ELSEVIER

Journal of Public Economics 58 (1995) 429–451

JOURNAL OF PUBLIC ECONOMICS

Lifetime income redistribution by the old-age state pension in The Netherlands

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Received May 1993; final version received September 1994

Abstract

This paper looks at how the Dutch General Old-Age Pensions Act impacts the distribution of equivalent lifetime income, using a dynamic cross-sectional microsimulation model. Considering both vertical and horizontal redistributional effects, the paper shows that lifetime redistribution is considerably smaller than the redistribution measured on the basis of a period approach. The horizontal lifetime redistribution is more important than the vertical one, but this effect is rather limited, in particular due to the increasing premium percentages in combination with the regressive nature of the contribution levying.

Keywords: Income redistribution; Public pensions; Microsimulation

JEL classification: D31; H55

1. Introduction

Treating income and income (re)distribution in a particular year is generally accepted to be too simplistic a view (for example, Pestieau, 1989; Klevmarken, 1983; and Atkinson, 1983). Doing so fails to take account of changes in, for example, the population structure, the labour market structure, and so on. As a consequence, an annual analysis differs from a lifetime analysis. We see, therefore, a growing interest in intergenerational redistribution, an approach, however, which is hampered by the absence of sufficient (longitudinal) data. All available studies in this field (for an overview, see Nelissen, 1994, ch. 2) have strong limitations: they look only

SSDI 0047-2727(94)01485-X

at the cohort's average (e.g. Moffit, 1982), or limit themselves to some income categories or to a number of hypothetical family types (see Ferrara and Lot, Jr., 1985; Nelissen, 1987; and Boskin et al., 1987). The reason for this is that these studies cannot take account of the (larger part of the) socio-economic environment; they can only take into account the scheme under consideration and, if possible, some demographic forecasts.

I propose to overcome this limitation by using a microsimulation approach, which will make it possible to follow one or more generations using (most of) the relevant information with respect to the socio-economic environment. The microsimulation approach has not often been used in this area. Comparable studies have been applied only to proposals (Wolfson, 1988, and Wagner, 1984), whereas a steady-state approach can be found in Harding (1993) and Falkingham et al. (1993).

This paper will examine the lifetime impact of old-age state pensions. Social security aims to redistribute income in order to maintain, or to reach, a certain level of existence. This relates to the consumption possibilities of the households in question. Therefore, this paper will not emphasize the effect of the old-age pension on the income distribution, but rather its effect on consumption possibilities via equivalent lifetime income. To reach that goal, the paper employs the microsimulation model NEDYMAS, a dynamic cross-sectional microsimulation model that takes into account the changes in population structure, labour force participation, income developments, and so on. Actually, this analysis, with respect to the lifetime redistributional aspects of the Dutch General Old-Age Pensions Act (from now on to be referred to as the AOW), is the first one that opts for a longitudinal approach applied to an existing scheme.

After presenting a short overview of the AOW, the paper then describes the microsimulation model and discusses the main elements that determine the redistributive impact of the AOW (Section 3). The simulation results will be shown in Section 4. Section 5 covers the effect of using equivalent income and shows the intra-personal and intra- and intergenerational income streams via the AOW. Finally, Section 6 concludes.

2. The old-age state pension (AOW) in the Netherlands

Since 1 January 1957 the AOW has insured all Dutch residents between the ages of 15 and 65 years old, and has provided them with an old-age pension beginning from the age of 65. The pension is financed by a pay-as-you-earn system. Those insured pay a premium; roughly speaking, this includes people aged between 15 and 65. Every resident in The Netherlands is insured and can build up an annual 2% of his or her old-age state pension, irrespective of income. The premium was a percentage of the

so-called premium income up to 1990. In 1989 this premium percentage amounted to 10.8% and had to be paid up to an income of (at most) Dfl. 65,900. Since 1990, the AOW premiums have been incorporated in the tax system. For that purpose, the tax rate in the so-called 'first income tax group' (all taxable income above the basic tax allowance – Dfl. 4,568 generally in 1990 – up to a maximum of Dfl. 42,123 (1990) above the basic allowance) consists of two parts: 13% general revenue and 22.1% (1990) social security contributions, of which 14.30% has been reserved for the AOW. An important point is that the contribution is limited to the 'first income tax group'. This implies that the revision, at the contribution side, was rather regressive. In 1994 the percentage is 14.25%, which is levied on a maximum of Dfl. 43.267 plus the basic allowance (generally Dfl. 5,925). Table 1 presents the data.

Unlike the contributions, benefits are flat-rated. The net benefit equals the net minimum wage for married and cohabiting couples, whereas non-married and non-cohabiting persons receive 70% of this amount. The amounts are Dfl. 1,779.96 and Dfl. 1,240.08, respectively, per month in 1994. Before 1 April 1985, married women who had reached the age of 65 were, in general, not allowed to claim an old-age pension. Their claims were included in those of their husbands. After 1 April 1985, all persons, upon reaching the age of 65, were granted benefits, with only few exceptions. As of 1 April 1985 the benefit for a married person was 50% of the amount for a married couple. If the partner of the person receiving the pension was younger than 65 years old, then the pension was adjusted depending on the

Table 1
Premium percentages and annual ceiling for the AOW

	AOW (%)	Ceiling (Dfl.)	Ceiling (in 1990 prices)
1960	5.5	7,450	26,450
1965	8.7	12,000	34,860
1970	9.5	17,450	41,830
1975	10.4	31,750	49,900
1980	10.25	46,400	54,920
1985	11.7	63,200	60,590
1989	10.8	65,900	67,580
1990	14.3	42,123	42,123
Forecasts			
2000	16.4		
2010	17.5		
2020	21.1		
2030	25.5		

Sources: Ministerie van Sociale Zaken (1989) and Nelissen (1993).

partner's income (as of 1 April 1988). Another change, introduced in 1985, was that both the husband and wife had to pay the AOW contribution separately, up to the maximum premium income, whereas before their premium incomes were totalled together and the AOW contribution was levied on this sum (up to the maximum premium income).

