# Intergenerational redistribution of income through capital funding pension schemes: simulating the Dutch pension fund ABP

Dekkers, Gijs J.M. and Nelissen, Jan H.M. and Becker, Henk A.

Federal Planning Bureau

2002

Session Number:7B
Session Title: microsimulation
Paper Number:2
Session Organizer: Joachim Merz and Holly Sutherland
Discussant:

*Paper Prepared for the 27th General Conference of*
*The International Association for Research in Income and Wealth*
*Djurhamn (Stockholm Archipelago), Sweden*
*18 to 24 August 2002*

# INTERGENERATIONAL REDISTRIBUTION OF INCOME THROUGH CAPITAL FUNDING PENSION SCHEMES: SIMULATING THE DUTCH PENSION FUND ABP

Gijs J.M. Dekkers[a], Jan. H.M. Nelissen[b] and Henk A. Becker[c]

For additional information, please contact:

Gijs Dekkers
Federal Planning Bureau,
Kunstlaan 47-49, 1000 Brussels, Belgium
gd@plan.be
fax: ++(0)2/5077373
phone ++(0)2/5077413

This paper is placed on the following websites: **http://www.iariw.org**
**http://www.econ.nyu.edu/iariw**
**Swedish Statistical Office address to be announced**

[a] Federal Planning Bureau, Brussels, Belgium.
[b] CentER Applied Research, Tilburg and Erasmus University Rotterdam, the Netherlands.
[c] Utrecht University, Utrecht, the Netherlands.

## Introduction

As is the case in most developed countries, the Dutch population is ageing rapidly. The number of individuals older than the mandatory retirement age of 65 expressed as a fraction of the rest of the population will increase from 21.2% in 1995 to about 43.6% in 2050 (CBS&CPB, 1997: 40). In most countries, the largest proportion of the pension benefits that are paid out to the elderly are brought together by the contributions of the active population. This type of financing is known as a Pay-As-You-Go-scheme (PAYG, see Miles and Timmermann, 1999, p. 255). In this scheme, an important 'chain of solidarity' covers for the pension of the preceding generation. There is however increasing strain on the chain: as a result of ageing, the proportion of elderly in the population increases. So, fewer contributors must cover for the pension benefit of more beneficiaries. Hence, the active population will see their pension contributions increase, whereas the future pension benefit they can expect, will not change. In other words, given a certain relative pension benefit, the members of some generations pay more than members of other generations. So, there is a pattern of winners and losers that is caused by the rates of ageing of the populations, in combination with PAYG-pension schemes.

How much will the contribution rates increase? Will the contributors accept these increasing costs, or will they someday push their political representatives to abolish the pension scheme and thereby break the solidarity-chain? These are all important questions who have been dealt with in numerous theoretical and empirical research (Aaron, 1997, Guillemard, 1999, Raffelhuschen, 1999, Verbon et.al., 1992).

One of the policy measures that are generally believed to be able to prevent this breakdown, concerns the development of additional pension schemes based on the Capital Funding (CF) type. In CF pension schemes, individuals of every generation contribute to a pension fund, and thereby build up a certain future pension claim. So, every generation builds up its own future pension benefit in this type of scheme. Hence, CF pension schemes are believed not to rely on income flows between generations, since every generation finances its own future pension. The advantage then is that there are no winners or losers, from the generational point of view at least, so that demographic developments cannot jeopardize the system.

But, this only holds for Defined-Contribution (DC) pension systems. In practice, we also observe Defined-Benefit (DB) pension systems. In fact, the larger part of the occupational pensions schemes in the Netherlands are DB ones. For this type of schemes it

holds that absence of intergenerational income flows is a too optimistic view, though the redistribution is not that strongly as in the case of PAYG schemes.

The central question in this contribution is whether intergenerational redistribution of income occurs via Capital Funding in case of DB pension schemes. To that end we analyse a fund in practice, namely the Dutch civil servants' pension fund Algemeen Burgerlijk Pensioenfonds (ABP). This is one of the largest pension funds in the world.

This paper has been organized as follows: in the first section, the pension fund ABP and the way in which the pension benefits as well as the contributions are determined, will be discussed. Next, 'intergenerational redistribution of income' will be defined, and conditions should be met for it to occur, will be discussed. Next, the lifetime simulation results of including a pension-fund module in the Dutch dynamic microsimulation model, NEDYMAS, will be presented in more detail. Finally, a simulation variant controlling for the exogenous contribution rate of before 1995 will be discussed.

**The Dutch Pension fund ABP**

A definition of a pension fund in the Dutch context can be found in WRR(1999: 173). Here, a pension fund is defined as a non-profit organization that manages pension-savings on the basis of solidarity between the participants. Participation is compulsory and there is no competition in the market. The Dutch civil servants' pension fund ABP has a capital reserve of more than 85 billion euro . In 1996, there were 878,000 active participants in the ABP, 264,000 old-age pension beneficiaries, 160,000 individuals receiving a Widows- Widowers and Orphans pension benefit and 86,000 disability pension beneficiaries. So, there were 510,000 pension beneficiaries. Moreover, there were about 714,000 inactive and non-retired participants: 41,000 of them receiving an early retirement benefit (ERB), 66,000 people eligible to a retaining pay and about 607,000 individuals with non-contributory pension claims (ABP, 1996). On the whole, more than 2 million people were, or had been, participating in the pension fund. The sum of benefits paid out amounts to about 3.4 billion euro, while the ABP received about 1.9 billion euro of contributions (ABP, 1996: 10). All this makes the ABP the largest pension fund of the Netherlands and one of the largest of the world.

The way the contribution rate was set changed profoundly in 1995. Before, the contribution rate was decided upon by the Ministry of Social Affairs, and set by law each

year. The contributions were therefore exogenous to the ABP and were not determined by actuarial information on the expected future pension benefits of the fund. In 1993, the social partners decided to end the dominant role of the government in the ABP and to turn the ABP into a private, self-administrating and independent pension fund from 1995 onward (ABP , 1993: 7). As a result of this privatisation process, the premium-setting mechanism changed profoundly. First of all, the APB no longer organized and financed disability pensions and the early retirement scheme, which finance scheme switched from being funded out of interest receipts in the CF-scheme to an explicit PAYG-scheme. Secondly, a new contribution rate, called the synthesis-contribution rate, was adopted. This contribution rate was no longer exogenous to the ABP itself and became subject to the actuarial position and assets of the fund.

