumption smoothing. In this paper the relationship between these two goals in 30 European countries using Eurostat data for the years 2007-2013 is investigated. Two different poverty measures: the at-risk-of-poverty rate and severe material deprivation ratio, and two different measures reflecting consumption smoothing: aggregate replacement ratio and relative median income ratio, are used. The method employed in the analysis is based mostly on the regression models for cross-section and panel data, however trend analysis and correlation analysis are also implemented. The results of the study suggest that despite deteriorating demographics and pension finance sustainability, the two analysed objectives seem to be still more convergent than divergent. In the majority of the studied countries, measures reflecting poverty are positively correlated with measures reflecting consumption smoothing. The other interesting conclusion is that there are many countries where relative poverty is not correlated with absolute poverty, or is even negatively correlated, which means that these two types of poverty may be quite different phenomena. This is probably caused by the ineffective redistribution which supports to a greater extent poor people instead of the poorest. The results also suggest that today's workers are paying for the generosity of pension systems, therefore intergenerational redistribution may be a more important tool to ensure adequate pensions than an intragenerational one.

Keywords: pension, retirement, consumption smoothing, poverty, redistribution, income

JEL Classifications: D31, I32, J26

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1. INTRODUCTION

Contemporary pension systems have been permanently reformed. The main driver forcing the changes in pension systems is population ageing. Increasing pension expenditures have created a completely new perspective in which pension systems are compared and assessed, namely today they have not only to be adequate but also efficient and financially stable. This

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results in some changes in the perception of the adequacy. Not so long ago, public pension systems were responsible for ensuring not only minimum, but even adequate benefits. This goal is included in, e.g. the Open Method of Coordination in terms of pension systems (European Commission, 2003). In this document, pension adequacy means mainly preventing social exclusion and enabling people to maintain their standard of living. The third goal in terms of adequacy is promoting solidarity within and between generations, however this is not the actual goal, it is rather a tool to realize the two former goals. Today, the view that public pension systems should not only protect against poverty but also ensure adequate benefits enabling retirees to maintain their living standards from the working period seems to have been revised. The forecasted replacement rates are lower than in the case of today's pensioners, which means that the future working generations should expect more benefits protecting against poverty and less ensuring a relatively high living standard. Thus, pension adequacy seems to have changed its meaning: it has become less related to consumption smoothing and more related to poverty alleviation.

The existing literature on pension adequacy concerns mainly the problem of how to measure this category of a pension system. The main measures applied in such analyses are replacement rates defined in various ways. Biggs and Springstead (2008) use replacement rates based on four different measures of income in the pre-retirement period in the denominator of replacement rate: final earnings, the constant income payable from the present value of lifetime earnings, the wage-indexed average of all earnings prior to claiming social security benefits as well as the inflation-adjusted average of those earnings. Holzmann and Guven (2009) suggest two main variants of the replacement rate: gross and net. In their research, which covers eight post-communist countries, gross and net replacement rates are evaluated for full-career workers and for partial-career workers. Borella and Fornero (2009) propose a three-dimensional approach to the analysis of pension adequacy encompassing consumption smoothing, prevention of poverty, and generational compact. They employ comprehensive replacement rates (CORE) founded on the comparison between living standard after retirement and living standard during working life. Love, Smith and McNair (2008) in their study on current wealth adequacy of older U.S. households use a very interesting measure called comprehensive wealth relative to poverty-line wealth. It is interpreted as the minimum level of wealth required to finance consumption at the level of the expected poverty line. An important advantage of this indicator is its capacity as it provides for two

main dimensions of pension adequacy: income smoothing reflected by wealth, and poverty alleviation. The main disadvantage of this measure is the fact that it expresses expected, not empirical values and therefore, it is sensitive to the uncertainty related to the economic parameters affecting lifetime utility and consumption smoothing. The multidimensional approach to the adequacy evaluation in cross-country studies is also employed by Chybalski (2012). He uses the multivariate statistical analysis to compare European pension systems in terms of adequacy referring to the pensioner incomes, poverty alleviation, and the gender difference between incomes and poverty among pensioners. Another author who treats the adequacy as a complex rather than one-dimensional category is Abatemarco (2009). In his view, the adequacy includes preventing poverty, leaving standard smoothing after retirement, and intra and intergenerational solidarity. This approach is fully consistent with the adequacy goals of the Open Method of Coordination. Many works refer to the problem of minimum pension provision which is the main tool to maintain the living standard on a level not lower than the poverty threshold. Other authors focus most of all on the issue of poverty among older adults. Rodrigues and Andrade (2014) analyse ageing and poverty in Portugal, showing that the poverty rate as well as material deprivation decrease among elderly Portuguese. They indicate that the evolution of contributive and means-tested pensions has a vital influence on the reduction of poverty and improvement of the living standard of pensioners. Dethier, Pastieu, Rabia (2010) show, with the example of 18 Latin America countries, that a universal minimum pension benefit would significantly reduce poverty among older people. Such pensions have many advantages like spillover effects or administrative simplicity; however, they have a high fiscal cost. Jimenez-Martin (2014) also recognizes minimum pension programs as an efficient means to reduce poverty in the population of retirees, however the side effects of such programs can be detrimental for the economy as they can affect the labour supply in a negative way. Chłoń-Domińczak and Strzelecki (2013) analyse the minimum pension as a tool of poverty alleviation in the new Polish pension system based on the notionally defined contribution (NDC) scheme. They show that a minimum pension needs significant improvements to keep its effectiveness of protecting the elderly from poverty, since simulations suggest that a minimum pension will fall below the International Labour Organization standard of the poverty protection of the elderly by the mid-2020s. This actually means that the last instrument of the poverty protection of pensioners is going to disappear. Grech (2015) also indicates the emerging problem of ensuring poverty

alleviation by public pension systems after their reforms implemented during the last two decades. His estimates suggest that the reforms have tended to reduce the function of protecting older people from poverty.

