



Institute of Actuaries of Australia



GLOBAL AGEING: CAN WE GROW OLDER COMFORTABLY ?

Prepared by J.B. Kuné

Presented to the PBSS Program Part of the IACA, PBSS & IAAust Colloquium
31 October – 5 November 2004

This paper has been prepared for the IACA, PBSS & IAAust Colloquium 2004. The IACA, PBSS & IAAust wishes it to be understood that opinions put forward herein are not necessarily those of IACA, PBSS & IAAust and are not responsible for those opinions.

© 2004 Institute of Actuaries of Australia

The Institute of Actuaries of Australia
Level 7 Challis House 4 Martin Place
Sydney NSW Australia 2000
Telephone: +61 2 9233 3466 Facsimile: +61 2 9233 3446
Email: insact@actuaries.asn.au Website: www.actuaries.asn.au

GLOBAL AGEING: CAN WE GROW OLDER COMFORTABLY ?

Abstract

Population Ageing was unknown before the middle of the 20th century. Nowadays developed countries are in unprecedented transition to a new era with Ageing populations. Ageing will result in a smaller proportion of the population being employed in the decades after 2010/2020. Another primary issue which may harm industrialized economies is whether Ageing and particularly pay-as-you-go based pension systems will depress saving and investment.

Changing demography, fewer workers and more retirees, gives rise to much concern on the fiscal sustainability of public pension schemes, health care systems and other social services¹. As a result pension reform is in discussion in all developed countries. The main features of the debate of the relationships between population Ageing, labour supply and saving behaviour are summarized.

Technological development, economic globalization and institutional changes are long-term processes occurring over the same time period as population Ageing. Under the plausible assumption that 1³/₄ percent yearly growth in per worker production can be realized in the coming two decades, it can be demonstrated that per capita consumption of the working population increases from 2000 to 2020 by 44.7 percent and that of the 65⁺-population by 81 percent. Only with a zero growth rate of labour productivity average welfare will decrease by about 6 percent, whereas a minor 0.3 percent productivity growth with unchanged labour participation rate suffices to maintain welfare at its present level.

Increased life expectancy and lower birth rates are in the coming decades significantly shifting the age distribution of population in developed countries towards older persons and in the second half of the 21st century in developing countries as well.

As a result scope and structure of pension systems are in discussion throughout the world. Apart from lowering benefit levels and increasing contribution rates the issue of funding versus pay-as-you-go is often raised to address the future problems of financing public pensions. The relative merits of funding and pay-as-you-go are dealt with in Chapter 2. After some introductory observations in paragraph 1, in paragraph 2 of the present chapter the debate on the impact of an Ageing population on the economy is summarized. Paragraph 3 presents economic scenarios for the coming decades. It is argued in paragraph 4 that under realistic and plausible assumptions the EU-15 can indeed grow old rather comfortably. Though population Ageing is far from a problem on a macro-level, nonetheless severe budgetary difficulties can arise and thereby a new paradox (paragraph 5). Paragraph 6 draws some concluding remarks.

1) The concern about Ageing is briefly summarized by Donald J. Johnston, secretary-general of the OECD, '... the Ageing of our societies over coming decades present OECD-countries with a complex and formidable set of interrelated challenges', preface of OECD [1998].

1. Some introductory observations

The pension burden

The economic costs of a pension scheme or the true measure of the *pension burden* for a society as a whole are the resources or benefits forgone, the resources that are no longer available (for consumption of the non-retired and for investment purposes), as they are being used for supporting the elderly. The costs in respect of any retirement income system are always the same, irrespective how they are financed though they may be distributed differently among generations at date. It will be clear that the costs of population Ageing cannot be avoided.

Those economic costs are financed by some combination of transfers from labour earnings of the active population (pension contributions), general tax payments and investment revenues (earnings on assets owned by individual retirees or by pension funds). Different approaches to pension financing involve different allocations of pension costs between contributions out of labour income and capital returns.

On the other hand by increasing savings and investments now – the economic costs or the benefits forgone are the reduced current consumption expenditures of the present generations – one is anticipating the difficulties that could otherwise (with no-funding) arise in an economy with a lower national product. This burdens present generations and favours future generations.

The essence of support capability is production. Hence, policies to promote economic growth are the best strategy to cope with the rising costs of an Ageing population. Assuming the standard of living of the retired population does not stay (far) behind with that of the working-age population, the economic costs of supporting the retired will increase proportionally.

We are of the opinion that the burden of an Ageing society can nonetheless be easier borne when national product is larger and, otherwise, the burden can be felt as more worrisome when national product is smaller². Increased labour and capital supply and higher productivity are necessary to stimulate economic growth. Higher labour force participation in particular is of great relevance for the elderly as they spend much/most of their income on labour intensive services. You can save and invest in productive capacity, you can save and store durable consumer goods, but you cannot save urgently needed services.

Pension Finance

More emphasis on funding is generally recommended to cope with the adverse consequences of population Ageing in the 21st century in the Western world³. Evidently a major difference between funding and pay-as-you-go is that funding is generally leading to an additional flow of saving during the period of growing up and under circumstances also in an Ageing economy with economic growth

2) Higher levels of future national product evidently will not alter the spending on old-age pensions in relative terms, but paying for pensions out of a larger economic 'pie', still leaving higher incomes (a grown 'slice' out of the future bigger economic pie) for the non-retired population in absolute terms, is much more comfortable.

3) Apart from the national economic aspects of Ageing and pension schemes one of the most prominent features of the current debate is the controversy in respect of pension financing, viz. pay-as-you-go versus funding. This is dealt with by J.B. Kuné [2000].

,thereby creating a resource base, which enables higher levels of production and consumption for both future workers and retirees.

If certain conditions are fulfilled, the question whether funding matters and could be part of the solution to the problems caused by e.g. adverse demographic developments (and deteriorating ecological conditions) can be answered in the affirmative (J.B. Kuné [2000]). Funding will be preferential to the extent that it causes national product to be higher.

Budgetary issues

In virtually all the literature on the impact of an a changing demographic structure on the performance of the economy a heavy emphasis is laid on fiscal and budgetary aspects to the neglect of the output of gross national product and its growth. A threatening language has developed, burden of Ageing, demographic time bombs, dramatic public finance, shrinking welfare state, crises of this and that and all other.

Instead, in this paper we pay adequate attention to productivity growth, the growth of real product and to average per capita consumption expenditures. In as far per capita welfare still grows, we believe, this will smooth the demographic transition and alleviate the alleged Ageing problems. We present evidence that could be conclusive to dispose of the idea that a pessimistic scenario is inevitable for most Ageing countries. Important policy issues, nonetheless, remain. We will dwell on those subject matters in subsequent chapters.

2. The impact of an Ageing population on the economy

The Ageing of the population, the costs of supporting the elderly and the way pension plans are financed have an important impact on the performance of the economy as they influence saving behaviour, labour force participation behaviour, technological progress and productivity as well as the level and composition of public spending and the size of the shadow economy.

Ageing and capital formation (2.1)

The study of the relationship between Ageing, pension finance and saving behaviour has produced a considerable volume of (empirical) publications. The primary issue has been whether pay-as-you-go based pension systems reduce aggregate national savings and/or whether greater reliance on funded pension plans would increase national savings. The second question is whether population Ageing affects other components of saving. The main findings are presented in BOX 1.

BOX 1

How pensions affect personal and total savings¹

In most developed countries national basic pension plans (first pillar) are predominantly financed on a pay-as-you-go basis. Theoretical analysis suggests a negative relationship between the creation and availability of a pay-as-you-go based basic pension scheme and the level of personal savings. Empirical studies to establish the relationship between this kind of pension plans and the personal as well as the aggregate saving ratio have not produced unambiguous evidence. Introducing pay-as-you-go plans do not seem to have led to depressed personal savings levels nor to less total national savings in a significant way². Most likely public schemes have to a considerable degree replaced 'within family transfer systems'. On the other hand, pay-as-you-go based systems – particularly when confidence in future pension payments and long-term care is deteriorated – may give rise to a high level of precautionary saving.

Funded pension schemes

There has been much theoretical and empirical research as to whether supplementary funded pension schemes (second pillar) do affect savings and capital investment³. Much of the theoretical work is based on the traditional life-cycle theory, its main weakness being that bequests are ruled out. The life cycle hypothesis postulates saving during working age years for retirement and dissaving in retirement.

The substantial degree of acceptance of the modified life cycle hypothesis nonetheless is evident, as virtually all mainstream models use a specification where consumption responds to changes in current income as well as in permanent income and account is given to precautionary saving, possible bequest motives and liquidity constraints.

Mandatory supplementary pension plans are assumed to have a positive impact on the level of personal savings but probably by less than the amount of pension saving itself. On the other hand, tax incentives of supplementary plans tend to reduce government's tax revenues and, *ceteris paribus*, a higher budget deficit. Empirical evidence shows that funded schemes increase saving fairly relative to the no-pension state – 20 to 60 percent was crowded out, so the net positive effect is 80 to 40 percent of the volume of personal pension savings⁴. See e.g. IBRD [1994]. Empirical studies for several OECD-countries do not show an unambiguous relationship between the growth in pension assets and the *total* national saving ratio, due to decreased offsetting governments savings (needed to implement funded schemes) or reduced private savings (cf. L.H. Thompson [1998]⁵, E.M. Engen and W.G. Gale [1997]).

Hence, the productive capacity of an economy using a funded pension system at least in the short term according to these studies is not necessarily higher compared to an economy using pay-as-you-go schemes only⁶. But a favourable impact can also not be denied on the basis of the same studies. In the

long term, however, government savings can be higher than they otherwise (with no-funding) would have been. Tax receipts are less in the short term due to fiscal pension incentives; these taxes are not forgiven, but they are postponed several decades later when pensions are paid out. At that time a higher (government) savings and investment level can result. Though convincing evidence of a strong case for funding on a macro-level is absent, the momentum for a shift from pay-as-you-go to funding remains in many developing countries and former Soviet-republics in transition. On a micro-level there certainly is a strong case for funding.

We may wonder furthermore whether a lower saving rate, if any, is the real issue, remembering that the Ageing societies has an unprecedented large capital stock and corresponding high capital intensity. Shortage of skilled labour supply may be a more serious challenge.

- 1 An elaborate survey of Ageing, pensions and saving is from R. Kohl and P. O'Brien [1997]. To people from the Netherlands G.E. Hebbink [1996] can be recommended.
- 2 R.J.M. Alessie, A. Kapteyn and F. Klijn [1997] using micro (panel) data of the years 1986 through 1990 for the Netherlands find evidence supporting the hypothesis of full displacement of household's savings by basic pensions (AOW) wealth. In sharp contrast R. Euwals [2000] concludes that the impact of the AOW on household savings cannot be identified.
- 3 Apart from the question whether or not funding has contributed to increased savings and investments – compared to what it otherwise would have been – , another relevant question is whether the actual savings level is sufficient and adequate. This question is not dealt with here. It is interesting to note however that the savings ratio and level of investments in e.g. the UK (with a high extent of pension funding) have been lower in the last decades than those in the other large European countries, mostly with a high extent of pay-as-you-go. In macro terms it must be expected therefore that the UK will face at least the same Ageing problems, probably worse, despite a high extent of funding in its pension finance system. On the other hand Luxemburg, by far the wealthiest country in Europe with an old-age income system predominantly based on pay-as-you-go is allegedly well equipped to face its population Ageing.
- 4 R.J.M. Alessie, A. Kapteyn and F. Klijn [1997] for the Netherlands find evidence supporting the hypothesis of no displacement of free household's savings by supplementary pensions wealth. R. Euwals [2000] comes to opposite findings; the complementary pension schemes have a significant negative impact on household savings, though no full displacement.
- 5 J.M. Poterba et al. [1998] find strong support for the view that contributions to personal retirement saving programs in the US represent largely new saving.
- 6 It is interesting to consider more carefully a society with a fully funded pension system but an aggregate capital stock equal to that in a pay-as-you-go based situation. Assuming equal labour input and hence equal output levels, on a macro level there is no difference in national economic performance under both pension finance systems. Thus, on the average there is no difference on a micro level, irrespective of the values of n , g and r in the Aaron 1 rule. Is there a contradiction involved and if so, how it can be cleared up and reconciled with empirical data? L.H. Thompson ([1988], p. 216), I think, gives the right answer/explanation. Assume an interest rate of 10 percent and a growth rate of population and wages of zero. Thus $r \gg g+n$ and funding is to be preferred according to the Aaron-rule. Clearly the individual can obtain a higher rate of return in the private market by escaping from the (pay-as-you-go based) social security program. Thompson: '... assume that we adopt the advance funding approach under which wage earners are forced to come up with \$ 90.90 now instead of \$ 100 next year. Where do the wage earners get the \$ 90.90? Suppose they borrow it from a bank by taking out a home equity line of credit at 10 percent, which costs them \$ 100 to pay off next year. Where does the bank get the money to lend? It issues a certificate of deposit to the pension fund, which just happens to have \$ 90.90 to invest. What difference does it make whether the system is current cost financed or advance funded? In this example, the difference is one of appearance, not substance: the income claim needed next year to allow the retiree to consume \$ 100 comes through a series of private sector transactions if the system is advance funded and from taxes if it is current cost financed.'

