EQUALITY OF DESERT IN THE PENSION SYSTEM FROM THE GENDER PERSPECTIVE. THE CASE OF POLAND

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1. Introduction

Equality is treated as one of the effects of *welfare state* (Golinowska 2018, pp. 22-23) and at the same time as the key category of *welfare economics* (Blake 2006, p. 3, 171ff.). Equality is considered in connection with distributive justice[1], taking into account both normative (distributive justice defined through equality) and positive relations (distributive justice results in equality in a given area) between these two categories (Szarfenberg 2008, p. 71). Hence, equality is a relevant criterion in defining, operationalisation, implementation, control and assessment of social policy (Schmähl 2009, p. 122; Szumlicz 2015, p. 14).

Analysis of the literature on the subject of equality in social policy shows an important cognitive weakness: the concept is seldom conceptualised and particularly rarely operationalised (Österle 2002, p. 46). At the same time, in literature on pensions we can observe remarkable chaos in terminology concerning equality. It is also characteristic that both researchers and decision-makers, when referring to pension provisions, usually cite distributive justice in its default sense, while literature mentions numerous definitions thereof.

Equality as a principle of distributive justice in the pension system is usually referred to in two contexts: either as a constraint on or the goal of pension reforms (Howse 2007). In the former case, justice referred to equality is a criterion on the basis of which the character of proposed reforms is analysed, evaluated and selected. It is assumed at the same time that their implementation cannot infringe justice in the pension system (e.g. excessively burden the generations which are financing the provisions), without explicitly defining the set of its qualities (referents/denotations). In the latter case, when justice is the goal of the reform and the premise of the changes undertaken in the pension policy, the reform is aimed at achieving defined referents of justice in the pension system (e.g. achieving inter-generational justice).

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[1] Distributive (allocative) justice refers to "distribution of something that people cannot provide to themselves sufficiently compared to their needs or demands" (Rysz-Kowalczyk, 2002, p. 199).

Pension system is one of the most important institutional platforms for the fulfilment of distributive justice principle. The base pension provision (i.e. common, obligatory, state-initiated and often state-delivered), which primarily amounts to the volume of collected and transferred financial means, constitutes a significant area for distributive justice to take place.

Equality in the pension system is usually taken into consideration in the description and assessment of pension systems. For instance, in the open method of co-ordination of the EU pension systems equality is indicated directly as the aim of modernisation and indirectly in the context of adequacy (e.g. the level of replacement rate) and financial stability of pension systems (Żukowski 2010; Chybalski 2012, p. 79ff.). The World Bank approaches equality as one of the six criteria of pension systems assessment (Holzmann et al. 2008, p. 8ff.). It's worth noting that intra-generational equality in pension systems is by far less frequently analysed (Kohli 2008, p. 196).

Equality in the context of gender, understood as formally identified equal rights and treatment of both men and women is a crucial premise in the EU legislation and activities (Śledzińska-Simon 2011). Research of pension systems from the point of view of gender equality encompasses mainly regulations and the benefit levels for men and women. The regulations refer to formal equality and are directed at the analyses of pension regulations in terms of the access to the provision and its amount. The latter are concentrated on the impact of regulations on actual access to a pension system and on estimation of provision amounts for men and women considering their differing biographies.

The concern with analysis and especially evaluation of pension systems from the gender perspective is important for several reasons. Firstly, it stems from the increase in female activity on the labour market, especially starting from the 60's of the twentieth century. Obtaining income from labour leads to individual pension entitlements in pension systems and this in turn inspires research of pension level differences between genders (Jefferson 2009; James 2011). Secondly, changes in the family model including a limited occurrence of the single breadwinner model seem to question the traditional forms of pension security for women based on derived entitlement in the form of a survivor's benefit. Thirdly, pension reforms conducted in various countries are clearly directed at strengthening equivalence of the contribution and the pension, which has an adverse effect on pension amount received by females. This is caused by unstable or interrupted careers on the labour market as well as differentiation between retirement ages of men and women in some of the countries.

The aim of the article is to operationalize equity with regard to one of the equity dimensions, i.e. the equity of desert within a generation in the pension system. In the next step the intergenerational (in)equity between women and men in the Polish (obligatory) pension system will be identified. The calculations will focus on the results of the descriptive microsimulation model, which bases on the female and male biographies and pension outcomes received from the new pension system.

