GROWTH AND WELFARE DISTRIBUTION IN AN AGEING SOCIETY: AN APPLIED GENERAL EQUILIBRIUM ANALYSIS FOR THE NETHERLANDS

BY

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Summary

This paper studies the effects of the imminent ageing of the population on economic growth and the distribution of welfare in the Netherlands. It shows that with the current system of social security ageing leads to a substantial increase of the tax burden and an estimated welfare loss for future generations of approximately 4% of lifetime wealth. It discusses the effect of reform measures in the pay-as-you-go social security system. It shows that a cut in PAYG pensions is efficiency-improving, but hurts the lower income groups of current generations. This effect can be ameliorated by a debt-financed cut in indirect taxes.

Key words: CGE model, overlapping generations, ageing, social security, intergenerational distribution

1 INTRODUCTION

The age composition of the population in developed countries is shifting rapidly in favour of the elderly. Projections by the United Nations indicate that for the OECD area as a whole the share of the elderly (people of age 65 and over) will increase from 15% in 1990 to 22% in 2040. At the same time, the old-age dependency ratio (the ratio of the elderly to the working age population) is expected to rise from 20% to 37%. For developing countries, a similar change is expected at a later stage (United Nations (1994)). Since the last decade, it is recognized that this worldwide change in the age structure of the population will have far-reaching economic consequences.

The demographic change will generate a substantial shift in the distribution of the net financial burden of the public sector across generations, mostly as a result

of declining labour force participation. Rising dependency ratios imply a decline in the size of the tax base that can be used to finance public expenditure and social security transfers. In addition, they will increase the outlays for health care and social security. In most OECD countries, social security is largely on a pay-as-you-go (PAYG) basis, so that the currently active population pays for the pensions of the retired population. Without a substantial cut in public expenditure programmes and transfers, ageing will therefore cause a substantial increase in the net tax burden for younger generations.

To estimate the size of the burden of future generations, Auerbach and Kotlikoff introduced the method of Generational Accounting (see Auerbach et al. (1991)). Calculations for the US show that the lifetime tax rates for future generations are expected to almost double, from around 29% to around 50%, under the current policy regime (see Gokhale et al. (1999)). Kotlikoff and Leibfritz (1999) conclude that 10 out of 17 countries in their survey have severe generational imbalances, among others the Netherlands. On the other hand, Ter Rele (1998) estimates that for the Netherlands the burden of future generations needs to be raised by only 3%, due to a future increase in labour participation and the substantial funding of Dutch pensions. Since intergenerational accounting does not include the deadweight loss of an increase in the tax burden, these estimates must be regarded as lower bounds of the intergenerational burden.

A fundamental limitation of generational accounting is its neglect of market forces that provide a counterbalance to the consequences of an increasing dependency ratio. Ageing will affect the relative scarcity of production factors. On the transition path, the decline in the labour force will cause a reduction in labour supply that also depresses investment and the demand for capital. On the other hand, during the first stage of the transition life-cycle saving will be at a maximum. Therefore, for individual OECD countries a relative scarcity of labour may be expected during the transition. To the extent that ageing is synchronized over countries, international capital flows will not be able to equalize capital returns over time, which will lead to a movement along the factor price frontier, boosting wages and depressing interest rates (see Auerbach and Kotlikoff (1987), Börsch-Supan (1996), Chauveau and Loufir (1997), and Miles (1999)). Thus relative wage increases may lead to a partial restoration of the intergenerational balance.[1]

Another counterbalance to the distributional consequences of ageing is offered by the capital deepening that results from a decline in population growth, which boosts output per capita. On this account, Cutler et al. (1990) argue that the slow-

1 As a caveat it may be pointed out that the life-cycle model is not generally accepted as a good description of saving by individual households. Poterba (1998) for the US and Alessie, Kapteyn and Klijn (1997) for the Netherlands show that old-age households generally dissave less than predicted by the life-cycle model. However, Miles (1999) argues that once saving through pension funds is taken into account the life cycle model is much closer to observed saving profiles. In addition, Auerbach, Cai, and Kotlikoff (1991) show that the projected macroeconomic savings rate is not sensitive to the precise model of household behaviour used.

down in population growth does not create any problems. However, it may be argued that the demographic shift not only entails a drop in fertility but also an increase in longevity that boosts the share of elderly in the population. In addition the rising excess burden of social security will have adverse supply effects on saving and labour supply that may dominate the capital deepening effect. For instance, taking these effects into account, Chauveau and Loufir (1997) predict that OECD output will fall some ten to fifteen percent below the value on a balanced growth path as a result of the increasing social security burden.

As a large part of the expected increase of the burden of future generations has to do with unfunded social security, the policy discussion focuses to a large extent on social security reform as well. PAYG social security has typically been introduced to extend the coverage of pre-existing work-related private schemes (Fabel (1994)). In the process the funded character of the original schemes was gradually abolished. This transition was motivated both by distributional considerations and by efficiency arguments. On the distributional side, the first few generations to participate in the PAYG system did not have to pay for their PAYG pensions. On the efficiency side, until the 1980s, the benefits of PAYG financing outweighed the disadvantages. As pointed out by Aaron (1966), the rate of return on PAYG social security is the population growth rate plus the real growth of wages. In the sixties and seventies, this rate of return exceeded the return on a funded social security, which is the real rate of interest. In the eighties and nineties, the real rate of interest rose and the ranking was reversed. In the next century, a lower population growth rate lowers the return on a PAYG system, making a funded system even more attractive.

Thus both distributional concerns and efficiency arguments suggest a transition to a funded system. Many proposals to switch to funding have been made in recent years, see e.g. Feldstein (1995, 1996), and Börsch-Supan (1998). Generally, these proposals aim both at a reduction in the size of the intergenerational redistribution that is caused by the PAYG system and the exploitation of the higher expected return to be achieved from a funded system.[2] However, a transition to a funded system requires that some generations pay both the PAYG contribution rate for the pensions of the currently retired, as well as the contribution to the new funded system. In a sense, these generations pay for the free lunch of the elder generations at the creation of the PAYG fund. Therefore a difference between the rates of return on a PAYG system *versus* a funded system is not in itself an indication of a possible efficiency gain from a transition.

The issue of a Pareto-improving conversion from a PAYG system to a funded system has been investigated by Raffelhüschen (1993), Breyer and Straub (1993), Broer et al. (1994), Kotlikoff (1996), and Fehr (1999). From these analyses it

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2   If ageing also lowers the rate of return on capital, the case for funding is less clear-cut. In particular, a *transition* to a funded system would incur substantial costs in the presence of falling interest rates.

appears that such a transition is feasible if it reduces the distortion of the labour supply decision sufficiently to enable current and future generations to pay off the burden of the PAYG system from the reduced deadweight loss. A limitation of these models is that they assume that households differ only by age. Intragenerational heterogeneity is introduced by Kotlikoff et al. (1998) and by Fehr (1999). From these studies it appears that a Pareto-improving transition is more difficult to achieve if intragenerational heterogeneity is also taken into account. Different income groups are affected differently by alternative financing modes of the reform and have different tax-benefit linkages.

This paper studies the effects of population ageing on economic growth and the distribution of welfare in the Netherlands. It explicitly takes into account the effects of factor price movements and distortionary taxes on growth and intergenerational distribution. In addition, it also investigates the effects of ageing on the intragenerational distribution. It explores the possibilities to improve both efficiency and income distribution through a reform of the social security system. For this, it uses an extension of the OLG general equilibrium model of Broer, Westerhout and Bovenberg (1994). The model is calibrated on the Dutch economy as of 1994 to compute the expected time path of the Dutch economy over the next century.

Broer et al. (1994) showed that in the absence of intragenerational heterogeneity a Pareto-improving transition to a funded pension system would be possible. In this paper I take up the same issue, but with intragenerational heterogeneity included. In comparison with both our previous work and the studies by Kotlikoff et al. (1998) and Fehr (1999), I use a calibration of the model to a baseline solution that includes the projected ageing of the population, i.e. outside of the steady state. Since the demographic transition produces its own redistribution of welfare across generations, this redistribution should properly be looked at in conjunction with the redistributive effects of the social security reform. This means that a reform that in itself would harm certain generations may nevertheless be considered equitable if considered together with the distributive effects of the demographic shock. Evaluation of social security reforms are therefore not very informative if the reference scenario is a steady-state path.

The paper considers two reforms: first, a straightforward reduction in PAYG benefits, and second a combined cut in PAYG benefits and consumption taxes to compensate current old generations for the loss in income. The first option comes close to the international privatization literature, whereby PAYG saving is replaced by private life-cycle saving, but it incorporates an idiosyncrasy of the Dutch pension system that provides for a built-in compensation of existing elderly. This occurs through the supplementary occupational pension schemes that apply for most households participating in the labour market. The second option uses government debt to transfer part of the efficiency gain of the PAYG cut to

current generations. This transfer is achieved by implementing a maximal sustainable cut in consumption taxes.[3]

The rest of the paper is organized as follows. Section 2 presents an overview of the model, section 3 discusses the effects of population ageing for the Dutch economy in terms of a baseline projection with a constant interest rate and the expected development of the population. Section 4 discusses some policy options to combat the adverse effects of population ageing and section 5 concludes.

2 THE MODEL

The model is basically a small open economy version of the Auerbach-Kotlikoff (1987) overlapping generations model. It consists of the following sectors: households, a private enterprise sector producing tradables, private health insurance firms, public health insurance (subdivided into two categories), health care, a pension sector (with both a basic and a supplementary pension scheme), a government sector, and a foreign sector. Four markets are distinguished, the labour market, the tradable goods market, the health care market, and the capital market. All markets clear, prices for tradables and capital are determined on world markets through arbitrage, the wage rate and the price for health care are determined on the domestic markets.