Further information on the AOW can be found in Nelissen (1993, 1994).

The structure of the Dutch old-age state pension implies, among other things, the following redistributional aspects:

(a) because of the PAYE financing, the specific contribution rates are dependent on the population structure, so that changes in this structure lead to intergenerational transfers. The 'greying' of the population is an important aspect in this;

(b) before the revision of the law in 1985, couples had only to pay contributions up to the (individual) maximum premium income; this implies a redistribution from unmarried to married people;

(c) the differences in mortality rates between men and women cause a redistribution from men to women;

(d) because the term of insurance has not been linked to premium payments, and because higher-educated persons start working at an older age than do lower-educated persons, there is, at least to some degree, a redistribution from lower-educated persons to higher-educated persons;

(e) the labour force participation of women is lower than men's, and becomes lower the higher the number of children; this also implies a redistribution from men to women and, moreover, a redistribution from families with no children or a limited number of children, to families with a large number of children;

(f) the temporary provisions (made in 1957), in order to overcome the problems with respect to the insurance duration, favour the generations born before 1942, and consequently imply an intergenerational redistribution.

3. The microsimulation model NEDYMAS[1]

NEDYMAS is a dynamic cross-sectional model. Dynamic microsimulation comes initially from the ideas of Orcutt; see Orcutt et al. (1976, 1986). An overview of the ins and outs of the microsimulation approach, especially with respect to social policy, can be found in Citro and Hanushek (1991). The dynamic approach implies that demographic processes are explicitly simulated, which means that the size of the micro database changes during the simulation period. The sample passes through time, year by year. For

[1] NEDYMAS stands for NEtherlands DYnamic Micro-Analytic Simulation model.

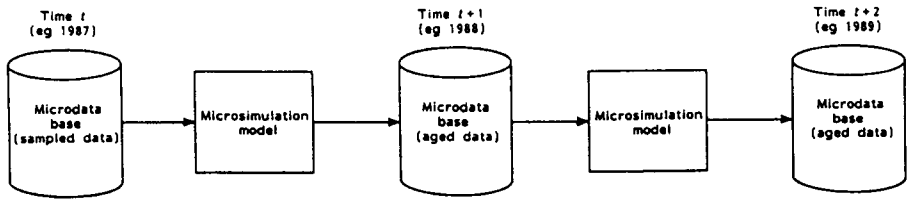

Fig. 1. The principle of microsimulation. *Source:* Hellwig (1988).

each person in the micro database, one examines which personal characteristics change, and to what extent, each year. The principle of microsimulation is shown in Fig. 1. To illustrate this, I will use the modelling of mortality. The decision of whether an individual will or will not undergo a potential transition, is simulated with the aid of the Monte Carlo method. In view of this, the conditional probability of an individual undergoing that event has to be given. For example, for a 77-year-old widowed woman, the probability of dying was 6.75% in 1968. We then randomly draw a number from the uniform [0, 1] distribution. If this number is smaller than or equal to 0.0675 (the probability of dying) the woman is expected to die. If the number is larger than 0.0675, the women is expected to remain alive. If she dies, we then check to see if she had dependent children (who have become orphans). So, decisions (or events) in the life of an individual can have implications for other individuals. Microsimulation creates a synthetic database which reflects the (developments in the) demographic and economic structure of the population. A stylized example is given in Table 2.

At the heart of microsimulation modelling is its state representation of the components of the system of interest. To execute this representation, first draw up a list of attributes for each individual in the sample. Next, after the adaptation of a micro-representation, specify an initial population. It would have been preferable to use a real sample of individuals and households along with their attributes. However, such a sample is not available. A usable sample can be derived from the 1947 Census data; see Nelissen (1991, 1994). So, the model simulates all events from 1947. Each year, the characteristics of the individuals (and thus the households) are updated, if necessary. The modules, which are used in the current version of NEDYMAS, and the sequence of treatment, are given in Table 3.[2] Like all microsimulation models, NEDYMAS is a recursive model. First, all demographic transitions are made in the model. Next, education is considered, and thereafter changes in economic activity, with the resulting labour income. Finally, the income transfers and taxes are modelled. The

[2] An extensive description can be found in Nelissen (1991, 1993, 1994).

Table 2
An example of microsimulation

1986 (sample data)						1987 (aged data)					
	ID	Age	Sex	Job	Income		ID	Age	Sex	Job	Income
Household 1						*Household 1*					
P1	1	47	M	Yes	38,000	P1	1	48	M	Yes	38,000
P2	2	44	F	No	0	P2	2	45	F	No	0
P3	3	20	M	Yes	23,000	P3	4	16	M	No	0
P4	4	15	M	No	0						
Household 2						*Household 2*					
P1	5	79	F	No	14,000	P1	3	21	M	Yes	25,000
						P2	8	19	F	No	0
Household 3						*Household 3*					
P1	6	37	M	Yes	32,000	P1	6	38	M	Yes	35,200
P2	7	38	F	No	0	P2	7	39	F	Yes	14,175
P3	8	18	F	No	0						
Household 4						*Household 4*					
⋮						⋮					

Notes: *Pi* = *i*th person in the household. ID = identification number.
Source: Hellwig (1988).

simulation model is not able to simulate nonlabour income because it does not contain a module for private consumption. So, savings cannot be determined, and, as a consequence, neither can wealth or income from wealth. Therefore, the analysis is limited to the redistributive impact of the social security system on lifetime *labour* income. Because the model does not contain a module for capital income, the taxes are imposed only on wages and social security income. This means, of course, that only a part of all tax transfers is considered. Moreover, the model is not able to take full account of the redistributive impact, via public funding, of the schemes under consideration. Therefore, the model limits itself to the redistributive impact of social security benefits and of social security contributions and does not consider contributions from general revenue. This implies that about 10% of the financing side of the social insurances is left aside; because the AOW does not receive contributions from public funds, however, this omission creates no problem for this scheme.