2. Equality of desert – definition

The studies of literature and analyses of the available research findings indicate clearly that the category of equality is a key instrumental value of social policy and it determines another value, which is distributive justice. In the course of the research I assumed that the relations between these two categories are both conceptual and normative in character. A conceptual relation may be considered at least in two aspects (Fig. 1).
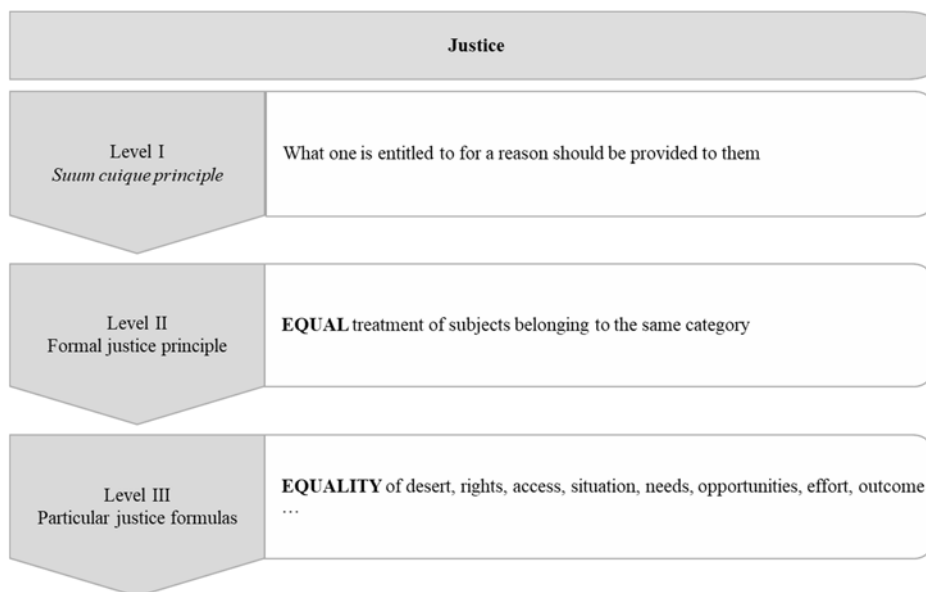
Justice

Level I *Suum cuique principle*	What one is entitled to for a reason should be provided to them
Level II Formal justice principle	**EQUAL** treatment of subjects belonging to the same category
Level III Particular justice formulas	**EQUALITY** of desert, rights, access, situation, needs, opportunities, effort, outcome ...

Fig. 1. Conceptual relations between justice and equality
Source: author's own work.

Firstly, equality may be understood as a principle which determines operation of other principles („the principle's principle", meta-principle) and understood as undiscriminating (treating equally) for all the subjects belonging to the given category. Secondly, equality refers to the criteria (distribution principles) which are implemented in (re)distribution of limited goods. In the adopted approach, equality is not limited to just one distribution principle i.e. equality of situation which leads to a narrowly taken egalitarianism. I have assumed that there is a set of distribution principles consisting of five criteria: desert, situation, needs, access and opportunities.

The relation between equality and distributive justice may be normative in character. In such case the factual condition is the subject of description and evaluation from the point of view of an equality principle or a bundle of equality principles. Hence, a discovered inequality (as opposed to diversity or differentiation) may become the premise for activities directed at its limitation or even abolition.

It should be emphasised that the paper discusses the subject of real equality (referred to the outcomes of the pension system). This limitation has made it possible, among

other things, to organise research findings on various aspects of equality which are / can be referred to as equality dimensions. In research so far, one could use three equality dimensions i.e. (1) a subjective one, giving the answer to the question who is the subject of equality, (2) an objective one, answering the question what is the object of equality and (3) a dimension of distribution principles, answering the question of how/on the basis of what / which? equality criterion a given good is distributed. I have used two additional criteria, which are: (4) the time dimension which answers the question when equality is examined and (5) the space dimension, which answers the question in which area of pension provision and where equality is examined. As a result, I have developed an original five-dimensional matrix of equality dimensions (who? what? how? when? where?) and a set of features of these dimensions (denotations) with reference to the base pension provision (Fig. 2).

