Altruism and Fairness in a Public Pension System*

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Abstract

In this paper it is empirically investigated whether feelings of altruism towards members of other generations and senses of justice have an impact on the individual's evaluation of the public pension system. The data have been obtained from a large-scale survey carried out among a representative sample of the Dutch population in January 1994. The main topic of the questionnaire is the evaluation of changes in the pension system that have varying income effects for different generations. We find that young and middle-aged people indeed seem to be affected by feelings of altruism and fairness whereas the elderly appear to be non-altruistic.

JEL classification codes: H55, D63.

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1 Introduction

In the past, Pay-As-You-Go-financed pension schemes (PAYG) have been established in almost all western countries. As is well known, PAYG-financed systems generate a higher rate of return than capital financed systems in the case of a large population growth and a large increase of the income per head in comparison with the interest rate. However, that was no longer true in the late 1960s and 1970s when population growth came to a halt and the interest rate started to grow. As a result, the contribution rate for the old-age pension schemes has increased and will remain to increase in the next two or three decades. A major question from a policy point of view is the question of whether or not people remain willing to maintain the PAYG-system in spite of the fact that for the young at least the intergenerational redistributions, engendered by the PAYG-system will have a negative effect on lifetime income. More specifically, what role play solidarity, altruism and fairness in the support of a public pension system? How do people evaluate their situation if the structure of the scheme changes and, as a consequence, the extent of fairness and (required) solidarity changes? What is a fair rate of return for various generations?

A method to detect individual preferences and thereby feelings of altruism and/or fairness, is by direct observations of people's behaviour. However, individuals can only marginally choose their 'optimal' pension. Furthermore, individuals' pensions are mostly determined by institutions, which have changed considerably in the past fifty years. Hence, instead of using some revealed preference method, we opt for stated preference methods (see e.g. Kroes and Sheldon (1988)). In these methods individuals are induced to make statements about their preferences. In our study individuals have been asked to evaluate changes in their and other individuals' incomes and rates of return due to hypothetical changes in the old-age pension system. For this purpose a questionnaire has been developed. This questionnaire is described in Section 3. However, we start in Section 2 by indicating the possible effects of considerations of altruism and fairness via a limited overview of the literature on altruism and fairness. The model is also presented in Section 3. Three generations are distinguished in this model. Feelings of altruism and / or fairness are measured by assuming that they have an impact on utility. Section 4 presents the estimation results. We find, among other things, that feelings of altruism and fairness affect utility. The size of the effect differs among generations. The elasticity of altruism for the youngest generations is about 0.3 whereas it is probably not significant for the older generation. The elasticities of fairness are considerably lower: they vary from 0.001 to 0.005. However, in some cases it turns out

to be hard to establish the effects of altruism and fairness separately. Finally, the concluding remarks are presented in Section 5.

2 Altruism and fairness

One obvious explanation for the maintenance of public pension plans is the existence of altruism among generations. In particular, younger generations might want to support such plans because the well-being of the older generations is an argument in their utility functions (see e.g. Veall (1986)). As a result young individuals are willing to invest, through the tax system, part of their income in a PAYG-financed plan, even if an alternative investment choice would generate a higher rate of return. Typically, one would expect that spending on pensions is not completely determined by altruism so that people will also save a part of their income in a more or less individual pension plan based on a Capital-Reserve system. As noted in the literature, however, in addition to altruism, senses of social justice or fairness can also play a role in explaining non-egoistic behaviour. Kahneman, Knetsch and Thaler (1986), for instance, derive several community standards of fairness from a household survey. They argue that fairness can be a constraint on profit seeking.

In psychological and economic experimental studies it has been established that norms of fairness can have a significant effect on market outcomes. De Vries, for instance, argues that most people try to maximize their own well-being within the boundaries of what they consider to be tolerable behaviour from a social justice point of view (De Vries (1991, p. 58)). Several papers (e.g. Fehr, Kirchsteiger and Riedl (1993) and Burrow and Loomes (1994)) conclude that people place a value on fairness. However, their results show that the motive of altruism cannot easily be separated empirically from the motive of fairness. As noted above altruism prevails if the income, or more general well-being, of other individuals, is an argument of an individual's utility function. On the other hand, fairness cannot always be associated with utility maximising behaviour. People may be willing to transfer part of their income even if that detracts from maximum utility. In our empirical study based on a survey, notions of fair rates of return on pension taxes for different generations can be derived. We verify empirically whether such notions have any effect on the individuals' evaluations of the collective pension plan. Moreover, if we take for granted that other generations' income determine the degree of altruism of any individual, it is possible to test whether altruism and fairness have an independent role in shaping the evaluation of the public pension system.