The model builds on Broer, Westerhout and Bovenberg (1994) and Broer and Westerhout (1997). It extends these studies in a number of respects, the most important of which are a disaggregation of households by productivity as well as age and a calibration on a recent, non-steady-state, demographic projection.[4] Below I give a summary description of the main characteristics of the model. A complete documentation can be found in Broer (1999).

2.1 *Firms*

The tradable goods sector uses capital, labour, and raw materials to produce goods and services that are freely traded on domestic and international markets at internationally determined prices. Investment in physical capital is subject to internal adjustment costs, which makes it internationally immobile in the short run. Firms issue debt in fixed proportion to the value of their capital, so that the marginal source of finance for investment is retained earnings. The discount rate of dividends is derived from an arbitrage relation between bonds and equity for do-

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3 Note that a cut in consumption taxes is partly a lump sum subsidy to the accumulated wealth of existing generations.

4 Other new elements are: age-dependent wage profiles for each (productivity-defined) type of household, age-dependent demand for health care per household, a separate health insurance sector, and age-dependent government expenditure on education and social security transfers.

mestic investors. The labour input of different productivity types is perfectly sub-stitutable, so that wages are proportional to productivity.

The health sector only uses labour to produce health care services. Different productivity types are complementary in production, so that the skill distribution in the health sector is fixed. Since health care is labour intensive, and health care demand is larger in an ageing society a sectorial shift will occur from tradable goods to health care. This shift will reinforce the labour market effects of the declining participation rate.

2.2 Social Security

Pension provisions are modelled as a two-tier system. The first tier is a basic PAYG scheme that pays a flat benefit to all residents of age 65 and over. This scheme is financed from a proportional levy on income.[5] Residents of age 65 and over are exempt from PAYG contributions. The PAYG contribution rate is fixed and deficits of the PAYG scheme are subsidized by the government.[6] The second tier takes the form of a supplementary occupational scheme that aims at supplementing the PAYG pension to achieve a total pension maximally equal to 70% of the wage income earned in the year before retirement, depending on the number of years workers have contributed to the fund. The supplementary char-acter of the occupational scheme creates a franchise level so that workers with a wage income below the franchise do not currently contribute to the scheme. They do not accumulate rights for the supplementary scheme either. Contributions to the occupational scheme are deductible for both income tax and PAYG contribu-tions but benefits are subject to income taxation. By adjusting its contribution rate, the occupational scheme tries to match its assets and its projected benefit obligations to households that are currently participating in the fund.

In the model, the form of health care insurance depends on the wage level of the household. Low-productivity households are publicly insured. The public health insurance firm levies both a proportional tax on labour income and a small, nominally fixed, contribution. It reimburses (nearly) all health care expenditures of its clients. The private health insurance sector levies a lump sum contribution on households. In the model, it reimburses a fixed proportion of the health care expenditures of its clients. Both insurance firms close their budget annually by adjusting their contribution rate.

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5   A more extensive discussion of the model for the pension sector can be found in Broer et al. (1994).

6   Officially, only a *ceiling* has been imposed on contribution rates. In view of the expected increase in contribution rates, this amounts to the same thing. This change in the financing method of the Dutch basic pension scheme implies that it is no longer strictly pay-as-you-go if the government uses debt financing.

2.3 Households

Households choose their consumption of goods, health care, and leisure by maximizing expected lifetime utility subject to a lifetime budget constraint and a time constraint per period. Lifetime is uncertain and the death hazard increases with age. Households insure against this hazard by buying annuities. Preference for the consumption of leisure and health care is age-dependent. Households are free to retire when they choose, but they are eligible for old-age pensions from their 65th birthday, irrespective of their actual retirement date. Households differ both by age and by productivity (human capital). Productivity is exogenous to the individual household, but it varies by age.

Income for working age households consists of labour income, capital income, and government transfers. Households differ both by age and by productivity (human capital). Productivity is calibrated so that wages match the observed distribution over households of different ages in the base year. Households pay a proportional income tax on all forms of income. In addition, working age households contribute to the old-age social security fund and an occupational pension fund. All households are also compulsory insured with either a public health insurance fund or a private one. Households are only eligible for old-age pensions from their 65th birthday, irrespective of their actual retirement date.

Figures 1 and 2 present labour supply and wealth of households by age and position in the productivity distribution as these follow from the model for the starting year (1995).[7] The wealth accumulation profiles show that households incur some debt in the early parts of their life, to be able to smooth their consumption over the life cycle in spite of their low initial wage. The effect is most pronounced for the highest productivity type. Note that households do not dissave until high age. This is a consequence of the assumption that households insure against death by selling their assets against lifetime annuities. The return to wealth increases with age as a result of the increasing death hazard. For the median household, the wealth profile matches observed saving behaviour reasonably well. For the upper 5% of the distribution, the wealth profile after retirement is probably less realistic.

Labour supply profiles show participation rates for the base year that show a similar hump-shaped age pattern as observed participation rates. Participation rates for young low-productivity households are lower than for other types. Qualitatively, this conforms with reality. The model generates participation rates for households in their early fifties that may be too low. However, a direct compari-

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7   E.g. type 0.48 is the household type for which 48% of households has a lower productivity at the same age.
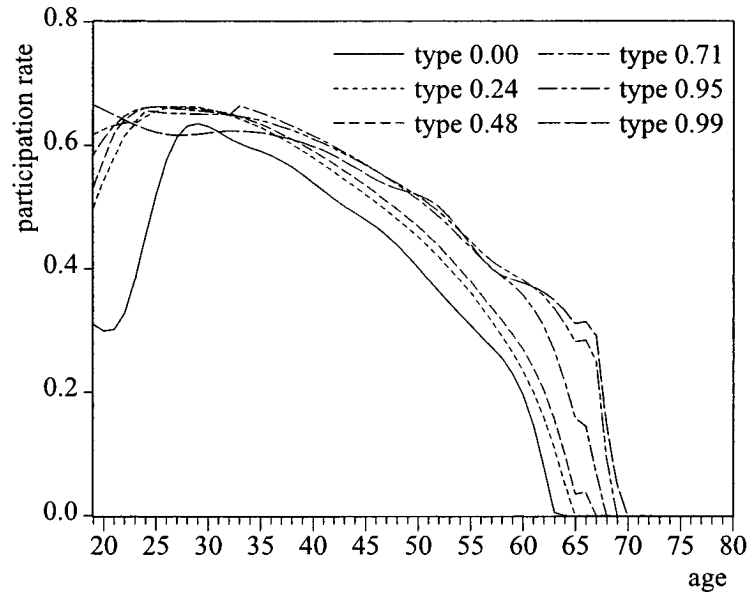
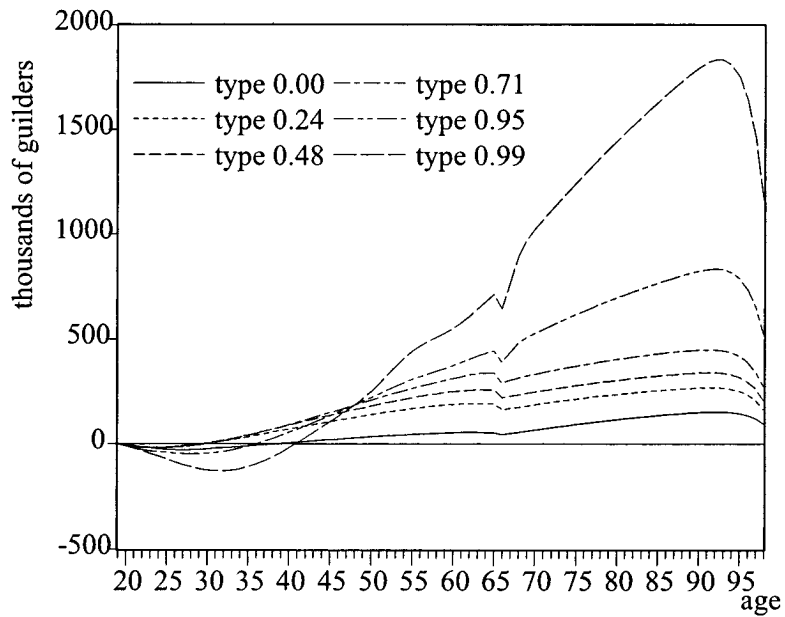Figure 1 – Labour supply distribution by age in 1995

Figure 2 – Wealth distribution by age in 1995

son of the results with the data is hindered by the lack of observations on participation by hours worked.[8]

2.4 Taxation

In the model, the tax system discriminates between households in a number of ways. First, old-age households do not contribute to PAYG old-age social security or to the pension fund. Second, households with a wage below the franchise level of the occupational pension fund do not contribute to that fund nor receive a supplementary pension upon retirement. Third, households with a wage below the public health insurance threshold are compulsory insured with the public health insurance fund, while households with a wage above the threshold are privately insured.[9] So the wage level of a household determines whether it contributes to the supplementary pension scheme, and whether it is insured with the public health insurance system or with the private health insurance system.

In an ageing society, both the health insurance system and the pension system impose an increasing burden on households. The burden of the health insurance system originates primarily with the public health insurance system which raises its income through a distortionary tax on labour income. Thus, as the share of elderly in the population grows, the contribution base shrinks at the same time when demand for health care increases. This generates both a redistribution of income between generations and an increase in the tax wedge on labour. This latter effect is absent from the private health scheme. As a result, in an ageing society the tax burden of high-income households grows less than that of low income households. High-ability households escape the health insurance tax altogether, whereas medium ability households escape it over the later half of their life, when their productivity is at a maximum. The health system therefore primarily distorts labour supply decisions of young and low-ability households.