Equality dimension	Who?	What?	According to which rule?	When?	Where?
Denotation of a given dimension	individual	burdens (e.g. pension contribution)	deserts	at a given moment (retirement)	The whole of the pension system
			needs		Selected pension subsystem
	group (women and men)	revenue (pension)	situation	within a given period of time	Selected layer of the pension system (base)
	cohort or generation	rights	access		part of the pension system
		duties	opportunities	in the whole period of "functioning" in the pension system	political area (Poland)
					administrative area
					economic area
					geographic area
	Formal equality				
	Real equality				

Fig. 2. Multidimensional approach to equality in a pension system
Source: author's own work.

In this paper a real equality of pension provision between women and men in the first year of their receiving obligatory pension, which is distributed according to the principle of desert is used.

Desert is an ambiguous term and it is sometimes used as a synonym for the term *merit*. However, "merit is a broader concept, the genus of which the desert is the species" (Pojman 1999, p. 86). Merit results from any feature or quality of a subject which is a base for the positive or negative (demerit) attribution of that subject even if the treatment is not undeserved. Desert is connected with the positive attribution of merit resulting from intended action and is strictly linked to the

responsibility of subject for his or her action. The question remains, what is treated as a merit and for what is the individual subject responsible, so what is the desert exactly? Is the desert only the result of the action or should the effort be also taken into consideration? Furthermore, there is a question of how the desert should be transferred into the distribution of desired good.

In the pension system, the term desert is noted twofold: (1) as an input into the pension system and (2) as a position.

An input covers both financial and non-financial input. The first one is associated with a pension contribution, which is paid in the pension system (fund) directly, mostly on a base of individual earnings. As a result the final individual pension entitlements should reflect the previous pension contributions proportionally. It is also called individual pension equivalence, which means individual actuarial pensions (Disney 2006, p. 269). Pension reforms introduced in the last decades were at least partly aimed at individualization of pension entitlements and followed the individual pension equivalence (Holzmann 2013).[2] The non-financial input is associated with the activities conducted in the private sphere. The decision about which of those activities are treated as an input into the pension system and how they are transferred into individual pension entitlements is a normative issue. There has been e.g. a criterion of positive external effects used, which are generated by the individual, family, generation or sex (Leisering 2004, p. 16 and f.). For the evaluation of the private activity in the pension system it is important, if an activity was performed instead of a paid-work or not. In other words, there is a question of a trade-off between paid and unpaid work or between financial and non-financial input into the pension system. If an unpaid activity (e.g. care) is done in a place of paid work, this activity can be evaluated on the basis of non-performed paid work. It means that the individual pension entitlements refer to the level of contributions, which would be transferred to the pension system if the paid work was not stopped by the private activity. It is in line with the idea of pension insurance, which is a selective one and covers employed workers. The other approach is to treat the private activity (e.g. care) as non-financial input even if the paid work is performed simultaneously. In this case the non-financial input is treated as a *per se* input into the pension system. Evaluation of such input can refer to the value of the positive external effects or increase in the GDP (Döring 1998, p. 2018).

Position is treated in the pension system merely as a professional one and identified with a (public) service. There is an assumption that the service also involves the pension retirement phase and the old-age security is a part of the salary in a broader sense. Because of this a DB pension formula is very often used. From that point of view, the term 'position' in the pension system can be treated as a part of specific desert (Raphael 2003, p. 172; following Šimo 2009, p. 70).

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[2] It is true that individualization of the pension entitlements often follows the shift towards a private pension system, but the DC pension formula was also introduced without movement towards funding (Moshe and Ratajczak 2020).

3. Equality of desert – operationalization

In the operationalization of the equality of desert only the financial and non-financial input is considered. Financial input refers to the individual contributions. In the pension systems which receive state subsidies (like in Poland), individual share of those subsidies could also be taken into consideration and counted as financial input. However, there are at least three difficulties in doing it: a) the amount of subsidy has been various in different years, b) the subsidy is covered by diverse tax revenues paid by the group which differs from the group of pension contribution payers, c) the contribution payers/ insured people pay different taxes. The non-financial input covers non-paid activities, which are recognized in the pension system and which increase the individual pension level. In this paper the non-paid activities include all care periods, for which pension contributions are paid by the third subject, e.g. the state. In Poland it includes especially (Ratajczak 2019, pp. 83-86): (1) periods of maternity, parental, paternity and child care leave or long-term care for dependent children and (2) long-term care for dependent elders.