3 Specification and data

3.1 Specification

In our survey individuals are supposed to belong to one of three generations, namely the young (25-44 years old), the middle aged (45-64 years) or the old (older than 65 years). For an individual of generation k (k=y, m, o) the evaluation function is supposed to be determined by the following logarithmic function:

$$\ln U^k = \alpha_0^k + \alpha^k Y^k + \beta^k (Y^h + Y^i) + \sum_{g=y,m,o} (\gamma_g^k r_g^k + \delta_g^k r_g^{k\,2}) \quad k,g = y,m,o, \quad h \neq i \neq k \tag{1}$$

where U^k denotes the utility of an individual belonging to generation k, Y^k indicates measured discounted lifetime income of the respondent and $Y^h + Y^i$ indicates measured total discounted lifetime income of the representative individuals of the other two generations. Altruism is assumed to be measurable by means of the income of other generations, so by the parameter β^k. r_g^k ($r_g^{k\,2}$) is the actual rate of return for a representative member of generation g (squared)[1]. These terms are assumed to represent notions of fairness regarding oneself and members of other generations. We expect that fairness can be represented by a parabolic function[2]. Therefore, γ_g^k is expected to be positive, whereas δ_g^k is expected to be negative. The 'optimal' rate of return for generation g as perceived by generation k (r_g^{k*}) can be calculated from the estimated parameters as $-\frac{\gamma_g^k}{2\delta_g^k}$. Note, however, that the feelings towards one's own ratio may be different from the feelings towards the ratios of others. It might be possible that people consider their own rate of return never to be too high. In particular, the rate r_k^{k*}

[1]The actual rate of return is defined as the discounted pension benefits divided by the discounted pension contributions made during the entire life. The actual rates of return are calculated from Nelissen (1994), assuming a real discount rate of 2% and a real growth rate of the economy of 2%. The actual rate of return for the respondent is the average rate of return for the 5 years age category s/he belongs to, whereas the actual rates of return for the other two generations are given by the average rates of return for the representative members of those generations.

[2]The idea is that we expect individuals to dislike rates of return on public pension systems for members of other generations that are too high or too low compared with an 'optimal' rate of return r_g^{k*} (k≠g). More specific, it seems reasonable to assume that individual's notions of fairness are determined by the function $(r_g^k - r_g^{k*})^2$. By including r_g^k and $r_g^{k\,2}$ separately in the regression equations we are able to calculate the 'optimal' rate of return r_g^{k*} (k≠g) (see Section 4). Implicitly, the r_g^{k*2}-part is contained in the constant term α_0^k. The parabolic specification of the fairness function is supported by the data (see Section 4).

may be regarded as a minimum for an individual of generation k. In that case $\gamma_k^k > 0$ is no longer guaranteed or δ_g^k should turn out to be equal to zero.

Some remarks should be made with respect to the specification of the utility function. First, consider the variables Y^k and $Y^h + Y^i$. Usually, it is assumed that an individual's utility is determined by his consumption. Data on consumption are not available, however, so income is used as a proxy. The present consumption possibilities are supposed to be equal to disposable income where account is taken of taxes paid and savings. In principle, the same holds for future consumption. However, in our survey the development of future income could not be measured individually. Therefore, in determining the future consumption possibilities, we only take account of changes in public pension benefits and contributions. For a young respondent this means that it is assumed that the before tax household income in middle age (y_m^y) is equal to the present household income (y_y^y). For a young individual the definition of lifetime income reads:

$$Y^y = \ln y_y^y + \mathbf{R}^{-1} \ln y_m^y + \mathbf{R}^{-2} \ln y_o^y \tag{2}$$

with R a discount factor pertaining to twenty years. Y^m and Y^o are defined accordingly. Further, when estimating the utility functions (1) some additional variables are included, to wit the background characteristics partner (0=no, 1=yes), gender (0=female, 1=male) and age.

3.2 The questionnaire

In order to estimate eqs. (1) a survey has been held among Dutch individuals, asking them to evaluate the current and future pension system under various alternative assumptions regarding the size of the pension benefit and the associated contribution rates. The panel used in the research is the Telepanel. A part of this panel is not needed for the survey because in the Netherlands most people under the age of 25 do not contribute to (private) pensions. Moreover, within a household only one individual has been questioned, who was not necessarily the head of the household. Although only one respondent per household has been interviewed, household income can be calculated because the respondents had to answer several questions about the income and pension situation of a possible partner in the

household. In the older households, we interviewed two members of the household, if present, because there were not so many old respondents.

The questionnaires for members of the various generations are basically the same, although some specific generation-related questions have been asked (e.g. about children and grandchildren in the case of an older individual). All respondents answered a number of questions about their income position, the public and private pension contributions paid, total savings etc. In this way we obtained information concerning the provisions for their old age. This information has partly been used to inform the respondents about the current public pension system and the consequences of changes in the system for their own situation. Moreover, additional information about the return on investment of public pension contributions and the return on investments on the market has been given during the questionnaire. The respondents have also been provided with some information on the income distributions of the various generations.

The main part of the questionnaire consists of five different, partly hypothetical situations. In the remaining part of this section these situations are briefly described. A summary of the situations and the codes used in the tables are given in appendix A. In all situations people have been informed about their own position and about the average values of the relevant variables for members of the other generations with the same marital status. So, a single middle-aged respondent, for instance, got information about the contribution rate, the public pension benefit, his own contribution and the average contribution of the young. In each situation, people have been asked to evaluate this situation by means of a grade between 1.00 and 10.00, whereby 1.00 is the lowest possible and 10.00 the highest possible grade.

The first situation involves the present situation, also referred to as the basic situation (BS). In the basic situation information is given on the current level of the public pension benefit, the contribution rate and the average contribution. In BS, it is assumed that the present system does not change in the course of time or, in other words, the current situation is considered to be the steady state situation; the effects of ageing are neglected here. Among other things, this implies that in the basic situation it is assumed that the current young will receive the same public pension benefit when they reach the age of 65 as the old receive now. In addition, the contribution rate does not change.