What pension benefits does the ABP provides and how are they determined? As said in the previous section, the ABP provides old-age pension benefits, Widows- Widowers and Orphans pension benefits (from here on abbreviated to WW&O), disability pension benefits and early retirement benefits (abbreviated to ERB). The specific old-age and WW&O-pension allowances of the ABP proceed from a final- wage system: the benefit is a function of the final wage, the number of years which the individual has been contributing to the pension system and the type of the pension. In this context, the total upbuilding and annual rate of upbuilding must be defined. The ABP promises a total old-age pension benefit of 70 percent of the final wage after a working career of 40 years. So, each year that an individual is a civil servant who participates in the pension fund, his or her future pension claim increases by 1.75% times the annual rate of upbuilding. For a civil servant, the upbuilding rate equals one. For other participants, it depends on the situation the individual is in with respect to the pension fund. Early retirement beneficiaries and retainment pay beneficiaries have an annual upbuilding rate of 0.5. The annual upbuilding rate of individuals receiving a disability pension depends on the degree of disability, but is on average 0.91 for men and 0.87 for women. Lastly, old-age pension beneficiaries and non-contributing participants do not contribute at all and their annual upbuilding therefore equals zero.

The actual pension benefits paid out to a beneficiary depend on the final wage and the upbuilding of this individual. The old-age pension benefit is equal to the final wage times the upbuilding, so that an upbuilding of 40 years results in a total pension equal to 70 percent of the final wage. In this, the gross state pension benefit (following the General Old Age Act or Algemene OuderdomsWet AOW) is taken into account via a so-called exemption. The disability pension and the early retirement pension are both derived as a fraction of the wage

that the individual earned the year before entering the scheme. Like the old-age pension benefit, the disability pension benefit takes an exemption into account. The disability pension depends on the degree of disability. Before 1993, the early retirement pension benefit was 80 percent of the final wage instead of the pension base. In 1993, this percentage was decreased to 70. The fixation of the WW&O pension is a bit more complex, as it is equal to five-sevenths of the fictitious old-age pension allowance which the deceased partner would have had *if he or she had continued working until reaching the age of 65*. This adjustment is only the case if the deceased was a civil servant at the time of death. If the beneficiary (i.e. the surviving partner) is younger than 65, this annual allowance is increased by 12.9 percent. The orphans pension benefit is a fraction of this fictitious old-age pension benefit.
The contribution rate, a fraction of the annual wage minus the exemption, is – as said – set either by law (before 1995) or -using actuarial information- by the ABP (from 1995). Active participants pay the full contribution, whereas the contribution rate which early retirement beneficiaries and retaining pay beneficiaries face, is half the contribution of active participants. Individuals receiving a WW&O-pension benefit, a disability pension or an old-age pension, as well as those having a non-contributory pension claim, do not contribute.

**Intergenerational redistribution of income**

Redistribution of income means that money is (consciously or unconsciously and directly or indirectly) transferred from one individual or group of individuals to another individual or group of individuals. If redistribution is indirectly, it means that there is an organization (for instance, the government or, as it is in this case, a pension fund) which willingly or unwillingly organizes the redistribution.

The above definition is an oversimplification since the difference between annual and lifetime income redistribution must be made. Ermisch (Ermisch., 1989, p.19) defines inter generational income redistribution as the situation where "an age group consumes more or less than its labour income". This is a rather general definition that is more general, as it is applicable for annual - as well as lifetime-redistribution between age groups. If an age group consumes less than its labour income in a certain period of time, which means that this age group is a net saver, then annual income redistribution does take place with one or more other age groups, who are net consumers. Likewise, if an age group consumes more than its labour income, *where both consumption and income are defined over the lifespan of that age group*, then lifetime income redistribution between generations does take place.

**Conditions for intergenerational redistribution to occur**

In this section, the conditions for intergenerational redistribution of income to be inherent in any Capital Funding pension system other than a pure individual defined contribution scheme, will be considered in more detail. For this, a closer look will be taken at how a typical pension fund such as the ABP sets the contribution rate using actuarial information of its participants. Before doing so, it should be noted that even if these conditions are not met, intergenerational redistribution might occur as a result of conscious actions of the funds' managers, or as a result of the fact that the contribution rate of the ABP was exogenous before 1995.

In the case of wage-related pension systems, the pension claim depends on the wage that participants earn. This wage-base can either be a function of the average or the final wage. The ABP organizes a final wage scheme, where the future pension is a function of the (full-time) wage earned in the last two years. The so-called 'system of constant annual premiums' is the individual funding method that forms the actuarial basis for the way in which the ABP bases its contribution rate. In the system of constant annual premiums, a constant or age-independent contribution rate is set such that the sum of the discounted future values of the contribution payments of an individual equals the expected discounted value of the benefits - referred to as the pension cost- taking mortality rates and a certain return on investment into account. Given the actuarial information (i.e. expected pension benefit, wage-base and mortality rates), the contribution rate is set such that it remains the same for all the future years until retirement.

The above system to determine the contribution rate is explained on the basis of one individual or a group of individuals of the same age and income. Of course, this does not mean that these methods are necessarily only applied on the individual level. Instead, the pension cost, the contribution base and therefore the contribution rate are determined for all participants together, so that individuals cover a pension-wide average pension cost. This means that one's contribution rate is set independent of one's age and is an average contribution rate, among other things based on the age distribution of the group of contributing participants. Kleynen (1996: 40) calls this the 'going concern method'. The WRR (1999: 184) refers to it as the (dynamic) liability-asset-contribution rate ("lasten-batenpremie").

To summarize, the pension fund first determines how much assets it should have to cover the sum of future pension benefits, given an expected rate of return on assets (the

discount rate). The difference between these required assets and actual assets then has to be covered by current and future contributions of the active participants, and it should therefore be expressed as a fraction of the discounted current and future wage-mass. The continuation premium is therefore equal to the difference between required and actual assets, divided by the discounted sum of current and future wages.

The result of the differences just presented is that in a certain year, every active participant has to contribute the same fraction of his or her income to the pension fund, regardless of his or her age. The most important reason for this is that it allows for solidarity among the contributors in terms of coverage of an increase of the wage-base.