The review of literature on the adequacy of contemporary pension systems indicates an important gap concerning the analysis of the relationship between two main dimensions of this adequacy: poverty alleviation and consumption smoothing, perceived as maintaining the living standard from their working period. This paper attempts to fill this gap by studying the above mentioned relationship and by examining whether today's pension system has increased their contribution to poverty alleviation or to consumption smoothing. What is worth emphasizing is that two different measures of poverty (the at-risk-of-poverty rate and the severe material deprivation ratio) are used. The first indicator measures so-called relative poverty, and the other absolute poverty. Consumption smoothing is also reflected by two measures (the aggregate replacement ratio and the relative median income ratio). Both indicators refer to different periods and incomes. The results are surprising to some extent in terms of the relationship between these measures and show that the trends of poverty alleviation and consumption smoothing are not homogenous across European countries.

2. POVERTY ALLEVIATION AND CONSUMPTION SMOOTHING IN A PENSION SYSTEM: A THEORETICAL FRAMEWORK

Consumption smoothing is the natural goal of a pension system and refers to both the accumulation and decumulation phase. People decrease consumption when they work and earmark part of their incomes for long-term savings. In this way they accumulate the pension's wealth which they decumulate after retirement to be paid pension benefits. This distribution of incomes and consumption over the life cycle is justified by three theories of consumption. The first one is the intertemporal choice model by Fisher, according to which agents make a choice between today's consumption and future consumption. Their goal is to maximize the utility over the whole life cycle (today and in the future), not in the short term (only today or only in the future). Therefore, they refrain from a part of current consumption and transfer it to the future. The division of current income between consumption and saving determines the future consumption. This way agents smooth consumption over the whole life cycle. Obviously, the real interest rate also matters since it determines the difference between the cost of present and

future consumption (Fisher, 1930). Fisher's model was the background for two further theories on the basis of which pension microeconomics is built. Modigliani, Brumberg and Ando proposed the life cycle hypothesis (Modigliani and Brumberg, 1954; Ando and Modigliani, 1963) and Friedman (1957) proposed the permanent income hypothesis. According to these hypotheses, people smooth consumption. The main reason for such behaviour is income fluctuations over the life cycle which is mainly caused by retirement at a given age. To avoid a significant decrease in consumption and standard of living after retirement, agents save and accumulate pension wealth in the working period (see Mankiw, 2009), thus they try to ensure sufficient incomes and avoid falling into poverty after retirement.

A pension system enables agents to transfer their incomes from the period of working activity when they earn a living, to the period when they are unable to work, or when they become eligible to be paid pension benefits, which is more common today. Regardless of whether a pension system is based on the defined contribution (DC) or defined benefit (DB) formula, pension benefits are to some extent a derivative of incomes from the working period, however obviously, this relationship is stronger in the case of the DC than the DB model. Consequently, people who were poor when working are more likely to remain poor when retired. In the case of the DC model, people with high incomes during the working period can also become poor when they retire. This is possible if the public pension system is relatively small and obligatory contributions are low. Then the state relies on citizens' providence, and private savings determine the incomes of pensioners. When an agent does not accumulate private pension capital, his or her consumption may dramatically fall after retirement. Therefore, the incomes during working life and the level of consumption smoothing (realized by saving, which reflects refraining from consumption now to consume when one retires) are two main factors determining the incomes of pensioners. However, there is a third factor, relatively independent from the agent's decisions or choices. This is the government's will to support pensioners, mainly by intra or intergenerational redistribution. Barr and Diamond (2006) indicate consumption smoothing as "a central purpose of retirement pensions". They also see poverty relief as another objective of a pension system. These two goals should not raise any doubts; they are thought to be obvious. However, Barr and Diamond also perceive redistribution as an objective of a pension, and this view seems to be controversial. In their opinion, "Pension systems can redistribute incomes on a lifetime basis, complementing the role of progressive taxes on annual

income. Lifetime redistribution can be achieved by paying pensions to low earners that are a higher percentage of their previous earnings (i.e. a higher replacement rate), thus subsidizing the consumption smoothing of lower earner. (...) Pension systems can also redistribute across generations, for example if a government reduces the contribution rate of the present generation, thereby requiring future generations to pay higher contributions or have lower pensions” (Barr and Diamond, 2006). However, redistribution is not an objective of the pension system itself. When imagining an economy in which people earn enough and are provident enough as to save money for retirement, redistribution would be unnecessary. In such a case people would smooth their consumption and this would be the main purpose of a pension system. The problem becomes more complex if some agents are not able to allocate their incomes in a way enabling them to maintain their living standard over the poverty threshold after retirement. Then another objective of the pension system appears which is poverty alleviation. How to achieve this objective? Redistribution seems to be the only tool for the reduction of poverty. The government may transfer incomes from affluent pensioners to poor ones (intra-system intragenerational redistribution), finance poverty relief from taxes (outside-system intra and intergenerational redistribution, since not only pensioners but also the working generation pays these taxes), or increase pension contributions (intra-system intergenerational redistribution, i.e. the working generation pays for poverty relief). Therefore, redistribution should be perceived as a tool to achieve a very important objective of a pension system, which is protecting old people from poverty. However, redistribution may result in some distortions in the linkage between the contributions paid by workers during their productivity period and the pensions benefits paid to them after retirement. This refers especially to a pension system with an internal redistribution mechanism. Then the consumption smoothing is weakened by redistributive transfers between pensioners, and therefore, one can expect that poverty alleviation in a pension system is realized at the cost of consumption smoothing.

Redistribution may affect not only poverty measures but also the level of consumption smoothing, measured by the replacement rate or relative median income ratio. This is probable especially in the case of intra-system intragenerational redistribution. Hence, poverty reduction may be accompanied by the reduction of benefits paid to more affluent pensioners. Thus poverty measures may be positively correlated with consumption smoothing indicators. This is the main premise which raises an important question in the era of ageing population and decreasing sustainability of

pension financing: is there any relationship between poverty alleviation and consumption smoothing in contemporary pensions systems, and if so, of what type? Since pension reforms lead to less public and more private pension systems, one can expect that poverty alleviation has become the main objective of public pensions. An appropriate level of consumption smoothing may be ensured by higher tiers of pension systems, especially voluntary and privately managed. Today's states (governments) seem to be less capable of ensuring highly appropriate pension benefits. However, it remains hard to imagine that states will transfer the objective of poverty alleviation to the private sector; this should remain within the domain of the government and should be treated as the most important goal of public pension systems.