Ageing and labour supply (2.2)

Ageing of the population tends to reduce labour supply as labour force participation among the elderly is lower than among the youngsters. One cause of lower participation is the income effect of more generous public pension plans and a broader coverage of supplementary private plans. Other factors that are important are an increased willingness to retire on grounds of (bad) health, worsening labour market opportunities for the less skilled elderly and, above all, a higher valuation of leisure time.

A slowdown or a possible decline in the labour force will result in a slowdown in output growth. Increased labour productivity growth can compensate for this. However, there appears to be much

uncertainty on the impact of (working) population Ageing on productivity growth. More evidence is presented in BOX 2.

The rapid shift to earlier retirement in many countries has slowed down in the 1990's; there is even a minor reversal, like in The Netherlands.

Programs to encourage early retirement through disability benefits, more lenient unemployment insurance schemes and several early retirement schemes are gradually cut back. Though the trend to earlier retirement has come to a halt nowadays, the continued population Ageing by itself will lead to a lower future participation rate of the total working population.

BOX 2

How pensions affect labour supply

From a theoretical point of view a pension system affects work effort differently to the extent that people perceive social insurance contributions to an unfunded scheme differently from their own savings to a funded scheme. In the first situation with a set of unrelated taxes and income transfers the effect on work effort depends on which of two influences, viz. the substitution effect and the income effect, is the stronger. There may also be an incentive to seek employment in the informal economy where contribution payments can easily be evaded. When people view a pension program as a program of their own pension savings, where future pension payments are closely linked to past contributions, the impact on labour supply, if any, will be substantially less. Nor is there any incentive to seek employment where contribution payments can be evaded.

The impact of the payment of pension benefits - irrespective of how people view its contribution payments - less ambiguously will be a reduction of the work effort of those of retirement age.

Empirical studies examining the impact of income and employment taxes on the labour supply of the working-age population reveal that the impact on the work effort of these taxes for certain small groups of workers can be about 5 percent in response to a 10 percent reduction in net earnings.

Studies examining the factors determining the retirement decision reveal that i.a. the following determinants are of relevance in the individual labour force decision, 1) age, 2) availability and level of an old-age pension, 3) other sources of income, 4) health status, 5) worsening job opportunities and 5) partner's preferences¹.

Older workers generally receive higher wages not because of enhanced productivity but because of seniority systems. Changing age structures undermine these systems and make them unsustainable, necessarily leading to a lower wage level for the older workers, termed demotion. Furthermore, per (older) worker reduced productivity will affect relative earnings again. This will offset the declining job opportunities many (less skilled) older workers are faced with.

Ageing and productivity

A fundamental question is the impact of a changing age composition of the workforce on the overall productivity of the economy. The allegedly adverse effects of an Ageing workforce on productivity and output cannot be supported unambiguously by empirical evidence. According to some research Ageing will be detrimental to technical progress, as an Ageing working population turns out to be less dynamic and innovative, obsolete, lack motivation and reluctant to learn ('old dogs cannot learn new tricks'), less prepared to take risks and being less entrepreneurial. Slower growth in the capital stock will increase its average age, a distinct disadvantage in a time of rapid technological growth. It is argued that particularly young workers use new technology. Hence, an older labour force will be dependent on old technology.

D.M. Cutler et al. [1990] on the other hand present evidence to support the alternative view that labour scarcity (in a growing older society) not only induces higher real wages but also investment in human capital (and less investment in physical capital), leading to increased innovation. This is 'the scarcity is the mother of invention' argument. K. Futagami and T. Nakajima [2001] argue that in some specifications of the endogenous growth theory the effects of Ageing on economic growth might even be positive.

P. Johnson [2002] has pointed out that government-financed opportunities for early retirement often have skewed the choices for it in the past; and that these distortions should be removed and eligibility for public income support before standard retirement age should be tightened. However, in several countries (e.g. the US, the UK, the Netherlands) private (funded) pensions and other sources of capital income constitute the major share of old-age income for many households and, as a consequence, the government's ability to influence the labour force participation of older people declines. Only fiscal measures (grey-tax) may discourage early retirement.

- 1) See for the Netherlands e.g. C.J.I.M. Henkens [1998], M. Lindeboom [1998] and A.O.H. Heyma [1999]. In OECD Economics Department Working Papers series several microeconomic analyses of the retirement decision are published, viz. no. 202 all OECD-countries, no. 203 the US, no. 204 Germany, no. 205 Italy, no. 206 the UK and no. 207 the Netherlands. They can be downloaded free (as PDF-file).

General equilibrium models (2.3)

Since one and half decade general equilibrium approaches to the issue of Ageing, national and multinational, mark a significant departure from earlier partial studies on effects of Ageing on saving rates and labour supply. General equilibrium approaches enable to take account of market adjustments, which tend to mitigate the effects of population Ageing. For unchanged pension levels an Ageing population, for instance, necessitates higher contribution rates in the general equilibrium model, but generally not as high as contribution rates predicted from simple partial projections (BOX 3.). See for a critical but not very convincing review of the adverse effects of Ageing on the performance of the economy P. Mullan [2000, chapter 7].

One of the most admirable attempts at a general equilibrium approach is the model of A.J. Auerbach and L.J. Kotlikoff [1987]. In a study of A.J. Auerbach et al. [1989] an adapted model is used to examine the impact of population Ageing in four OECD-countries, the United States, Japan, Germany and Sweden. In this model rational consumers live for 75 years, which creates 75 overlapping generations of identical consumers. The model also has a competitive production sector and a government sector. Individuals supply labour under given assumptions about the age-productivity profile and the effects of technical change. They supply capital through an efficient capital market. The social security budget is balanced at all time. A general equilibrium coordinates the three sectors of the economy, ensuring market clearing in all periods. The simulations showed (over the period 1990-2030) a fall in the national saving ratios by 4 percentage points in the US and about 18 percentage points in Japan. Social security taxes (pay-as-you-based pension contributions) will in the same period increase by 8 percent of GDP in Germany and about 4½ percent in the US.

As a consequence (see also L.J. Kotlikoff et al. [2001]), there is capital shallowing rather than capital deepening. Real wage per effective unit of labour decreases and the real return to capital rises. Nonetheless output growth continues, provided technical progress continues (an annual one percentage point is assumed nowadays), though the economy and per capita welfare will grow less than otherwise, with a constant capital-output ratio would have been the case.

Analyses of saving data in the US demonstrate that the elderly hardly save less than younger age groups (e.g. H.J. Aaron et al. [1989]). Rather, it turns out that an older population holds a larger capital stock (even when the saving rate decreases), thereby causing capital deepening rather than capital shallowing, increasing the marginal productivity and the real wage level of the working population, which creates favourable conditions for solving the distributional problem of retirees and younger age cohorts.

BOX 3

Population Ageing and economic performance

The first detailed analyses of the economic effects of an Ageing population have been carried out about one decade ago by e.g. A.J. Auerbach et al. [1989], P.R. Masson and R.W. Tryon [1990], P.R. Masson [1991], R.C. Fair and K.M. Dominguez [1991]¹. They examined the macroeconomic effects of population Ageing in a number of developed countries using general equilibrium models, the middle two employing the IMF's multi-regional econometric model. Demographic variables are determined exogenously and the aim is to explore the effect of Ageing on i.a. saving and consumption propensities, government expenditures and tax revenues, social security expenditures and health care provision, labour supply and real wage rate, capital supply and real interest rate, exchange rates, the current account of the balance of payments and international capital flows.

Factors of production

The simulation results indicate that Ageing could have a significant negative effect on the national saving rate, leading to lower capital formation, productivity and employment. A large negative effect of Ageing on private savings in Europe is calculated by Miles [1999; 2002^a]: the saving rate in the base case scenario decreases from 14.5 percent in 2000 to 4.5 percent or less in 2050 (mainly dependent on the assumed productivity growth). These results however are as plausible as are the underlying assumptions, and one of the key assumptions in these models is that savings rates decline with age. The theoretical justification for this assumption derives from the life-cycle model with no bequest motive, where assets are accumulated over the working years and used during retirement. The empirical foundations however are weak or contradictory: the elderly save as high a proportion of their income as the younger age groups or even more.

The Ageing of the labour force population probably will not have much effect on its flexibility in respect of e.g. mobility, ability to adapt to new techniques and innovative capacities, and thereby on the overall performance of the economy [P. Johnson & K.F. Zimmermann, 1993; P. Johnson, 2002; R. Disney, 1996].

Another assumption of utmost and predominant relevance is the effect of Ageing on the rate of technological progress. Technical progress could decrease due to a lesser dynamism of an Ageing population. On the other hand innovation can increase as labour becomes more scarce [D.M. Cutler et al., 1990]. The last author concludes that population Ageing will not bring about major problems for productivity. The models of the OECD [1998^b] and the European Commission [1999] also assume no impact of population Ageing on productivity growth.

Simulations using general equilibrium models are pioneering attempts to examine the economic impact of Ageing in developed economies, demonstrating the complexity of the relationships between population age structure and economic performance. Assumptions about e.g. saving behaviour, technology, global developments are crucial. Small changes and differences in initial assumptions produce large differences in long-term simulation results.

It is often argued that unfunded public pension schemes are increasing the depressing effects of Ageing on savings. In the life-cycle framework public pensions can be regarded as a form of implicit wealth accumulation, whereby the need for old-age savings is reduced. M.S. Feldstein [1974, 1995] has produced

a lot of evidence. His findings have been disputed. Other studies indicate that the effects, even if negative, may be small².

International relations

Differences in Ageing patterns between countries will result in prolonged swings in the current account of the balance of payments against each other and against other parts of the world, leading to large changes in their net foreign asset positions. Note the situation in which Ageing might lead to dissaving and a deficit on the current account. Clearly not all more developed countries (going through the same Ageing process) can show simultaneous declines in the current account position. General equilibrium mechanisms therefore are introduced in the model. Recent examples are Brooks [2000^b] and the INGENUE world model [2002], where six relatively homogeneous regions are economically and financially perfectly integrated.

The older a society is, the greater the per capita expenditures on social security will be, and the larger the part of pay-as-you-go based pension systems the greater the share of unit labour costs and the higher the prices for goods and services. The higher the prices of internationally traded goods, the less favourable the competitive position in world markets.

Monetary policy

E.P. Davis [2002] has pointed out that the process of population Ageing will involve major shifts in financing, which may give rise to financial turbulence. They are brought about by risks arising from the overall macroeconomic development, the difficulties of pay-as-you-go financing, the risks arising from the manner of funding via institutional investors and the risks arising from the asset accumulation during funding.