Suppose that the future pension benefit of all participants increases as a result of an unexpected increase in the wage-base. As a result of this increase of the wage, the future pension of the participant increases *as if he or she had been earning the higher wage from the beginning of his or her career on*. This extra cost that occurs as a result of an increase of the wage is known as the 'back-service'. Of course, the back-service involved with a pension system where the future pension is a function of the last-earned wage (a final-wage system such as the ABP) is higher than in the case of a system where the pension is a function of the average wage of the participant (the average-wage system). So, given a certain uniform increase of the wage-base, the back-service costs for older participants will be higher than for younger participants, since the additional pension claim for the former ceteris paribus has to be covered within fewer years. As a consequence, older active participants should contribute more than younger active participants. The contribution rate should therefore increase by age and it could therefore be that the total contribution to be made to the pension fund for civil servants close to the retirement age would exceed the initial increase of the wage. The fact that the pension fund imposes a contribution rate that is equal for all participants of all age-groups, implies that there will be redistribution of annual income from the young to the old.

The fact that pension funds use a fund-wide and age-independent contribution rate means that the first condition for intergenerational redistribution of income is met: generations do not exactly cover their pension benefit. As a result of the continuation premium, some costs (or benefits) involved in a change in the wage are shifted to the future. To put it differently, in these cases, the capital funding system as used by pension funds incorporates implicitly some Pay- As-You-Go elements (Kuné, 1992:330), in which annual income is redistributed between generations. But by itself, this is no reason for intergenerational redistribution of lifetime income. If all generations were of the same size, composition and age-distribution and if the pension claim were to remain unchanged, then

part of the pension claim of a certain generation would be covered by a subsequent generation, whose pension claim in turn would be partly covered by the following generation, and so forth. This unfunded pension claim would in fact be transferred to eternity and the annual redistribution of income would not alter the lifetime-income of the various generations since every generation would pay exactly the same annual amounts of money as it sooner or later would receive from younger generations. Hence, there would be no intergenerational redistribution of income. This line of reasoning however assumes that the part of the pension claim which is funded by younger generations, is of the same size for all generations. This excludes unanticipated changes of the pension costs, such as those arising from expectation errors. Moreover, the requirement that the subsequent generations are alike in terms of size, composition, life expectation and age-distribution is unlikely to be met in practice. In fact, the Dutch population is ageing, and so is the population of civil servants. As a result, the same problem as in the case of a PAYG-financed pension scheme arises: the pension benefit becomes more expensive for younger generations. The reasoning behind this is very simple: intergenerational redistribution of income means that the cost of funding a certain generation is shifted to the following generations. As this following generation is relatively smaller, the part of the pension cost which any individual of the younger generation has to cover increases. In other words, in this case, the pension cost for an individual of the younger generation will increase whereas his or her expected pension benefit remains the same: the pension therefore becomes more expensive.

**Lifetime income**

When analysing intergenerational redistributive effects of pension systems, it is clear from the previous arguments that we prefer to look at the lifetime income flows. The effect of intergenerational redistributive income flows on the lifetime income of an individual can be interpreted as the balance entry of incoming and outgoing annually redistributive income flows. This way, purely age-specific income differentials are eliminated. Consequently, these redistributive lifetime-income flows are generally smaller than what would be suggested by looking at annual redistribution flows (Creedy, 1991 and 1999, Nelissen, 1998). But even if we are not so much interested in intergenerational redistribution of income but in income inequality in general, a number of authors argue that it is preferable to consider lifetime income inequality than annual income inequality (see e.g. Harding, 1993), since the former is

generally less unequal than the latter and since it is not affected by the situation which the individual is in a certain period of time.

The main reason for the dynamic longitudinal microsimulation model NEDYMAS (NEtherlands DYnamic MicroAnalytic Simulation system) developed by Nelissen (1994) was to analyse the effect of social security on the lifetime income of different generations. NEDYMAS generates a representative economic biography of participants of different generations. The most important modules are demography, education, labour market and income formation and a social security module. One of the most important modules is the demographic module. Here, historical information on fertility rates, death probabilities and other key variables is combined with expected trends in the labour market. The social security module has as input the information from the other modules and consists of a number of probability- and conditional statements, reflecting the Dutch social security system. The simulations start with a representative sample of 10,000 individuals in 1947, each characterised by about 350 variables. As the simulation period ends in 2060, the lifetime income of the generations born in 1930 until around 1960 can be simulated. This model is extended with a module representing the Dutch civil servants' pension fund ABP (Dekkers, 2001).

Before turning to the presentation and discussion of the simulation results generated by NEDYMAS, some conceptual difficulties involved with intergenerational redistribution of income via CF pension schemes must be discussed and overcome. Lifetime income redistribution between generations is said to happen if the lifetime income of one generation increases at the cost of the lifetime income of another generation. This implies a zero-sum-situation where the positive and negative intergenerational redistribution flows should cancel each other out. This would be the case in our model as well, if the fund were ‘closed' in the sense that the whole world were participating and if the history of the fund would have been limited to the four generations under consideration. This is not the case, of course. It is not realistic to assume that there are no financial transfers between the four generations under consideration, and other adjacent generations, while knowing that these transfers exist between these four generations themselves. This means that there will inevitably be some unobserved intergenerational redistribution between the four generations under consideration, destroying the zero-sum-situation requirement.

Moreover, we know that the pension fund invests the contributions and realizes a return on these investments. An expected real return on investment of 4 percent is reflected by the discount rate and is therefore already incorporated in the contribution rate. But if this

expectation is not met, i.e. if the real rate of return does not equal this 4 percent in the long run, then there is redistribution of income with the outside world, i.e. with those members of the various generations, which are not participating in the pension fund. This again destroys the zero-sum-situation requirement, since the profits and losses of the four generations do not cancel each other out.

Can these conceptual problems be solved, or at least overcome? The second one cannot, as we simply do not know how important these unobserved income flows between the four generations under consideration and other unobserved generations are. How can the first problem be overcome? By subtracting average per-guilder gain from the actual gain of every generation, a zero-sum-situation would be imposed: any gain that a generation would get above this level would be ‘covered' by an equivalent loss for other generations. Let us call this the ‘above-average profit'. Of course, subtracting a constant per-guilder percentage from the total gains of the various generations does not alter the pattern of profits. In other words, not the gain of a generation is shown, but the gain relative to other generations becomes visible.

**Lifetime simulation results**

The point of departure of this study is the lifetime household-income of four subsequent generations of civil servants. The 1930-generation was born between 1930 and 1935. For the other generations, the name used denotes the middle-year of the birth period. So, the members of the 1940-generation are born between 1936 and 1945, the members of the 1950-generation are born between 1946 and 1955 and, lastly, the members of the 1960- generation are born between 1956 and 1965. Table 1 shows the discounted, equivalent and individual lifetime-income results of the base-rate simulation, where the contribution rate is exogenous before 1995 and where there is no transition from a final-wage scheme to an average-wage scheme. In the above table, the standard errors are included. This is done to emphasize that these figures are averages of 15 runs, thereby introducing Monte Carlo variance. By dividing the total number of years by the number of individuals on which the figures in the above table are based, it can be seen that the average career-length is about 16.3 years for the 1930 generation. For the other generations, this is 15.7, 13.6 and 12.1.