Like the public health contribution rate, the PAYG pension contribution acts as a purely distortionary tax. The expected increase of this contribution rate therefore poses similar problems. The PAYG tax does not discriminate between households of different productivity, however.[10] Since the occupational scheme is a defined-benefit system, it cannot be actuarially fair and therefore distorts labour

8 Observed participation rates are given in terms of persons with a job of at least 12 hours per week. These rates start declining around age 55. At age 62, participation rates are only a few percent of the available population.

9 The actual regulations are formulated in terms of *income*. The formulation chosen here neglects the effects of tax progression on labour supply.

10 In the Netherlands, PAYG contributions are levied only in the first tax bracket. The size of the PAYG contribution rate therefore does not affect the marginal income tax of high-income households. This characteristic is missing from the model, in which all taxes are proportional to their base.

supply decisions.[11] The occupational scheme discriminates between high and low-wage households on account of its franchise, so that workers with a wage income above the franchise face a larger distortion. However, the distortion created by the occupational scheme is significantly less than that of the PAYG scheme on two accounts. First, a relation between contribution and benefit does exist, so that the contribution is not a pure tax (even though it is not actuarially fair). Second, the occupational scheme is fully funded, so that it should be able to stabilize contribution rates during the demographic transition. However, since the occupational scheme is also a defined-benefit scheme, substantial redistribution between generations may still occur if interest rates or wages change.

2.5 *Equilibrium*

In the model, the Netherlands is described as a small open economy with an exogenous interest rate and tradable goods sold at world market prices. As a result, interactions between agents have a fairly simple structure. In the long run, when the capital stock has adjusted, the factor price frontier causes the gross wage rate to be linked one-to-one to the world interest rate. In the absence of government intervention this property effectively severs the links between the decisions of domestic households. This holds even though labour is a non-traded good. Fluctuations in labour supply, or consumption, in the long run do not feed back to the domestic economy, but are absorbed in international markets. Thus, a fall in labour supply, e.g. through population ageing, would simply lead to an equiproportional reduction in capital through a fall in investment. The presence of capital adjustment costs does not substantially alter this conclusion, because forward-looking firms will anticipate the demographic shift and reduce investment in advance to smooth fluctuations in the capital-labour ratio. As a result, the real wage will fall off slightly before ageing sets in and rise somewhat thereafter. Major inequalities in income between generations as a result of ageing can only occur through changes in the world rate of interest.[12]

In a small open economy government spending and social security provide the main link between generations. A larger share of elderly simultaneously lowers government tax receipts and boosts social security outlays. Because social security is not funded, these extra outlays inevitably raise income taxes. A rise in income taxes has several effects. First, it directly affects the intergenerational income distribution. Since the return to PAYG social security falls, young generations must pay more to maintain the living standard of the elderly. Second, it

11   The distortion varies over the life cycle, and may be zero for some years. It is generally largest for middle-aged households.

12   As noted in the introduction, a fall in world interest rates is not at all improbable. From a life-cycle perspective, a fully anticipated change primarily boost the return to human capital and shifts the income distribution towards high-ability households.

lowers the after-tax interest rate, which reduces the required rate of return on equity, boosts investment per capita, and increases labour productivity and gross wages. This substitution effect partially compensates households for the rise in the tax burden. Third, the increase in the tax rate also distorts labour supply decisions and saving decisions of households. The decrease in the opportunity costs of leisure induces a shift towards consumption of leisure and towards current consumption relative to future consumption. As a result, taxes and contribution rates have to rise further. This creates an efficiency loss that lowers economic growth and welfare. In the next section I attempt to provide a detailed account of the effect of ageing on welfare and economic growth over the next century.

2.6 *Extensions*

To put the present model into perspective, it is useful to specify a number of extensions that might affect the results presented in this paper. The presence of substantial intergenerational transfers through bequests (Kotlikoff (1988)) suggests the introduction of a bequest motive as a determinant of saving, in addition to the consumption smoothing motive used in this paper. Modelling bequests presents somewhat of a problem, however. Microeconometric studies show that little support exists for an altruistic bequest motive (Altonji et al. (1992), Wilhelm (1996)). In addition, there are some well-known theoretical difficulties with attempts to model altruism explicitly (Bernheim and Bagwell (1988)). Davies (1981) shows that observed bequests can be explained to a large part from a precautionary motive related to uncertain lifetime and imperfect insurance markets. This requires modelling of liquidity constraints and uncertainty, which is a formidable task (see e.g. Carroll (1992)).

Next to private bequest motives, social equity is another important motive for intergenerational transfers. A satisfactory treatment of uncertainty would enable consideration of public insurance motives of pensions in the form of intergenerational *risk sharing* (Gordon and Varian (1988)). The current neglect of this rationale of public pensions biases the results in the direction of efficiency considerations.

The model does not describe human capital accumulation. Differences in household productivity by age are represented through exogenous wage profiles. Modelling of human capital decisions makes it possible to study the effects of changes in the return to human capital on the accumulation decision, both in terms of schooling and on-the-job training (Heckman, Lochner, and Taber (1998)). To also model endogenous growth it is necessary to introduce a spillover of human capital between generations (Bovenberg and Van Ewijk (1997)). The effects of ageing on growth are very sensitive to the size of this spillover, whereas empirical information on this size is deficient (Fougère and Mérette (1999)).

In the present model, taxes are proportional to income. Inclusion of progressive taxation in the model would enable a better estimate of the size of the dis-

tortions created by rising tax rates and their effect on labour participation, in particular for elder workers. Combined with endogenous human capital, it would also increase the relevance of the estimates of the equity-efficiency trade-off made with the present model.

Similar remarks may be made with respect to labour market imperfections. Whereas unemployment is less of an issue in an ageing society, wage bargaining outcomes may be affected by the increase in the tax burden. In addition, if rising wage profiles over workers' lives are the result of incentive schemes in the presence of incomplete information, instead of productivity differences, a substantial increase in the share of elder workers raises labour costs.

2.7 Calibration

The calibration of the model is based on the National Accounts of 1994. The calibration uses a steady-state growth path for the values of all exogenous variables for the period after 1994, except for population growth, that is based on the so-called 'mid-range' demographic projection of the Dutch Central Statistical Office (see Figure 3).
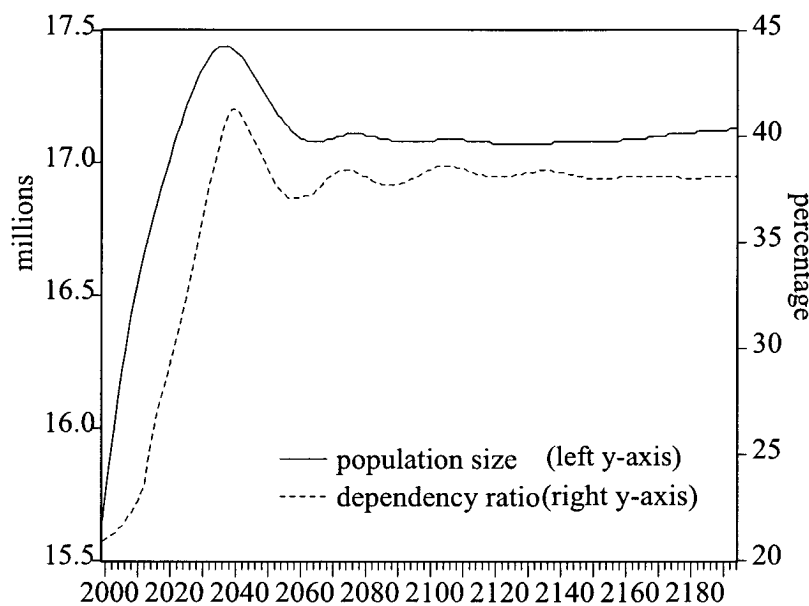

Figure 3 – Demographic projections, 2000-2194

For the household sector the scale parameters are chosen to make the model match observed aggregate labour supply, consumption of health care and of goods and services, and non-human wealth. In addition, labour participation of elderly

(> 64) is set at 2%, to conform to observed participation rates. The productivity distribution of households has been derived from a cross-sectional data set of individual wages, available by age, for 1995, by assuming that wage differences between workers in the same year are based solely on productivity differences. Steady-state price elasticities for the household sector as a whole are given in Table 4 below. The aggregate wage elasticity of labour supply is nearly zero. An increase in income taxes increases labour supply and reduces wealth accumulation (saving). In the long run, both aggregate consumption and saving respond positively to an increase in the rate of interest.

The calibration of the production sector sets the scale parameters to match the observed factor shares in the base year. For the tradable goods sector the substitution elasticities between capital and labour and between value added and the use of intermediate goods are set at 0.5. The resulting long-term price elasticities are shown in Table 5 below. These elasticities agree with the available econometric estimates for the Netherlands (see the survey in CPB (1997)). For the health care sector, it is assumed that labour is the only production factor.

3 THE EFFECTS OF AGEING ON ECONOMIC GROWTH

To evaluate the effects of ageing on economic growth, I compute a baseline projection of the development of the Dutch economy over the next two centuries. This projection assumes steady-state growth rates for all exogenous variables, except the demographics, that are taken from a recent projection by the Central Statistical Office (CSO) (see De Beer (1999)). The baseline projection deviates from a steady-state growth path both because of the demographic shift that is included and because the initial asset positions of households and government are not compatible with a steady-state growth path. However, other deviations from steady-state developments, e.g. changes in interest rates or the current government policy of debt reduction, are not taken into account. As a result, the projections presented here cannot be interpreted as forecasts of the future course of the Dutch economy, but should properly be regarded as conditional forecasts of the effects of ageing on economic growth.