Therefore, D. Miles [2002^b] raises the question whether monetary policy should be different in a greyer world. Nowadays, European monetary policy is directed almost exclusively at controlling inflation. That inflation target is based upon measures of consumer prices and do not reflect asset prices. The elderly population is likely to be relatively more concerned about asset-price level than about consumer prices. Do objectives of monetary policy have to change in the future?

1 During the nineties several other interesting studies appeared, e.g. J.A. Bikker [1996], A. Börsch-Supan [1996], S.K. Chand and A. Jaeger [1996], D. Roseveare et al. [1996], W. Leibfritz et al. [1996], OECD [1996, 1998], T. Chauveau and R. Loufir [1997] and D. Miles [1997, 1999].

2 It appears, as observed by H.J. Aaron [1982, p. 28], that ‘... a person determined to find a respected theoretical argument to support a preconception can find one, and that a person without preconceptions will find a bewildering diversity of answers in economic theory about whether social security is more likely to raise or to lower consumption or labour supply.

To get by this theoretical impasse, one turns with hope to the empirical research for measures of observed behavioral responses. As will become clear, most of these hopes remain unfulfilled.’

General equilibrium approaches take account of market adjustments which tend to mitigate the effects of population Ageing. For unchanged pension levels an Ageing population for instance necessitates higher contribution rates in the general equilibrium model, but generally not as high as contribution rates predicted from simple partial projections.

An illustration of the opposed results of a partial and a general equilibrium analysis can be found in the current social security and pension reform debate. The major concern here has been about the burden on the baby bust generation that a pay-as-you-go financed defined benefit-system imposes on it. H. Bohn [1999] convincingly demonstrates that for plausible contribution rates and elasticities of factor substitution, small cohorts are actually better off than large cohorts. This is because small cohorts enjoy favourable wage and interest rate movements even though they face relatively high

contribution rates to pay for the pensions of the preceding larger cohorts under a pay-as-you-go based DB-system. Conversely, large cohorts are worse off than small ones: their high labour supply drives down the wage rate when the cohort is young and pension asset prices go down when the cohort wants to sell these assets when old. This is clearly beneficial for the young small cohorts. Conventional partial equilibrium analysis makes long run projections of future wage and interest rates by extrapolating past trends and ignores endogenous factor price effects, which can be seriously misleading.

It can not be shown unambiguously from theoretical analyses that population Ageing adversely affects economic performance, though it seems likely - mainly due to a shrinkage of the labour force – that in the first quarter (and more so in the second quarter) of the 21st century growth rates of GNP in most OECD-countries will slow down. At that time it is only productivity that drives all growth.

The effects of Ageing on the performance of the economy, a (possibly) gradual shift to a funded system and other reform measures will have important implications for domestic and international capital markets. First the scope and structure, the breadth and depth of worldwide financial markets. Secondly, the impact on prices and rates of return on various types of assets in different geographical areas as well as across time. This subject matter is not pursued here.

It is demonstrated below in a simple scenario-analysis for the EU-15 that a rather moderate increase in labour productivity suffices to offset the negative impact of population Ageing on average per capita consumption or general standard of living⁴. Assuming a growth of labour productivity of 1¼ percent per year ensures significant welfare increases for both working-age groups and pensioners. This result contrasts with findings from e.g. a general equilibrium approach of A. Börsch-Supan [1996], investigating the impact of population Ageing on saving, investment and per capita consumption. Per capita consumption – the 1990-index being 100 – decreases in the coming decades to 92 à 87, depending on the rate of technical progress function (on labour force growth and its average age).

4) D.M. Cutler et al. [1990] also argue that a moderate rate of technological progress might be sufficient to offset a decline in the living standard due to Ageing.

3. Scenarios for the EU-15

The size of birth cohorts have a significant impact on labour and capital markets. The question arises what this impact is particularly in the more developed countries under consideration in the coming decades. Some tentative lines of thinking about developments of population, labour market and capital market in the coming decades are exposed in Table 1.

The baby boom generation is pronounced in the EU-15, the US, Canada and Japan, in Russia and the Eastern European countries and apart from China almost absent in the developing countries. The baby boom generations result in a bulge in the age structure, a demographic wave that passes its way through the population.

Taking 1955 as the year of birth of the average baby boomer and 1985 as the year of birth of the average member of the baby bust generation in the EU-15, then in the *near* term – the years between 2000 and 2015 – the representative baby boomer will be between 45 and 60 years of age and the average baby buster will be aged from 15 to 30. The next generation is still unborn.

In the *medium* term, 2015-2030, the average baby boomer is of age 60-75 – his parents are no longer living in this period – and the average baby buster is of age 30-45. The next generation is then between 0 and 15 years of age. In the *long* term – the period 2030-2050 – the average baby boomer will be older than 75 and the average baby buster is between 45 and 65. The next generation ages from 15 to 35.

Ageing and the labour market (3.1)

The groups over 60 years of age are characterized by labour force exit and pension assets divestiture. They sell these assets to members of the next generations who are between 30 and 60 years of age, who are then in the labour force and who are accumulating pension capital for themselves. Pensioners start selling assets after 2010/2015 and increasingly in the following decades.

There is a close relationship between cohort size and *labour market* conditions. In the *near* term and medium term the labour market is becoming gradually more tight as the leading edge baby boomers are leaving and the far less numerous young baby-bust cohorts are entering the labour market.

In the *medium* term the next baby boom generations are leaving the labour market. As a result labour is becoming scarcer whereas capital is relatively abundant. Capital intensity increases due to a sustained high level of investment; labour productivity and wage rates will rise.

We assume that the participation rate of the working age population in the EU-15 will rise with about 5 to 6 percentage points by 2020. Hence, with a slightly decreasing working age population the work force will increase over the two coming decades at a yearly rate of about 0.4 percent. In the *long* term with negative population growth and unchanged participation ratios the work force will decline in relative and absolute terms. Differences exist between EU-15 member states.

Table 1. Prospects for The Netherlands in respect of population, labour market and capital market; near term, medium term and long term.

N e a r t e r m (2 0 0 0 - 2 0 1 5)

POPULATION:

'last' generation: 70+, sellers assets
 baby-boom generation: 45-60y, buyers assets
 baby-bust generation: 15-30y, leading edge entry labour market
 'next' generation: unborn

LABOUR MARKET: gradual tightening; increasing participation rate, higher level of wages, particularly in respect of young labour supply

CAPITAL MARKET: structural large demand for assets; rather high asset prices; higher saving and investment level.

M e d i u m t e r m (2 0 1 5 - 2 0 3 0)

POPULATION:

'last' generation: dead
 baby-boom generation: 60-75y, exit labour market, sellers assets
 baby-bust generation: 30-45y, buyers assets
 'next' generation: 0-15y

LABOUR MARKET: tight, bottlenecks; high participation rate, rather high level of wages

CAPITAL MARKET: relaxing, baby-boom generation seller of assets to the less numerous baby-bust generation; lower real interest rate, lower asset prices; constant or slightly lower saving and investment level

L o n g t e r m (2 0 3 0 - 2 0 5 0)

POPULATION:

baby-boom generation: 75+, sellers assets
 baby-bust generation: 45-65y, buyers assets
 'next' generation: 15-35y, entry labour market

LABOUR MARKET: normalized; high participation rate

CAPITAL MARKET: relaxing, baby-boom generation seller of assets to the less numerous baby-bust generation; structural low real interest rate and low asset prices; constant or slightly decreasing savings and investments. After 2050 towards new equilibrium values.

Labour scarcity will induce wage increases. Higher wage rates can have two contradictory effects, first (in a world of global competition) inducing capital substitution and hence, further productivity and employment growth. Otherwise, higher wages can harm competitiveness, impede productivity growth, leading to diminishing investment and increasing unemployment, particularly of low-qualified labour.

The same argument holds for a relatively low wage rate: either inducing labour substitution and lower productivity growth or contributing to a strong competitive position.

Ageing and the capital market (3.2)

Of major relevance is also the behaviour of *capital markets* in reaction to demographic developments. In the *near* future there will be a continuing demand for assets from the baby boom generation. Asset prices will remain rather high. Savings and investments continue to grow; a less increasing labour supply will give rise to a higher capital intensity and a lower rate of return to capital, but also to inflationary forces, which work in the opposite direction⁵.

In the *medium* term asset prices and the expected return on capital will be permanently lower, when the younger baby boomers are leaving the labour force and the less numerous cohorts of baby busters are entering, further raising the capital-labour ratio.

In the *long* term the tail-end baby boomers and the (leading edge) baby busters continue selling assets to the next baby bust cohorts. Asset prices will fall further, even a crash or market meltdown may occur. Note that this problem arises in much more acute form with personal (individual) pension accounts – where on approaching retirement age investments are switched from equities to bonds – than in collectively organized pension funds with infinite horizon. R. Brooks [2000^a] finds (simulation) evidence for the US of significant asset market effects, with the expected return on retirement savings of (tail-end) baby boomer cohorts about 10 to 20 percent below returns to earlier generations. Past capital returns evidently are not a good guide, let alone a guarantee, to returns that can be expected over the coming demographic transition.

Labour force participation (3.3)

Of the total population in 2000 in the EU-15 about 42 per cent was actually employed. The labour force participation, defined as the ratio of the currently employed population to the present population of age groups 20-64 years, at that time was 0.69, which is lower than e.g. in the US and Japan. There appears to be ample room for a further increase of labour force participation in virtually all European countries, by reducing the unemployment rate, curtailing pervasive early retirement, increasing the female participation and that of allochthones in the labour force⁶.

The baseline scenario of the EU Economic Policy Committee's '*Progress Report on the impact of ageing population on public pension systems*' [2000] therefore assumes that participation rates in the EU-15 gradually converge from 0.69 in 2000 to 0.75 in 2020 and 0.78 in 2050 (the latter figure being

5) The projection of more scarce labour and more abundant (physical) capital implies a lower (long-run) marginal product of capital, which is the source of returns to financial assets. Or, in other words, returns to financial assets must reflect the returns on capital investment over the long run.

The decrease in the rate of return on capital in Germany, resulting from both population Ageing and more funding in pension finance is estimated by A. Börsch-Supan et al. [2001] to be 1 percentage point (assuming a closed economy). International diversification can improve the return on capital considerably. If capital is freely mobile within the EU-15 the decrease in the return to capital is only 0.2 percentage points.

6) The Netherlands Bureau for Economic Policy Analysis (CPB) thus expects a considerable increase in the labour force ratio in 2020 (in 2000: 0.71). A fraction of 0.77 of the working age population – or 0.45 of the total population at that time – can then be employed (CPB [1996], CPB/CBS [1997]). Note that – in calculating the results shown in Tables 3, 4 and 5 – the heroic assumption of an unchanged average number of hours worked per worker per year has been made. It can be expected that the number of part-time workers will increase further in relative terms in the coming two decades.

the performance in the US and Japan at the beginning of the 21st century and commonly considered as full employment). Considerable differences exist between EU-15 member states at date. Rather high participation rates are found in the UK and Sweden; Germany and the Netherlands take an intermediate position and relative low rates exist in France, Spain, Belgium and Italy. Hence, Italy expectedly will show the steepest increase in labour force participation in the near future, followed by the other countries, giving rise to considerable policy challenges⁷.

In the present paper a somewhat less optimistic scenario is used where countries with initial low participation rates, e.g. Italy, Spain, Belgium, raise working force participation with 7 to 8 percentage points at best to 0.67, 0.71 and 0.70 respectively. For the sake of completeness also a high employment scenario is presented, characterized by a labour force participation ratio of 0.78 in all EU-25 member states by 2050.