Table 1. Lifetime income results in 1992-guilders. Base-rate simulation*.

| *Generation* | *1930* | *1940* | *1950* | *1960* |
|---|---|---|---|---|
| **no of years** | 3779.35 | 6574.40 | 8980.25 | 8955.90 |
| **-- Standard deviation** | 106.38 | 108.86 | 92.98 | 151.25 |
| **no of individuals** | 231.70 | 419.70 | 660.90 | 737.90 |
| **-- Standard deviation** | 4.80 | 4.28 | 7.19 | 13.99 |
| **gross yearly wage as civil servant** | 40588.10 | 47617.40 | 52963.60 | 58440.70 |
| **-- Standard deviation** | 674.61 | 507.38 | 465.01 | 456.16 |
| **total yearly old-age pension benefit** | 7752.40 | 10959.10 | 13397.40 | 14252.20 |
| **-- Standard deviation** | 411.17 | 426.35 | 242.46 | 234.71 |
| **total yearly disability pension benefit** | 2779.80 | 4282.80 | 4467.80 | 3597.90 |
| **-- Standard deviation** | 314.24 | 460.14 | 322.50 | 300.47 |
| **total yearly WW&O pension benefit** | 6846.20 | 7073.90 | 8445.80 | 11079.10 |
| **-- Standard deviation** | 1433.32 | 825.21 | 592.91 | 700.93 |
| **total yearly ERB** | 1346.20 | 891.70 | 930.00 | 1047.40 |
| **-- Standard deviation** | 115.51 | 36.50 | 35.92 | 37.01 |
| **total yearly benefit** | 18724.70 | 23207.70 | 27241.20 | 29976.50 |
| **-- Standard deviation** | 1735.45 | 1017.91 | 682.09 | 953.41 |
| **total yearly employees' contributions (old-age and WW&O)** | 1145.90 | 1166.20 | 1159.90 | 1249.40 |
| **-- Standard deviation** | 25.51 | 22.50 | 38.42 | 55.86 |
| **total yearly employers' contributions (old-age and WW&O)** | 3438.30 | 3499.10 | 3479.60 | 3748.50 |
| **-- Standard deviation** | 76.55 | 67.48 | 115.29 | 167.64 |
| **total employees' contributions (disability and ERB)** | 46.10 | 243.70 | 450.90 | 619.80 |
| **-- Standard deviation** | 4.38 | 8.70 | 12.07 | 18.59 |
| **total employers' contributions (disability And ERB)** | 85.50 | 452.50 | 837.30 | 1150.90 |
| **-- Standard deviation** | 8.14 | 16.06 | 22.42 | 34.47 |
| **total contributions** | 4716.20 | 5361.60 | 5927.10 | 6768.70 |
| **-- Standard deviation** | 108.31 | 99.42 | 172.46 | 246.02 |
| **Employees' contributions (PAYG)** | 990.90 | 1406.40 | 2056.10 | 3004.00 |
| **-- Standard deviation** | 43.32 | 29.85 | 48.46 | 51.05 |
| **Employers' contributions (PAYG)** | 2900.90 | 4253.50 | 6207.20 | 9061.90 |
| **-- Standard deviation** | 126.04 | 89.81 | 146.91 | 156.52 |

* Discounted lifetime income figures, corrected for the wage-index and divided by the individual's number of upbuilding years were added up for all individuals in the generation and then divided by the number of civil servants in the generation.

The simulation results in these and other tables are expressed in so-called 'yearly income', whereas we said lifetime-incomes were simulated. 'Yearly income' or 'yearly contributions' does not mean annual income or contributions, i.e. money received or paid in a certain year. In these tables, the average discounted lifetime figures are discounted to 1992 and divided by the number of 'career-years' of all civil servants (and not of the beneficiaries). This way, figures are corrected for the average length of the career over generations as well as the number of civil servants. So, 'gross yearly wage as civil servant' could loosely be interpreted as 'the average equivalent annual wage which a typical individual received over his career as a civil servant, in guilders of 1992'. This way in which the simulation results are expressed is purely a function of the research problem. When the goal is to analyse the redistribution of

income between generations, it is not interesting to see how important the early retirement benefit is to its beneficiaries. What interests us is to see how important the early retirement benefit is for an entire generation of civil servants. A benefit that is paid to a few civil servants is not very important (even if the actual benefit paid out could be very high) since it does not add up significantly to the income of the entire generation. Unfortunately, this means that the above figures cannot be compared directly with actual 1992 pension benefits. Moreover, conclusions on the comparison of the level of various pension benefits are difficult to draw either, since both the levels of benefits and the proportion of beneficiaries differ.

Let us start the discussion of table 1 by noting that the average equivalent yearly wage increases over generations, despite of the fact that the income figures are discounted for changes in the wage index. A likely cause for this development is the increasing average age of civil servants, which results in non-incidental increases in the macroeconomic wage (wage-thrift). Note that these increases are the most significant between the first and second, and third and fourth, generations. As the equivalent old-age pension benefit is a function of the (final) wage, the fact that the yearly equivalent old-age pension benefit follows more or less the same pattern, is not unexpected. When the various pension benefits are compared, it can be seen that the old-age pension benefit and WW&O-pension benefit are more important than the disability pension benefit and -especially- the early retirement benefit (ERB). This is true even though the last two are a direct function of the last-earned wage, without taking the total upbuilding into account (the latter is also the case for the WW&O-pension if the claimant deceases while being a civil servant). The conclusion is therefore that it is not so much the average level of benefit but merely the number of beneficiaries that determines the importance of a pension benefit for a generation.

When considering the contributions, note that the old-age and WW&O-contributions are considerably higher than the disability and ERB-contributions. This is not very surprising. First of all, the exogenous contribution rate prior to 1995 is entirely an old-age and WW&O-contribution rate, which also explains why the increase of the disability and ERB-contribution rate over generations is considerably stronger than that of the old-age and WW&O-pension benefit. Secondly, the difference in contributions is caused by the difference in benefits, meaning that the old-age and WW&O-pension benefits are considerably higher than the disability pension benefit and ERB. Lastly, note that the total PAYG-contribution rate is higher than the total Capital Funding contribution rate for the 1940, 1950 and 1960-generations. However, for the first generation, the 1930-generation, the situation is the

opposite. It appears that a PAYG-system would have been more efficient for the first generation as it would have shifted the cost of its pension largely to the other generations.