3. POVERTY ALLEVIATION AND CONSUMPTION SMOOTHING: THE TRENDS AND RELATIONSHIPS IN EUROPEAN PENSION SYSTEMS

3.1. Research Strategy and Data

The main assumption of the study is that the most important aim of the contemporary pension systems is poverty alleviation. This can be justified by the deteriorating influence the demography has on the financial stability of pension systems and the fact that when a government faces the problem of the choice between poverty alleviation and consumption smoothing, it chooses the former. The most common indicator of poverty is the at-risk-of-poverty rate. In this paper the indicator dedicated for pensioners population (the at-risk-of poverty rate for pensioners – ARP) is used. This is defined as the percentage of pensioner population with an income lower than 60% of the median equivalised income in a given country. The equivalised income is a measure of household income that takes account of the differences in the household size and composition (European Commission, 2012). ARP measures relative poverty, since this indicator is based on the threshold measured as a percentage of median income, which means that the greater the income of a population, the higher the threshold. In a theoretical population in which all the citizens have a similar income, no one would be under the poverty threshold, even if he or she were really poor. This is an important disadvantage of the at-risk-of-poverty rate, therefore the severe material deprivation rate (SMD) as a complementary poverty measure is

employed. This rate measures the share of the population living in households unable to afford at least 4 out of the following 9 items: i) to pay rent, mortgage or utility bills, ii) to keep home adequately warm, iii) to face unexpected expenses, iv) to eat meat, fish or a protein equivalent every second day, v) to take a week's holiday away from home, or which could not afford (even if wanted to) vi) a car, vii) a washing machine, viii) a colour TV, or ix) a telephone (Eurostat, 2012). As opposed to the at-risk-of-poverty rate, the severe material deprivation rate is resistant to income equality since in the case of a population with very similar income, it still measures the ratio of people who cannot afford to pay for at least 4 out of the 9 items listed above.

The possible tools to reduce poverty among pensioners are as follows. The first one may be redistribution reducing the income inequality within the generation of pensioners. The indicator used to measure it is the ratio between income inequality among the population aged under 65 and income inequality in the population aged 65 and over. This ratio is thus expressed by the following formula:

$$S80/S20_r = \frac{S80/S20_65-}{S80/S20_65+}, \quad (1)$$

where $S80/S20_r$ denotes the ratio between the income quintile ratio for the population aged under 65 ($S80/S20_65-$) and the income quintile ratio for the population aged 65 and over ($S80/S20_65+$). The income quintile ratio measures the distribution of income across a given age group through the comparison of incomes of 20% of individuals at the top of the distribution to the income of 20% of individuals at the bottom of the distribution (European Commission, 2012). However, the $S80/S20_65+$ indicator provides only for the income dispersion among people aged 65 and over, disregarding the income of the younger population. Therefore, it does not give any view of how income distribution differs when people retire. To take this into account the income distribution in two populations can be compared. The first one is the population aged under 65 and the second one is the population aged 65 and over (which can be perceived as the population of pensioners). The difference between these two distributions informs about the redistribution used for smoothing income inequalities. If $S80/S20_r$ is lower than 1, the income inequality among people aged under 65 is lower than among pensioners. This suggests that a pension system does not reduce but even increases income inequalities. If $S80/S20_r$ equals 1, the income inequality in both populations is similar, which suggests that a pension system does not

affect income distribution. If $S80/S20_r$ is greater than 1, a pension system reduces income inequalities. The redistribution of income from the wealthy to the poor is thus probable and contributes to smoothing incomes and reducing poverty across pensioners. Obviously, such an approach is based on the simplification that today's pensioners, when they were at working age, are well represented by today's workers, and this assumption is necessary to examine whether a pension system increases, decreases, or does not affect income inequalities.

The next factor which may reduce poverty among pensioners is public pension expenditure measured as a percentage of GDP (PE). A government aiming at an increase in the income of poor pensioners may spend more on pension benefits. However, the dynamics of pension expenditure may result from the demographical changes in the analysed countries. Therefore, the ratio between pension expenditure and old-age dependency ratio (PE/ODR) is used, which ensures greater comparability of pension expenditure across countries caused by the higher resistance to the age structure of the studied populations (Marcinkiewicz and Chybalski, 2014). The assumption that the relationship between poverty alleviation and consumption smoothing is possible results in incorporating consumption smoothing as one of the potential factors affecting poverty alleviation or as a variable coincident to (one which follows) poverty alleviation. In both cases, the relationship between poverty and consumption smoothing may be positive. This would mean that a pension system ensures poverty alleviation (poverty measures decrease) at the expense of consumption smoothing (whose measures also decrease). However, a negative relationship between poverty alleviation and consumption smoothing is also possible if an increase in pension expenditure results in the reduction of poverty (poverty measures decrease), and in the increase in consumption smoothing (whose measures increase), and both poor and affluent people benefit from this increase. Two variables represent consumption smoothing: the aggregate replacement ratio (ARR) and relative median income ratio for people aged 65 and over (RMI). The ARR indicator is defined as the median individual pension income of 65–74-year-olds relative to median individual earnings from work of 50–59-year-olds. This measure is based on gross incomes and does not include other social benefits. Chybalski and Marcinkiewicz (2016) show that ARR is not the best measure of consumption smoothing and recommend using the relative median income ratio as at least a supplementary measure. The RMI indicator is based on net incomes, as opposed to the ARR. It is defined as the ratio between median equivalised disposable income for people aged above 65,

and the median equivalised disposable income for people aged under 65. Therefore, this measure seems to be more reliable when evaluating incomes of pensioners in comparison to the incomes of the working population. ARR as well as RMI are relative (not nominal or absolute) measures of pensioners' income since they are ratios of incomes before and after retirement. Their value lower than 1 means that incomes decrease after retirement, equal to 1 means that incomes do not change whereas greater than 1 means that incomes increase after retirement. Since RMI is based on the equivalised disposable income, it accounts for all the net incomes. This means that in the case of pensioners' households it includes not only pension benefits but also incomes from other sources.