Figure 3 shows the recent projection of demographics by the CSO.[13] The population is expected to grow till about 2040 (left y-axis). Extrapolating the fertility and mortality rates used by the CSO, the projection implies a small decline in the population thereafter. Shortly afterwards, the old-age dependency ratio reaches a maximum of 40% (right y-axis). This share then slightly falls off again, but it remains at almost double its present size. A sensitivity analysis reveals that, whereas the future size of the population is rather uncertain, the uncertainty in the dependency ratio remains within 2% (see Broer (1999), Figure 3). The CSO

13   The projections have been extended beyond 2050 by extrapolating the fertility and mortality rates for 2050 to later years.

projections also entail assumptions about immigration rates. In the model, these have been balanced with the mortality rates to obtain mortality rates that are slightly *negative* for young households.[14] Hence, immigration is assumed to continue at the rates projected for 2050.

The baseline path has been computed using the income tax rate as a closure variable for the government budget constraint and assuming that government debt as a fraction of GDP is kept constant at the calibrated value of 71%. At a steady-state growth rate of 2%, this implies a long-term government deficit of 1.4% of GDP. The (real) interest rate is assumed to remain constant at 5.5%.

In the long run, the growth rate of the economy is determined by the rate of technical progress (2%) and the growth rate of the population (−0.0%). On the transition path, the growth rate deviates from this benchmark value as a result of demographic shifts. Figure 4 shows the change in the labour market participation rate of the population. Overall participation rates fall until about 2035, to recover only partially thereafter. The end result is a fall in participation rates by about 4%-points. Obviously, this decline represents the increasing dependency ratio as a result of the ageing of the population. The endogenous part of this shift is largely captured by the participation rate of the working age population. It appears from Figure 4 that after an initial decline, this participation rate is expected to recover in the second half of the next century.

Figure 5 shows the consequences of these participation rate shifts for aggregate efficiency-corrected labour supply and labour employed in the tradable goods sector. Initially, labour supply in efficiency units grows, because the working age population grows older and, therefore, becomes more productive. From about 2010 on, these older cohorts retire, and labour supply stagnates. This effect is reinforced by the temporary decline in the participation of the working age population. The resulting fall in employment in the tradable goods sector is particularly severe. This discrepancy reflects the weight of both government labour demand and labour demand by the health care sector. Government employment is constant as a percentage of the population, and health sector employment actually increases as a result of the increasing demand for health care, due to ageing. As the health sector is labour-intensive, this sectoral shift adds to the effects of the declining participation ratio.

Since capital is immobile in the short run, the decline in labour supply creates labour scarcity in the first half of the next century, with a maximum around 2030. This scarcity does not materialize immediately, however, as employers anticipate this event, and start reducing their capital stock before the decline of labour supply sets in. Figure 6 shows that over the next decade the growth rate of the marginal product of labour lags behind the rate of labour saving technical progress.

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14   This procedure implies that these cohorts receive a negative annuity from the life insurance fund, which effectively provides immigrants with the same assets as the resident population. Otherwise, immigrants would have to be treated separately both by year of immigration and year of birth.
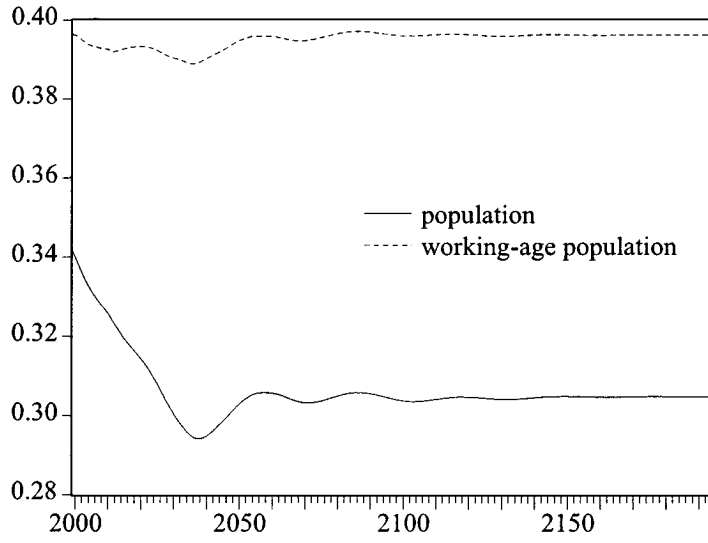
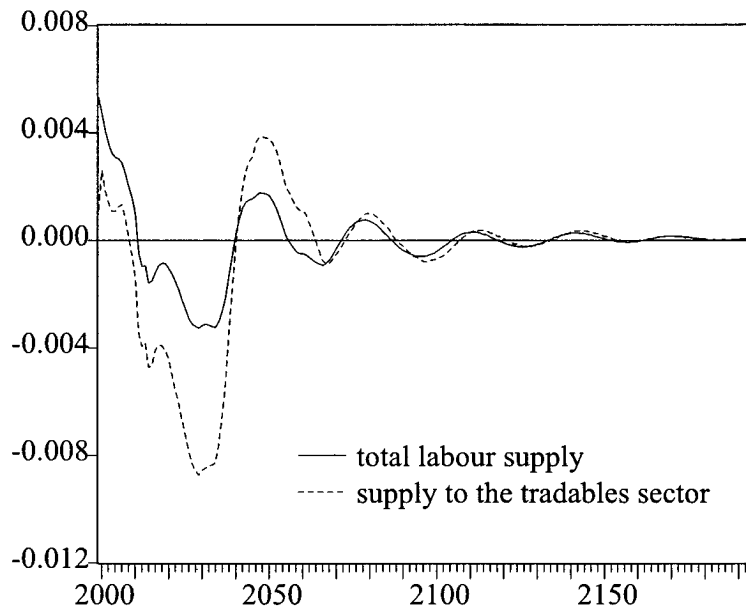Figure 4 – Participation rates

Figure 5 – Growth of labour supply

However, average wage rates do not show a lower growth rate because of the wage drift caused by the age composition effect. Figure 6 shows that the cumulative wage drift over the next decade is about 3 percent.
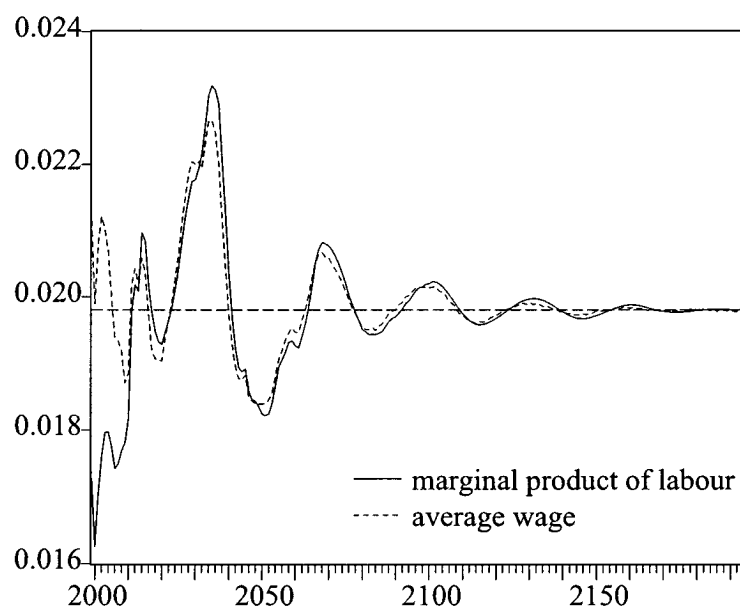

Figure 6 – Wage growth

Figure 8 decomposes the aggregate participation rate by age for a selected number of years. According to the baseline projection of the model, the labour participation of young households will decline by about 1.5%-points in the next century, whereas the labour participation of households of age 60 will increase by about 5%-points. The increase in the participation rate of households just above the statutory retirement age is even larger at 7%-points. For young households, the most important determinant of the participation change is the intratemporal substitution between time-related consumption (leisure and health care) and goods. It is negative because of the increase in the tax wedge (Figure 7).[15] Its effect is largely compensated by the wealth effect, so that only a small net negative labour supply effect remains. The single most important determinant of the increase over time in the labour market participation of older workers is the in-

15   The wedge is defined as $(1+t_c)/(1-t_l)$, where t_c denotes the consumption tax and t_l the tax and contribution rates on labour. The contribution rates consist of health insurance, AWBZ insurance, and basic pension contributions. The contributions to the FC pension fund have not been included in this measure, even though they are distortionary. The contribution to the public health care insurance has been included, even though a minority of households is privately insured.

tertemporal substitution effect. Since the after-tax wage falls, the increase in the intertemporal distortion of labour supply must be attributed exclusively to the decline in the net interest rate. The intertemporal distortion therefore originates with the increase in the rate of capital income taxation. It causes households to decrease their saving in their earlier years. When middle-aged, these households have accumulated less wealth and therefore supply more labour.
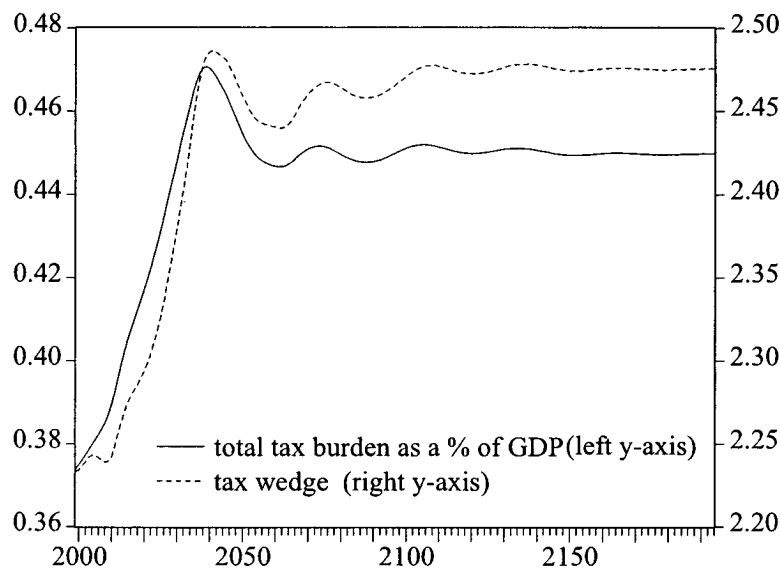