Labour force productivity (3.4)

Growth in labour productivity in European countries in the seventies and eighties – a period with rather low productivity growth, but still higher than in the nineties – amounted to 2 percent per year approximately (Englander, A.S. and A. Gurney [1994]). On the one side, it seems to be reasonable to take the productivity growth in these decades as a lower bound for future productivity growth. On the other hand, in the face of feasible negative consequences of population Ageing on labour supply, labour productivity and saving/investment decisions as well as the falling of the productivity growth due to an Ageing working population and a higher part of services in national product, that 2 percent productivity growth rate, particularly after 2020, must more likely be considered as an upper bound ceiling. The baseline scenario in the present paper, therefore, assumes that a slightly less 1¾ percent yearly growth rate in per worker production can be realized in the coming half century⁸. Note that those estimates are guestimates as it practically impossible to accurately project productivity growth.

In paragraph 4 below scenario findings are presented.

7) Under the Lisbon scenario of the EU Economic Policy Committee's study [2000] there are even more improvements in the labour force participation. Both male and female participation rates rise and converge to 83 by 2045. This assumes substantial increased participation by the elderly. Unemployment declines to 4 percent for both males and females by 2045.

8) The assumption of a convergence of labour productivity towards a (lower) 1,7 percent to 1,8 percent annually is found in the Progress Report of the EU Economic Policy Committee [2000] and in its report on budgetary challenges [2001]. OECD [2000a] and Dang et al. [2001] maintain productivity growth to converge towards an annual 1¾ percent as from between 2020 and 2030. The INGENUE team [2001] is also rather optimistic assuming 2 percent productivity growth in Northern America, and by a long-run convergence process in the medium, long and very long term all countries in the world reach the American level and grow at the same rate. For the Netherlands: CPB [2000] 1¾ percent and D.P. Broer [2001] 2 percent.

4. Will we grow older comfortably?

The future of old age and pension systems in the EU-15 is nowadays a widely discussed topic. Unfortunately, the debate compared to that in the US can be qualified as rather poor. An exception can be made for the Netherlands, where The Netherlands Bureau for Economic Policy Analysis (CPB) has published several excellent studies on this subject. In the US many studies were and are devoted to the so-called pension crisis, which has resulted in a large and rich literature, though the scale of the problems in the US is considerably smaller than in many European countries. The question necessarily is raised whether a serious crisis will arise in the major continental European countries in the coming decades or, in other words, are the (Western) more developed countries rich enough to sustain an older population affordably?

In the present and following chapters we make clear that no major difficulties exist or, if any, that they can adequately be overcome on a macro-level, but that serious budgetary problems may arise on a micro and meso-level.

Basic economics (4.1)

The total output of the economy is measured by gross domestic product (GDP) and can be decomposed in consumption expenditures (CE), investments (I) and the surplus/shortage on the current account of the balance of payments. Adjusted for price movements they are called real GDP, real CE and real I. Per capita CE is commonly used as a measure of personal welfare.

The consumption expenditures are quite a stable proportion of GDP in the long run. Estimates of GDP and GDP growth are also estimates of CE and CE growth and hence of the growth of personal welfare, though the value of consumption of leisure time should also be taken into account.

To demonstrate whether the economies of the Ageing developed countries have the prospective resources to permit (early) retirement, expanded health care and expanded other types of government expenditures, the focus in the present analysis is on the average producer and the average consumer. Three age groups are distinguished. This is a marked simplification of reality – to overcome the frustrating sterility that everything depends on every thing else –, thereby disregarding the dynamic economics on a meso or intermediate level and at a micro or personal level. An explanation in more detail of the methodology used is given in J.B.Kuné [2003].

Table 2 presents evidence on national welfare, measured by per capita consumption expenditures, in developed countries – the EU-15, the US, Canada and Japan – by 2020 and 2050. The base year 2000 has index 100. To measure the Ageing burden per capita welfare under the projected age distribution as well as under the unchanged age structure in the base year are shown.

Productivity growth and welfare (4.2)

The case of the EU-15 (first row in Table 3A) is discussed now in more detail for explanatory purposes. Under the assumptions made on labour force participation and productivity growth, total production in the EU-area makes possible an average per capita consumption by 2020 of 144.7 for all people over 20 years of age, with index 100 in the year 2000 for the group aged 20-64 years and index

80 for the 65⁺-population. Per capita consumption amounts to 72.35 for the under-twenties (index 50 in the year 2000).

Consumption of the working age population in the EU-15 thus rises in the period 2000 to 2020 by 44.7 percent and the consumption of the 65⁺-population by an impressive 80.9 percent (from index 80 in 2000 to index 144.7 in 2020).

Note that there is even room for a further increase of consumption. The EU-15, the US and Japan generate balance of payments surpluses of 2 à 3 percent GDP up to 2025, thus building up a stock of net foreign assets. From the returns of it the import of consumer goods can be paid. Secondly, a further welfare growth can be achieved by an increased capital intensity, leading to higher production per worker and rising wage rate, but also lower capital revenues. It must be emphasized again that the aforementioned welfare gains of 44.7 percent and 80.9 percent over the first two decades of the 21st century critically depend on a broad range of successful policy measures stimulating the economy (chapter 6).

In a demographically unchanged population (no Ageing from 2000 onwards) per capita consumption would be 151.0 for all people over 20 years of age instead of 144.7. The difference between the indexes 151 and 144.7, hence, can be considered as the consumption sacrifice or the amount of consumption expenditures forgone by the younger population groups in favour of the elderly. The difference of 6.3 (index 151 minus index 144.7) can be regarded as the increased tax necessary to support a larger number of non-producing elders. Or, in other words, welfare in 2020 is 4.2 percent lower than otherwise without Ageing would have been the case.

Between 2020 and 2050 according to rather optimistic assumptions per capita consumption increases with about 1.3 percent annually, leading to a consumption index 211.2 by 2050 (the year 2020: 144.7). In the non-Ageing environment the consumption index would be 254.0. The difference, amounting to 42.8 (index 254 minus index 211.2), being the consumption sacrifice should not be ignored but also should not be considered as dramatic. Welfare in the EU-15 by 2050 relative to 2000 is 16.8 percent lower that would have been the case without Ageing.

Differences exist among EU-15 member states. Most EU-countries can gain from a substantial increase in the participation ratio in the coming decades. In Sweden and the UK with already relatively high labour participation in 2000 the increase in per capita consumption by 2020 and 2050 is less than in other countries.

The same holds for the US, Canada and Japan. There is no labour force participation dividend that can be reaped.

Table 2. Welfare in more developed countries, EU-15, US Canada and Japan in the years 2020 and 2050 (indexes; the year 2000: 100), assuming 1¾ percent yearly production growth and some increase in the labour force participation rate (in 2050 ≤ 0.78 and 0.78), for an Ageing population and an unchanged (non-Ageing) population

Year	2020		2050		2050	
	Ageing Non-Ageing	Non-Ageing	Ageing (partic. ratio ≤ 0.78)	Non-Ageing (partic. ratio = 0.78)	Non-Ageing	Ageing
Country						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU-15	144.7	151.0	211.2	254.0	219.7	264.2
Belgium	146.7	152.3	220.5	256.3	245.7	285.5
France	142.8	148.7	219.1	250.2	234.1	267.3
Germany	138.8	146.5	205.8	246.6	214.1	256.4
Italy	147.7	155.6	198.3	261.1	230.8	304.8
Netherlands	141.7	151.1	215.0	254.2	217.8	257.5
Spain	149.2	153.5	191.4	258.3	210.3	283.8
Sweden	133.8	142.0	213.0	238.9	equal (4)	equal (5)
UK	139.9	143.2	212.0	240.9	equal (4)	equal (5)
Other world						
US	133.1	138.9	209.1	233.7	equal (4)	equal (5)
Canada	135.2	141.2	205.2	237.7	equal (4)	equal (5)
Japan	120.4	138.4	178.9	233.0	equal (4)	equal (5)
Australia	151.6	157.6	232.7	265.3	equal (4)	equal (5)

Strain on political, social and economic systems (4.3)

The prospective production capacity in the EU-15 member states, thus, enables consumption expenditures to rise from 100 in 2000 to 144.7 by 2020 and further to 211.2 by 2050 (2000: 100). We may conclude therefore that the resources to finance the expanded demand of workers and pensioners for e.g. high-quality medical services, education, consumer durables, housing, etc, etc will be abundant. There is room for a further reduction of the length of the yearly working time or to retire earlier (if one prefers). Real consumption of the working age population by 2020 is 51.0 percent higher before (increased) tax and 44.7 percent higher after tax. Or, in other words, after tax paying

standards of living of workers and pensioners are substantially higher than they are today. The tax increase, thus, is economically feasible.

Nonetheless, in the more developed countries it may occur that the growth in the size of the older population will indeed strain political, social and economic systems.

Allegedly a higher tax or contribution level is not (or hardly) feasible from a psychological or political point of view. Arguing that the welfare of individuals after the tax increase is still 44.7 percent higher than it is today and much higher than people had a generation ago, will probably not persuade them to accept the tax increase and will not take away their misgivings to be overtaxed and exploited. But this is by no means certain. Much depends on the rate at which non-working people at date enter the labour force, the growth of productivity, the effects of economic restructuring and above all, our success in developing effective policies for intergenerational integration.

Secondly, the share of income destined for old-age purposes can increase as personal income rises.

Concluding

Given the psychological and political strains the search for a system of financing retirement income and health care at old age is the search for a system that can be accepted wholeheartedly by all irrespective (up to a certain extent) the height of the tax. All individuals under that system are required when young to set aside a quarter to a third of their income (in a collective or personal account or otherwise) to use for old-age income purposes, health and long-term care included. Thereby individuals create a resource base of their own. Time bombs will not explode nor political explosions will occur in 2010, in 2040 or in any other year. This issue is pursued in chapter 5.

Alternative presentations (4.4)

Table 3 below shows the consumption level of the adult population in 2020 (the year 2000: 100) with assumed increased labour force participation rates in all countries under study and under different growth rates of production per worker, 0 percent, 1 $\frac{3}{4}$ percent (also shown in Table 2) and 2 $\frac{1}{2}$ percent respectively.

In column (2) of Table 3 the effect on welfare of a higher participation ratio (for the EU-15 rising from 0.69 to 0.75) combined with a zero growth of productivity is shown. Columns (3) to (5) give evidence of the welfare-gain of alternative productivity growth rates with (constant) participation at the higher level.

With zero growth rate of production per worker for the EU-15 as a whole there remains a slight increase in welfare of 2.3 percent in 2020 relative to 2000, due to the fact that labour force participation is assumed to rise from 0.69 in 2000 to 0.75 in 2020⁹. Welfare is decreasing with some percentage points in Germany and Sweden and slightly more than one percentage point in the UK. Welfare decreases are more substantial in the US, Canada and Japan, where participation rates were already high at the turn of the century and could hardly be higher.

9) The right amount of labour market reform measures, resulting in a participation rate of 0.73 by 2020 (and 0.84 by 2050!, not shown in the Table) with no productivity growth can on its own compensate for the adverse effects of population ageing on welfare. On the other hand, a slight 0.3 percent productivity growth with unchanged labour force participation suffices to maintain welfare on the year 2000 level.

Only with an unchanged labour force participation rate (of 0.69) as in the baseline year 2000 and a zero growth rate of production per worker, the consumption level of the adult population in the EU-15 is decreasing from 100 in 2000 to 94.1 in 2020, which seems (very) serious but not utterly dramatic as nobody will starve. With increased labour force participation from 0.69 to 0.75 there is a slight (almost negligible) rise in welfare of 2.3 percent in the EU-15 over the first two decades of the current century.