The various transition rates are based on observations, if available. However, especially for the period 1947–1965, additional assumptions had to be made. The future demographic transition rates are based on the forecasts of the Netherlands Central Bureau of Statistics. The transition probabilities, with respect to the education submolecules, are held constant

Table 3
Programme module sequencing for each individual in NEDYMAS

A. Demographic module	
1. Immigration	2. Emigration
3. Old people's home	4. Death
5. Marriage	6. Divorce
7. Child custody	8. Dehabitation[a]
9. Cohabitation selection	10. Fertility
11. Splitting-off children	
B. Labour and income module (first part)	
12. Education	13. Scholarship
14. Income percentile	15. Labour supply
16. Transitions from school	17. Transitions from disablement
18. Transitions from military service	19. Transitions from being employed
20. Transitions from being unemployed	21. Transitions from the state houseman/ housewife
22. Retirement	23. Labour income
C. Social security module	
24. Private pension premiums	25. Pension premiums for civil servants
26. Deduction civil servants	27. Old-age state pension benefits
28. Widowers state pension benefits	29. Widow, widower and orphan pensions for civil servants
30. Family allowances	31. Disability state pension benefits
32. Sickness insurance benefits	33. Disability insurance benefits
34. Disability pensions civil servants	35. Old-age pensions for civil servants
36. Unempl. benefits civil servants	37. Unemployment insurance benefits
38. Unemployment provision benefits	39. Supplementary benefits
40. Provision older and partly disabled employees	41. Social assistance benefits
	42. Sickness insurance contributions
43. Health insurance contributions	44. Disability insurance contributions
45. Unemployment insurance contributions	46. Old-age state pension contributions
47. Widowers state pension contributions	48. Disability state pension contributions
49. Family allowances contributions	50. Exceptional medical expenses contributions
51. Contributions civil servants pension fund	
B. Labour and income module (second part)	
52. Taxes	

[a] This paper uses the term 'cohabitation' only for people living together without being married. If they decide to dissolve their consensual union, we speak of 'dehabitation'.

at the 1988 level, whereas future developments in the field of labour participation and unemployment are based on forecasts of the Dutch Department of Social Affairs. It will be assumed here that national income has an annual growth of 2%. Furthermore, it should be noted that from 1991 onwards the social security premiums were determined endogenously

on the basis of simulated benefits and income. A comparison of simulated data with real data can be found in Nelissen (1991, 1993).

The purpose of this study is to gain more insight into welfare distribution. Thus the model will have to take into account the consumption possibilities of households and to consider welfare differences between various types of households. To make the welfare positions of households, which differ in size and composition, comparable, equivalent income must be used. For that purpose we use the results of Diederen (1983), who applies an empirical-subjective approach.[3,4] The equivalence scale is applied to each income component and the sum of all the equivalent income components is imputed each year to each individual in the household unit. This implies that the income measure takes full account of the variance in household circumstances by attributing the standard of living of the household to each individual residing in that household. For a further discussion, see Harding (1993, pp. 51–55). Lifetime income (or benefit, or contribution) is measured by the sum of the (discounted) annual equivalent income (or benefit, or contribution) amounts.

4. The simulation results

To determine the redistributional effects of the AOW, we look at the following: (1) the average lifetime wage and the average benefits from and contributions to the AOW; (2) the effect of the AOW premiums and benefits on the Theil coefficient; (3) the contribution of the AOW benefits and premiums towards income per decile; and (4) the benefit–tax ratio per decile. These four elements are given for the cohorts born in the years 1930–1935 (called cohort 1930), 1936–1945 (cohort 1940), 1946–1955 (cohort 1950) and 1956–1965 (cohort 1960).

The income components have been adjusted for household composition (via the equivalence scale) and the resulting amounts have been adjusted for changes in the price index and discounted to 1990, using a discount rate of

[3] Economists disagree on this issue and on which equivalence scale should be used. Research in the field of lifetime redistribution inclines towards the application of equivalence scales; I will come back to this issue in my evaluation. With respect to the choice of the equivalence scales, it holds that other scales (e.g. empirical-objective methods) do not lead to other conclusions. Of course, the exact figures differ, but the direction of the results does not. See, for a discussion, Coulter et al. (1992).

[4] Here a single adult counts for 0.70. Two adults count for 1.00 and each subsequent adult adds 0.30 to this value. The value for a child depends of its age and the number of children in the household. The average values are 0.11 (children below the age of six years old), 0.15 (children aged six to 11 years) and 0.20 (children aged 12–17 years).

2%, which is roughly the real interest rate in the Netherlands during the last century. Therefore, the net benefit can be considered as the real gain from the system or, in the terminology of Burkhauser and Warlick (1981) and Wolff (1991), as the transfer component of the scheme(s) under consideration.

Moreover, persons who were involved in migration have been excluded from my calculations. The calculations are based on ten runs with a different set of random numbers, all starting with a micro database of 10,58 persons in the year 1947. The simulation runs to the year 2060. Thus the birth generations 1930 up to 1960 can be followed almost completely, with respect to their socio-economic life history.[5,6] The redistributive impact has been measured via comparison with the gross wages, because no data exist to simulate a world in which government is absent. Furthermore, it is assumed that the burden of benefits (contributions) is fully incident upon the person who receives (pays) the benefit (contribution). This follows standard practice in major incidence studies; see Reynolds and Smolensky (1977) and Central Statistical Office (1990).

The simulation results, with respect to lifetime wages, social security benefits and contributions, are given in Table 4. Equivalent lifetime gross wages, including employers' contributions (hereafter called employers' gross wages), are on average Dfl. 3,148,500 for the cohort 1930, Dfl. 3,466,700 (cohort 1940), Dfl. 3,721,700 (cohort 1950) and Dfl. 3,719,300 (cohort 1960). The net benefits[7] from the social security system amount to Dfl. 430,300 for cohort 1930 (being 13.7% of the gross wages), and decline rather rapidly to Dfl. 297,700 for cohort 1960 (8.0%). Remember, however, that part of the gain follows from contributions via public funding (about 10% of the benefits). Take these contributions into account, and the various cohorts still gain from the system. This gain is caused by intergenerational

[5] In 2060 only 0.8% of the persons born in the year 1960 and about 5% of those born in 1965, will still be alive. No account has been taken of income and contributions after 2060.