To search for possible relationships between above mentioned variables, the Eurostat data base for 30 European countries covering the period from 2007 to 2013 is used (excluding pension expenditure in the case of which data for 2013 are unavailable when conducting the study). The method employed encompasses the analysis of correlation and regression models for cross-section and for panel data (cross-section time series), where poverty measures (ARP for pensioners and SMD 65+) are the dependent variables, and RMI, ARR, S80/S20_r, and PE/ODR are independent variables. For the regression models estimated on the basis of cross-section data, the ordinary least squares (OLS) estimator is applied. These models are evaluated with the application of the F-test (for the overall significance) and the t-test (for individual regression parameters). The White test is also employed to examine whether the residual variance for a given model is homogenous or heterogeneous. The homogenous residual variance suggests that there are not untypical observations (objects) in the examined group of countries. In the case of panel regression models, the fixed effects (FE) and random effects (RE) estimators are employed. These models are evaluated with the application of the F-test for group intercepts (FE estimator) as well as the Breusch-Pagan test (for the presence of unobserved effects), and the Hausman test (to compare RE and FE estimators); see e.g. Ajmani, 2009; Wooldridge, 2002; Matyas and Sevestre, 1992. According to the time effects, intuition suggests that in the period of a few years the changes in a pension system should be rather weak and insignificant, since pension systems usually evolve smoothly, even in a period of crisis, and pension reforms show the effects in the long term. Hence finally, one-way random effects and one-way fixed effects models are estimated. In case the intercept is statistically insignificant, the next model without intercept is estimated. The estimation procedure is developed with the use of Gretl software.

3.2. Results

The analysis concerning the trends of average values of analysed indicators delivers some initial information on how pension systems evolved in the studied period (Figures 1–7). ARP (for pensioners) as well as SMD (65+) show downward trends (Figure 1), however the former decreases faster than the latter. This means that although the share of pensioners' population with a living standard under the poverty threshold decreases, the ratio of people who cannot afford 4 out of the 9 items (listed before) remains stable or decreases very slowly. The difference between the trends of the two poverty indicators justifies using them together instead of relying only on ARP, which is a relative measure as opposed to SMD having an absolute character. Both poverty indicators are negatively correlated with the PE/ODR ratio (Figure 2). This suggests that pension expenditure increasing faster than old-dependency ratio affects poverty negatively, especially relative poverty. Since 2009, when the PE/ODR remained stable, the SMD stopped decreasing as well. Figure 3 suggests that there is also a negative relationship between poverty and redistribution measured by the S80/S20_r indicator (i.e. the quotient of S80/S20 in populations under 65 (S80/S20_65-) and 65 and over (S80/S20_65+)). This refers especially to relative poverty (ARP), in the case of which every increase in redistribution was accompanied by a decrease in ARP. For SMD this relationship seems to be weaker. The indicators reflecting consumption smoothing behave in a very similar way to the PE/ODR (Figure 4), which means that an increase in pension expenditure expressed as the ratio of old-dependency rate supports not only poverty relief, but also consumption smoothing. This may suggest that poor as well as more affluent people benefit from this increase. The changes in the S80/S20_r indicator are also to a significant extent accompanied by changes in RMI and ARR (Figure 5), which may imply that affluent pensioners do not pay for poverty relief among poor pensioners, since the level of consumption smoothing does not decrease simultaneously. As a result, one may suppose that since the working population is charged with the poverty alleviation of older people, the redistribution is more intergenerational than intragenerational. Figure 6 confirms that people aged under 65 experience an increase in poverty and income inequality while these measures fall for the population of pensioners in the analysed period. Figure 7 also delivers some interesting information, since until 2009 the increase in the PE/ODR ratio was simultaneous with the increase in S80/S20

65+, and after 2009 the PE/ODR has remained stable while the S80/S20 65+ indicator has decreased. This means that until 2009 increasing pension expenditure could support an increase in income inequalities, e.g. through the percentage indexation of benefits. After 2009, the relation between pension expenditure and old-dependency ratio has remained stable, and the income inequality has fallen. In this period, directly after the global financial crisis of 2008-2009, some countries decided to lower or even to change the benefits indexation formula from a percentage to a quota, and this could have been an important factor decreasing income inequalities among pensioners.

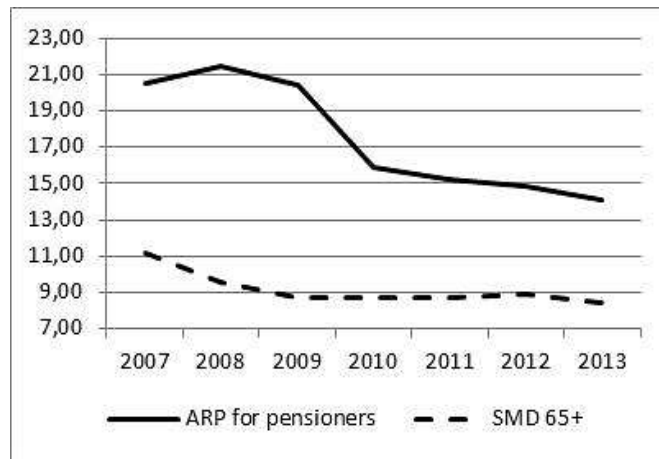


Figure 1. Average values of ARP and SMD 65+ in the analysed countries in the years 2007–2013

Source: own elaboration based on Eurostat data.