The next situation also neglects the ageing process. In this hypothetical situation, changes in the steady state situation are introduced by means of a once and for all change in the contribution rate and the public pension benefit[3]. The change can entail lower contribution rates (LC) or higher contribution rates (HC) than the current rate (which equals 14% of taxable income). Because of the PAYG-system, the public pension benefits are adjusted in the same way. The contribution rates in these two situations are randomly determined. The new contribution rate is chosen from the interval 7% to 12% in steps of 1% in the case of a lower rate and between 16% and 21% in the case of a higher rate. All respondents have been informed about the effect on the average contribution. In addition, the youngest generations have been informed about the effects on their own contribution.

In principle, in the situation with lower contribution rates (LC), young and middle-aged individuals can spend more. However, in the questionnaire it is told that the difference between the contributions paid in the basic situation and in the situation with lower contributions will be saved. These savings plus the interest earned (a kind of private pension) are used as a supplement to the lower public pension benefit that they will receive reaching the age of 65. Note that the assumption of a once-and- for-all shock implies that the income position of the current old always deteriorates. What happens to the future income position of the young and middle-aged individuals depends on several aspects, such as the level of the new contribution rate, and the income and age of the respondent. The very young individuals with high incomes and high contributions will most probably gain. The individuals have thus been asked to trade off their own income position during old age against the income position of the current old. Appendix B presents an example in order to illustrate the way the information has been provided to the respondents.

In the case of an increase in the contribution rate (HC), the young and middle-aged individuals can generally spend less. However, the respondents have been told that the difference between the higher contributions in this situation and the contributions in the basic situation will be at the expense of the savings account or, if one does not have such an account, the money will be borrowed. Because of this, current consumption possibilities remain the same, but the decrease in savings is at the expense of old-age savings. On the other hand the public pension benefit increases. In HC, the effect on the income position of the elderly is certainly positive as they benefit from a higher pension. The effect

[3]The calculations of the contribution rate and the pension benefit in the alternative situations are based on Van Dalen (1991).

on the future incomes of the young and middle-aged is uncertain as it depends again on the contribution rate, income and age.

The last two scenarios involve situations that include the consequences of the ageing process. Two (extreme) hypothetical situations are presented in the questionnaire. The fourth scenario (LB) describes the situation in which pension contribution rates do not change but the total ageing effects are intercepted by a decrease in the pension benefits. The respondents have been informed about the amounts the young and middle-aged will have to save in this situation in order to compensate for the decline in their public pension benefit. If they (will) save that amount of money, the present consumption possibilities are negatively affected, but the future possibilities remain the same as they are in the basic situation. The very last scenario (EB) more or less describes the opposite case. Now the public pension benefit remains the same, but the contribution rate increases over time because of the ageing effects. In this situation the income position of the contemporary old does not change. The income position of the young and middle-aged decreases because of the higher contributions. Again, the respondents have been informed about the possibility of maintaining current income at the expense of a lower amount of old-age savings.

Table 3.1 Summary of the effects on the pension variables in each situation

code	ageing included	old		middle-aged			young		
		pension	ratio	pension	contrib.	ratio	pension	contrib.	ratio
BS	no	0	0	0	0	0	0	0	0
LC	no	-	-	?	-	-	?	-	-/0*
HC	no	+	+	?	+	+	?	+	+/0*
LB	yes	-	-	-	0	-	-	0	-
EB	yes	0	0	0	+	-	0	+	-

*) This effect depends on the age of the individual. For individuals of about 25 years old the ratio will hardly change since they face a higher or lower contribution rate during their entire life. Correspondingly, they receive a higher or lower benefit.

For each situation, table 3.1 gives for each generation an overview of the effects on the public pension benefit, the contribution and the ratio between benefit and contribution. In the table, + indicates an increase (relative to the basic situation), - a decrease, 0 no effect and ? an unknown effect.

It may seem complicated for the respondents to evaluate the situations by comparing list of about thirteen numbers each. One has to keep in mind, however, that before expressing their opinion on the situations, people answered several other questions, which involved one specific part of the list of numbers, e.g. their opinion on the contribution rate or on the rate of return for the old generation. Furthermore, at the end of the questionnaire, the respondent has been provided with a summary of the situations and one's own grades assigned to these situations. The respondent could change the grades if he wanted to. Therefore, we think that there is no reason to believe that the respondents were not able to make a serious comparison.

4 Empirical results

4.1 Data and specification

In total, the sample contains 1103 respondents. Per generation, the numbers are as follows: 278 old respondents, 362 middle-aged and 463 young respondents. Due to several reasons[4], we are left with 988 respondents. The overall response rate including technical non-response is 70%[5]. The overall response rate corrected for this technical non-response amounts to 83%, which is rather high. Table 4.1 shows the number of respondents involved in each situation.

[4]Some respondents did not receive all questions, some of them did not answer all questions and others obviously gave incorrect answers etc.

[5]Technical non-response refers to non-response due to technical problems or due to holidays.