When expressed in percentages of the gross yearly wage as a civil servant (the seventh row), we can consider the development of the importance of the various pension benefits (in terms of how much they add to the lifetime income) over time, since the effect of the incidental development of wages (wage-thrift) is neutralized as well. For the four generations and the four relevant pension benefits, these figures are shown in table 2.

Table 2. Pension benefits, as a percentage of the gross yearly wage, base-rate simulation*.

| *Generation* | *1930* | *1940* | *1950* | *1960* |
|---|---|---|---|---|
| **total yearly old-age pension benefit** | 19.10 | 23.01 | 25.30 | 24.39 |
| **total yearly disability pension benefit** | 6.85 | 8.99 | 8.44 | 6.16 |
| **total yearly WW&O pension benefit** | 16.87 | 14.86 | 15.95 | 18.96 |
| **total yearly retainment pay** | 1.78 | 1.91 | 1.94 | 1.88 |
| **total yearly ERB** | 3.32 | 1.87 | 1.76 | 1.79 |
| **total yearly benefit (ex. Ret.pay)** | 46.13 | 48.74 | 51.43 | 51.29 |

* See table 6.1, but figures are also corrected for the importance of the lifetime civil servants wage, so that the effect of ageing on wage-thrift is taken out.

In the case of the old-age pensions, expressing the benefit as a percentage of the gross wage does not reveal very much we did not know before. The importance of this benefit is gradually increasing, at least for the first three generations. The increase between the 1930- and 1940-generations is particularly considerable. The relative yearly disability pension benefit increases between the first and the second generation and decreases afterwards. It appears that the increasing number of disability pension beneficiaries (Dekkers, 2000: Figure 6.3), belong mainly to the 1940 and 1950-generations. The development of the relative yearly WW&O pension benefit over generations is somewhat awkward, which is mainly due to the low relative benefit for the 1940-generation. This in turn is caused by a slow increase of the numerator, the lifetime guilder-value of the WW&O-benefit, combined with a strong increase of the denominator, the lifetime civil servant's wage. The relative importance of the early-retirement benefit is very much as expected, by contrast. This scheme is the most important for the first generation, and decreases afterwards, a development caused by the development of the numbers of beneficiaries over time (as shown in Dekkers, 2000: Figure 6.5). The high number of early retirees at the end of the eighties and beginning of the nineties seems to have been mainly members of the 1930-generation, which is not very surprising, since the oldest members of that generation reached the age of 60 in 1990. Note again that the disability pension benefit is considerably more important than the ERB for the four relevant

generations, even though the actual individual ERB as a fraction of the wage of the civil servant is higher than the disability pension benefit. The reason for this is that there are more disability pension beneficiaries than ERB-beneficiaries. The last row of table 2 shows the total yearly pension benefit. This is about 46 and 49 percent of the gross yearly wage for the first two generations, and 51 percent for the last two generations. It is clear that the development of the relative total yearly benefit is to the largest extent caused by the development of the yearly old-age pension benefit.

Of course, generations not only receive money from the pension fund, they contribute to it as well. Table 3 shows the total pension contributions as a percentage of the gross yearly wage.

Table 3 Pension contributions, as a percentage of the gross yearly wage, base-rate simulation

| *Generation* | *1930* | *1940* | *1950* | *1960* |
|---|---|---|---|---|
| **total yearly old-age and WW&O-pension contribution** | 11.29 | 9.80 | 8.76 | 8.55 |
| **total yearly disability and ERB- contribution** | 0.32 | 1.46 | 2.43 | 3.03 |
| **total yearly contribution** | 11.62 | 11.26 | 11.19 | 11.58 |

The relative value of yearly total contributions remains stable over the four generations, a development which is clearly determined by the countering developments of the old-age and WW&O-pension contribution, on the one hand, and the disability and ERB- contribution on the other hand. The most striking aspect of this is the high per-guilder contribution of the 1930 generation to the old-age and WW&O-pension schemes, accompanied by a very low contribution to the disability and early retirement pension schemes. The first observation is caused by the high exogenous contribution rate that existed during the sixties and seventies. The second is caused by the fact that no separate contributions for the disability and ERB were made before 1995. It is true that this contribution rate decreased during the eighties, but by then the members of the first generation were already in their fifties. As a result, they did not benefit as much from this decreasing contribution rate as the two subsequent generations did. Moreover, the early years were more upwards discounted than the later years. Of course, the 1940 generation has been contributing according to this exogenous contribution rate as well, but for a fewer number of years, and -as they were younger during the period that the high contribution rates applied- over a lower income than the members of the 1930 generation. That the ERB- and disability pension contribution rates are considerably lower is not surprising, since the amounts of money involved in these schemes are lower than those involved in the old-age and WW&O-pension schemes. The second reason for the increasing

disability- and ERB contribution rate, which applies for the last two generations, is that these disability pension benefits and ERB are financed through PAYG. So, the important increase in the number of early retirement beneficiaries during the eighties is not financed by these individuals themselves, but by individuals who where civil servants at that time, and who most likely were younger. This means that the cost of these pension schemes was shifted to the future, causing an increasing relative contribution for the last two generations.

To summarize, the relative old-age and WW&O-contribution rate decreases over generations, whereas the disability- and ERB-contribution rate increases strongly over the generations. However, as the latter is by far less important than the former, the total yearly 'lifetime-average' contribution to the pension fund decreases over generations.

The comparison of the figures in these tables 2 and 3 shows that the benefits obtained from the pension fund are considerably larger than the contributions which they made to the fund. This shows the effect of the real rate of return on investments that the pension fund generates. Table 4 shows the balance of lifetime-equivalent benefits and contributions, as a percentage of the gross wage.

Table 4. balance of benefits and contributions, as a percentage of the gross wage.

| *Generation* | *1930* | *1940* | *1950* | *1960* |
|---|---|---|---|---|
| **old-age and WW&O-pension benefit** | 24.67 | 28.07 | 32.48 | 34.79 |
| **disability pension benefit and ERB** | 9.84 | 9.40 | 7.76 | 4.92 |
| **Total** | 34.51 | 37.48 | 40.24 | 39.71 |

The net benefit which the generations get from the old-age and WW&O-scheme increases from 24.7% for the 1930 generation to more than 34% for the 1960 generation. As opposed to this, the relative net benefit coming from the disability and ERB-scheme decreases from almost 10% for the 1930 generation (caused by the low contributions) to a bit less than 5% for the 1960 generation. On the whole, the last two generations gain considerably more from the pension fund than the first two generations. This is again caused by the net benefits from the old- age and WW&O-pension schemes.