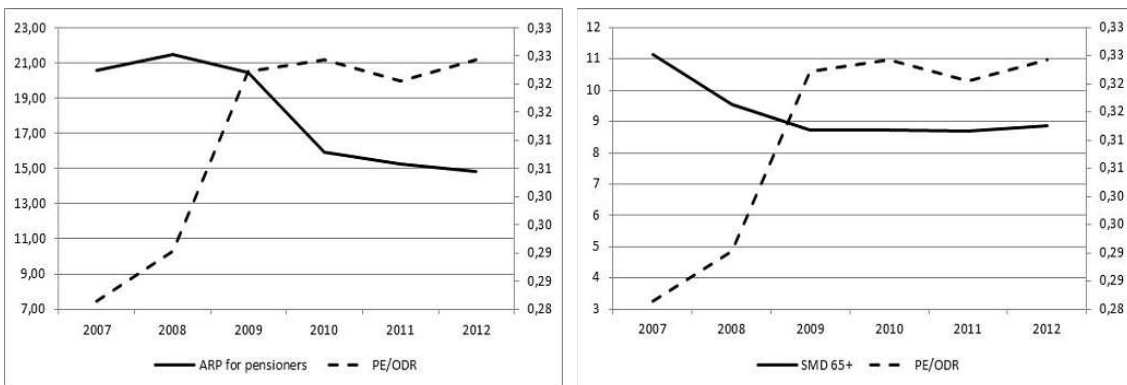


Figure 2. Average values of ARP and SMD 65+ in comparison to PE/ODR in the analysed countries in the years 2007–2012

Source: own elaboration based on Eurostat data.

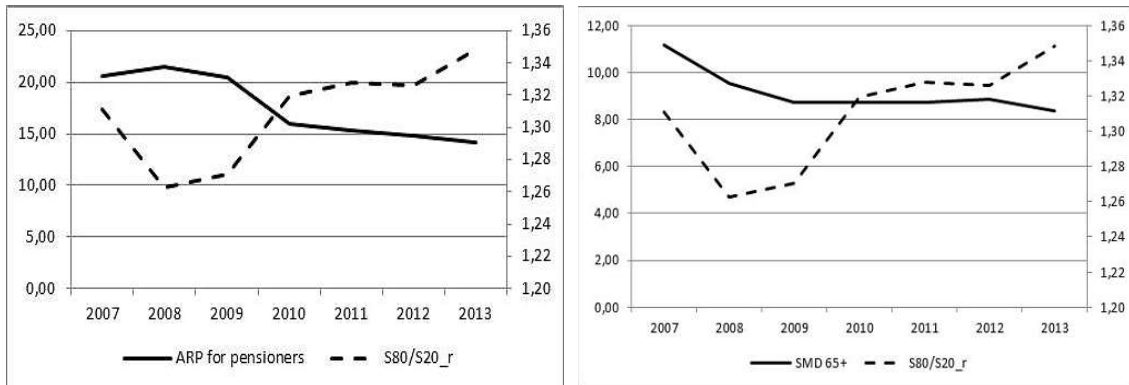


Figure 3. Average values of ARP and SMD 65+ in comparison to S80/S20_r in the analysed countries in the years 2007–2013

Source: own elaboration based on Eurostat data.

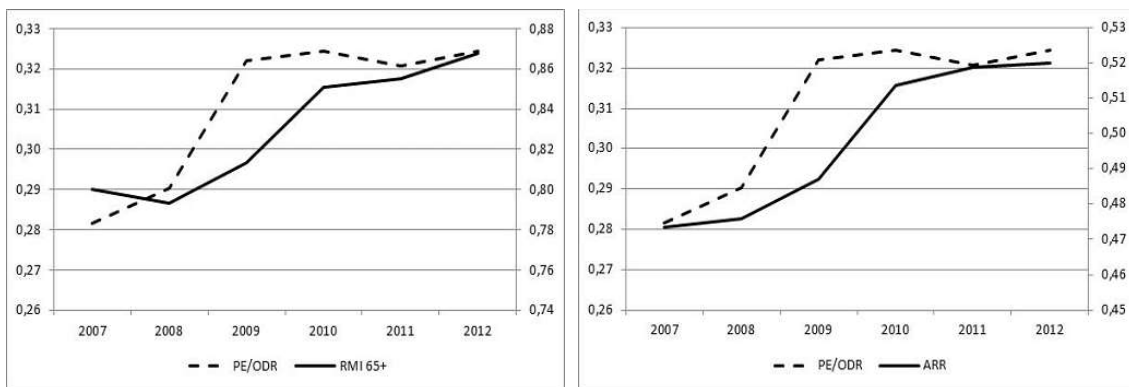


Figure 4. Average values of RMI 65+ and ARR in comparison to PE/ODR in the analysed countries in the years 2007–2012

Source: own elaboration based on Eurostat data.

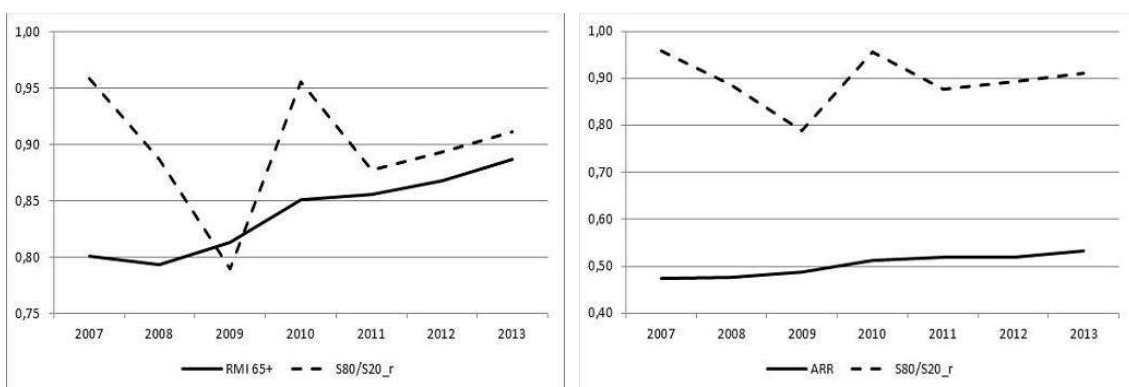


Figure 5. Average values of RMI 65+ and ARR in comparison to S80/S20_r in the analysed countries in the years 2007–2013

Source: own elaboration based on Eurostat data.