Table 4.1 Number of respondents per situation

situation code	all generations	old	middle-aged	young
BS	988	269	314	405
LC	492[6]	129	156	207
HC	496	140	158	198
LB	988	269	314	405
EB	988	269	314	405

As mentioned before, the respondents have been asked to evaluate four situations: two situations without the inclusion of ageing effects (BS and LC or BS and HC), and two with the inclusion of ageing effects (LB and EB). To get an idea of the evaluations of these variants, the average grades given by the respondents are presented in table 4.2, both for the total sample and for the separate generations[7].

Table 4.2 Average evaluations of the situations

	grade			
code	sample	old	middle-aged	young
BS	6.26	6.35	6.24	6.20
LC	4.46	4.30	4.37	4.63
HC	5.75	5.48	6.23	5.55
LB	4.29	4.56	4.23	4.16
EB	5.74	5.93	6.05	5.48

There appears to be hardly any difference between the evaluations of the basic situation (BS) by the various generations: all generations prefer the basic situation to all other alternatives presented. The variation in the evaluations of the situation without ageing, lower contributions and lower public pension benefits (LC) is also rather small. The middle-aged generation classifies the situation without ageing and with higher contributions and higher public pension benefits (HC) relatively high, even

[6]In the questionnaire, respondents got either the situation LC or HC.

[7]See also Van der Heijden (1995) for a further analysis.

higher than the older generation does. The last two situations are the situations with ageing effects. The elderly evaluate the situation with lower public pension benefits (LB) better than the other generations do. Notice, however, that situation LB as well as EB pertain to future changes that barely harm the income positions of the elderly. Finally, the situation with higher contributions (EB) has been evaluated higher than the situation with lower public pensions (LB) by all generations.

As noted in Section 3, one of the basic goals is to estimate whether altruism and notions of fairness play an independent role in the individual evaluation of public pension systems. The variants described in Section 3.2 produce changes in pension contributions, savings, income and rates of return in the public pension system for the individual respondent and for the members of other generations. The changes have been communicated to the respondents during the survey. The evaluations and the (changed) values of the variables mentioned above are used as data. Thus, for each individual four observations on the dependent and independent variables in eqs. (1) are available[8].

To compensate for individual-specific effects, first differences of the variables are used. That is to say, for each variable the difference between the alternative situation and the basic situation is calculated[9]. This yields the equations that we will estimate:

$$\ln U^{k'} = \alpha_0^{k'} + \alpha^k Y^{k'} + \beta^k (Y^{h'} + Y^{i'}) + \sum_{g=y,m,o} (\gamma_g^k r_g^{k'} + \delta_g^k r_g^{k^2'}) \quad k,g = y,m,o, \quad h \neq i \neq k \tag{3}$$

[8]Notwithstanding the variation in independent variables, several income variables and the variables taking account of fairness are plagued by multicollinearity problems. So, for instance, a change in the contribution rate moves current and middle-aged income of the current young in the same direction which prevents detecting their independent influence on the evaluation of the pension system. For respondents of other generations analogous effects hold. This multicollinearity problem was partly circumvented by taking discounted individual lifetime income as an explanatory variable. Furthermore, we had to combine the lifetime income of members of the other two generations in one variable.

[9]If we do not take first differences the following problem occurs. One of the assumptions of OLS or WLS is that the error terms are normally distributed i.e. $e_i \sim N(0,\sigma^2)$. In our case the disturbance terms are likely to reflect background characteristics and some common unmeasurable or omitted factors that are probably individual-dependent. The assumption is, therefore, likely to be violated as we use a vector in which every individual arises four times. This problem disappears if we take first differences. However, background characteristics are still assumed to play a role, so the terms $\alpha_0^{k'}$ appear in eqs. (3). Furthermore, it is likely that taking first differences decreases possible generational differences in the perception of grades, e.g the chance that an old person perceives a 7 differently than a young person does (and therefore gives a 6 or an 8) is larger than the chance that a difference of 2 between two grades is perceived differently.

where $U^{k'}$, $Y^{k'}$, $Y^{h'}$, $Y^{i'}$, $r_g^{k'}$ *and* $r_g^{k^{2'}}$ are first differences.

Another problem is that eqs. (1) and (3) deal with the knowledge of the individuals about their income during old age. Typically, individuals' retirement income consists of a public pension payment supplemented with a complementary pension payment from a firm-related pension plan. Based on macro data it is known that in this system more than 80% of the employees are able to reach a pension income approximately equal to 70% of last earned income. The data reveal, however, that most respondents (except the elderly) have no idea about the size of their own complementary pension or the partner's one. Table 4.3 illustrates this point.

Table 4.3 Complementary pension payments

	respondent				partner			
	sample	old	middle	young	sample	old	middle	young
known	38%	95%	30%	15%	37%	82%	35%	10%
unknown	62%	5%	70%	85%	63%	18%	65%	90%
(n)=	(744)	(173)	(247)	(324)	(320)	(83)	(102)	(135)

Apparently, the respondents, and especially the young ones, know little about their future retirement income. Based on this observation it was decided to use only the public pension benefit as an indication of retirement income of the young and middle-age respondents. This means that in (2) the old-age income of the young (y_o^y), which is part of Y^y, is determined by the public pension benefit.