Table 3. Consumption level of the 20⁺ population in 2020 under alternative growth rates of production per worker (EU-15, US, Canada and Japan; increased labour force participation; year 2000: 100)

Country	Growth rate of production per worker (percent)			
	0 (unchanged partic.)	0 (1¼ ← higher participation →	2½)
(1)	(2)	(3)	(4)	(5)
EU-15	94.1	102.3	144.7	167.6
Belgium	94.5	103.7	146.7	169.9
France	94.2	101.0	142.8	165.4
Germany	93.0	98.1	138.8	160.8
Italy	93.0	104.4	147.7	171.0
Netherlands	92.3	100.2	141.7	164.1
Spain	95.4	105.5	149.2	172.8
Sweden	93.9	96.1	133.8	157.5
UK	96.0	98.9	139.9	162.0
Other world				
US	94.4	94.0	133.1	154.1
Canada	94.3	95.5	135.2	156.6
Japan	85.3	85.1	120.4	139.5
Australia	103.1	107.2	151.6	175.6

In other words, if the EU-15 succeeds only partly in raising employment to US levels (with a participation ratio of 0.78 in 2000), there would be no serious Ageing problem. Per capita welfare at least remains constant over the coming decades.

In the other two productivity growth scenarios (1¾ percent and 2½ percent annual growth respectively), however, the standard of living not only can be maintained, but there is ample scope for a further increase in welfare, ranging from 144.7 to a formidable 167.6 by 2020. Note however that productivity growth hampers, when the economy is short of skilled labour.

Concluding

Productivity growth allows per capita consumption of all age groups to rise throughout the period of demographic transition. Nobody has to 'sacrifice'. Production will be sufficient to substantially increase the per capita consumption of all age groups. All age groups in 2020 are on average better off – and in 2050 much better off – than in 2000. Hence, the burden of a larger number of retirees should be borne rather easily.

But this is not the whole story. It appears difficult to construct adequate financial arrangements – and satisfactory for all –, to implement the distribution of total GDP to younger and older generations.

Required productivity growth to maintain welfare (4.5)

We can also reverse the question and examine which yearly growth rate of labour productivity is necessary to offset the negative impact of population Ageing on living standards or average per capita consumption in 2020. Subsequently the question is answered which level of productivity growth is necessary to achieve 15 percent, 30 percent or 60 percent growth of average per capita consumption over the time period 2000-2020. Evidence is presented in Table 4.

It turns out that a modest rate of technological progress is (necessary and) sufficient to offset the adverse consequences of Ageing on welfare and the consumption level. With increased labour force participation of the working age population a growth rate of average production per worker of -0.11 percent in the EU-15 suffices to keep welfare at a constant level¹⁰. Or, in other words, even a slowdown of the yearly productivity growth rate to 0.11 percent, combined with a higher labour force participation guarantees an equal welfare level in the EU-15 by 2020 as in the year 2000. Note that the productivity growth in the last two decades of the 20th century amounted to about 2½ percent. Furthermore, a growth rate of production per worker of zero necessitates the labour force participation ratio to rise from 0.69 to 0.73 to offset any detrimental effect of population Ageing on welfare.

On the other hand, if overall participation rates were to remain constant, the working population of the EU-15 needs to be almost 6.5 percent more productive in the year 2020 relative to 2000 – or an annual productivity growth rate of 0.31 percentage points – if it is to produce the same per capita quantity of goods and services.

Alternative policy measures to increase labour force participation and to stimulate immigration necessary to maintain per capita welfare are dealt with in ...

10) It can make a difference for workers' perception of bearing the pension burden in an Ageing population whether GDP growth is reached by productivity growth with a constant or even smaller labour force or by expanding the working population. In the former case higher gross wages and higher contribution rates will result than in the latter case with higher employment and slower productivity growth.

Marked differences exist between EU-15 member states. The lowest productivity growth rates are needed in Belgium and the UK (0.18 percent and 0.21 percent respectively) and the highest growth rates are required in the Netherlands, Germany and Italy (from 0.36 percent to 0.40 percent). In Japan

Table 4. Growth rate of production per worker (percentage) required to achieve zero percent, 15 percent, 30 percent or 60 percent higher level of consumption of the 20⁺-population in 2020 (EU-15, US, Canada and Japan; increased labour force participation)

Country (1)	Desired growth of consumption level from 2000 to 2020 (percent)				
	0 (unchanged partic.)	0 (15 ← higher participation →	30	60)
	(2)	(3)	(4)	(5)	(6)
EU-15	0.31	-0.11	0.59	1.21	2.26
Belgium	0.18	-0.28	0.42	1.04	2.09
France	0.30	-0.04	0.66	1.27	2.33
Germany	0.36	0.09	0.80	1.42	2.47
Italy	0.36	-0.21	0.49	1.10	2.16
Netherlands	0.40	-0.01	0.83	1.45	2.51
Spain	0.24	-0.27	0.43	1.05	2.11
Sweden	0.32	0.20	0.90	1.52	2.58
UK	0.21	0.06	0.76	1.38	2.44
Other world					
US	0.29	0.31	1.01	1.63	2.69
Canada	0.29	0.23	0.93	1.55	2.61
Japan	0.80	0.81	1.52	2.14	3.21
Australia	-0.15	-0.35	0.35	0.97	2.02

an annual 0.8 percent growth rate of productivity is necessary to guarantee the same welfare level in 2020 as in 2000. Or, in other words, in Japan fifty percent or more of the average long-term productivity growth will be ‘eaten up’ by the changing age structure of its population. The US and

Canada take on an intermediate position, both with 0.29 percentage annual growth rate necessary to maintain the per capita consumption level¹¹.

Concluding

As pointed out in the preceding paragraph, the adverse effects of an older age structure in the EU-15 countries are to a large extent compensated for by the increase in labour force participation. Further welfare growth can only be achieved 0.59 percent annually combined with a higher labour force participation results in by continuing productivity growth. A rather modest increase in productivity of a growth of per capita consumption in 2020 of 15 percent relative to the year 2000. A moderate yearly productivity growth of 1.22 percent leads to a welfare increase of 30 percent in 2020.

From Table 4A it follows that in EU-15 a yearly growth rate of labour productivity ranging between 1 percent and 2½ percent combined with increased labour force participation, gives rise to considerable welfare increases in the year 2020 vis-à-vis the year 2000, varying between 24.8 percent and 67.6 percent. Welfare increases in Belgium, Italy and Spain are among the highest, as those countries reap their labour participation dividend. High annual productivity rates are required, if we are to sustain the rates of welfare growth we were accustomed to during extended periods in the second half of the 20th century, 3 to 4 percent on an annual basis. To achieve 60 percent or more welfare growth over the period 2000-2020 (equivalent to 2.4 percent per annum), annual productivity growth rates of at least 2.26 percent in the EU-15, 2.69 percent in the US and 3.21 percent in Japan are needed.

Concluding observations (4.6)

Real per capita output in Western countries doubled between 1960 and 1995 and would double again between 1995 and 2030 to 2035. It can be concluded that without doubt we can afford to grow older. We in the European countries (and elsewhere in the more developed world as well) are rich enough to sustain an old-age pension for a more numerous older population. A fortiori, it can be said that we are approaching saturation in the consumption of material goods, not only of necessities but of luxury goods as well, which were only science fiction or dreams during the first half of the 20th century¹².

It is (too) easy to forget how rapidly real incomes have grown over the 20th century, viz. about a sevenfold increase. At current trend growth rates GDP will double in real terms roughly every 30 to 35 years. As individuals and nations grow more affluent they tend to increase the share of total spending devoted to some commodities and reduce the share devoted to others. Food is a clear example of the first category. Outlays for health, education and provision for incomes in retirement, sickness/disability and unemployment will all increase their share as per capita national income rise. As individuals and nations continue to grow more affluent it seems likely that they will wish to spend – and can afford to do so – more on pension income and health care. Hence, the share of expenditures

11) Similarly D.M. Cutler et al. [1990], '... even a 0.2 percentage point increase in annual productivity growth between 1990 and 2040 would offset the decrease in per capita consumption as a result of rising dependency burdens over that period [...], there is little evidence for the more pessimistic view of demographic change.'

12) In most western countries nowadays the poverty line is at a level of real income that was attained by only those in the highest 10 percent of the income distribution about 1900.

for pension provisions and health care facilities in national income will grow further and as a result is not anything to be overly concerned about.

It is often said that the younger generation is no longer willing to give up such a large part of their income (a doubling or more) in the form of necessary contributions for the pension payments of the elderly¹³. Though welfare increases for all, it is argued that a relative deterioration will not be accepted, as the fiscal burden is already high.

This may be true, but we cannot be sure about this. We don't know whether a (by three to five percentage points) higher contribution level can not be borne by citizens nor do we know whether such an increase gives rise to labour market distortions with adverse effects on the proper functioning of the economy.

13) Some questions need to be answered. Have the youngsters reached some ceiling on their willingness and ability to finance pay-as-you-go based pensions? Can that ceiling be measured? Why they are unwilling to pay out of their much higher incomes the transfers to the retirees?

5. A paradox

As pointed out before the best guarantee that future pensions can be paid is a large volume of future national product¹⁴. A decline in the labour force and a slowing down of the productivity growth cause problems for any pension and welfare scheme to the extent that they induce a fall in output. The problem is solved to the extent this can be prevented or, preferably, the economy can be boosted.

But this is not the whole story. Budgetary and fiscal imbalances allegedly have harmful effects on the economy (inducing declines in output) and the income distribution. Furthermore, creating a situation that is unsustainable in the long run is highly unfair to the generations to come. The problems are solved to the extent that budgetary deficits can be eliminated.

There appears to arise a (new) *paradox* that on a macro-level the affluent society can afford to grow older comfortably and that on a meso- and micro-level serious and prolonged budgetary and fiscal problems arise, that allegedly will impede economic development and are detrimental to the welfare of citizens. Evidently the mechanisms to levy taxes and pension plan contributions on labour income alone will produce unmanageable difficulties.

In our view budgetary and fiscal problems are not arising from the inadequacy of national resources, but they arise from the ill-shaped systems for financing public expenditures out of labour income only and not out of production. This fallacy is mainly due to accidents of history.

Not a scarcity of resources is at the basis of the affordability and sustainability of pension systems and an Ageing society but how and by who they are financed.

The method of pension finance - on a micro or personal level (5.1)

Allegedly paying taxes and pension contributions out of workers' income on behalf of the elderly under a pay-as-you-go system is up from a certain point felt to be no longer or less sustainable, in the sense that it will give rise to an unacceptably high and unbearable premium level for the group of contribution payers¹⁵. We may add that probably such is true as well for the welfare state as a whole at that time as it is financed also on a pay-as-you-go basis. One may wonder under which conditions old-age social security is no longer a benefit but a burden – and when the reverse holds – as it was developed to produce more security for the elderly population?

In contrast, contribution payments under a funded scheme are less likely be regarded by individuals as taxes rather than their own savings for an old-age income provision, thereby avoiding to a large extent negative labour market distortions and probably giving rise to increased labour force participation.

14) Note that guarantees are in some way or other always virtual. In a pay-as-you-go scheme they are based on the strength of an implicit social contract between generations; under funding they are based on the ability of the economy always to yield an adequate return on financial assets. When, in a funded scheme, total monetary purchasing power or the demand for goods and services (largely) exceeds the value and amount of current output at prevailing prices, a general price inflation will bring them back into line.

15) Strengthening the link between contribution and benefit levels might make the (felt) burden of those contributions – e.g. an increase of 3 to 5 percentage points – easier bearable and more acceptable. This can be accomplished irrespective the way of pension financing.

Participants to a funded scheme may consider the accumulated assets as their own (collective) capital, generating returns, which from an economic point of view can be compared with labour income, but they are less visible as pension capital income usually is not paid out.

In other words, paying retirement income to the elderly out of the labour income of the workers is likely perceived as a burden. Opposed, setting aside pension capital revenues for their own retirement income purposes is viewed by individuals as being very different from paying contributions under a pay-as-you-go based pension scheme and is less likely considered as a burden, let alone as being unbearable, since the link between future benefits and current contribution payments is more clear. The returns on pension capital, in other words, contribute to a further accumulation of capital as though contributions were levied on pension capital income at a full hundred-percentage rate. As a result, budgetary and fiscal problems do not or only to a far minor extent arise.