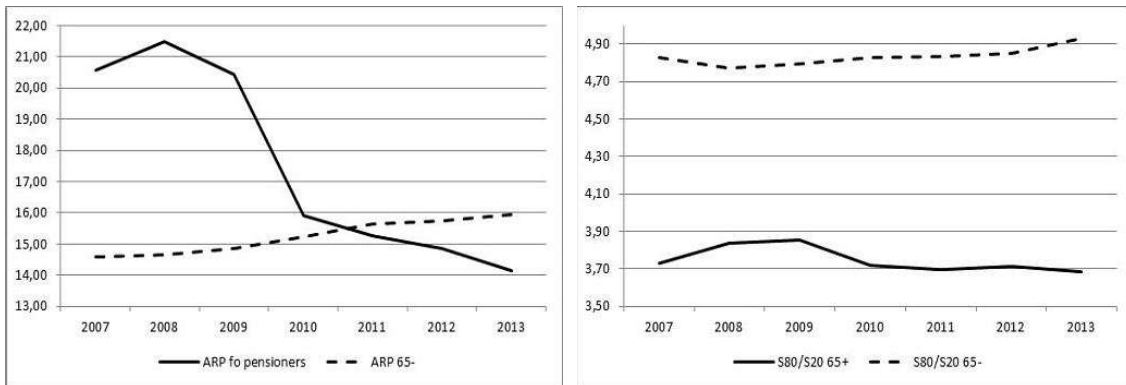


Figure 6. Average values of the ARP and S80/S20 indicators in the population of pensioners (or people aged 65 and over) and in the population aged under 65

Source: own elaboration based on Eurostat data.

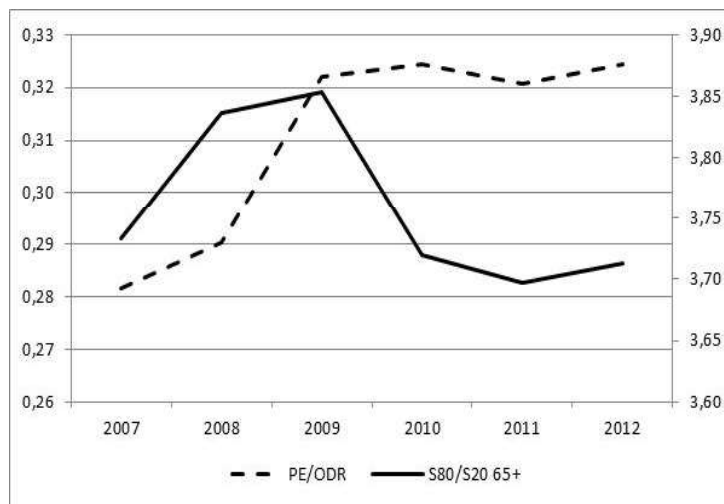


Figure 7. Average values of S80/S20_r and PE/ODR in the analysed countries in the years 2007-2012

Source: own elaboration based on Eurostat data.

Tables 1 and 2 include the estimates of regression models for cross-section data (separately for each year of the period from 2007 to 2012), and for panel data (for the whole period 2007-2012). Parameter estimates statistically significant at the significance level 0.05 are in bold. For almost all the models based on cross-section data the residual variance is homogenous (excluding the model for SMD in 2008). Moreover, the models for both variables ARP (for pensioners) and SMD 65+ are very stable over time in terms of the significant parameters and their signs. For panel data, fixed effects (FE) as well as random effects (RE) estimators also produced

very similar results, which strengthens the credibility of inference on the basis of their parameters (which are very similar and have the same signs for FE and RE models).

Table 1
Regression models for ARP for pensioners

Year	Const.	RMI 65+	ARR	S80/S20_r	PE/ODR	R ²	F-stat.	F-test p-value	White test p-value
2007	108.19	-55.34	-46.73	-9.07	-33.18	0.77	21.27	<0.0001	0.056
2008	109.73	-66.86	-36.00	-7.79	-28.35	0.75	18.59	<0.0001	0.232
2009	106.28	-75.20	-23.28	-4.66	-23.05	0.72	16.02	<0.0001	0.830
2010	77.57	-50.05	-23.77	-3.74	-5.96	0.56	8.03	<0.0001	0.406
2011	75.53	-47.91	-16.11	-7.62	-2.53	0.57	8.27	<0.0001	0.848
2012	57.45	-35.62	-14.12	-3.37	0.41	0.45	5.02	0.004	0.897
2007-2012 FE	101.41	-75.51	-6.31	-12.92	-2.15	0.94	72.27	<0.0001	—
2007-2012 RE	101.04	-73.65	-7.87	-11.64	-8.35	—	—	—	—
Tests for panel regression	Breusch-Pagan test: Chi-square=261.82, p-value<0.001 Hausman test: Chi-square=5.903, p-value=0.207 Test for differing group intercept: F-stat.=24.898, p-value<0.001								

Source: own elaboration based on Eurostat data.

Table 2
Regression models for SMD 65+

Year	Const.	RMI 65+	ARR	S80/S20_r	PE/ODR	R ²	F-stat.	F-test p-value	White test p-value
2007	—	41.37	-99.44	27.55	-38.83	0.64	11.57	<0.0001	0.078
2008	—	-1.39	-45.72	29.09	-14.74	0.60	9.72	<0.0001	0.013
2009	—	2.92	-45.23	24.22	-7.67	0.54	7.58	<0.0001	0.193
2010	—	-1.26	-17.72	18.10	-15.39	0.48	6.11	0.0001	0.547
2011	—	18.89	-44.36	18.29	-26.99	0.56	8.13	<0.0001	0.198
2012	—	9.47	-24.11	17.99	-32.73	0.58	9.06	<0.0001	0.248
2007-2012 FE	17.84	15.28	-26.88	3.68	-40.68	0.98	207.83	<0.0001	—
2007-2012 RE	17.81	14.19	-27.12	4.47	-40.52	—	—	—	—
Tests for panel regression	Breusch-Pagan test: Chi-square=379.89, p-value<0.001 Hausman test: Chi-square=7.681, p-value=0.104 Test for differing group intercept: F-stat.=159.06, p-value<0.001								

Source: own elaboration based on Eurostat data.