4.2 Estimation results

The coefficients of eqs. (3) can now be estimated. One other remark has to be made in advance, though. Inspection of the data showed that women are underrepresented in the sample, compared to the Dutch population. In addition to this, it turned out that not all age categories were present as they should be according to the statistics of the Dutch Central Bureau of Statistics (see also appendix A). These two deviations in the sample were taken into consideration by applying weighted least squares (WLS) where

the weighting factors with regard to gender and age have been calculated so that they correspond to those of the population.

One of the purposes of the research was to detect whether altruism or fairness plays a role in the evaluation of the public pension system. We tested for the effects of these variables by estimating different specifications of eqs. (3) where the differences are due to the inclusion or exclusion of variables that might deal with feelings of altruism and fairness. Table 4.4 presents for 9 variants the estimated coefficients for the younger generation by means of WLS regression.

[INSERT TABLE 4.4 ABOUT HERE]

Obviously, the income position of the respondents themselves (Y^y) plays a key role in the evaluation of the pension system. It is significant and positive in all variants considered. Further, it is rather robust. Its average value amounts to 1.38.

The introduction of altruism (measured via income of others) and / or fairness (measured via the rate of return) improves the explanatory power of the equation considerably. In particular, adding altruism (variant 1) or altruism and the rate of return for the young themselves (variant 3) doubles or triples the explanatory power. Adding next rates of returns for other generations leads to problems regarding the statistical significance of the variables and/or their signs (compare e.g. variant 3 with variant 5). The generation's own income gives a larger contribution to utility than income of other generations. Incorporating both the fairness terms with respect to the elderly (r_o^y and r_o^{y2}) and the income of other generations ($Y^m + Y^o$), results in a negative sign for the latter variable. In particular, these statistical results are due to the fact that the fairness terms for the middle-aged, the fairness terms for the elderly and $Y^m + Y^o$ are strongly correlated. So, the size and / or the significance of variables measuring altruism and fairness is affected by the specification. When all rates of return are included (variant 4) fairness turns out to be completely insignificant which, as noted before, is probably due to multicollinearity problems. The same problems make it empirically impossible to include all the rates of return and the income of other generations at the same time in the regression equation (variant 8). On the other hand, the fact that it is difficult to discriminate between altruism and fairness also indicates that individuals do not clearly separate altruistic feelings from notions of fairness. From the estimated coefficients we have derived the elasticities of altruism and fairness. The elasticity of altruism, which

is due to the logarithmic specification given by the coefficient of $Y^m + Y^o$, is about 0.28[10]. This means that (ceteris paribus) on average the utility of a young individual increases by 0.28% if the income of the other generations is increased by 1%. Note that the young individual's own income elasticity amounts to about 1.38.

The desired or optimal rates of return r_k^{y*} - only considering significant parameter estimates - show the following picture from the point of view of the young generation[11].

$$r_y^{y*} \approx 1.49 \quad (0.16,\ n=6)$$

$$r_m^{y*} \approx 2.57 \quad (0.01,\ n=2)$$

$$r_o^{y*} \approx 4.72 \quad (0.75,\ n=5)$$

The actual rates of return amount to 1.2 for the young generation, 2.4 for the middle-aged persons and 3.5 for the elderly. So, respondents appear to take the status quo situation as a preferable situation which should not be amended too drastically. The elasticity of fairness towards the middle-aged generation is about 0.002 and towards the older generation about 0.001. So, for instance an increase of 1% (ceteris paribus) in the actual rate of return for the elderly gives the young 0.001% higher utility[12].

The coefficients of the background characteristics appear to be rather robust. Changes in the system lead to significantly larger losses when a partner is present. This could be expected as it reduces consumption possibilities with a given income. Moreover, age sometimes has a small negative effect. Finally, the intercept term is small. Most of the time it is insignificant as it should be if the specification chosen is correct.

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[10]When calculating the elasticities of altruism we only considered the variants in which altruism and fairness are not both included.

[11]This includes additional estimates not reported here. The first term between parentheses is the standard deviation, whereas n gives the number of observations.

[12]Note, however, that the effects of an increase or a decline in the actual rate of return are not symmetric. For instance, an increase in the actual rate of return of the old brings the value closer to the rate desired by the young. This positive effect (elasticity) is smaller than the negative effect which a decline in the actual rate would have.

[INSERT TABLE 4.5 ABOUT HERE]

In table 4.5 the regression results for the middle-aged generation are reported. What stands out quite remarkably is the less robust effect of their own lifetime incomes (Y^y). Again, altruism and / or fairness improves the estimation results. This holds in particular for the fairness measures. Altruistic feelings increase the explanatory power of the equation to a fairly small degree ($\bar{R}^2$ increases from 0.11 to 0.12; see variants 0 and 1), but it is significant at the 5% level. The lifetime incomes of the middle-aged appear to interfere with the notion of fairness, in particular regarding the elderly, r_o^m and r_o^{m2} (compare e.g. variants 3 and 5 or 4 and 6). Moreover, notions of fairness regarding one's own contribution to the public pension system and fairness with respect to other generations apparently cannot be established independently from each other. In particular, as soon as fairness with respect to other generations is introduced, the coefficients of the rates of return of the middle-aged themselves become statistically insignificant (compare variant 3 with the other variants). Without incorporation of the rates of returns with respect to the other generations, the own ratio clearly affects utility and the fairness function then has a reversed U-shape. Estimation of the equation without taking account of one's own ratio results in an on average higher coefficient for one's own lifetime income Y^m[13]. This can be seen as an indication that the (egoistic) feelings about one's own situation influence both the coefficient of one's own fairness ratio and the coefficient of one's own income, or in other words, the (egoistic) feelings are divided over these two variables.