The method of pension finance - on a macro or national level (5.2)

It is often argued that the origins of all future pension problems, if any, is the failure to start and maintain funded pension schemes rather than pension plans pay-as-you-go financed. If public and supplementary pension plans had accumulated sufficient assets – so the argument goes – paying future pension expenditures would be less or not a problem at all.

A proviso must be made however as this 'solution' will not change the basic mechanism redistributing production among different groups of population, e.g. the retired and the non-retired. Or, in other words, basically the competition over resources raised by the pensions to be paid to the elderly is not removed by the transition from pay-as-you-go to funding. The way of pension financing does not affect in its essentials the distribution across time of the resources to be transferred to the elderly. No generation generally can store (for its own retirement purposes) the commodities that it has produced itself, apart from durable goods to some extent. Thus, for a society as a whole there can be, *ceteris paribus*, no redistribution of pension assets and purchasing power over time to a substantial degree. The consumptional expenditures of the elderly, today and in the future, always has to be provided for out of current production in the same time period, irrespective of whether the pensions are funded or not¹⁶.

Funding will be preferential to the extent that it causes the volume of national investments and national product to be higher. If certain conditions are fulfilled funding matters and could be part of the solution to the problems caused by e.g. adverse demographic developments¹⁷. A review of the merits and demerits of both pension finance systems, pay-as-you-go and funding is presented in Appendix C.

A further expansion of funded occupational supplementary pension plans can be considered as an adequate, but not a unique mechanism to promote savings.

Note however that pension finance systems are not created, at least not in the first place, because of the impact they might have on the performance of the national economy. Foremost, they are designed as a mechanism to adequately provide for pension incomes to the elderly.

16) The confusion, if any, originates from the tendency to generalize from the individual to the economy (*fallacy of composition*). It is a fallacy of composition to assume that because something is true for an individual it is (necessarily) true on aggregate. For instance, '... if I stand on my seat in the theatre I will get a better view, but if everybody does so, nobody will get a better view'.

17) See e.g. N. Barr [2000] and J.B. Kuné [2000].

Though the financing method may seem of minor importance as the competition over resources is not basically affected by the transferring mechanism pay-as-you or funding, pay-as-you-go opposed to funding increases labour costs in the form of higher taxes and payroll contributions, thereby giving rise to labour market distortions and threatening the competitiveness of most European countries.

The ownership of pension capital (5.3)

Economic and social institutions like the ownership of goods and assets, embodied in pension entitlements and other social security benefits, are of much more relevance for the sustainability of old age income plans than levying taxes and contributions from labour income or capital income as there are many risks involved. Workers can evade contributions, and taxes on capital income are very difficult or not at all to enforce effectively due to the high mobility of the financial capital. Under a pay-as-you-go system benefits are more likely to be cut than contributions to be increased.

The ownership of assets comprises a claim upon physical assets and creates a claim on future production of goods and services in the economy that is generated with the joint input of labour and capital.

Pensioners are thought to be better able to fight for their share of national product as owners of capital than as lobbyists for pay-as-you-go financed pensions.

Thus, from a security point of view pensioners might prefer not to be dependent on the willingness and ability of the working population who pays the contributions to finance old-age pensions. Instead, it is preferential that the elderly possess a factor of production of their own. The ownership of (part of) the capital stock is a more secure basis for sustaining a pension scheme and minimizing its vulnerability. It is also probable that the ownership of assets makes the process of transfer of resources less political and/or represents a safeguard against political seizure.

In a future world of immobile labour and mobile capital, it can be assumed that the long-run incidence of pension contributions is almost entirely on labour. This reinforces the relevance of the ownership of pension capital and its revenues.

No guarantees

Note, however, that guarantees cannot be given as they are in some way or other always virtual. In a pay-as-you-go scheme they are based on the strength of an implicit social contract between generations; under funding they are based on the ability of the economy always to yield an adequate return on financial assets. When, in a funded scheme, total monetary purchasing power or the demand for goods and services (largely) exceeds the value and amount of current output at prevailing prices, a general price inflation will bring them back into line. First, prices of consumer goods will rise, thereby bringing about a cut in the real income of the retired. Secondly, the elderly will see the prices of the securities they wish to sell to the younger age groups, decreasing and thereby their claims on real goods and services¹⁸. This means a further cut in their real purchasing power. On the other hand, under a pay-as-you-go scheme contributions will be lowered when a readjustment seems to be inevitable and

18) In this way e.g. P. Wallace [1999] in a popularly written, but well documented book, who is rather sceptical about many future developments. Similarly, B. Bosworth and G. Burtless [1998 (2)] are rather pessimistic about the effects of expanding domestic capital formation in the face of population Ageing and a falling growth rate of the labour force, involving large declines in the return of capital. Labour income will rise. On the other hand it is observed by R. Hemming [1999] that there will not be an 'asset meltdown' as Ageing populations switch out of stocks. 'Asset values will adjust gradually as national and

consequently the real income of the pensioners will decrease proportionately. S.J. Schieber and J.B. Shoven [1997] notice there could be wide falls in asset prices. Also R. Brooks [2000] suggests that there will be an excess supply of equities in coming decades with a marked decline in the returns on retirement savings. Opposed, J.M. Poterba [1998] finds no evidence of a (strong) likelihood of a depressing effect of the demographic transition on asset prices around 2020-2030.

No controversy between workers and pensioners (5.4)

The argument that funding and pay-as-you-go are equivalent in real economic terms has its own drawbacks as it ignores the basic nature of the economic process and of social and financial institutions in solving the distributional problem in respect of old-age.

The notion of a large volume of material goods and services being transferred from their producers – the de facto working labour population equipped with the national capital stock – to the elderly is artificial and not right from an economic point of view.

To consider workers and pensioners as groups with opposed interests is not correct¹⁹. Evidently, national product is the result of the joint input of labour and of capital and as a consequence output is divided between capital and labour – under equilibrium conditions – according to their marginal product, i.e. wage rate and profit rate. This basic distributional aspect is ignored in much of the old-age social security literature. Particularly, at least on a macro-level, the (role of the) ownership of the capital stock is frequently ignored.

The crucial issue in respect of accrued pension rights is that it constitutes a claim on future output in exchange for foregoing a part of present output. Pensioners want and need a firm and solid claim on national product in order to be able to consume the goods and services currently being produced. Under funding the retired population has at its disposal such a claim arising from their identifiable ownership of productive capital as a resource base of their own²⁰. A higher labour force participation of the elderly gives also rise to such a resource base.

Concluding observations (5.5)

It can be argued that the Ageing of societies will lead to less innovation, disserving and disinvestments. Productivity and technical progress also come to a halt. Or, in other words, the problems might be worse than projected in many studies. There is natural tendency of pessimists to depict apocalyptically almost the end of civilization and it is natural tendency of optimists to want to believe that the problems are not that bad. The pessimistic outcomes may, in fact, not occur. There is slight probability that some danger (or in part) comes through and if that happens, their impact would be dramatically severe. Therefore adequate policy measures on a broad scale in all countries should be taken to make sure that the chances of bad outcomes are greatly reduced.

global financial markets respond in a measured way to country-specific and worldwide population Ageing which is well understood and quite predictable.’

19) From a social and psychological point of view there certainly can and will be opposed interests, as future generations of retirees receive high pension incomes and are (very) wealthy as well. Cf. S.A. MacManus [1996], ‘... today’s intergenerational differences primarily involve intensity rather than direction. [...] Tomorrow, we are more likely to find different generations supporting policy priorities that are diametrically opposed to each other as the nation undergoes its greying metamorphosis and the economic realities associated with it sink in.’

20) P.A. Diamond [1997] proposes to give social security benefit promises the same status as private contracts or private property as a means of constitutional protection and insulation against benefit reductions.

It has been made clear before that pensioners throughout time as a rule are better off than their parents at those same ages and in our analyses they (deliberately) also fare well relative to the working age population at that time.

It is a preconceived idea that each retired generation should have a standard of living comparable to that of current workers rather than comparable to their own standard of living when young or middle-aged. The question arises, however, whether the issue of indexation is actually important for policy purposes? Particularly, to the extent that the welfare of the retirees results from their own choices (viz. voluntary early retirement and preference for leisure), their situation is of less direct policy concern, probably not at all.

The increase in the labour force participation rate and an adequate annual productivity growth necessary to compensate for the adverse effects of Ageing and to enable a further rise in welfare do not take place automatically. Instead, they pose huge challenges to economic and social institutions. Most national and international studies on Ageing tend to focus on social policy issues (pensions, health care). As pointed out, population Ageing is more; it will change the macro-economic balance in many countries, primarily through factor prices. Though this is not a new insight for experts, the policy debate tends to get lost by one-sided interest in the sustainability of pension and health care schemes and the need for pension reform and fiscal policy measures. Availability of labour and capital and their respective rates of return are at least of equal importance, if not more.

Policy guidelines defined at the EU-level and individual member states often disappoint by their failure to present a clear and comprehensive strategy for dealing with the process of population Ageing, as they heavily focus on the fiscal and budgetary implications of pension reform measures. Though understandable, this happens to the neglect of generating the national product and its growth rate, let alone the income distributional consequences over time of policy actions, which, at least in the long run, are crucial for the political and generational sustainability of all reform processes. Economic growth should remain the central policy objective, while at the same time budgetary sustainability is not ignored.

Policies to be pursued in the face of Ageing are dealt with in the next chapter.

6. Policies in the face of Ageing

Preventing a decline in labour supply can be realized from increased labour force participation by those of working age (reducing unemployment) and importing labour (either directly by selective immigration or indirectly by exporting capital abroad) and, most powerful, raising the age of retirement²¹. Increasing labour force participation will also diminish the amount of (means-tested) social assistance expenditures.

Increased output per worker can arise from increases in the quantity (and quality) of the capital stock the working force is equipped with, and from growth in the quality of labour.

Hence, the policy strategy first centres on achieving an increase in the average number of years people spend active in the labour force. Concurrently, policies that aim at augmenting productivity will help support improvements in living standards. Secondly, to avoid severe fiscal imbalances, substantial increases in public debt and/or unacceptable rises in contribution rates policy measures should be directed at creating sources other than pay-as-you-go based public pension payments in providing retirement income. As observed, there are no simple solutions, let alone fully satisfactory. Policy actions are required at many fronts. Part of its framework is exposed in the following sections.

Policy measures to enlarge the contribution or resource base (6.1)

Policy measures to broaden the contribution base by increasing the size and quality of the labour force therefore should aim at (1) stimulating investments in the human capital of the working age population and its labour force participation as well, (2) encouraging investments in physical capital domestically or abroad, in infrastructure and in R&D programs²².

Investments in labour supply and human capital include,

- policies to reduce public debt (leading to less interest payments, thereby alleviating government budgets) and to restrain increased taxes (necessary to finance public pensions and public health care) in order to reduce distortionary effects;
- policies to raise the labour force participation by reducing official unemployment, eliminating the poverty trap and above all, other forms of non-employment by adequate labour market regulatory reforms²³;
- particularly for some countries policies to increase the female labour force participation rate by e.g. creating child-care facilities and reducing the tax-wedge on labour income;
- policies to increase the labour force participation of the older workers²⁴ by,
 - reducing moral hazard in social security schemes (early withdrawal, disability and unemployment schemes) and eliminating the disincentives and other penalties for older workers to remain active in the labour force;

21) Note that increasing welfare may (on a micro-level) stimulate people to retire earlier, frustrating the (macro) policy goal to increase the average age of retirement.

22) See also OECD [1996, 1998, 2000b], Group of Ten [1998], D. Turner et al. [1998].

23) As soon as (near) full employment is attained, new problems will arise. That is of labour mobility. In a situation of labour shortages for certain skills in certain regions, the need for enhanced mobility of labour within the EU-15 and migration (also from outside the EU-15) will grow.