Figure 7 – Tax burdens

The preceding analysis shows that the rising tax burden is an important factor in the evolution of the labour market participation of the population. The estimated increase in the total tax burden of 7% of GDP reflects both the decline in the labour income tax base and an increase in age-related government expenditures, viz. subsidies to the PAYG fund, disability insurance, and health care subsidies (Figure 7).[16] The larger part of the rise in expenditures can be attributed to government contributions to the PAYG fund (Figure 9). The main components of government tax receipts are consumption taxes and income taxes. Consumption tax receipts rise as a consequence of an increase of 3.5% in the consumption-GDP ratio, which reflects the higher propensity of the elderly to consume. This

16   The estimated increase in the tax burden is much higher than the estimate of 0.7% presented in Van Ewijk and Ter Rele (1999). One reason is that they assume an exogenous upward shift in labour participation rates, due to socio-cultural factors. Another reason is that they assume that the tax increase is implemented immediately, whereas this paper uses a balanced-budget financing rule. Lastly, van Ewijk and ter Rele do not take into account the effects of the tax burden on economic activity.
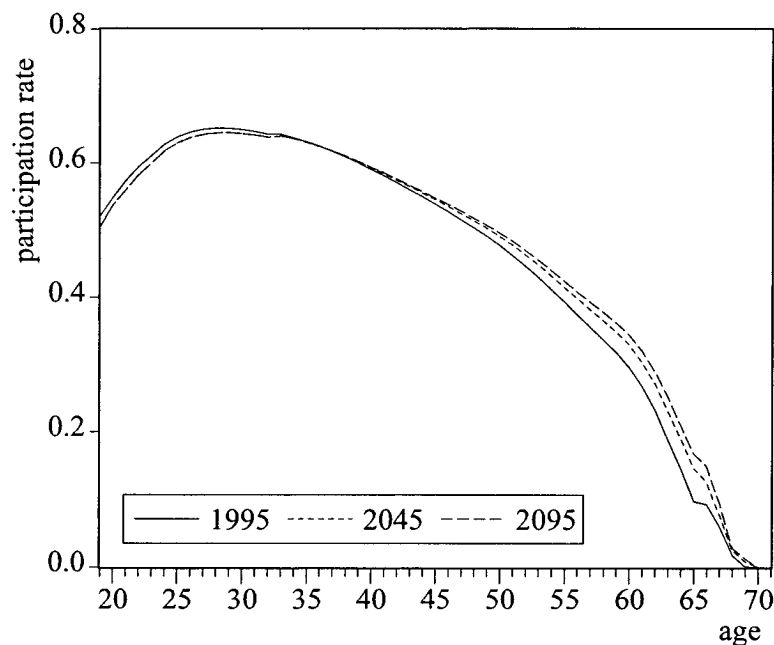
Figure 8 – Participation rates by age for selected years

rise explains 1.5%-points of the increase in the total tax burden. As a result, income tax rates need to be raised by only 3.5%-points. The increase in the marginal burden on labour is larger, due to the increase in health insurance contribution rates.[17] Health care consumption depends strongly on age, and the increasing share of elderly will boost expenditures by about 3% of GDP (Figure 10). As private health insurance contribution rates are lump sum, high-income households escape part of the increase in the marginal tax burden. The net result of this development is a substantial increase in the leisure-consumption decisions of households. Figure 7 shows a ten percent projected increase in the wedge on labour supply for households below the public health insurance threshold.

The sharp increase in government subsidies for the PAYG fund stands in marked contrast to the moderate 2% increase of the contribution rate for the (funded) supplementary pension fund. This relative constancy arises from the substantial assets owned by the pension fund in the base period. By legal obligation, these assets are sufficient to cover the accumulated pension rights by households that are currently participating in the fund. A rise in contribution rates must therefore reflect a rise in projected benefit obligations that exceeds the current accumulation rate of the fund. This can occur because of a future acceleration in wage

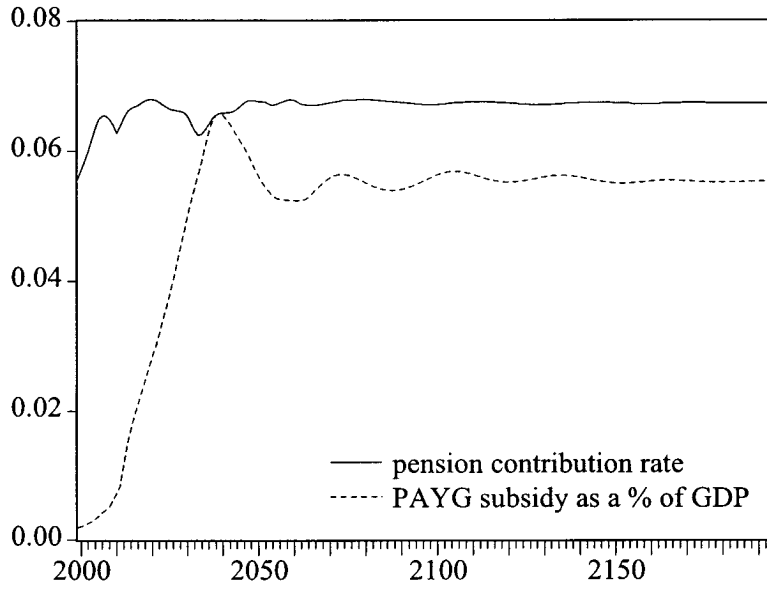17 Note that the AWBZ tax base also consists of capital income and pension benefits.

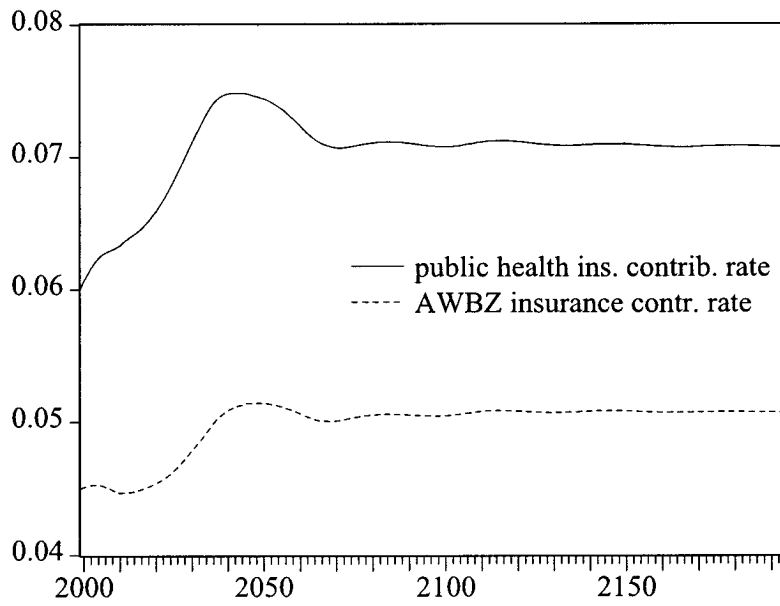Figure 9 – Old-age social security contribution rates

Figure 10 – Health insurance contribution rates

growth, as a result of a fall in future interest rates (that increase the present value of the obligations), or due to shifts in the age composition of the contributing members of the fund. All these events lead to intergenerational redistribution as a consequence of the lack of actuarial fairness of the pension fund. Figure 9 shows that shifts in the age composition lead to an increase in contribution rates of about 1.5%-points.
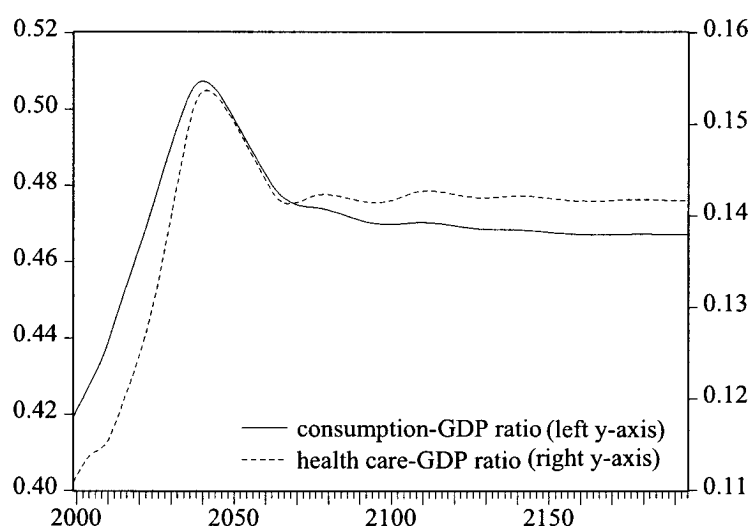

Figure 11 – Consumption-output ratios

The propensity to consume reaches a maximum a few years after the share of elderly, demonstrating the aggregate effect of the life cycle behaviour of individual households (Figure 11). Subsequently, the health care-consumption ratio declines less than the consumption ratio of other goods and services, as a result of the extreme age dependence of health care expenses. The boost of the propensity to consume is preceded by a more short-lived boost in the national savings rate. The current account reaches an all-time high of 11% of GDP around 2010, at a time when a large proportion of households are net savers, to fall back to a minimum value of 2% around 2050 because of the retirement of these large cohorts of savers. The current account remains positive however as a result of a substantial surplus on the primary factor income account. The trade balance must of course show a substantial deficit in later years.