Just as in the case of the young generation, multicollinearity problems prevent us from getting precise and significant estimates of the notions of fairness. To get an idea we calculated the fair return r_k^{m*} for generations k (k=y, m, o) from the significant estimates. The estimates are remarkably robust with respect to the young, whereas some more variation exists with respect to the elderly. The estimated optimal rates are:

$$r_y^{m*} \approx 0.97 \quad (0.026,\ n=6)$$

$$r_m^{m*} = 2.67 \quad (0.00,\ n=2)$$

$$r_o^{m*} \approx 5.24 \quad (0.50,\ n=6)$$

[13]These results are not reported here. The concerning tables are available from the authors upon request.

So, it is assumed to be fair by the middle-aged that the rates of return for the older generations are higher than for the youngest generations. This is, again, in line with the actual rates of return obtained by the current generations.

The income of other generations ($Y^y + Y^o$) only shows an interpretable effect if the notions of fairness with respect to the elderly are not included. This possibly means that altruism and notions of fairness towards the elderly cannot be discriminated from each other. This is in agreement with our findings for the young generation. When the notions of fairness with respect to other generations are not included, the elasticity of altruism of the middle-aged is about 0.3, which is similar to that of the young. The elasticities of the actual rates of return are about 0.0040 for the young and 0.0025 for the elderly. Further, it turns out that the background characteristics hardly affect the utility of the middle-aged generation.

[INSERT TABLE 4.6 ABOUT HERE]

From table 4.6 we see that for the elderly their own actual income has a positive effect on the evaluation of the pension system. The size of the effect, however, depends on the variant that is chosen. Introduction of fairness here also results in a considerably higher $\bar{R}^2$. It increases from 0.05 to at least 0.10. Altruistic feelings towards other generations seem to be absent among the elderly; compare the variants 0 and 1 and 3 and 7. The measured effect of fairness appears to be very much dependent on the specification. Focusing on the specifications without the (future) income of other generations, we always find a significant effect for the fairness rates that refer to the young. The ones referring to the middle-aged are only significant if the fairness rates for the young are not included. This is caused by the high correlation between these two groups of ratios. The ratios with respect to the own generation are unequivocal. A point to note here is that the we assumed that respondents would evaluate the rates of return according to a function with a reversed U-shape (see footnote 2). With respect to the rate of return of the elderly themselves, the function has a U-shape instead of a reversed U-shape in six out of seven cases. Remember, however, that feelings with respect to the own rate of return do not necessarily follow a reversed U-shape. It is again striking that the optimal fairness rate is very robust for the other two generations. As an average, we find:

$$r_y^{o*} \approx 0.93 \quad (0.02,\ n=4)$$

$$r_m^{o*} \approx 2.74 \quad (0.17,\ n=2)$$

The elderly consider a small loss for the younger generation on their investments in the public pension system as fair. The optimal fairness ratio for the youngest generation as conceived by the middle-aged and older generation is about the same. For the rate of return for the elderly themselves we find on average $r_o^{o*} \approx$ 1.6, but the old probably regard this rate of return not as an optimal value but as a minimum required rate.

The elasticity of altruism of the elderly is not significant in variant 1. In variants 5 and 6 it is significantly negative (-2). The estimation results for these latter variants are debatable, however, as the coefficients of the fairness ratio with respect to the elderly themselves do not have the right sign due to multicollinearity problems. There is no evidence for altruistic feelings among the elderly, however. The elasticities of fairness with respect to the actual rates of return for the young and middle-aged generation are respectively about 0.0008 and 0.0013. Note also that the elasticity with respect to the old individual's own income is very low in comparison with the young generation (0.54 versus 1.38, considering only estimates that are significant at a 1%-level). The estimated coefficients for the background characteristics are rather robust and significant in almost all variants considered for the elderly. Since we took the differences of the reported evaluations, this implies that there exists an interaction effect for the elderly. This hardly occurred for the other generations. Apart from one case, the intercept term is not significantly different from zero.

Comparing the results for the three generations shows among other things the following.

* The intercept is insignificant in almost all variants, as it should be if the specification chosen is correct.
* Background characteristics have a different impact on the utility of the elderly compared with the impact on other generations' utility.
* For young couples changes in the pension system lead to significantly larger declines in utility and significantly smaller increases in utility than for young singles, whereas this is just the other way round for the elderly. The presence of a partner has no effect on the utility of the middle-aged generation.

* The elasticity of altruism is positive (about 0.3) for the youngest generations but certainly not positive for the older generation. The elasticities of fairness are in the same order among generations. The size of the fairness elasticities is considerably smaller than the size of the altruism elasticities.

* Individuals' own income has a significantly smaller impact on utility for the elderly compared to the impact for the young generation.