24) Unused labour capacity between the ages 55 and 65 ranges from 67 percent for Belgium to 35 percent for Sweden (it is 37 percent in the US and 22 percent in Japan).

- making pension schemes (and other social security measures) more actuarially fair on an individual level²⁵ and removing fiscal disincentives for delayed retirement and eliminating over-generous or all incentives for early retirement²⁶, access to disability, unemployment and social welfare schemes, increasing the age of entitlement to full pension, increasing the length of the contribution period for full benefit and above all, decreasing the size of the informal or shadow economy and;
- bringing into line wage rate and productivity, leading to lower earnings for older workers and improving job opportunities;
- policies to increase productivity by further training, retraining and education of the present workforce, stimulating R&D programs and up to a certain extent increasing the capital-output ratio in production (capital deepening). As the decrease in the relative size of the economically active population can only partly be offset by a higher (physical) capital intensity (in turn limited by diminishing returns), growth in labour productivity predominantly has to be provided for by strengthening the education, skills and abilities of the working age population (human capital);
- policies to increase productivity of the future labour force by (more and better) education of those now younger than 20 years of age and stimulating parents to invest widely in the human capital of their children²⁷. Facilities for child-care and other allowances must make possible combined high female labour force participation, fertility at replacement level and accumulation of human capital particularly in young children.

Concluding

The growth rate of human capital may more than offset the decreasing or even negative growth rate of population and its detrimental effect on the economy. However, this is not an automatic process. We are not sure that greater returns on investment in human capital will provoke more investments of people in their education and skills and we are not sure that higher wages stimulate labour force participation. Thus, there may be need for adequate policy measures to encourage people to invest in their human capital if they do not have sufficient stimulus to make those investments themselves.

The impact of reform policy measures (6.2)

The OECD is rather optimistic about the effects of a comprehensive policy package to address the adverse impact of Ageing²⁸. Policies that succeed in reducing the rate of structural unemployment to levels recorded in the late 1960's, policies that raise the labour force participation – that of older males by 7 to 9 percentage points or more in countries with particularly large distortions in their pension

25) S.Blöndal and S. Scarpetta [OECD, 1999] estimated that achieving actuarial neutrality in pension schemes in many developed countries would have the effect of raising labour force participation rates of males aged 55-65 by about 3 to 4 percentage points, representing a return approximating the situation prevailing in the early 1979's. In countries where the financial incentives for early retirement were particularly large (Finland, France, Italy, the Netherlands, Portugal), the participation rate of older workers can increase by about 8 to 9 percentage points.

26) Many countries have brought about increases in the retirement age. Germany is increasing the minimal pensionable age from 63 to 65 years for males (over the period 2001 - 2009) and from 60 to 65 for females (over the years 2011 - 2018). Italy (with currently one of the lowest retirement ages, at 50 for females and 55 for males) will increase retirement age for both sexes to 60 by 2001 and thereafter up to 65. In the UK the retirement age for females will be increased and be brought into line with that of males from 60 to 65, starting with those to retire in 2010 and completing the process in 2020. In the US an unreduced pension is payable at an age of 67 by 2022 and it is proposed to raise that age to 70. In Japan the age of retirement is increased from 60 to 65 by 2014 for males and by 2019 for females.

27) Cf. L.A. Bovenberg [2002].

28) D. Turner et al. [1998] and OECD, *Reforms for an ageing society*, Paris, 2000a.

systems, e.g. France, Italy and the Netherlands, by 4 to 6 percentage points in most other European countries and by less than 4 percent in North America and Japan²⁹ – and policies that raise the labour force participation of women towards 'best practice' levels achieved in Scandinavian countries, will raise output growth by an extra 0.75 percentage point per annum in Europe, 0.5 percentage point in Japan and a modest 0.25 percentage point in the US. Hence, a combined package of reform measures is estimated to raise output levels by over 40 percent in the EU-15, 30 percent in Japan and 15 percent in the US by 2050. In the case of Europe, the right combination of reform options can even lead to higher growth rates than the region has experienced in the past.

Real interest rates in the EU-15 countries could fall by about 1.5 point in the first half-century relative to the reference scenario from close to 5 percent in 2000 to 3.5 percent in 2050. Similar declines in the real interest rate occur in the US and Japan.

An Ageing study of the European Commission (DG Economic and Financial Affairs; K. McMorrow and W. Roeger [1999]) arrives at similar results as found in the OECD reports. Without any offsetting policy adjustments annual per capita growth of GDP would be 0.5 percent less relative to the baseline scenario, where the adverse effects of Ageing on the labour market and public expenditures are disregarded. In the comprehensive reform scenario the increase of GDP not only compensates for the detrimental effects of Ageing but GDP can grow by an extra annual 0.1 percent relative to the baseline scenario. Thus, if the right combination of reforms is chosen the EU-15 can entirely overcome the impact of Ageing and increase the level of GDP by an additional 5 percent in 2050.

Long-run trends (6.3)

Population Ageing is a long-run process occurring over the same time period as major institutional and technological developments and growth of international trade, which will reduce the adverse effects of population Ageing and favour future economic development. It can be assumed that there exists a key trend of a further rise in labour productivity, which may far outweigh the relevance of population Ageing. Population Ageing does not operate in isolation. The gloomy short-term perspectives contradict the long-term prospect of global developments and technological change which favour the international economy³⁰.

Several long-run trends reduce the expected adverse effects of population Ageing on the economy, the most important of which is the growth of labour productivity. Another major trend is the growing flexibility and decentralization of economic activities, indicated as institutional changes. There is a development from the (postwar) Keynesian economy – characterized by mass production techniques, large national corporations, standardized products, mixed economic order and an extensive welfare state with centralized pension systems – to the capitalist post-industrial society, with IT-induced

29) The case of Switzerland with a labour force participation rate of 82 percent for men of 55 to 65 years of age demonstrates conclusively that early retirement is by no means inevitable.

30) According to J.H. Schultz, A. Borowski and W.H. Crown [1991, p. 341], 'Not only is most of "the burden of the elderly" literature oversimplistic, it encourages us to look for solutions in the wrong places. Today, as in the past, the most important determinants of the future economic welfare of people (of all ages) are the longstanding factors discussed by economists and others as influencing growth: labour-force participation, saving, investment in human and business capital, technological change, entrepreneurial initiatives, managerial skills, government provision of infrastructure, and so on. *Thus the debate over how best to run an economic system is not primarily an Ageing discussion. In fact, the Ageing of populations may have little to do with the outcome.*'

smaller-scale production and flexible production techniques, diversified products and less commitments to the former welfare state (Laczko and Phillipson [1991]).

The formal retirement at a fixed age in the former centralized welfare state hence will evolve in the post-industrial state into a flexible (earlier and partial) exit route at various ages, based on more diversified and to a large extent privatized arrangements, which are predominantly actuarially fair on an individual basis. Institutional innovations in respect of retirement practices – more diversified, less restrictive – will in an atomized society to a major extent solve the problems associated with Ageing. The new exit routes comply with the new ways of production, the increased welfare of large groups of population and a new balance between individual and collective responsibilities. Growth in labour productivity will do the rest, leaving room for a further increase in welfare. Evidently there appears to be much reliance on market forces with their own merits and demerits.

In this brave new world we can rely upon that societies can adapt their economies successfully and can get older comfortably.

7. Summarizing and concluding remarks

Ten summarizing and concluding remarks are made.

* The so-called demographic transition primarily results from a decline in fertility rates, followed by increased longevity. Countries over the world are in different phases of the demographic transition. In all more developed countries and in many less developed countries as well over the course of the next 50 years there will be a substantial increase in the proportion of the population of age over 65 and a substantial decrease in the proportion of the population aged under 20. The working age population (those between 20 and 64 years of age) is less increasing or even slightly decreasing in the coming half century. Hence, young people in the developed countries (and in the more rapidly Ageing developing countries as well) likely will have to pay higher pension contributions, but out of higher incomes, thereby leaving further welfare growth for all. Older people have to work longer, but at better jobs and under better working conditions. Pensioners will receive lower incomes in relative terms and their assets unfortunately will be less worth than they expected.

The demographic transition presents the developed world with marked challenges and the developing world with appealing opportunities.

* Technological change, product specialization on a global scale together with international trade, institutional changes and population Ageing are all elements of the same long-term process. Hence, future production levels suffice to sustain a twice as large retired population. Society can afford to grow old. Population Ageing is not likely to create an aggregate shortage of savings and investment, thereby lowering the future resource base. There is more reason to be concerned about a qualified labour supply, notably in the health care sector. Note also that unemployment has reached levels comparable to the size of the elderly population in many Western countries³¹. Thus, there are much more resources that can be used. Policies stimulating labour force participation are necessary. Without sustained improvements in labour productivity and without increases in labour force participation economic growth rates in the EU-15 and in many other countries as well, will slow down in the coming decades.

The central conclusion of several general equilibrium multi-country simulation studies, done by IMF [1991], OECD [1998^b] and European Commission [1999, 2001, 2002] is that economic growth may slow down as populations age. The studies of the OECD and the European Commission also include calculations of the effect of comprehensive reform scenarios. Their impact is beneficial. They will more than compensate the negative effects associated with Ageing.

* Though population Ageing has not proven to be a real constraint on productivity so far, it may nevertheless require major adjustments as to the mechanism of distributing national product, hence to economic and social policies. The main example is the balancing of public budgets in respect of basic pension schemes, health care facilities and other government expenditures on behalf of the elderly. Higher taxes levied on labour income cause distortionary effects, impeding in turn economic

31) The EU opposed to the US and Japan, has still considerable unemployment. The paradox is that this weakness represents at the same time its force in facing the demographic transition.

development. To avoid budgetary imbalances and distributive problems (generational equity) drastic policy measures have to be taken on a broad front, viz. reducing benefits, increasing contribution rates, raising the retirement age and policies to improve the working of product and factor markets (labour and capital) and the allocation of resources. As a result economic growth will be boosted.

* Though the way of pension financing does not affect in its essentials the distribution across time of the resources to be transferred to the elderly, pay-and-you-go and funding differ in that the former increases labour costs as contributions and payroll taxes are predominantly paid out of workers' income or from the government's budget. There appears to be a strong emphasis upon fiscal and budgetary aspects to the neglect of a probable and hypothetically reasonable projection of real income and productivity growth, provided that adequate policy measures are taken.

To avoid severe fiscal and budgetary imbalances funding as a method of pension finance can be helpful, as reserving pension capital revenues for old age income provisions are not regarded as a burden opposed to contribution payments under a pay-as-you-go system.

* The basic issue in respect of accrued pension rights is that it constitutes a claim on future output in exchange for foregoing a part of present output. The real value of that claim under both systems depends on the availability of future resources. Under funding this value is dependent on e.g. inflationary processes, capital returns and the (market) price of assets. Under pay-as-you-go the claim value depends on the ability and the willingness of workers and taxpayers to finance pension outlays. Pensioners need and have under funding a firm and solid claim on national product, arising from their identifiable ownership of productive capital as a resource base of their own. Production is the result of the joint input of labour (belonging to the younger generations) and capital (to a large extent belonging to the elderly). Hence, pensions can be paid out of capital revenues rather than out of the labour income of the next generation.

* If funding of pension provision makes little difference as it does not increase national savings and investments and therefore does not lead to a higher national product, all Ageing countries may have similar problems ahead. It is often argued that the pension systems in e.g. France, Germany and Italy are not sustainable in the coming decades. Note, however, that saving rates and capital formation are not lower in the aforementioned countries than in the UK and the US.

If funding is (a part of) the solution, countries like Switzerland, the Netherlands and the UK are (happily) faced with a problem that can be easier dealt with than that in the aforementioned continental countries. From a security point of view, the UK pension system is (for the retirees) preferential to the systems we find in France, Germany and Italy. Nonetheless there is no bigger pie available out of which larger slices can be given. Guarantees are in some way or other always virtual. In a pay-as-you-go scheme they are based on the strength of the implicit social contract between generations, under funding they are based on the ability of the economy always to yield an adequate return on financial assets.