[6] The average number of persons per run, involved in the simulation, amounts to 923 for cohort 1930, 1667 for cohort 1940, 2297 for cohort 1950, and 2363 for cohort 1960. Because ten runs have been used, this implies that for cohort 1930, for example, the calculations are based on about 9200 individual life histories.

[7] Define net benefits as the lifetime sum of equivalent social security benefits received minus the lifetime sum of equivalent social security benefits paid. Because the AOW is financed via the PAYE system and no general revenues are involved, the net benefit from the AOW is partly determined by the application of equivalence scales and for the rest it has been paid by younger cohorts. Cohorts born after 1975 show a large net AOW loss. For the total social security net benefit, it holds that a (rather constant) part of the funding (about Dfl. 120,000 for each cohort) comes from tax revenue, which is not included in the simulation. Because our emphasis is on the redistributive aspects of the AOW, the lack of general revenue has no effect on the conclusions. The aspect of the use of equivalence scales is discussed further in Section 5.

Table 4
Lifetime equivalent wages and social security benefits and premiums; mean and standard deviation (in thousands of Dfl., 1960 prices)

	Cohort 1930		Cohort 1940		Cohort 1950		Cohort 1960	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Wages incl. employers' contributions	3148.5	93.3	3466.7	56.0	3721.7	49.9	3719.3	76.8
Employers' contributions	*244.9*	*5.0*	*260.6*	*4.0*	*276.2*	*7.8*	*259.0*	*12.9*
Employees' contributions	*337.1*	*7.7*	*446.5*	*10.5*	*573.6*	*5.0*	*705.7*	*26.4*
of which AOW	166.5	3.3	209.2	3.1	261.0	3.3	326.1	4.3
Benefits	*1012.3*	*23.7*	*1125.5*	*18.6*	*1177.8*	*16.3*	*1262.4*	*19.5*
of which AOW	369.0	9.9	365.0	6.8	341.7	8.0	344.1	9.6
Net benefit	*430.3*	*17.0*	*418.4*	*8.1*	*328.0*	*12.0*	*297.7*	*21.7*
of which AOW	203.5	8.2	155.8	6.2	80.7	6.3	18.0	7.2

S.D. = Standard deviation.

transfers, especially via the AOW. But persons born after about 1970 will, on average, suffer a loss.

The AOW contributions and benefits form an important part of the net benefit. The contributions equal 28.6% of the total social security contributions paid by cohort 1930, and amount to 33.8% for cohort 1960. The percentages for the AOW benefits are 36.5% and 27.3% of the total social security benefits, respectively. The equivalent net AOW benefit amounts to Dfl. 202,500 for cohort 1930 and declines to Dfl. 18,000 for cohort 1960. So, the decrease in the net AOW result is larger than the decrease in the net benefit for the combined social security schemes. This decrease is caused by the large increase in the AOW contributions, a consequence of the 'greying' of the Dutch population (see Table 1). The (equivalent) AOW benefits hardly differ between generations.

The net AOW benefit, subdivided by sex, marital status, employment status at age 45, number of children and level of education, is shown in Table 5. With respect to marital status, the following are distinguished: (a) unmarried persons who have never cohabitated during their life; (b) persons who have been (re-)married or have been living together and have not separated during their last union; and (c) persons who were once married or once cohabited and who have separated, but did not remarry or recohabit afterwards. They are indicated by single, married and separated, respectively. Employment status has been measured as the situation at the age of 45 years (if alive) or the status in the year of death, if deceased before the age of 45 years. The following distinctions are made: (a) employees in private

Table 5
The net equivalent AOW gain (in thousands of Dfl., 1990 prices) decomposed by sex, marital status, employment status, number of children and level of education

Cohort	1930	1940	1950	1960
Total	204	156	81	18
By sex				
(a) male	107	71	−5[a]	−54[b]
(b) female	304	244	163	91
By sex and marital status				
(a) single men	35[a]	27[a]	−13[b]	−69[b]
(b) married men	120	80	8[a]	−40[b]
(c) separated men	79	62	6[a]	−67[b]
(d) single women	219	162	79	43
(e) married women	316	253	176	112
(f) separated women	284	237	173	86
By sex and employment status				
(a) male employees	110	70	−12[a]	−56[b]
(b) male civil servants	89	62[a]	−42[b]	−99[b]
(c) self-employed men	100	42[a]	−21[a]	−88[b]
(d) male nonworkers	130	105	68	30
(e) female employees	286	232	145	76
(f) female civil servants	–	–	110	43
(g) self-employed women	301	229	160	86
(h) female nonworkers	309	252	178	117
By number of children				
(a) 0 children	123	77	18	−27[b]
(b) 1 child	169	136	71	15
(c) 2 children	206	155	97	37
(d) 3 children	215	175	107	43
(e) 4 children	237	208	107	60
By level of education				
(a) lower education	216	168	90	35[a]
(b) 1st stage secondary general educ.	216	157	104	46
(c) junior vocational training	183	149	46	7[a]
(d) 2nd stage secondary general educ.	205	159	100	36
(e) senior vocational training	206	170	95	34[a]
(f) vocational colleges	205	148	73	−5[a]
(g) university	122	110	36	−20[a]

[a] Not significantly differing from 0 ($\alpha = 0.05$).
[b] Significantly less than 0 ($\alpha = 0.05$).

firms and persons who became unemployed or disabled from this state; (b) civil servants and persons who became unemployed or disabled from this state; (c) persons who were self-employed at the age of 45; and (d) all other

persons (e.g. housewives, housemen, early-disabled persons, unemployed school-leavers, but also unemployed persons who were once self-employed). These groups are called employees, civil servants, self-employed persons and nonworkers, respectively.