Having discussed the above figures, what can be said about intergenerational redistribution of income through the pension fund ABP? For reasons given earlier, the average per-guilder gain is subtracted from the actual gain of every generation, thereby imposing a zero-sum-situation. Any gain that a generation gets above this level is therefore covered by a equivalent loss for other generations. This subtraction does not alter the pattern of profits, so its informational value is limited, but the relative sizes of gains and losses

become more emphasized. Figure 1 shows the known pattern of ‘winners’ and ‘losers’ in the case of this ‘above-average profit'.

Figure 1. Intergenerational redistribution of income in the base variant.

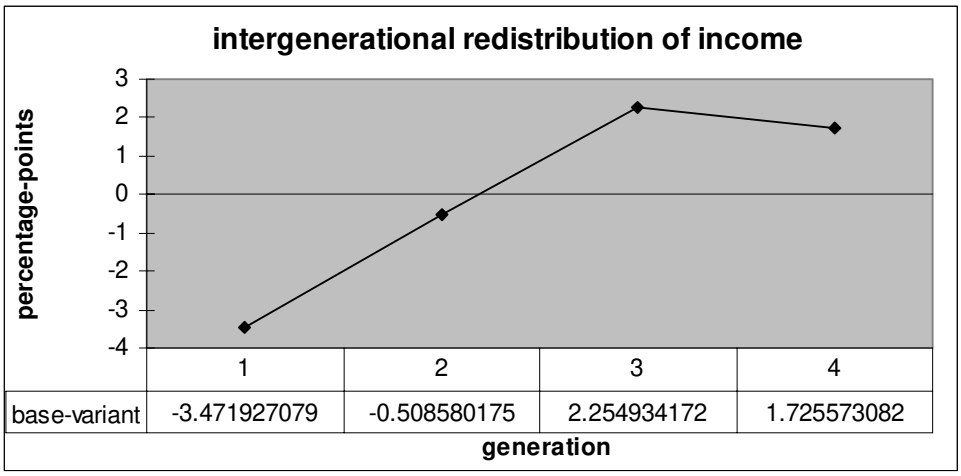



Figure 1 shows that the 1960 generation and especially the 1950 generation gain considerably, a gain which implicitly takes place at the expense of the 1930 generation in particular. This pattern is for the most part caused by the net benefit that the subsequent generations get out of the old-age and WW&O-pension schemes. This suggests the important role of the exogenous contribution rate that was imposed upon the ABP by the Minister for Social Affairs before 1995. The fact that the older generations gain more from the disability and ERB pension schemes than the younger generations is not important enough to neutralize this pattern caused by the old-age and WW&O-schemes. Only the somewhat higher per-guilder gain that the 1950 generation gets out of the pension fund, as compared to the 1960 generation, is caused by the higher disability and ERB pension benefits of this generation, as compared to the 1960 generation. It is for this reason that the 1950 generation becomes the ‘winner’ of this zero-sum situation, with the 1930 generation as the main ‘loser’.

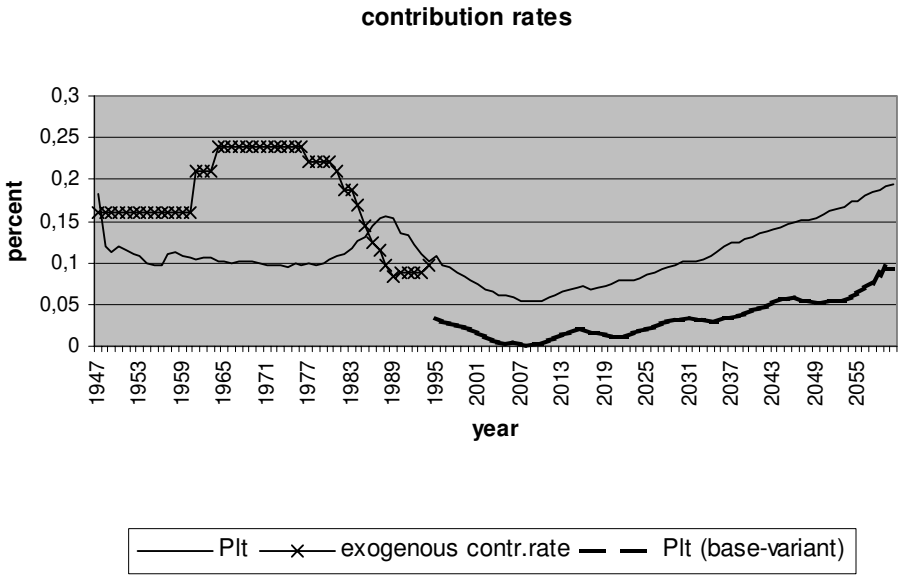
**The effect of the exogenous contribution rate**

Before 1995, the ABP faced an exogenous contribution rate that was decided upon by the Minister of Social Affairs. This meant that the development of the pension fund's liabilities was only to a limited extent reflected in the contribution rate. During the sixties and early seventies, this contribution rate remained stable at 24 percent. In the late seventies, a

number of specific measures however caused the contribution rate to decrease. It is clear from the previous discussion that this has a strong effect on the patterns of intergenerational redistribution shown in figure 1. It is therefore interesting to simulate the model assuming the ABP to be privatised not from 1995 on, but from the first simulation year 1947. Not only does the comparison of the simulation results reveal the effect of the exogenous contribution rate, but the simulation results in this simulation variant also show the redistributive patterns that are inherent to the pension system used by the ABP, i.e. that redistribution that would have occurred in the case of a private and independent pension fund. The second difference with the base-variant is that the disability pension and ERB of before 1995 are paid for by a PAYG-system.

Figure 2 shows the development of both the exogenous contribution rate as used in the base-variant, and the endogenous contribution rate that is the result from the actuarial modules of the ABP-model. The post-privatisation PAYG-contribution rate for the disability pension benefit and the ERB has not been taken into account.