The projected scarcity of labour has an adverse effect on investment and output growth. The fall in the investment-output ratio in the tradable goods sector leads the decline in labour supply until 2030. Output growth is half a percent below the steady-state rate over the next three decades, until the ageing process reaches its maximum. Then labour supply recovers because of both the demo-

graphic swing and the increase in the participation rate of the working age population and output growth is boosted for over a decade (see Figure 12). The net result is a relative decline in long-run output per capita. Accumulating the deviations from the steady-state path yields an output loss of 12 percent.
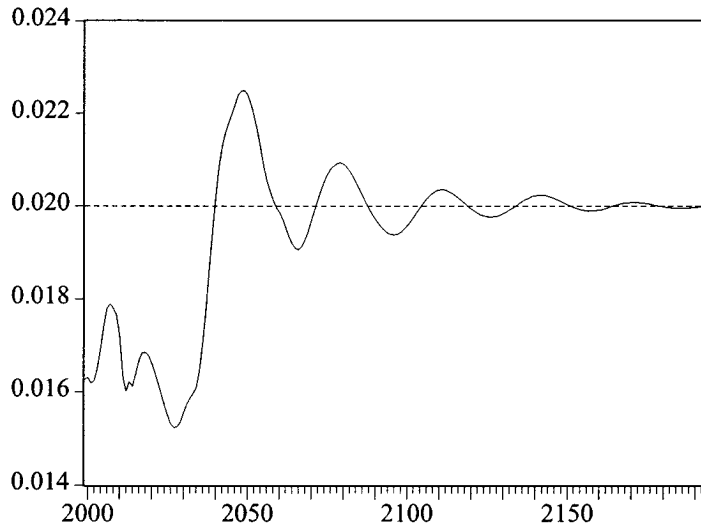

Figure 12 – Growth rate of GDP per capita

While an output loss of 12% due to ageing may seem considerable, the proper measure of the costs of ageing is welfare, not output. In contrast to output, a welfare indicator also takes into account the value of the consumption of leisure and it provides a consistent discounting of future fluctuations in prices and income. The intergenerational distribution that corresponds with this baseline scenario is given in Figure 13. The distribution is defined in terms of the compensating variations required to bestow the same lifetime utility on all generations as the 1976 generation (that enters the labour market in 1994), *corrected for technological progress*. This correction is required because, on a steady-state growth path, successive generations will experience ever-increasing lifetime consumption and utility. To measure the extent of intergenerational redistribution, we must therefore compare the actual utility levels with those on a steady-state growth path. On this growth path the correction used would result in compensating variations equal to zero. The compensating variations in Figure 13 show that, after correction, future generations do about 4% worse than current young generations. This is equivalent to only two years of growth, so all future generations are still better off than the 1976 generation, despite the demographic shock. Regarding the intragenerational distribution, high-productive households do somewhat better than low-productive households, because they escape the increase in public health

contribution rates. The intergenerational balance worsens until about 2035 (generation 2016), when the ageing shock is maximal. This coincides with the peak in the labour tax burden (see Figure 7) and the minimum labour participation ratio (Figure 4). Afterwards, the distribution remains fairly stable.
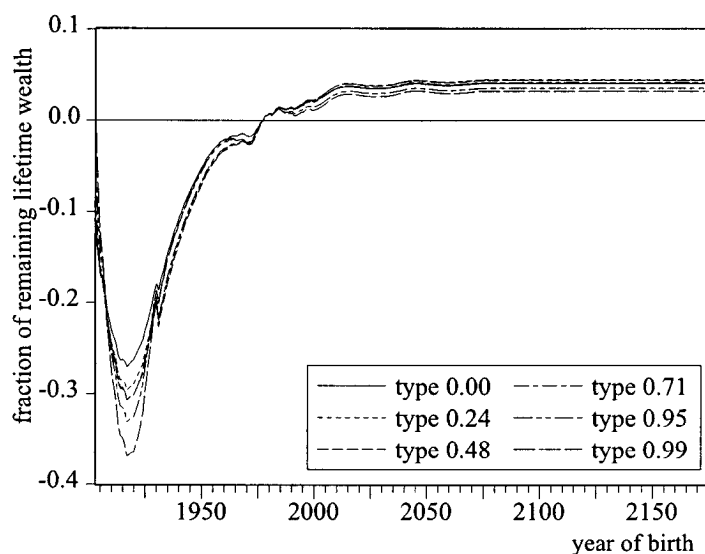

Figure 13 – Compensating variations per generation, relative to the 1976 generation

Though future generations are not much worse off than the 1976 generation, generations born before 1976 do considerably better. In Figure 13, the comparison is made in terms of remaining lifetime utility, again corrected for technical progress. Generations born around 1930 are on the brink of retirement, so they largely escape the coming rise in tax rates. In comparison with the 1976 generation, this implies a 16% higher net wage over their time in the labour force (corrected for technical progress). The remaining part of the compensating variation is largely due to a different saving profile over the life cycle. Future generations save less, because of a lower net interest rate, and so have comparatively fewer assets and lower remaining lifetime utility than current generations at the same stage in their life. The lower lifetime interest rate of future generations therefore generates an additional source of inequality.[18]

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18 It is not correct, however, to conclude from Figure 13 that the elderly are up to 40% better off if evaluated over their entire life. A comparison in terms of remaining lifetime utility does not take into account past events that may have adversely affected the utility of these generations. Calvo and Obstfeld (1988) show that a time-consistent treatment of utility by a social planner requires discounting back to the birth dates of the generations involved.

4 SOCIAL SECURITY REFORM

The analysis of the effects of the demographic shock identifies several problems. In the baseline projection the main problem is the sharp rise of the tax burden, which causes generational imbalance, as shown in Figure 13. Figures 7, 9, and 10 identify the source of this problem in terms of the rise in PAYG social security contributions and health care contributions. In addition, the increasing tax rates boost the excess burden starting from an initial situation that is already characterized by high marginal rates. It is therefore attractive to try to correct both problems at once by a suitable reform of social security. Judging from the baseline projection, the obvious candidate for reform seems to be the PAYG social security system, as it contributes most to the increase in the tax burden.

To investigate the benefits of this reform, I compute the effects of three reform measures:

- an immediate reduction in PAYG benefits, compensated for by a reduction in income taxes;
- an immediate reduction in PAYG benefits, compensated for by a sustainable permanent reduction in indirect taxes;
- a gradual phasing out of PAYG benefits, compensated for by a sustainable permanent reduction in indirect taxes.

4.1 A balanced-budget reduction in PAYG benefits

A reduction in PAYG benefits aims at a decrease in the distortionary impact of the PAYG contributions on labour and capital income. The cut implies a smaller deficit of the PAYG fund, and consequently a smaller PAYG subsidy from the government. In the present scenario, income tax rates are cut to maintain a constant debt-GDP ratio. Existing old generations in the Netherlands are to some extent sheltered from the income effects of a reduction in PAYG benefits, if they are eligible to a supplementary pension. The pension fund supplements PAYG benefits to a maximum of 70% of the final wage before retirement, provided that a household has contributed to the fund during its entire working life. Households with a wage higher than the franchise threshold implied by this arrangement therefore receive a higher supplementary pension if PAYG benefits are cut.[19] All households benefit from the cut in income taxes. Table 1 below presents a summary of the macroeconomic effects of this policy measure. The welfare effects for generations and productivity types are given in Figure 14.

19   In reality, this obligation does not exist for all pension funds. For the national civil pension fund it is subject to the restriction that the pension fund has 'sufficient financial resources.'

TABLE 1 – EFFECTS OF A DECREASE OF 10% IN PAYG PENSION BENEFITS, COMPEN-
SATED FOR BY A REDUCTION IN INCOME TAXES

	year	1	10	20	30	40	50	200
L	%	0.04	0.25	0.35	0.36	0.32	0.20	0.01
K	%	0	0.42	0.65	0.67	0.56	0.21	−0.33
c	%	−0.44	−0.24	0.01	0.32	0.63	0.90	1.80
S/GDP	D%	0.16	0.36	0.52	0.61	0.69	0.69	0.46
I/GDP	D%	0.11	0.06	0.02	−0.02	−0.08	−0.15	−0.23
TB/GDP	D%	0.03	0.21	0.23	0.15	0.07	−0.09	−0.72
A_e	%	0	−0.74	−1.87	−2.98	−4.12	−5.83	−10.4
t_y	D%	−0.27	−0.41	−0.58	−0.76	−0.95	−1.05	−1.19
w	D%	1.18	0.40	0.09	−0.05	−0.10	−0.14	−0.14
p_l	%	−0.11	−0.02	0.05	0.06	0.02	−0.09	−0.21

Legend: L is labour supply, K capital, c consumption, S/GDP saving-GDP ratio, I/GDP investment-GDP ratio, TB/GDP trade balance-GDP ratio, D/GDP Government debt-GDP ratio, A_e foreign assets, t_c indirect tax rate, t_y income tax rate, w pension contribution rate, and p_l wage rate. All variables are given either as percentage deviations from the baseline solution (%), or as absolute deviations (D%).
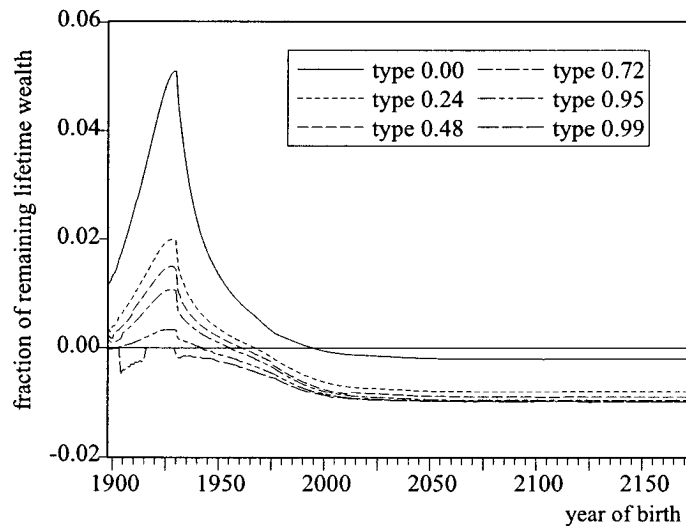