The assessment of the relation between (financial and non-financial) input and output (pension provision) is related to actuarial equivalence. It is assumed, that:

$$PV_{sn}(t) = PV_{en}(t) \tag{1}$$

where:

$PV_{sn}(t)$ – present value of the pension contributions of the n-contributor at the moment of retirement in the t-year,

$PV_{en}(t)$ – present value of the n-beneficiary at the moment of retirement in the t-year.

In the Polish pension system the present value of the pension contributions consists of the pension capital on the individual pension account and individual pension subaccount in the first pillar at the moment of retirement (at the moment of achieving the minimum retirement age).[3] Because of that:

$$PV_{sn}(t) = K_{in}(t) + K_{sn}(t) \tag{2}$$

where:

$K_{in}(t)$ – pension capital on the individual account in the first payg pillar of the n-person at the moment of retirement in the t-year,

$K_{sn}(t)$ – pension capital on the individual sub-account in the first payg pillar of the n-person at the moment of retirement in the t-year.

The pension capital can be treated as a lump-sum contribution. From the actuarial point of view, pension payments are lifelong annuities, paid in advance ($\ddot{a}_x$), with a constant interest and payment:

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[3] It was assumed, that there is no funded pillar and the total pension contribution is split between individual account and subaccount in the first, payg financed pension pillar. This assumption is justified, because the aim is to estimate the differences between sexes, so resigning from the funded pillar both for women and men should not influence the outcome of calculation. Furthermore, it could have some influence if the structure of women and men who belong to the first payg and second funded pillars differed, but there is no proper data concerning that issue.

$$\ddot{a}_x = \sum_{k=0}^{\omega-x} v^k \cdot {}_k p_x \tag{3}$$

where:

x – age of the person who retires,

ω – top age limit (110 years old) of the person who retires,

v – discount factor,

${}_k p_x$ – probability of survival up to time k of a person at the age of x.

It means, that:

$$PV_{sn}(t) = \ddot{a}_x \cdot E_{ap}(t) = \sum_{k=0}^{\omega-x} v^k \cdot {}_k p_x \cdot E_{ap}(t) \tag{4}$$

where:

$E_{ap}(t)$ – lifelong annuity of a males/females in the year t,

p – sex (m – male, f – female).

For the calculation of the lifelong annuity uni-sex tables are used. It is consistent with the EU-recommendation.

For the operationalization of the equality of desert a difference between the factual pension provision and lifelong annuity will be calculated. This difference will be called the indicator of pension equivalence $E_{ep}(t)$ for the beneficiaries born in the year t:

$$E_{ep}(t) = \frac{\left(E_p(t) - E_{ap}(t)\right)}{E_p(t)} \cdot 100\% \tag{5}$$

where:

p – sex (m – male, f – female),

$E_p(t)$ – median of the pension provision of males/females born in the year t,

$E_{ap}(t)$ – median of the annuities of males/females born in the year t.

As it was mentioned above, a decision about what is the non-financial input and how it is transferred into the pension entitlements is a normative one. In the next step of operationalization of the equality of desert the following assumption is made: every activity which is considered a non-financial input will be evaluated with the contribution calculated on the basis of the paid work. It means that the contribution base for every non-financial input will be the monthly salary (the average wage by sex and age). In the case of the Polish pension system the mentioned leaves because of child care or dependents as well as the non-activity periods caused by delivering care will be taken into consideration. As a result, the corrected indicator of pension equivalence $SE_e(t)$ is proposed and calculated as following:

$$SE_{ep}(t) = \frac{\left(E_p(t) - E'_{ap}(t)\right)}{E_p(t)} \cdot 100\% \tag{6}$$

where:

p – sex (m – male, f – female),

$E_p(t)$ – median of the pension provision of males/females born in the year t,

$E'_{ap}(t)$ – median of the annuities of males/females born in the year t for the corrected contribution base for the care periods.