5. Concluding remarks

This paper discusses the possible effect of feelings of altruism and / or fairness on the evaluation of the public pension system. In general, it is assumed that utility of individuals is determined by their own current and (expected) future incomes. In addition to this, it is supposed here that feelings of altruism, expressed by the incomes of members of other generations, and senses of justice could have an impact on people's utility. These elements are introduced via the assumption that income of other generations and rates of return also affect someone's own utility. The data used for estimating the utility functions have been obtained from a large-scale survey carried out among a representative sample of the Dutch population in January 1994. The main topic of the questionnaire is the evaluation of several changes in the public pension system that have varying income effects for different generations. By stating their preferences, respondents also implicitly give information on the degree to which other generations' utility affects their own utility.

The analysis shows that altruism and / or fairness, which in general are not included in studies in the fields of pensions, have a substantial impact on lifetime utility. Altruism towards other generations is present among the working population (the young and middle-aged generation), but seems to be absent among the elderly. Fairness plays an important role for all generations. It also appears that it is difficult to discriminate between altruistic feelings and fairness motives. Partly, this can be ascribed to statistical reasons, but in part it is also due to the fact that individuals themselves do not make a clear distinction between these concepts. In view of the multicollinearity problems, it is striking that the optimal fairness ratios, as desired by the various generations, have a very robust character.

The results for the old are different from the results for the young. In particular, altruism of young individuals was clearly discernible, but altruism from the old toward the young was of a perverse nature (if there was any). In line with this finding, the old consider a rate of return for themselves as high as possible to be desirable. The dominant one-way transfers from the young to the old in western welfare states could be a result from this specific form of intergenerational altruism.

Appendix A Data

Table A.1 Overview of the situations and the corresponding codes

situation code	description of the situation
BS	basic situation (without ageing)
LC	alternative situation with lower contribution rates and lower public pension benefits (without ageing)
HC	alternative situation with higher contribution rates and higher public pension benefits (without ageing)
LB	alternative situation with equal contribution rates and lower public pension benefits (with ageing)
EB	alternative situation with higher contribution rates and equal public pension benefits (with ageing)

The following tables present some general data. All numbers in the tables indicate percentages except for (n)= which indicates the number of respondents.

Table A.2 Gender

	sample	old	middle-aged	young
female	37	42	34	35
male	63	58	66	65
(n)=	(988)	(269)	(314)	(405)

Obviously, more male than female respondents participated in the survey. Particularly in the middle-aged and young households, in which only one member answered the questions, women are under represented. Table A.3 presents an overview of the age of the respondents. The age of the young and middle-aged respondents turns out to be rather uniformly distributed, but half of the elderly have an age between 65 and 70. Apparently, also some very old respondents participated in the survey.

Table A.3 Age structure of the sample

	sample	old	middle-aged	young
25-30	9			21
30-35	10			26
35-40	11			27
40-45	10			25
45-50	9		30	
50-55	7		21	
55-60	9		27	
60-65	7		22	
65-70	14	50		
70-75	9	32		
75-80	3	13		
80-85	1	4		
85-90	0.5	1		
(n)=	(988)	(269)	(314)	(405)

Most of the respondents have a partner (table A.4) and they are head of the household (table A.5).

Table A.4 Presence of a partner

	sample	old	middle-aged	young
no partner	30	30	28	32
partner	70	70	72	68
(n)=	(988)	(269)	(314)	(405)

Table A.5 Position in the household

	sample	old	middle-aged	young
head of the household	80	78	82	79
partner (married)	17	21	17	14
partner (not married)	3	1	1	7
(n)=	(988)	(269)	(314)	(405)

Appendix B Example from the questionnaire

We show a part of the questionnaire in order to demonstrate how the information was provided to a (young) respondent. The question involved was as follows: How would you evaluate the situation with lower contribution rates and lower pension benefits? The respondent already evaluated the basic situation.

	basic situation (grade ..)	situation with lower contributions
contribution rate	14%	9%
own contribution	f 493	f 317
average contribution	f 300	f 193
own public pension	f 1974	f 1269
public pension for an old person	f 1974	f 1269
public pension for a middle-aged person	f 1974	f 1269
own ratio	1.2	1.15
ratio of a middle-aged person	2.4	1.9
ratio of an old person	3.5	2.9
own return on savings	f 0	f 1022
return on savings for a middle-aged person	f 0	f 101
own public pension + savings	f 1974	f 2291
public pension + savings for a middle-aged person	f 1974	f 1370
public pension + savings for an old person	f 1974	f 1269

In this example the public pension contribution of the (male) respondent in the basic situation (BS) was 493 Dutch guilders whereas it was 300 Dutch guilders for an average (middle-aged) person. The public pension in the basic situation was 1974 Dutch guilders. In the hypothetical situation with lower contributions (LC) the contribution rate was determined to be 9%. The contribution of the respondent was reduced to 317 Dutch guilders and that of an average person to 193 Dutch guilders. The pension benefit was reduced to 1269 Dutch guilders. The rates of return decreased due to the lower pensions. As it was assumed that differences between contributions in BS and LC will be saved, the respondent would save 176 Dutch guilders per month in a savings account. When retired the account would pay him 1022 Dutch guilders per month, whereas an average male middle-aged person would get 101 Dutch guilders per month when he would save 107 per month now. The large difference in the return on savings between the young respondent and the average middle-aged individual exists due to a difference in age and in income. For the respondent the public pension plus savings would amount to 2291 Dutch guilders (which is higher than the current public pension), while it would be only 1370 Dutch guilders for an average middle-aged person. Finally, the current old would only receive 1269 Dutch guilders.