The AOW forms a large part of the total gain for women from the social security system, which is, of course, related to the longer life expectation for women. Women receive, on average, Dfl. 145,000 (cohort 1960) to Dfl. 197,000 (cohort 1930) more than men. The net result for men is even negative in the youngest two cohorts, which implies that the contributions are larger than the benefits. So, the AOW redistributes income from men to women.

With respect to marital status, single men pay most, followed by separated men. The net result is significantly negative in the youngest cohort for all male groups. On average, married women receive the most among females and single women receive the least.

With respect to the employment status at age 45, nonworkers benefit most from the AOW. This is mainly because they contribute less than the other three groups do. Among men, employees have the second largest gain, and nonworkers have the smallest loss, whereas among women, self-employed persons and employees receive about the same net result. Civil servants are the worst off: they have the lowest net gain c.q. the highest net loss for both men and women. The cause of this is the higher income of civil servants, which implies higher contributions.

With respect to the number of children, it can be seen that the net gain increases, the larger is the number of children. This is partly related to the equivalence scales applied, but it is also a consequence of the effect of household composition on labour supply, which in turn affects the claims for various social security schemes. The net gain, by level of education, is roughly higher, the lower the level of education. The AOW is especially beneficial to the educational groups (a), (b), (d) and (e), whereas those who finished vocational colleges or have a university degree always receive less than the average, in net terms.

Table 6 reports on the lifetime redistributive impact of the Dutch social security system, as measured by the Theil coefficient. The Theil coefficient for employers' gross wages, that is to say before social security, is 0.161 for cohort 1930, 0.133 for 1940, 0.125 for 1950, and 0.116 for 1960. This shows that income inequality decreases quickly in the course of time.

Social security benefits result in a decrease in the income inequality, whereas contributions have a regressive effect. The income inequality enlarging effect of contributions is larger, the younger the cohort. The Theil coefficient for lifetime wages minus social security contributions amounts to 0.181 for cohort 1930 and 0.141 for cohort 1960. So, the contributions increase income inequality by 12.3% and 21.8%, respectively. The

Table 6
Lifetime redistributive impact of social security benefits and contributions (Theil coefficients and procentual differences with respect to the Theil coefficient for employers' gross wages)

	Cohort 1930	Cohort 1940	Cohort 1950	Cohort 1960
Theil coefficient				
(1) Employers' gross wages	0.161	0.133	0.125	0.116
Changes in Theil coefficient [*per cent deviation from* (1)]				
(2) Benefits	−35.3	−35.5	−32.5	−36.6
AOW	−16.4	−15.0	−12.4	−12.7
(3) Contributions	12.3	14.2	16.1	21.8
AOW	5.2	6.0	7.0	9.3
(4) Net benefits	−26.2	−26.7	−22.1	−24.8
AOW	−13.0	−10.8	−7.4	−6.1

regressive effect is caused by the existence of a maximum premium income. The increase is due to the smaller premium income limit, as introduced by the tax reform in 1990.

The benefits result in an equalizing effect; the Theil coefficients for lifetime wages plus social security benefits are about 35% smaller than those for lifetime wages. The AOW benefit has a proportionally large effect, diminishing income inequality by 16.4% for the oldest cohort and 12.7% for the youngest cohort. The AOW contributions lead to an enlargement of income inequality. Thus the AOW contributions cause the Theil coefficient to increase by 5.2% for cohort 1930, 6.0% for 1940, 7.0% for 1950 and 9.3% for 1960.

Thus, both the benefits received and the contributions paid determine the net impact. All social insurances together reduce income inequality by 26% for cohort 1930, 27% for 1940, 22% for 1950 and 25% for 1960. The decline in income inequality in the course of time, as a consequence of the social security system, is comparable with the developments in the Theil coefficient for employers' gross wages, albeit somewhat less. It is striking that the reduction in income inequality by the social security system hardly differs between cohorts. The AOW forms an important part in this equalizing effect, but its role is decreasing. The net equalizing impact of the AOW amounts to 13.0% in the oldest cohort (which is about half the total equalizing effect of the social security system) and 6.1% in the youngest cohort, implying still only a quarter of the total effect. This decrease comes from the increasing contribution rate and the regressive nature of the contributions.

An examination of the various subgroups yields the following. The equalizing effect appears to be considerably larger (8 to 10 percentage

points) for women than for men. The AOW equalizes income most among separated women and, slightly less, among married women, with the exception of women in the youngest cohort, where the married women's income is equalized most by the AOW. Single and separated men show a small redistributive effect. The effect of the AOW on income distribution is, for single men in the youngest cohort, even positive, which means that it enlarges income inequality within this group. However, it does not significantly differ from zero. The same holds for the equalizing effect for single men in the cohorts 1930 and 1950, and separated men in the youngest cohort.

The redistributive impact of the AOW is particularly large for nonworkers and self-employed persons, and is the lowest for civil servants. The redistributive impact is significantly positive for male civil servants in the youngest cohort, whereas it does not differ significantly from zero for male civil servants in cohort 1950 and for self-employed men in the two youngest cohorts.

The effect is rather small for childless persons, with the exception of the oldest cohort. The differences between households with children are smaller, but the redistributive effect is generally higher, the larger the number of children. With respect to educational groups, those who have reached the first stage of secondary general education, senior vocational training or vocational colleges receive on average the greatest impact, with the lowest effect for those with a university degree.

The third element, with respect to the redistributional impact of the social security system, is the contribution of the various social security benefits and premium payments towards equivalent lifetime income per decile. This is shown in Fig. 2 for the AOW, whereas the net benefits for the combined social insurance schemes are given in Table 7. The deciles are determined on the basis of the employers' gross wages. In interpreting this figure and table, note that the contributions paid within a year and the benefits received within a year are adjusted for household composition. For pension schemes, for example, this implies that the equivalent contributions are generally lower than are the nonadjusted premiums, whereas the equivalent benefits are sometimes higher than the nonadjusted benefits. This means that pension premiums have been paid during a period in which the cohort's average household size is proportionally large, whereas benefits have been received during a period in which the average cohort's household size is proportionally low.