Models based on cross-section data, estimated for each year separately, deliver further results of the study. Firstly, when considering all the possible factors affecting the at-risk-of-poverty (ARP) rate among pensioners, only one independent variable is significant in each of the analysed years. This is RMI, and the negative relation between this variable and ARP means that the

higher the RMI, the lower the ARP. ARR, although insignificant in the majority of periods, is also negatively related to ARP. However, relative poverty behaves in a different manner than the absolute one, which was previously observed on the basis of the figures. In models for SMD 65+, the only statistically significant variable in each year is S80/S20_r, which is treated as a measure of redistribution. To one's surprise, the relationship between these variables is positive. This probably results from the first part of the analysed period when a positive correlation between SMD 65+ and S80/S20_r was observed (Figure 3). In models for ARP, although S80/S20_r has an insignificant parameter in each year, it is still negative. This supports the hypothesis that relative poverty is a quite different phenomenon from absolute poverty. The decreasing absolute values of the parameters next to RMI and ARR in models for ARP, and the decreasing absolute value of the parameter next to ARR in models for SMD 65+ may suggest that the relationship between poverty alleviation and consumption smoothing has become weaker and weaker. Also, the decreasing (although insignificant) parameter next to PE/ODR in models for ARP suggests that pension expenditure adjusted to demographic trends has affected poverty relief less and less.

The hypothesis about the difference between relative and absolute poverty is strongly confirmed by the panel regression models, since the signs of their statistically significant parameters next to respective variables differ in the case of RMI and S80/S20_r. The decrease in relative poverty is accompanied by the increase in RMI and S80/S20_r. However, the decrease in absolute poverty is accompanied by the decrease in RMI and S80/S20_r, and by the increase in ARR and PE/ODR. The different influence the relative median income ratio and aggregate replacement ratio have on absolute poverty is surprising and hard to explain. Additionally, the more smoothed the incomes among pensioners in comparison to the population aged under 65, the higher the severe material deprivation. The probable explanation of such results may be as follows. Redistribution supports pensioners under the poverty threshold (60% of median equivalised income), yet not the poorest ones. Then, the negative parameter next to the S80/S20_r indicator in the model for ARP and positive in the case of the model for SMD would be justified. Also the difference between the signs of parameters next to RMI could be explained, since an increase in the median income of pensioners would be then caused mainly by an increase in the income of more affluent and poor old people, however not the poorest pensioners (these are definitely under the median income). This is confirmed by the data

in Table 3. In some countries (shaded in the table) the poverty rate decreases (increases) more (less) in groups with an income equal to 50–60% or 60–70% of the equivalised median income than in the group with an income under 50% of the median equivalised income in the population, or, in the group with 60–70% of the equivalised median income, it decreases (increases) more (less) than in the group with an income from the 50–60% interval of the equivalised median income. This may be the reason why lowering relative poverty is easier than the absolute one: redistribution does not always improve the material situation of the poorest pensioners, above all. Sometimes it supports less poor people, which shows the ineffectiveness of redistribution, since it reduces dispersions in the groups of average incomes instead of increasing the income of the poorest pensioners. The poorest still remain the poorest, while the less poor become even less poor, or leave the group of the poor. The last column of Table 3 confirms this in the case of many countries in which ineffective redistribution increased income inequalities (measured by the S80/S20 indicator in the age group 65 and over). The best examples are Bulgaria, the Czech Republic, Denmark, Ireland, France, Lithuania, Luxembourg, the Netherlands, Austria, Poland, Finland and Sweden.

The interpretation of the regression models should be made very carefully. However, in this study regression models support many results of the trends analysis conducted on the basis of Figures 1–7, and give an overall view of the relationship between poverty relief and consumption smoothing, as well as the redistribution or pension expenditure in the whole group of the analysed countries. Although the White test suggests homogenous residual variance for estimated models, the set of pension systems under study seems not to be homogenous. When analysing the trends and correlations for each country separately, other interesting results occur. In the first instance, Ireland is the only country for which RMI and ARR are definitely negatively correlated. In the analysed period, RMI has increased from 0.69 to 0.94, whereas ARR has decreased from 0.49 to 0.37. This means that while consumption has been more and more smoothed in the long run, in the shorter run (covering the 10 years directly before, and the 10 years directly after retirement) the smoothing has weakened. Ireland is also the only country with a positive relationship between ARP and ARR, which means that a decrease in relative poverty could have been supported by a decrease in the level of consumption smoothing (in the shorter perspective) in the analysed period. In the case of RMI (reflecting the level of consumption smoothing in the long run), the relationship with ARP is

Table 3

The difference and relative difference (increase or decrease) in ARP 65+¹ in the period 2007-2013 providing the poverty threshold at the level of 50%, 60% and 70% of the national median equivalised disposable income, and the difference in S80/S20₆₅₊