The present value of the contributions for the corrected contribution base for the care periods $PV'_s(t)$ is calculated as:

$$PV'_s(t) = K_i'(t) + K_s'(t) \qquad (8)$$

where:

$K_i'(t)$ – pension capital on an individual account in the first payg pillar of the n-person at the moment of retirement in the t-year for the corrected contribution base for the care periods,

$K_s'(t)$ – pension capital on an individual subaccount in the first payg pillar of the n-person at the moment of retirement in the t-year for the corrected contribution base for the care periods.

The annuity for the corrected contribution base for the care periods ($E'_{ap}(t)$) for women or men born in the year t will be calculated according to (4) and by consideration of the lump-sum net contribution.

The indicator of the equality of desert is calculated as a weighted average mean of the difference in the indicator of pension equivalence according to gender $RE_e(t)$ and the difference in the corrected indicator of pension equivalence according to gender $RSE_e(t)$, when the weight of both partial indicators amounts to 50%.

4. Equality of desert in the Polish pension system

Empirical analyses adopt a specially designed model which belongs to the category of micro-simulation descriptive models. The model makes it possible to obtain macro-aggregates of data (e.g. the median of female pension income) on the basis of projections of information about individuals (here – the participants of the pension system). Such models are applicable for studying redistributive effects of various policies (Bourguignon and Spadaro 2006; Żółtaszek 2013, p. 42ff.). It is worth emphasising that in Poland the microsimulation descriptive model has not been yet used for the analysis of the old age provision and the models which have been applied (SIMPL, EUROMOD sub-model and the Ministry of Finance model) are mainly connected with the subject of taxation and benefits. (Żółtaszek 2013, p. 8, 18ff.). Furthermore, the microsimulation method has only been partially used so far in pension system in Poland and mainly for estimation of inter-generational redistribution (e.g. Jablonowski and Müller 2013).

The scope of the empirical study encompasses Poland and refers to a cohort aged 18-25, affected by the new pension system of 1999 only and will reach retirement age in 2034-2046. While the estimates concerning the levels of provision were based on genuine data until the end of 2018, starting from 2019 simulations of career related and non-career related biographies have been absolutely necessary. A descriptive microsimulation model contained four modules: (1) earnings, (2) breaks in earnings (14 reasons for lack of earnings were distinguished); (3) family situation before reaching retirement age; (4) pension calculation. On these grounds, hypothetical individual biographies with annual frequency were generated, where the events affecting the value of the raised capital were selected at random. Each occurrence was modelled by means of categorical distribution, or for its possibly

exceptional case Bernoulli distribution. Probability for the distributions was calculated on the basis of authentic data. In total, I performed 20000 simulations for the cohorts born between 1974-1981 (more Ratajczak 2019, pp. 71-83).

The regulations concerning the access to the obligatory pension system and pension provision (including minimum pension) as well as the pension calculations refer to 2019. It was assumed, that the pension provision is acquired at the moment of achieving the minimum retirement age of 60 for women and 65 for men.

For the measurement of the equality of desert in the pension system the pension provision covers both the individual pension and the survivor's benefit. The reason for that is that the derived pension benefits constitute an important source of income, especially for older women (OECD 2018, pp. 233-254).

The results of the calculation show that the median pension provision of male beneficiaries born in the years 1974-1981 is about 36 percent points lower than the median male actuarial annuity (Table 1). In the case of women the difference amounts to less than 4 percentage point, which means that their median pension provision only slightly differs from the actuarial one. When comparing the results between women and men it has to be stressed that there is an inequality against male beneficiaries and the level of this inequality (in percentage points) seems to be quite stable across all cohorts.

Table 1. The indicator of pension equivalence $E_{ep}(t)$ and the corrected indicator of pension equivalence $SE_{ep}(t)$ for beneficiaries born in the years 1974-1981

Cohort born in the year t	The indicator of pension equivalence $E_{ep}(t)$ (in pp)		The difference in the indicator of pension equivalence according to gender $RE_e(t)$ (in pp)	The corrected indicator of pension equivalence $SE_{ep}(t)$ (in pp)		The difference in the corrected indicator of pension equivalence according to gender $RSE_e(t)$ (in pp)
	male	female		male	female	
1974	−36,31	−3,58	−32,73	−37,34	−8,23	−29,11
1975	−35,98	0,00	−35,98	−36,68	−4,48	−32,20
1976	−36,29	−0,70	−35,59	−38,14	−6,10	−32,04
1977	−35,00	−0,32	−34,69	−35,81	−7,34	−28,47
1978	−35,70	−2,19	−33,51	−36,75	−7,40	−29,35
1979	−35,90	−2,29	−33,61	−36,86	−9,31	−27,54
1980	−35,49	−2,69	−32,80	−37,58	−8,84	−28,75
1981	−35,97	−1,43	−34,54	−36,64	−8,92	−27,72
Total	−35,59	−3,83	−31,77	−37,62	−10,93	−26,69

Source: results of author's own calculations based on the microsimulation model.