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Tables

Table 4.4 Estimation results for the younger generation[1)]

	0	1	2	3	4	5	6	7	8
Y^{y}	1.50 ***	1.59 ***	1.36 ***	1.15 ***	1.47 ***	1.45 ***	1.17 ***	1.30 ***	1.47 ***
$Y^{m}+Y^{o}$		0.28 ***		0.29 ***		-0.48 **		0.59 ***	-0.21
r_{y}^{y}			0.37 **	0.96 ***	0.26	-0.35	-0.10	1.20 ***	0.11
r_{y}^{y2}			-0.13 *	-0.35 ***	-0.07	0.08	-0.02	-0.35 ***	-0.03
r_{m}^{y}					1.18		3.34 ***	0.96	-0.06
r_{m}^{y2}					-0.35		-0.65 ***	-0.29 *	?[2]
r_{o}^{y}			0.70 ***		0.14	0.90 ***			0.60 **
r_{o}^{y2}			-0.09 ***		0.02	-0.09 ***			-0.04
partner	-0.10 ***	-0.10 ***	-0.10 ***	-0.09 ***	-0.10 ***	-0.11 ***	-0.09 ***	-0.09 ***	-0.10 ***
gender	-0.006	-0.003	-0.001	-0.001	-0.002	-0.004	0.000	0.002	-0.003
age	-0.003	-0.003	-0.005	-0.008 **	-0.003	-0.005	-0.007 **	-0.003	-0.003
constant	-0.07	-0.05	0.14	0.18	-0.03	0.07	0.26 **	0.06	-0.01
$\bar{R}^{2}$	0.03	0.06	0.11	0.08	0.11	0.11	0.09	0.10	0.11

1) If *** is appended to a parameter, then is significant at a 1%-level, ** at a 5%-level and * at a 10%-level.

2) A ? means that this variable was excluded due to multicollinearity problems.

Table 4.5 Estimation results for the middle-aged generation[1)]

	0	1	2	3	4	5	6	7	8
Y^m	1.68 ***	1.13 ***	-0.32	0.73 **	-0.04	0.24	1.66 ***	-0.05	0.04
$Y^y + Y^o$		0.25 **		0.34 ***		-0.42 ***		0.79 ***	-1.68 ***
r_y^m					7.49 ***		7.82 ***	10.93 ***	-1.09 ***
r_y^{m2}					-4.04 ***		-3.96 ***	-5.61 ***	?
r_m^m			0.11	0.64 ***	0.13	-0.04	0.08	0.12	0.12
r_m^{m2}			-0.02	-0.12 ***	-0.01	0.00	-0.00	-0.00	-0.01
r_o^m			0.95 ***		0.51 ***	1.01 ***			1.67 ***
r_o^{m2}			-0.10 ***		-0.04	-0.10 ***			-0.14 ***
partner	-0.023	-0.019	-0.005	-0.009	-0.006	-0.010	-0.018	-0.005	-0.008
gender	-0.001	-0.000	0.005	0.009	0.002	0.003	0.001	0.002	0.000
age	0.000	0.000	-0.001	-0.004 *	-0.000	0.000	0.000	0.000	-0.000
constant	-0.20	-0.19	-0.03	0.16	-0.15	-0.10	-0.16	-0.15	-0.12
$\bar{R}^2$	0.11	0.12	0.22	0.14	0.24	0.23	0.20	0.24	0.23

1) See table 4.4 for details.

Table 4.6 Estimation results for the older generation[1)]

	0	1	2	3	4	5	6	7	8
Y^o	0.52 ***	0.59 ***	0.70 ***	0.62 ***	0.39 ***	0.22 *	0.48 ***	0.60 ***	0.38 **
$Y^y + Y^m$		-0.17				-2.26 ***	-2.04 ***	-0.40	-0.31
r_y^o				11.56 ***	15.75 ***			10.07 ***	14.23 ***
r_y^{o2}				-6.09 ***	-8.61 ***			-5.27 ***	-7.79 ***
r_m^o			3.90 ***		0.20		2.5 ***		0.46
r_m^{o2}			-0.76 ***		0.11		-0.43 ***		0.06
r_o^o			0.63 ***	-0.45 ***	-0.08	-1.35 ***	-0.16	-0.55 **	-0.10
r_o^{o2}			-0.20 ***	0.14 ***	0.05	0.41 ***	0.03	0.17 **	0.05
partner	0.06 **	0.06 **	0.07 **	0.07 **	0.07 **	0.04	0.05	0.07 **	0.07 **
gender	0.06 **	0.06 **	0.07 **	0.06 **	0.06 **	0.05	0.05 *	0.06 **	0.06 **
age	-0.006 **	-0.006 **	-0.005 *	-0.006 **	-0.006 *	-0.006 **	-0.006 **	-0.006 **	-0.006 *
constant	0.09	0.06	-0.14	0.35	0.27	0.77 ***	0.08	0.36	0.25
$\bar{R}^2$	0.05	0.05	0.12	0.14	0.15	0.10	0.14	0.14	0.15

1) See table 4.4 for details.