Figure 14 – Compensating variations for a 10% reduction in PAYG benefits

Equity and Efficiency

Overall, the reform is efficiency-improving. The present value of the aggregate of compensating variations is − Dfl. 40 billion, 6% of GDP. Relative to the reduc-

tion in PAYG benefits of Dfl. 148 billion, the efficiency gain is 27 cents per guilder.[20] The efficiency gain results from the decrease in distortionary income taxes and an implicit lump sum tax on the elderly. Table 1 shows that the benefit cut allows for a gradually falling income tax rate (t_y), to a final -1.2%-points. The income tax is to some extent replaced by a higher contribution rate (w) from the funded supplementary pension system, at least in the first two decades after the reform. However, this contribution is less distortionary, since it is linked to pension benefits. Efficiency also increases due to the lump sum component in the reform. Old low productivity households are not included in the supplementary pension scheme. Following the cut in PAYG benefits, they therefore receive no compensation from the supplementary pension fund, so that for them the reform operates as a lump sum tax. Young generations profit in the form of lower income taxes. Figure 14 shows that old generations of low-productivity households are indeed much worse off than households of the same age, but with higher productivity. Nonetheless, most retired households lose from the reform. Supplementary pensions are indexed on the gross wage rate, which falls as a result of the increase in labour supply of working age generations. Also, the income tax rises to compensate for the loss in tax revenue due to the decrease in consumption. Compared with younger generations, retired generations profit less from the simultaneous decrease in the income tax rate, since they do not supply labour.

Macroeconomic Effects

Labour supply increases because of the lower burden. Initially, the labour supply response is dampened by the increase in the pension contribution rate (w), which rises because the pension fund has to compensate most retired households for the fall in PAYG benefits. However, this contribution rate is less distortionary, as pension benefits are linked to hours worked. Over time, this rate declines again as the pension fund succeeds in regaining its desired coverage of future obligations. The increase in labour supply boosts investment as well, which gradually restores labour productivity and wages. The reform also stimulates savings, as the PAYG contribution also bears on capital income. This implies that consumption of young households falls initially. Consumption of retired households also falls, as a result of lower lifetime income. Since part of the increase in saving is invested abroad, this implies an initial decrease in the domestic tax base. As a result, the income tax rate initially falls by only 0.3%, less than what corresponds to the ex ante saving on PAYG subsidies.

The results of this analysis lead to the conclusion that a reform of old-age social security through a balanced-budget reduction in the basic PAYG pension

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20   Alternatively, this outcome may be formulated as a marginal cost of funds of 27 cents per guilder for PAYG social security, if financed through income taxes. This result is at the lower end of estimates of the size of the marginal cost of funds (see Ballard and Fullerton (1992)).

benefits must hurt poor households. They cannot profit from the shelter offered by the funded pension scheme, because their income is already near the minimum level defined by the current PAYG scheme. A straightforward cut in PAYG benefits also hurts old rich generations, however. The compensation offered by the FC pension fund is incomplete, because it does not provide shelter against the general equilibrium effects of the reform, notably the fall of gross wages. These conclusions are similar to those obtained by Fehr (1999, chapter 8), for a comparable reform of the German pension system (even though that system does not provide a compensation through an FC scheme).

It is therefore improbable that the reform would enjoy sufficient political support to be feasible. A reform that makes current generations better off must compensate these generations for any implied income transfer to future generations. This can be achieved in a generic fashion through the use of debt financing.

4.2 A debt-financed cut in PAYG benefits

A simple way to implement a debt-financed cut in PAYG benefits is to combine the cut in PAYG benefits with a cut in indirect taxes that is larger than what is compatible with a balanced budget tax cut. Section 4.1 showed that the full beneficial effects materialize only in the long run. By using government debt the efficiency gain caused by the PAYG cut can be partly transferred from future generations to current generations. Table 2 presents the effects of the same 10% cut in PAYG benefits, now compensated for by a maximal sustainable cut in the indirect tax rate. The income tax rate now remains at the level of the benchmark

TABLE 2 – EFFECTS OF A DECREASE OF 10% IN PAYG PENSION BENEFITS, COMPENSATED FOR BY A SUSTAINED REDUCTION IN INDIRECT TAXES

	year	1	10	20	30	40	50	200
L	%	0.13	0.31	0.37	0.34	0.27	0.23	0.21
K	%	0	0.45	0.61	0.61	0.54	0.47	0.39
c	%	0.23	0.33	0.43	0.56	0.67	0.76	0.97
S/GDP	D%	0.16	0.36	0.42	0.45	0.41	0.37	0.31
I/GDP	D%	0.22	0.17	0.13	0.10	0.09	0.09	0.07
TB/GDP	D%	−0.13	0.08	0.13	0.06	−0.05	−0.14	−0.21
D/GDP	D%	0.62	3.28	5.43	7.86	8.83	9.18	9.89
A_e	%	0	0.17	−0.42	−0.99	−1.44	−1.90	−2.34
t_c	D%	−1.87	−1.87	−1.87	−1.87	−1.87	−1.87	−1.87
w	D%	1.17	0.40	0.10	−0.03	−0.08	−0.14	−0.15
p_1	%	−0.25	−0.11	−0.05	−0.01	−0.01	−0.02	−0.00

Legend: see Table 1.

path. This cut causes an increase in government debt and thereby transfers part of the welfare gain to current generations.

Equity and Efficiency

The present value of compensating variations is Dfl. −50 billion, 8% of current GDP. The present value of the cut in PAYG benefits is Dfl. 151 billion, so that the efficiency gain is Dfl. 0.33 per guilder. This is slightly more than the efficiency gain of the reform with balanced budget income tax compensation. As in the previous case, the efficiency gain is caused by a decrease in distortionary taxes. The indirect tax rate falls by 1.9%-points. This reduces the consumption-leisure wedge in the long term by nearly the same amount as the fall in income taxes in the preceding case. In the short-term the reduction is considerably greater, as a result of the tax smoothing. This provides a better stimulus to labour supply and generates a larger inflow of foreign capital, to finance investment. Indeed, both the capital stock and employment are larger in the long run. The larger tax base allows for lower tax rates and a smaller efficiency loss.

The reform has much more equitable intergenerational distribution effects than a balanced budget cut in PAYG benefits. Figure 15 shows that for most productivity types, almost all generations gain. Only for generations born around 1930 the majority loses. The more equitable welfare distribution results because the cut in indirect taxes operates in part as a lump sum subsidy to old households, which finance a large part of their consumption from financial wealth. This compensates for the likewise lump sum cut in PAYG benefits. Only low-productive households still suffer a substantial welfare loss. They finance most of their consumption from current income so that for them the reduction in indirect taxes does not imply a substantial lump sum subsidy. In addition they are the only type without any compensation from the FC pension fund.

The welfare loss of low-productivity households is difficult to avoid if the social security system must provide a basic income to all old households, independent of past contributions. A possible way out would be to make the PAYG benefit means-tested. This would increase the progressivity of the tax system and is beyond the present paper. Still, even for poor households the welfare losses associated with the reform are considerably less than the redistribution caused by the ageing itself. A comparison of Figures 13 and 15 shows that the combined effect of ageing and the reform is beneficial for all current generations. From an equity point of view, it may be argued that the effects of the shock, ageing, and the policy reform that addresses the shock should be evaluated together. Politically, the reference point is more plausibly the status quo, which includes ageing. Not surprisingly, all high-productivity households gain from the reform. All low-productivity households lose. Most intermediate types gain. From the compensating variations it appears that 62% of existing households profit from the PAYG reform, if accompanied by an appropriate debt policy.
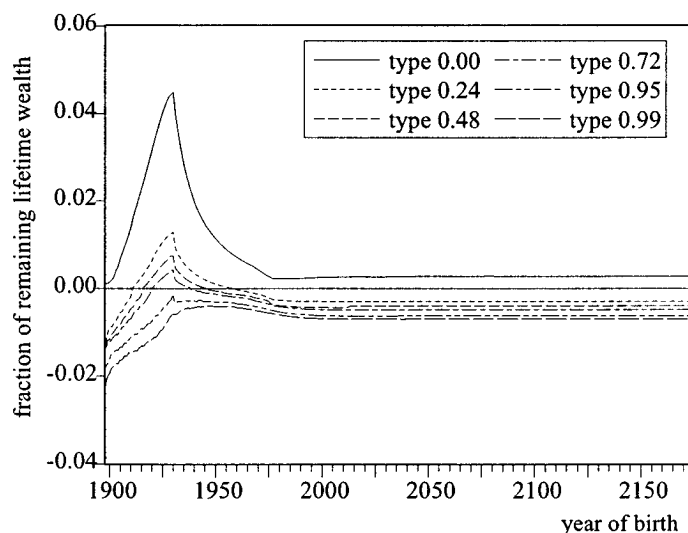
Figure 15 – Compensating variations for a 10% reduction in PAYG benefits, compensated by a 2% reduction in the consumption tax rate

Macroeconomic Effects

The macroeconomic effects of the tax-smoothed reform resemble those of the balanced budget reform discussed in the previous section with respect to their effect on labour supply. Labour supply increases more than in the previous case because the tax wedge is lower. Consumption is stimulated as a result of the tax cut. At first, this is financed through the balance of payments. In later years production increases. However, savings are lower than in the alternative case and the surplus on the trade balance remains small. As a result, income effects on labour supply in later years are also limited, and the labour supply response stays positive in the new steady-state. Government debt increases by 10% of GDP, as a consequence of the transfer of welfare between generations. Though marginal tax rates fall, the average tax burden as a percentage of GDP increases by 1.5%, as a result of the increased debt service and the increased share of non-GDP related government expenditures.[21]

4.3 Phasing Out the PAYG Pension System

In section 4.2 we saw that a reduction in PAYG benefits is welfare increasing for most current and future generations, provided that part of the welfare gain is transferred to the present through an appropriate debt policy. Even so, the reform

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21 However, since indirect tax rates fall by 2%, the tax burden does not increase if GDP is evaluated against factor costs.

has a number of disadvantages. All low-productivity households lose from the reform, and it requires a substantial increase in FC pension contribution rates on impact to cover the sudden increase in projected benefit obligations. This curbs labour supply in the first few periods. A possible remedy to these side effects is to reduce PAYG benefits gradually. Such a policy is more in line with both the gradual expected increase in PAYG benefits and with stable FC contribution rates. This policy also resembles the actual development of PAYG benefits in the Netherlands over the past decade, where PAYG benefits were linked to contractual wage increases. PAYG beneficiaries therefore missed out on the wage drift, which amounted to about a half percent per year over that period. Since a continuing decline of PAYG benefits is incompatible with a final steady-state, I implement the policy with a reduction of a half percent per year for the next 50 years.