AOW benefits are almost equally distributed over the deciles. Only the first decile, which contains a greater proportion of people who die at a young age, gets a somewhat smaller average benefit. On the other hand, the contributions increase, the higher the decile is. This results in a smaller net benefit for the AOW, the higher the decile. The net AOW benefit is

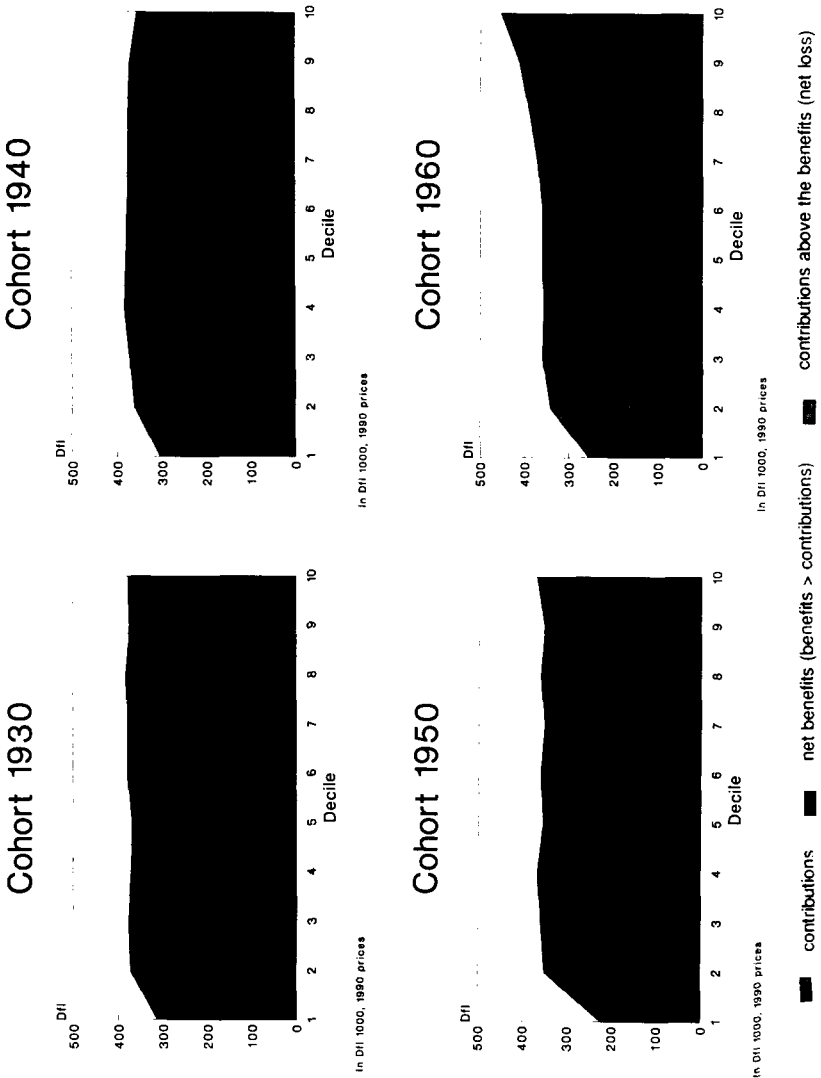

Fig. 2. The equivalent AOW benefits and contributions by decile (ranked on the basis of equivalent before-tax income).

Table 7
Net equivalent benefits (in thousands of Dfl., 1990 prices) by decile (ranked on the basis of equivalent before-tax income); the net AOW benefit as a percentage of lifetime wages is in parentheses

Decile	1930	of which AOW	1940	of which AOW
1	622	237 (28)	659	203 (20)
2	605	261 (18)	599	210 (12)
3	569	243 (13)	543	202 (9)
4	516	222 (10)	498	195 (8)
5	402	204 (8)	457	171 (6)
6	420	199 (7)	385	157 (5)
7	370	185 (5)	352	140 (4)
8	286	176 (4)	282	121 (3)
9	281	149 (3)	189	102 (2)
10	74	130 (2)	−12	55 (1)
	1950	of which AOW	1960	of which AOW
1	484	119 (14)	602	103 (10)
2	583	156 (8)	576	99 (5)
3	525	138 (6)	493	82 (3)
4	394	127 (4)	371	55 (2)
5	383	92 (3)	328	35 (1)
6	291	80 (2)	231	15 (0)
7	208	57 (1)	130	−23 (−1)
8	184	45 (1)	95	−25 (−1)
9	70	17 (0)	−18	−61 (−1)
10	−82	−15 (−0)	−209	−99 (−1)

generally smaller, the higher is the decile number. Fig. 2 also clearly shows the decreasing net benefit, the younger the cohort is. A net loss for the highest decile in cohort 1950 can be found, as well as for the deciles 7 up to and including 10 in the youngest cohort.

Table 7 shows the net lifetime social security benefits and the net lifetime AOW benefits by decile. Clearly, the net effect of the social security system for all deciles diminishes with time. The only exceptionis decile 1 in the youngest cohort. This group is better off than the same group in the preceding generation. The social security system raises the income of decile 1 in cohort 1930 by about 74% of the employer's gross wages. The increase for decile 5 amounts to only 15%, for decile 9 almost 6% and for the highest decile the gain from the social security system amounts to 1%. The AOW always forms a large part of this gain. Next follow the figures for the net benefit in the youngest cohort. Decile 1 again receives a proportionally larger gain from the system, namely 60% (in terms of the employers' gross wage), but for the other deciles the effect of the social security system is

rather limited. The income after social security for decile 5 is only 10% higher than before social security. Deciles 9 and 10 suffer a loss, which amounts to almost 3% of the gross wage for decile 10. The significance, however, of the AOW diminishes or even has a negative impact on the net gain.