If we assume that all periods of care for children and dependents (i.e. periods of maternity, parental, paternity and child care leave or long-term care) are evaluated for the pension provision as if paid work was performed during the care and there

is no limitation for long-term care in treating those periods as contributory ones in the pension system[4] the results show only a little difference for men. Their corrected indicator of pension equivalence increases by about 1-2 percentage points depending on the cohort. It is because care is mostly delivered by women. In their case the higher evaluation of care periods for pension provision causes their pension capital to increase by about 4-7 percent. Consequently, the median female 'care corrected' pension provision is lower than their actuarial annuity by about 11 percentage points.

As a result the indicator of equality of desert in the obligatory pension system amounts to 29 percentage points and according to the partial indicators is negative (Fig. 2). It means that the inequality of desert is the male case and their median pension provision differs from the actuarial annuity much more than the female one.

Fig. 3. The indicator of equality of desert (in pp) in the Polish pension system according to gender for the beneficiaries born in the years 1964-1981
Source: results of author's own calculations based on the microsimulation model.

5. Conclusions

It has been stressed that what has been measured is the level of inequality of desert in the pension system between women and men only. It means that the main focus is on is the difference between sexes and not the absolute level of various indicators. Secondly, the purpose of the paper was to operationalize and estimate the equality of desert and not to ask why some pension regulations were introduced.

The pension reform of 1999 was aimed at strengthening the link between individual contributions and pension provisions and following the justice understood as an equality of desert. To achieve this goal the defined contribution pension formula has been introduced. In this paper the desert was defined as both

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[4] If the contributions for long-term care were paid in the Polish obligatory pension system, they are limited up to the period required for acquiring the minimum pension (20 insurance period for women and 25 for men).

financial and non-financial input into the pension system, which differs from the previous research. Furthermore, the pension provision from the obligatory pension system was simulated on the basis of real biographical data and not given biography scenarios.

The results of this research show that there is a large inequality of desert in the obligatory pension system in Poland. It seems to contradict the leading principle of individual equivalence.[5] This inequality is especially to men's disadvantage. The reasons for this situation can be a field of further research. One of the explanations could be the establishment of a minimum pension from which women benefit more often than men. Furthermore, the interest rate taken for the calculation plays a role, too.[6] Lower interest rate (for a given cohort and mandatory retirement age) increases lump sum contribution needed for a given level of pension provision and consequently lead to lower annuities. As a result, if the lower interest rate was taken for the calculations, inequality drops down or even reverses. On the other hand, the spotlight in this research is on the difference in equality between women and men. The assumed interest rate is the same for both sexes, so it should be less important for the results. Another issue is that uni-sex tables lead to higher life expectancy for men and lower for women than in the case of single-sex tables. However, this factor does not seem to be crucial (Malec 2017) especially, because uni-sex tables were consistently applied both in the calculations of pension provision and annuities.

It has to be stressed, that higher evaluation of non-paid care input into the pension system causes reduction of the inequality by about 5 percent points. Therefore a question arises about the possible recommendation of this approach for policy making sake. However, these recommendations should follow the decision concerning the desired direction of achieving equality of desert (if we assume it as a goal at all): should it be achieved by reduction of non-paid work rewarded in the pension system or its evaluation for the pension purposes (which will lead to higher inequality indicators among women) or should we broaden the non-financial input into the pension system by rewarding activities which are much more typical for men than for women (which will lead to lower inequality among men)? This normative question, however, goes far beyond the scope of this paper.

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doi:10.1007/s10888-005-9012-6

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[5] However, for the broader view the comparison between 'old' and 'new' pension system will be helpful.

[6] Following the European Commission the interest rate is assumed at the level of 3% (for this and other macroeconomic assumptions see European Commission, 2017, p. 80, 92, 204).

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