Equity and Efficiency

The cut results in a reduction in the present value of PAYG benefits of Dfl. 210 billion. The present value of compensating variations is −Dfl. 86 billion, 14% of current GDP. The efficiency gain is therefore 41 cents per guilder, considerably more than with the immediate cut discussed in the preceding sections. This gain indicates a steep rise in the marginal cost of funds of PAYG pensions in the future. Table 3 shows that the contribution rate to the FC pension fund rises less on impact than in the previous cases, despite the larger present value of the cut. This explains most of the extra efficiency gain. The fact that the cut in PAYG benefits is now pre-announced does not generate distortions, because the benefits are of a lump sum character. The fall in the consumption tax again serves to transfer part of the future efficiency gains to current generations. The substantial

TABLE 3 – EFFECTS OF A PHASING OUT OF PAYG PENSION BENEFITS BY 0.5% PER YEAR, COMPENSATED FOR BY A SUSTAINED REDUCTION IN INDIRECT TAXES

	year	1	10	20	30	40	50	200
L	%	0.36	0.61	0.70	0.70	0.65	0.64	0.70
K	%	0	0.80	1.12	1.21	1.24	1.31	1.31
c	%	1.09	1.11	1.07	1.01	0.97	0.96	1.14
S/GDP	D%	−0.03	0.13	0.22	0.26	0.23	0.18	0.23
I/GDP	D%	0.35	0.29	0.26	0.24	0.25	0.30	0.26
TB/GDP	D%	−0.47	−0.07	0.08	0.11	0.05	−0.02	−0.07
D/GDP	D%	0.91	8.80	19.4	29.7	37.4	42.5	43.6
A_e	%	0	1.61	1.63	1.38	1.23	1.48	1.43
t_c	D%	−2.96	−2.96	−2.96	−2.96	−2.96	−2.96	−2.96
w	D%	0.64	0.57	0.57	0.53	0.41	0.11	−0.34
p_1	%	−0.57	−0.21	−0.09	−0.04	−0.01	−0.06	−0.00

Legend: see Table 1.

increase in the debt-GDP ratio results from the gradual implementation of the cut. This implies that the efficiency gains will be postponed as well, and more debt is required to bridge the transition. Figure 16 shows that the policy succeeds better in transferring welfare gains to current generations than an immediate cut of PAYG pension benefits. As a result, the percentage of households that benefits from the reform is also higher. On the other hand, the negative welfare effects for future low-productive generations are also larger. Figure 16 shows that type 0.24 almost breaks even in the long run. This implies that slightly more that 24% of the population eventually loses from 0 to about 1.5% of lifetime wealth from the reform.

TABLE 4 – PARTIAL DEMAND ELASTICITIES FOR THE HOUSEHOLD SECTOR[22]

	c	c_{zf}	c_{zp}	c_{za}	L_s	W
wage rate	0.747	0.096	0.179	0.125	0.016	1.690
price of health care	−0.005	−0.340	−0.296	−0.325	0.007	0.031
wage tax	−1.213	−0.211	−0.296	−0.240	0.060	−3.818
PAYG contr. rate	−0.710	−0.232	−0.088	−0.183	−0.041	−2.010
pension contr. rate	−0.428	−0.042	−0.116	−0.067	0.009	−1.215
transfers	0.112	0.070	0.035	0.058	−0.082	0.298
interest rate	2.700	0.789	1.418	1.000	−0.119	22.20

Legend: c is consumption, c_{zf} consumption of public health care, c_{zp} consumption of private health care, c_{za} consumption of AWBZ health care, L_s labour supply, W wealth

TABLE 5 – PARTIAL DEMAND ELASTICITIES FOR FIRMS IN THE TRADABLE GOODS SECTOR[22]

	labour	capital	materials
wage rate	−0.281	0.219	0.219
capital user costs	0.142	−0.358	0.142
price of materials	0.139	0.139	−0.360
interest rate	0.968	−2.440	0.969

Macroeconomic Effects

Labour supply is boosted more on impact than in the previous cases. The cut in consumption taxes is larger and the FC contribution rate rises less. As a result the tax wedge on labour supply is reduced substantially. The increase in labour also stimulates investment and GDP against factor costs. GDP against market

22   The effects of taxes and the interest rate are given as the percentage response to a 1 percentage point shock.
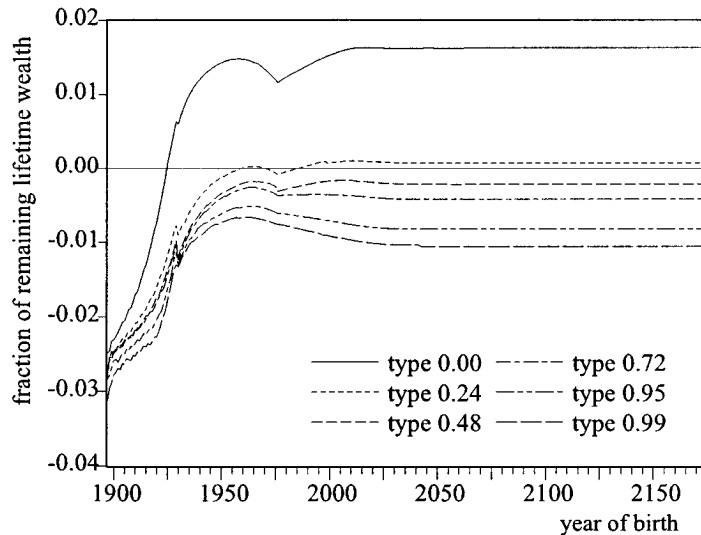
Figure 16 – Compensating variations for a phasing out of PAYG benefits by 0.5% per year, compensated for by a 3% reduction of consumption taxes

prices falls, however, which explains the initial jump in the debt ratio. Consumption is boosted more than before on impact, because the adverse consequences of the PAYG cut for the income of pensioners do not materialize right away. As a result, the trade balance turns negative initially. The increase in foreign debt is however limited, as the extra consumption is paid for from the increase in domestic production once the expansion of the capital stock has been completed.

5 CONCLUSION

This paper studies the effects of the imminent ageing of the population on economic growth and the distribution of welfare in the Netherlands. It shows that a slowdown in economic growth per capita may be expected as a result of the decrease in the participation rate and the increase in the tax wedge on labour. The slowdown results in a long-term output loss of some 12%, as compared to a steady-state growth path.

The paper identifies the PAYG social security system as the largest single distortionary influence on economic growth. The increase in PAYG benefits raises the tax burden by some 6%-points of GDP. The financing costs of public health care also contribute to an overall increase of the tax burden of 10%. This gives rise to large potential efficiency gains from a reform of social security. A balanced-budget cut in PAYG social security reduces the average excess burden over generations by 29 cents per guilder reduction and causes a redistribution of wel-

fare towards future generations. Losses of most current generations are fairly small, as they are sheltered to some extent from the PAYG cut by the existing supplementary occupational pension schemes. Low-income groups are hit particularly hard, however, as they not only face the full size of the cut, but also an initial fall in wages to which their social security benefits are indexed.

The burden of the reform can be shifted to future generations by an appropriate use of government debt. A cut in PAYG benefits that is combined with a maximal sustainable cut in indirect taxes largely succeeds in synchronizing welfare gains and losses over generations. 62% of current generations benefit from the reform. This percentage can be raised further by implementing the cut gradually. This policy also produces the largest efficiency gains, 41 cents per guilder. However, low-productivity households still suffer a welfare loss.

The paper measures the distributional impact of the social security system on future generations in terms of a comparison of their lifetime utility. The paper shows that the main redistributive effect of ageing is not between current young generations and future generations, but between current young generations and current middle-aged and old generations. Future generations suffer the equivalent of only some 4% loss in lifetime wealth, compared to generations that currently enter the labour force. However, current young generations suffer some 30% loss in wealth in comparison with current old generations, if evaluated at the same point in their life. This is because current old generations escape the larger part of the future rise in taxes and social security contributions, in contrast to current young generations. In addition, low and mid-income groups are hit somewhat harder than high-income groups.

While the model used in this paper contains a fairly elaborate model of households, it still neglects a number of issues that are relevant for an assessment of the effects of ageing. In addition to the modelling issues discussed in section 2.6 we may consider, first, the uncertainty in both the demographic projections and the interest projections (see Broer (1999)). An equally important source of uncertainty is the projection of labour participation rates. Whereas this paper assumes that preferences for leisure do not shift between generations, labour participation rates of women have been moving upward over the past decades on account of social-cultural factors. If this trend continues, the expected decline in labour participation may be less serious than the results presented here suggest.

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