With respect to the benefit–tax ratio, note the following (see Table 8): for all social insurances together (with the exception of health insurances) the benefit–tax ratio decreases. For cohort 1930, this benefit–tax ratio amounts to 1.91, for 1940 1.67, for 1950 1.38 and for 1960 1.27. This means that the cohort 1930 gets Dfl. 1.91[8] for each Dutch guilder invested in the social security system, so that the net gain amounts to 91%, in comparison with the fact that for cohort 1960, the net gain is only 27%. The largest reduction takes place between cohorts 1940 and 1950, with a decrease of 17%. Cohorts 1940 and 1960 are confronted with a decrease of 13% and 8%, respectively, compared with their preceding cohort.

This decline is reflected in the development in the benefit–tax ratio for the various schemes. The benefit–tax ratio for the AOW declines, the younger the cohort is, and the decline is steep: 20% or even more between successive cohorts. In the case of cohort 1960, the benefit–tax ratio for the AOW is 52% lower than for cohort 1930. The latter receives 2.19 times the premiums paid, whereas the former receives only 6% more than the contributions (the benefit–tax ratio amounts to 1.06). For the other two cohorts, the ratio for the AOW is 1.75 (cohort 1940) and 1.31 (cohort 1950), respectively. The benefit–tax ratio is, of course, considerably higher for women than for men. The benefit–tax ratio for cohort 1930 amounts to 1.53

Table 8
Benefit–tax ratios (based on equivalent income components) for the AOW by decile (ranked on the basis of equivalent before-tax income)

Decile	1930	1940	1950	1960
1	4.12	3.01	2.15	1.68
2	3.35	2.39	1.81	1.41
3	2.81	2.19	1.62	1.29
4	2.49	2.04	1.49	1.18
5	2.24	1.82	1.35	1.11
6	2.11	1.71	1.29	1.04
7	1.96	1.60	1.19	0.94
8	1.85	1.48	1.14	0.93
9	1.67	1.38	1.05	0.85
10	1.53	1.19	0.96	0.78
All	2.19	1.75	1.31	1.06

[8] Notice that this figure refers to discounted equivalent amounts.

for men, but is 3.00 for women. For the youngest cohort the figures are 1.32 for women and 0.83 for men. This implies that in the course of time the difference diminishes. This can be largely explained by the increasing labour-force participation of women, which implies that they contribute more than they have in the past. Within the two aforementioned groups, married men and single women show the highest yield. Separated persons show a somewhat lower profit, but the differences are small. Single men in the two youngest cohorts have a benefit–tax ratio significantly below 1.00 (which implies that they suffer a net loss from the scheme). This also holds true for married and separated men in the youngest cohort.

The benefit–tax ratio for the AOW is the highest for nonworkers and the lowest for civil servants. The differences, however, are rather small. Only male nonworkers have a proportionally higher ratio than do other male groups. Male nonworkers are also the only group, among men, with a benefit–tax ratio significantly above 1.00 in the youngest cohort. Male employees and civil servants also have a ratio which is significantly below 1.00 in cohort 1940. The ratio is larger, the higher the number of children. The benefit–tax ratio is the lowest for persons with a university degree. And those with a certificate from vocational colleges also have a ratio that is below average. The other educational groups show about an equal benefit–tax ratio, although for those with a certificate from junior vocational training the ratio is also rather small.

The benefit–tax ratios for the various deciles are given in Table 8. The proportion between the first and tenth decile is smaller, the younger the cohort. It amounts to 2.69 for cohort 1930 and to 2.15 for the youngest cohort, which is another indication of the smaller redistributive impact of the AOW over time.

5. Nonequivalent income streams

The use of equivalent income yields, of course, other results in comparison with an analysis based on nonequivalent income streams. Moreover, intra-personal, intra-cohort and intergenerational transfers cannot be measured via equivalent income streams. This section will therefore briefly go into the differences, with respect to the results, and show the (discounted) lifetime intra-personal, intra-cohort and intergenerational money transfers.

If income via equivalence scales is not standardized, the proportion of the AOW in net benefits increases to about half of total net benefits for all four cohorts. Moreover, the younger the cohort is, the lower its net benefit becomes, but the decline is smaller than in the case of equivalent income. The redistributive impact is considerably larger: the Theil coefficient for gross wages including net AOW benefits is 27% lower than the Theil coefficient for gross lifetime wages in cohort 1930 (against 13% in the case of

equivalent income). For cohort 1960, the figure is 18% against 6%. For males the difference is small, but women show a considerably larger redistribution. This is, of course, due to their relatively low lifetime wage income. As for the benefit–tax ratio, the picture between nonequivalent and equivalent income differs little: in both cases the ratio for the youngest cohort (1960) is about half the value of the oldest one. The level is about 25% higher in the case of nonequivalent income. The picture for subgroups, with regard to the benefit and the benefit–tax ratio, does not deviate in direction. All in all, the use of equivalent income streams results in a lower income inequality, but also in smaller redistributions in comparison with nonequivalent income streams. This has also been observed in annual data (see Nelissen, 1995).

The intra-personal, intra-cohort and intergenerational transfers on the basis of nonequivalent income streams are given in Table 9. Contributions are higher, the younger the cohort is, but benefits stay rather constant. Thus, the net benefit decreases and, consequently, so do the intergenerational transfers paid by the cohorts born about 1970 and later. Moreover, intra-cohort (or intragenerational) transfers[9] are limited, but on the rise due to the fact that the younger the cohort is the higher the contributions have been and the higher the probability that an intragenerational transfer can occur. The main part of the net result stems from intergenerational transfers. An important observation is that intra-personal transfers form a growing part of total benefit (28% in cohort 1930 against 51% in cohort 1960). The reason for this is, of course, the rising contribution rate. Older cohorts have been able to profit from circumstances that the current way of financing (PAYE) was, until recently, efficient (in view of the Aaron condition). For the younger cohorts, the reverse is true. At the moment, the contribution rate lies just above the level that would hold for the situation of a capital reserve system (being about 13.5%; see Nelissen, 1987). This largely explains the decreasing redistributive impact of the AOW in the Netherlands.