Figure 2. The effect of privatising the ABP on the contribution rates




Plt denotes the long-term endogenous contribution rate in this variant describing the privatised pension fund. Plt (base-variant) clearly denotes the endogenous contribution rate in the case of the base-variant, which was therefore applied only from 1995 on. Before that year, the ABP used the exogenous contribution rate, which is included in figure 2 as well. The

continuous line (Plt) shows the endogenous contribution rate in this variant, i.e. assuming that the pension fund have been privatised from the starting year on. It is clear that this endogenous contribution rate is lower than the exogenous contribution rate of before 1995, but as this results in a gradual decrease of the level of assets relative to the base-variant, the endogenous contribution rate after 1995 turns out higher than in the case of the base variant (indicated by Plt (base variant)). This lower contribution rate in the first decades, followed by a higher contribution rate from the second half of the eighties on indeed means that we can expect the position of particularly the first generation to improve relative to that of the last two generations.

Before turning to the other contribution rates, let us dwell for a moment on the development of the endogenous contribution rate in the beginning of the nineties. First of all, starting in the second half of the eighties, the number of civil servants first stabilized and then decreased (Dekkers, 2000, figure 7.2). Then, in 1989, the National Postal and Telegraph Service (P.T.T.) became a private organization. This had several effects for the pension fund ABP. First of all, the number of active participants decreased by about 8%, whereas the number of old-age (and other) pension beneficiaries remained the same. So, the number of contributors decreased relative to the number of beneficiaries, and this at a time when the return on assets started to decrease. The combination of these effects probably caused the endogenous contribution rate to increase, until 1995 when the discontinuous change of the contribution base caused a sudden decrease in the contribution rate.

Having discussed the most important pension fund-wide simulation results, we turn to the lifetime-incomes, contributions and benefits. Table 5 shows the ratio of the lifetime-benefits and contributions in this variant and the base-variant.

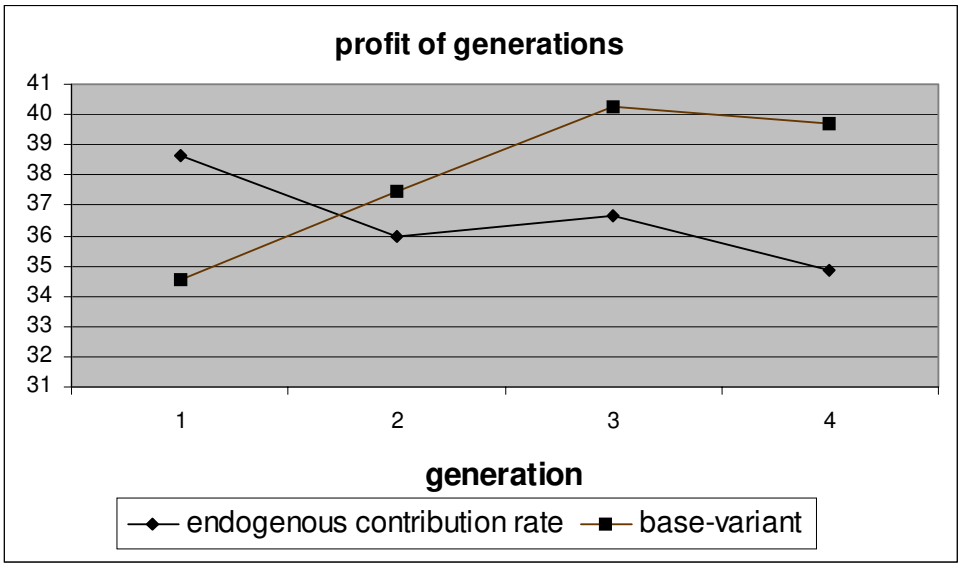
Table 5: lifetime simulation results: difference endogenous contribution rate with the base-variant.

| *Generation* | *1930* | *1940* | *1950* | *1960* |
|---|---|---|---|---|
| **total yearly old-age pension benefit** | 1.055 | 1.028 | 0.995 | 0.999 |
| **total yearly WW&O pension benefit** | 1.071 | 0.907 | 0.992 | 0.889 |
| **total yearly benefit (ex. Ret.pay)** | 1.078 | 1.010 | 0.991 | 0.966 |
| **total yearly old-age and WW&O-pension contribution** | 0.781 | 1.029 | 1.212 | 1.278 |
| **total yearly contribution** | 0.952 | 1.177 | 1.280 | 1.273 |
| **total yearly benefit minus contributions** | 1.120 | 0.960 | 0.910 | 0.877 |

As the difference between this variant and the base variant involves only the way the contribution is determined, the various pension benefits, as a percentage of the lifetime yearly

civil servants' wage, do not change considerably. It is also expected that the lower pre-1995 contribution rates, accompanied by the higher post-1995 contribution rates (both as compared to the base-variant, of course) have a strong effect on lifetime old-age and WW&O-contributions. The 1930 generation is the only generation for which the lower contribution rate of before 1995 lowers the lifetime contributions. Note, however, that the above table indirectly shows that the lifetime disability and ERB-contribution for this 1930 generation (and other generations) increases in relation to the base-variant. This is, of course, the result of the fact that in the base-variant and before 1995, no contributions to these schemes were made. This also explains why this indirect effect of the disability and ERB-contribution rate decreases for younger generations. For the 1940 generation, the decrease in the contribution rate before 1995 and the increase afterwards more or less cancel each other out. For the last two generations, the lifetime contribution ends up at about 21 and 28 percent higher, respectively. When looking at the last row of table 5, it can be seen that if the pension fund ABP did not have an exogenous contribution rate before 1995, i.e. if this fourth simulation variant had been real, the lifetime profit of the 1930 generation would have ended up 12 percent higher, whereas the profit of the younger generations would have been 4,9 percent (1-0,96) and about 12 percent lower. To summarize, as a result of privatising the ABP in the starting year 1947 instead of 1995, the profit of the 1930 generation increases strongly and this goes at the expense of the 1950 and 1960 generations. What is interesting is the effect of this variant on the redistribution between generations. This is shown in figure 3 on the next page. Again, as a zero-sum-situation is imposed, this important increase of the position of the first generation must be compensated for. This compensation is provided not so much by the 1940 generation, but mostly by the two main ‘winners’ in the case of the base- variant: the 1950 and 1960 generations. The last generation in particular sees its above-average profit deteriorate, and now becomes one of the main ‘losers’ in terms of intergenerational redistribution of income.