Country	Income groups (with different percentage of median equivalised income)						S80/S20 ₆₅₊
	<50%	50-60%	60-70%	<50%	50-60%	60-70%	
	Differences			Relative differences			Increase/ Decrease
Belgium	-4.30	-0.30	2.50	-42.57	-2.33	17.61	-
Bulgaria	3.60	0.40	-0.10	27.91	3.64	-0.88	+
Czech Republic	-0.20	0.50	-0.70	-12.50	12.82	-6.03	+
Denmark	-0.80	-6.30	-3.00	-22.22	-44.68	-14.15	+
Germany	-0.70	-0.60	-1.10	-8.05	-8.00	-10.78	-
Estonia	-7.20	-1.60	3.60	-58.54	-7.66	22.64	-
Ireland	-0.90	-17.30	-12.50	-11.84	-83.57	-62.81	+
Greece	-8.20	0.40	-4.50	-55.78	4.88	-41.67	-
Spain	-8.80	-4.60	-1.00	-58.28	-41.82	-8.40	+
France	-3.90	-0.50	-2.10	-56.52	-8.06	-21.00	+
Italy	-5.40	-1.20	-0.70	-44.63	-12.24	-7.69	-
Cyprus	-26.20	-4.30	6.90	-76.83	-26.06	75.00	+
Latvia	-14.10	-3.90	1.80	-68.45	-26.00	11.54	-
Lithuania	-5.10	-5.30	-2.00	-37.78	-32.52	-14.39	+
Luxembourg	-0.10	-0.90	-0.70	-3.45	-20.93	-10.77	+
Hungary	-0.60	-1.10	-2.00	-27.27	-28.21	-27.40	+
Malta	-3.80	-1.60	3.00	-35.85	-16.49	21.28	-
Netherlands	-1.20	-2.80	-3.70	-35.29	-45.90	-25.00	+
Austria	6.00	-4.60	-0.70	157.89	-45.10	-7.78	+
Poland	2.90	1.60	-0.60	87.88	35.56	-6.90	+
Portugal	-7.00	-3.90	-3.30	-52.63	-31.97	-26.40	-
Romania	-12.80	-2.80	-2.20	-60.38	-29.79	-19.47	-
Slovenia	0.60	0.50	0.50	5.56	5.81	5.56	+
Slovakia	-3.50	-0.10	-3.60	-74.47	-2.04	-30.25	-
Finland	-0.70	-4.80	-1.50	-12.28	-30.19	-8.77	+
Sweden	2.00	4.50	-4.70	52.63	73.77	-25.41	+
United Kingdom	-6.00	-3.90	-2.40	-40.00	-33.91	-18.32	-
Iceland	-1.50	-9.60	-3.20	-48.39	-80.00	-19.63	-
Norway	-2.30	-2.10	-4.30	-62.16	-20.19	-31.85	-
Switzerland	3.50	-0.10	-0.50	22.44	-0.95	-4.55	-

Source: own elaboration based on Eurostat data.

¹ Dispersion around the at-risk-of-poverty threshold of older people is not available for ARP for pensioners therefore ARP 65+ is used instead

negative for each country. Ireland represents also the strongest positive relationship between ARP and the S80/S20_r indicators. In the years 2007-2013 the decreasing poverty rate was accompanied by decreasing redistribution here. In the case of the relationship between relative and absolute poverty, three groups of countries may be identified. The first includes countries with a strong positive correlation between these variables. These are Belgium, Hungary, Romania, and Finland. In the group of countries with a strong negative correlation there are Lithuania, Malta, and Poland. In the rest of the countries these relationships are weak or do not even exist, especially in Estonia, Iceland, the Netherlands, Bulgaria, the Czech Republic, Latvia and Denmark. The trends of poverty analysed across countries are also very interesting. In the majority of countries the ARP indicator has decreased, whereas in some of them it has significantly increased. These are especially Bulgaria, Austria, Poland, Sweden and Switzerland. SMD increased significantly only in two countries, Italy and Malta. It is worth emphasising that Switzerland is the country with the highest at-risk-of-poverty rate among pensioners, equal to 30.50% in 2013. Concurrently, SMD equals 0.3% in Switzerland and is the third lowest in the analysed group. This confirms once again that relative and absolute poverty are two very different phenomena.

CONCLUSIONS

As far as the relationships between the poverty and consumption smoothing are concerned, three groups of countries may be identified. The first one is a group of countries with decreasing poverty and increasing consumption smoothing, which includes: Belgium, Denmark, Estonia, Greece, Spain, France, Cyprus, Latvia, Lithuania, Luxembourg, Portugal, Romania, and Slovakia. Among the countries with no significant trends in poverty and consumption smoothing there are Hungary, Austria, and Slovenia. The next group includes countries with decreasing poverty and without improvement in consumption smoothing, and these are Bulgaria, Poland and Finland. In the case of other countries it is difficult to identify clear relationship (or its lack) between poverty and consumption smoothing measured by two indicators for each of them. Thus 13 of the 30 countries under study improved the adequacy of pension systems in its two dimensions: poverty alleviation and consumption smoothing. Whereas in as few as 3 of the countries under study only a decrease in poverty was possible which suggests that deteriorating demographics enforced a choice between poverty alleviation and consumption smoothing. The rest of countries is

characterized by a stable level of poverty and consumption smoothing or it is difficult to identify significant and one-directional trends of these two phenomena.

The study shows that generally there is a positive relationship between the accomplishment of two crucial objectives of pension systems in Europe: poverty alleviation and consumption smoothing. The lower the level of poverty is, the higher the level of consumption smoothing. However, the at-risk-of-poverty rate and several material deprivation ratios are completely different measures of poverty. The first one has a relative character, and the other one is of an absolute nature. In some countries they are positively correlated, in others the relationship is negative or does not exist. The data also show that it is easier to decrease relative poverty than the absolute one since the average difference between ARP for the pensioners indicator in 2007 and 2013 equals 6.42%, whereas in the case of SMD it is 2.77%. This is consistent with the results of a study by Kotecka, Sue, Coutinho (2013), who conclude that the decrease in the percentage of pensioners with an income above the poverty threshold does not mean the same decrease in material deprivation, thus people living out of relative poverty may experience absolute poverty simultaneously. This is observed especially in selected post-communist countries (Bulgaria, Latvia, Hungary, Romania, Poland), where poverty rates are usually lower than material deprivation ratios. This conclusion about relative and absolute poverty also supports the results of the study by Notten and Neubourg (2011) who suggest using these two measures complementarily instead of alternatively, since relative indicators are based on the living standard perceived as “normal”, and absolute indicators refer to basic needs or rights.

To summarize, generally there exists a convergence between poverty relief and consumption smoothing in the pension systems under study. This results from the estimated models and the trends of the average values of indicators used in the study. Also, many of the studied countries show decreasing poverty together with increasing level of consumption smoothing which is to some extent surprising in the period of population ageing and the deteriorating sustainability of pension systems. This suggests that today’s workers are paying for this generosity of pension systems, and thus intergenerational redistribution may be a more important tool to ensure adequate pensions than the intragenerational one. However, there are some signs of weakening in the relationship between poverty relief and consumption smoothing, and this is worth observing and studying in the future, since it will show the direction of the evolution of public pension systems.

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