6. Conclusions and evaluation

This paper explores the lifetime redistributional effects of the Dutch General Old-Age State Pension (AOW), using a dynamic cross-sectional microsimulation model. The large role the AOW plays in the Dutch social

[9] We speak of an intra-cohort transfer if the lifetime benefits for an individual are smaller than his/her lifetime contributions. The intra-cohort transfer equals the difference between both. What remains has been considered as an intrapersonal transfer. The same holds for the contribution if lifetime contributions are smaller than the lifetime benefits. The intracohort transfers are redistributed over the deciles as a benefit according to total benefits.

security system has clearly been illustrated in Table 4. The AOW contributions account for 28.6% (cohort 1930) to 33.8% (cohort 1960) of all social security contributions. The percentages for the AOW benefits are 36.5% and 27.3%, respectively. These large proportions are also reflected in the proportional size of the redistributional impact (Table 6). However, the net AOW benefit is declining rapidly and so, too, is the net redistributive impact. All in all, the lifetime redistributive impact is rather small, varying

Table 9
Nonequivalent intra-personal, intra-cohort and intergenerational AOW transfers (ranked on the basis of equivalent before-tax income)

Decile	Contributions			Benefits				Net result		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Cohort 1930										
1	33	26	7	185	26	17	142	152	10	142
2	49	33	10	208	39	20	149	159	10	149
3	57	43	14	216	43	20	153	159	6	153
4	74	59	15	228	59	22	147	154	7	147
5	89	67	22	230	67	22	141	141	0	141
6	90	71	19	201	71	19	111	111	0	111
7	88	63	25	195	63	18	114	107	−7	114
8	93	69	24	228	69	22	137	135	−2	137
9	107	77	30	242	77	23	142	135	−7	142
10	123	88	35	197	88	19	90	74	−16	90
Cohort 1940										
1	47	35	12	184	35	24	125	137	12	125
2	69	55	14	224	55	30	139	155	16	139
3	80	56	24	218	56	29	133	138	5	133
4	93	70	23	226	70	30	126	133	7	126
5	97	71	26	224	71	30	123	127	4	123
6	107	80	27	201	80	27	94	94	0	94
7	131	98	33	205	98	27	80	74	−6	80
8	128	98	30	236	98	31	107	108	1	107
9	137	95	42	209	95	28	86	72	−14	86
10	155	103	52	205	103	27	75	50	−25	75
Cohort 1950										
1	48	36	12	137	36	24	77	89	12	77
2	89	68	21	220	68	39	113	131	18	113
3	104	78	26	223	78	40	105	119	14	105
4	114	84	30	206	84	37	85	92	7	85
5	122	91	31	212	91	38	83	90	7	83
6	139	103	36	207	103	37	67	68	1	67
7	145	102	43	217	102	38	77	72	−5	77
8	157	100	57	200	100	35	65	43	−22	65
9	163	111	52	207	111	37	59	44	−15	59
10	179	125	54	212	125	38	49	33	−16	49

Table 9 (*Continued*)

Decile	Contributions			Benefits				Net result		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Cohort 1960										
1	61	45	16	151	45	32	74	90	16	74
2	110	83	27	229	83	49	97	119	22	97
3	128	94	34	219	94	47	78	91	13	78
4	132	97	35	225	97	48	80	93	13	80
5	154	105	49	218	105	47	66	64	−2	66
6	165	122	43	213	122	46	45	48	3	45
7	168	117	51	216	117	46	53	48	−5	53
8	187	130	57	220	130	47	43	33	−10	43
9	196	125	71	200	125	43	32	4	−28	32
10	215	147	68	207	147	44	16	−8	−24	16

(a) total contributions
(b) intra-personal transfers (=self-financed)
(c) intra-cohort transfers (c) = (a)–(b)
(d) total benefits
(e) intra-personal transfers (=self-financed)
(f) intra-cohort transfers (f) = (Σ (c)/Σ(d))*(d)
(g) intergenerational transfers (g) = (d)–(e)–(f)
(h) net AOW result (h) = (d)–(a)
(i) of which intra-cohort (i) = (f)–(c) and
(j) intergenerational (j) = (g)

from a decline in the Theil coefficient of 13.0% for the oldest cohort to 6.8% for the youngest cohort. This implies that the lifetime redistributive impact of the AOW is considerably smaller than its effect on a yearly basis. For the latter, we found a redistributive impact of 40% (Muffels et al., 1986). The reason for this small lifetime redistributive impact lies in the fact that the redistributive effect of the AOW benefits is neutralized by the regressive nature of the contributions, which have been paid during working life. This effect is stronger, due to the higher premium percentages, the younger the cohort is. One consequence is a growing proportion of intra-personal transfers.

With respect to horizontal redistribution, the AOW redistributes income from single males, separated persons, civil servants, self-employed persons, households with few children and higher-educated persons to married and single females, married men, nonworkers, households with many children and the lower-educated groups. These redistributions can be considerable (see Table 5), which implies that the horizontal redistributional impact on lifetime inequality can be rather large in comparison with the vertical impact. For example, the net redistributive impact of the AOW for separated women and female employees in the youngest cohort is of about the same magnitude as that for the complete generation of 1930, whereas

the effect for married women, self-employed women and persons with a certificate from senior vocational training is only a bit smaller. But, redistributive impact for the lifetime approach remains rather limited as compared to the period approach.

Acknowledgements

Many thanks to the Dutch Scientific Organization NWO (grant no. 18.051 from the 'Research Program for Population Studies') and the Department of Social Affairs (TISSER benefit) for their financial assistance. The author wishes to thank two anonymous referees for their comments on a previous version of this paper.

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