Figure 3. Intergenerational redistribution of income in the case of an independent pension fund




**Conclusion**

This study deals with the existence, magnitude and causes of intergenerational redistribution of income through capital funding pension schemes as organized in the Netherlands. As opposed to common thought, there are actuarial reasons to believe that intergenerational redistribution might exist. The most important structural cause for this is the fact that pension funds derive and use one contribution rate for all active participants in the fund, whereas a certain change in the expected discounted pension benefit should in fact have a stronger effect on the contribution rate of older participants as opposed to their younger colleges. Moreover, and this is the second requirement for intergenerational redistribution of income to exist, subsequent generations differ in size and the redistribution of annual incomes between generations therefore do not cancel each other out, so that lifetime income of some generations increases at the expense of other generations.

A model representing the Dutch civil servants' pension fund ABP was included in the dynamic microsimulation model NEDYMAS and this allowed for the simulation of the effect of participating in the fund on the lifetime income of four subsequent generations born between 1930 and 1960. Moreover, by imposing a 'zero-sum situation, the various generations could be subdivided into 'winners' and 'losers' in terms of the above-average profit which they get from the fund. The main result was that the first generation (born

between 1930 and 1935) was the main 'loser' whereas the last two generations (born between 1946 and 1955 and 1956 and 1965, respectively) were the main 'winners'. This pattern is mainly caused by the old-age pension benefit and the Widows- Widowers and Orphans pension benefit (WW&O), and by the exogenous contribution rate which the ABP levied before 1995 and which was set by law by the Minister of Social Affairs. To make the last effect explicit, a simulation variant was developed where the ABP was assumed to be a private organisation, like all other funds, not from 1995 on, but from the first simulation year 1947 instead. As a result, a pattern where the first generation is the main 'winner' emerges, and this surplus lifetime pension income is mostly at the expense of the last generation.

In the first part of this study, some theoretical or actuarial causes for intergenerational redistribution of income to occur, were outlined. These would result in intergenerational redistribution from younger to older generations. The simulation results in the simulation variant, the 'privatised pension fund') confirm this. In reality, however, the fact that the ABP used an exogenous contribution rate before 1995 caused the pattern of intergenerational redistribution of income to be the opposite of what one would expect on the basis of these actuarial considerations. The oldest generation suffered the full blow of this high contribution rate, thereby causing intergenerational redistribution of income towards the youngest generations.

**Literature**

Aaron, H., 1977, Demographic Effects on the Equity of Social Security Benefits, in: Feldstein, M., Inman, R. (eds), *The Economics of Public Services*, MacMillan, New York, pp. 151-173.

Algemeen Burgerlijk Pensioenfonds ABP, 1980-1995, *Annual Reports/Jaarverslagen, incl. Statistical Appendices*, Algemeen Burgerlijk Pensioenfonds, Heerlen.

Boadway, R., M. Marchand and P. Pestieau, 1991, Pay-As-You-Go Social Security in a Changing Environment, *Journal of Population Economics*, no 4, pp. 257-280.

Centraal Planbureau (CPB)/ Centraal Bureau voor de Statistiek (CBS), 1997, *Bevolking en Arbeidsaanbod: drie scenario's tot 2020*, SDU-publishers, The Hague.

Creedy, J., 1991, Lifetime Earnings and Inequality, *Economic Record*, vol. 67, no 196, pp. 46-58, 1991.

Creedy, J., 1994, Pensions and Compensating Wage Variations, *Scottish Journal of Political Economy*, vol. 41, no 4, pp. 454-46.

Creedy, J., 1999, Lifetime versus Annual Income Distribution, in Silber, J. (ed) *Handbook on Income Inequality Measurement*, Recent Economic Thought, Kluwer Academic Publishers, Boston/Dordrecht/London.

Dekkers, G., J. Nelissen and H. Verbon, 1995, Intergenerational Equity and Pension Reform: the case of the Netherlands, *Public Finance/Finances Publiques*, vol 50, pp. 224-245.

Dekkers, G.J.M., 2001, *Intergenerational Redistribution of Income Through Capital Funding Pension Schemes*, Ph.D. thesis Tilburg University, Shaker Publishing, Maastricht.

Ermish, J., 1989, in: Johnson, P., Conrad, C., Thomson, D., (eds) *Workers Versus Pensioners: Intergenerational Justice in an Ageing World*, Centre for Economic Policy Research, Manchester University Press, Manchester.

Guillemard, A., 1999, Equity and Redistribution between Generations: a Challenge for the Future of Pensions and All Social Protection Systems, *International Social Security Review*, vol. 52, no 3, pp. 69-92.

Harding, A., 1993, *Lifetime Income Distribution and Redistribution: Applications of a Microsimulation Model*, Contributions to Economic Analysis 221, North Holland, Amsterdam.

Jansweijer, R., 1996, *Gouden Bergen, Diepe Dalen: de inkomensgevolgen van een betaalbare oudedagsvoorziening*, Wetenschappelijke Raad voor het Regeringsbeleid, Sdu-Uitgevers, The Hague.

Kleynen, R., 1996, *Asset Liability Management binnen Pensioenfondsen*, Ph.D. thesis, Tilburg University, Tilburg.

Kuné, J., 1992, *The Netherlands' government policy in respect of the public employees pension scheme*, Verzekeringsarchief, vol. 69, pp. 319-335.

Miles, D., A. Timmermann, 1999, *Risk Sharing and Transition Costs in the Reform of Pension Systems in Europe*, Economic Policy, no 29, pp. 253-286.

Nelissen, J.H.M., 1994, *Income Redistribution and Social Security: an application of of microsimulation*, Chapman & Hall, London.

Nelissen, J.H.M., 1998, Annual versus Lifetime income redistribution by Social Security, *Journal of Public Economics*, vol 68, no 2, 1998, pp. 223-250.

Petersen, C., (ed.), 1990, *Pensioenen, Uitkeringen, Financiering & Beleggingen*, Stefert Kroese, Leiden.

Ponds, E., 1995, *Supplementary Pensions, Intergenerational Risk-Sharing and Welfare*, Dissertation Tilburg University, Tilburg.

Raffelhuschen, B., 1999, Generational Accounting in Europe, In: Baldwin, J., Oaxaca, R., *The American Economic Review*, Papers and Proceedings of the Annual Meeting of the American Economic Association, vol. 89, no 2, pp. 167-170.

Verbon, H., M. Verhoeven, 1992, Decision Making on Pension Schemes Under Rational Expectations*, Journal of Economics*, vol. 56, no 1, pp. 71-97.

Wetenschappelijke Raad voor het Regeringsbeleid (WRR), 1999, *Generatiebewust Beleid*, SDU, The Hague.