* Particularly imbalances may arise in two situations, one of which is budgetary and the other one originates from an inflationary environment. First, pension schemes predominantly based on pay-

as-you-go will lead to a doubling (or more) of contribution rates on labour income. All pension costs are borne by the working population – capital income due to its mobility can not be taxed effectively – , leading to i.a. social injustice and impeding the proper functioning of the labour market. Second, when asset prices fall as pensioners want to sell their assets to the less numerous younger generations, the elderly are left with pension incomes lower than they had expected. Demographic transitions can have significant asset market effects that hit some generations harder than others. The situation might worsen when tight labour markets and fiscal imbalances give rise to inflation.

On the other hand, high capital returns create a world characterized by a large retired leisure class of elderly and a poor working population giving rise to severe social imbalances. It may be concluded that society has more important priorities than allocating ever-increasing parts of national product to sustain an increasing number of ever-wealthier elderly.

* Population Ageing will change the balance between capital and labour in the developed countries. Labour supply will be scarce whereas capital will be relatively abundant. This will result in higher wages relative to the rate of return to capital. The impact of Ageing on productivity is highly speculative; opinions widely differ. Increased labour force participation will lessen the wage increase. An adequate albeit modest growth of productivity up to certain degree can compensate for labour scarceness and, hence adverse effects on the economy will be virtually absent. In developing countries the population age structure is younger and their economies are still characterized by a high supply of labour and a low supply of capital in relative terms. As a result, the rate of return on capital is higher in many developing countries. Capital exports to (well selected) developing economies can be helpful to resolve the Ageing problem in developed countries by shifting production of (consumer) goods to those emerging economies. Political, social and economic stability are utmost important conditions that have to be met if the demographic dividend were to be reaped.

* A variety of fiscal and other structural measures must be pursued to strengthen the foundations of the economy in coping with the Ageing in the more developed countries. Gloomy long run projections will actually become optimistic if between now and 2050 a) about 1½ percent (or more) productivity growth can be achieved, b) public pensions and public health expenditures to GDP ratios rise only moderately; an increase of three to five percentage points of GDP should not necessarily be considered as harmful and thus, unacceptable, let alone dramatic, c) budget deficits can be avoided, d) saving ratios and investment levels do not decline and e) we experience a further rise in labour force participation.

Apart from being impractical immigration in general is dissuaded as the costs often outweigh the benefits. Selective immigration, though detrimental to the country of origin, will be advantageous.

By implementing the right combination of economic and social policy measures with many feedback mechanisms, the adverse effects of population Ageing on the economy can be adequately compensated for. A fortiori, we could surprise ourselves afterwards by having created a stronger economy in an older society.

* Though welfare increases substantially for all in the coming decades, taxpayers may lose in relative terms due to higher contribution payments associated with Ageing. It is argued that this is not

something to be too concerned about. As individuals continue to grow more affluent, it seems likely that they will spend more on pension provision, health and long-term care, as they earlier did in respect of expenditures for food. Workers of all ages pay more and older workers stay longer in the labour force ('active Ageing'). Early retirement is strongly discouraged.

Furthermore, societies (urgently) need a new concept of intergenerational commitment. Twentieth century's forms of mandatory solidarity have to be replaced by new forms of generational cultural integration. A central policy objective throughout the world should be to restore and strengthen social cohesion and stable family structures.

References

- Aaron, H.J (1982): Economic effects of social security. The Brookings Institution, Washington, D.C.
- Aaron, H.J., Bosworth, B.P., G. Burtless (1989): Can America afford to grow old?, paying for social security. The Brookings Institution, Washington, D.C.
- Alessie, R.J.M., Kapteyn, A., Klijin, F. (1997): Mandatory pensions and personal savings in the Netherlands. *De Economist* 45, 1997, 291-324.
- Auerbach, A.J., Kotlikoff, L.J. (1987): *Dynamic Fiscal Policy*. Cambridge University Press, Cambridge, MA.
- Auerbach, A.J., Kotlikoff, L.J., Hageman, P.R., Nicoletti, G. (1989): The economic dynamics of an Ageing population: the case of four OECD countries. *OECD Economic Studies* no. 12, 97-130.
- Barr, N. (2000): Reforming pensions: myths, truths, and policy choices. Working Paper no. 00/39, International Monetary Fund, Washington, D.C..
- Bikker, J.A. (1996): National savings, the current account and Ageing populations: a pension fund model. *Economic and Financial Modelling* 3, 1-20.
- Blommestein, H. (1998): Ageing-induced capital flows to emerging markets do not solve the basic pension problem in the OECD area. *Financial Market Trends* no. 70. OECD, Paris, 83-94.
- Blöndal, S., Scarpetta, S. (1999): The retirement decision in OECD countries. Economics Department Working Paper no. 202, OECD, Paris.
- Bloom, D.E., Canning, D., Sevilla, J. (2001): Economic growth and the demographic transition. Working Paper no. 8685, NBER, Washington D.C.
- Bohn, H. (1999): Social security and demographic uncertainty: the risk sharing properties of alternative policies. Working Paper no. 7030, NBER, Cambridge.
- Börsch-Supan, A. (1996): The impact of population Ageing on savings, investment and growth in the OECD area. In: *Future global capital shortages: real threat or pure fiction*, OECD, Paris, 103-142.
- Börsch-Supan, A. (1998): Germany, a social security system on the verge of collapse. In: Siebert, H. (ed.): *Redesigning Social Security*, Mohr Siebeck, Tübingen, 129-160.
- Börsch-Supan, A. (2001): Labor market effects of population Ageing. Working Paper no. 8640, NBER, Washington D.C.
- Börsch-Supan, A., Winter, J.K. (2001): Population Ageing, savings behaviour and capital markets. Working Paper no. 8561, NBER, Washington D.C.
- Börsch-Supan, A., Ludwig, A., Winter, J.K. (2002): Ageing and international capital flows. In: Auerbach, A.J., Herrmann, H. (eds.): *Ageing, Financial Markets and Monetary Policy*. Springer, Heidelberg, 191-227.
- Bosworth, B. (1996): Prospects for saving and investment in industrial countries. In: *Future global capital shortages: real threat or pure fiction*, OECD, Paris, 19-46.
- Bosworth, B.G. Burtless, G. (1998): Ageing societies, the global dimension. Brookings Institution Press, Washington D.C.
- Bovenberg, A.L. and A.S.M. van der Linden, A.S.M. (1997): Can we afford to grow old?. CPB research memorandum no. 134, The Hague.
- Bovenberg, A.L. (2002): Pension systems in Ageing societies. In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 183-206.

- Breyer, F. (1990): *Ökonomische Theorie der Alterssicherung*. Verlag Franz Vahlen, München.
- Broer, D.P. (2001): Growth and welfare distribution in an Ageing society: an applied general equilibrium analysis for the Netherlands. *De Economist* 149, 81-114.
- Broer, D.P., Westerhout, E.W.M.T. (1996): Pension policies and lifetime uncertainty in an applied general equilibrium model. In: Broer, D.P., Lassila, J. (eds.): *Pension policies and public debt in dynamic CGE models*. Physica Verlag, Heidelberg, 110-125.
- Brooks, R. (2000^a): Life cycle portfolio choice and asset market effects of the baby boom, Research Paper, IMF, Washington, D.C.
- Brooks, R. (2000^b): Population Ageing and global capital flows in a parallel universe. Working Paper no. 151, IMF, Washington, D.C.
- Chand, S.K., Jaeger, A. (1996): Ageing populations and public pension schemes. Occasional Paper no. 147, IMF, Washington D.C.
- Chauveau, T., Loufir, R. (1997): The future of public pensions in the seven major economies. In: Broer, D.P., Lassila, J. (eds.): *Pension policies and public debt in dynamic CGE models*. Physica Verlag, Heidelberg, 16-73.
- CPB (1996): *Omgevingsscenario's Lange Termijn Verkenning 1995-2020*. Working Paper no. 89, The Hague.
- CPB/CBS (1997): *Bevolking en arbeidsaanbod, drie scenario's tot 2020*. SDU, The Hague.
- CPB (2000): *Ageing in the Netherlands*, SDU, The Hague.
- Cutler, D.M., Poterba, J.M., Sheiner, L.M., Summers, L.H. (1990): An Ageing society: opportunity or challenge? *Brookings Papers on Economic Activity* 1, 1-73.
- Dang, T.-T., Antolin, P., Oxley, H. (2001): Fiscal implications of ageing: projections of age-related spending. *Economics Department Working Paper no. 305*, OECD, Paris.
- Davis, E.P. (1998^a): European pensions, 'fundamental' influences and the role of Economic and Monetary Union. *Journal of Pensions Management & Marketing* 3, 206-237.
- Davis, E.P. (1998^b): Population Ageing and retirement income provision in the European Union. In: Bosworth, B., Burtless, G. (eds.): *Ageing Societies*. Brookings Institution Press, Washington, D.C., 33-110.
- Davis, E.P. (2002): Ageing and financial stability. In: Auerbach, A.J., Herrmann, H. (eds.): *Ageing, Financial Markets and Monetary Policy*. Springer, Heidelberg, 191-227.
- Diamond, P.A. (1997): Insulation of pensions from political risk. In: Valdés-Prieto, S. (ed.): *The economics of pensions, principles, policies, and international experience*. Cambridge University Press, Cambridge, 33-57.
- Dielen, H., Kalshoven, C., Schotsman, H. (2002): *Nog vele jaren!* ABN-AMRO, Amsterdam.
- Disney, R. (1996): *Can we afford to grow older; a perspective on the economics of Ageing*. MIT Press, Cambridge, MA.
- Disney, R. (2000): Crises in public pension programmes in OECD: what are the reform options? *The Economic Journal* 110, 1-23.
- Disney, R., Johnson, P. (eds.): *Pension systems and retirement incomes across OECD countries*. Edward Elgar, Cheltenham, UK.
- Economic Policy Committee/EU (2000): *Progress report to the Ecofin Council on the impact of ageing populations on public pension systems*, Brussels.

- Economic Policy Committee/EU (2001): Budgetary challenges posed by ageing populations: the impact on public spending on pensions, health and long-term care for the elderly and possible indicators of the long-term sustainability of public finances, Brussels.
- Economic Policy Committee/EU (2002): Reform challenges facing public pension systems; the impact of certain parametric reforms on pension expenditure, Brussels.
- Elmeskov, J., Scarpetta, S. (2000): New sources of economic growth in Europe?, 28th economic conference of the Österreichische Nationalbank, OECD, Paris.
- Engen, E.M., Gale, W.G. (1997): Effects of social security reform on private and national saving. In: Sass, S.A. and Triest, R.K. (eds.): Social security reforms; links to saving, investment and growth. Conference Proceedings, Federal reserve bank of Boston, Boston.
- Englander, A.S., Gurney, A. (1994): OECD productivity growth: medium-term trends OECD Economic Studies no 22, 112-130.
- Esping-Andersen, G., Duncan, G., Hemerijck, A., Myles, J. (2001): A new welfare architecture for Europe? Report submitted to the Belgian Presidency of the European Union, Brussels.
- European Commission (1999), see McMorrow, K., Roeger, W. (1999).
- European Commission (2001): Prospects and policy challenges for the EU economy. Brussels, 2001.
- European Commission (2002), see McMorrow, K., Roeger, W. (2002).
- European Round Table of Industrialists (2000): European Pensions, an appeal for reform. Brussels.
- Euwals, R. (2000): Do mandatory pensions decrease household savings?, evidence for the Netherlands. *De Economist* 148, 643-670.
- Fair, R.C., Dominguez, K.M. (1991): Effects of the changing US age distribution on macroeconomic equations. *American Economic Review* 81, 1276-1294.
- Feldstein, M.S. (1974): Social security, induced retirement and aggregate capital formation. *Journal of Political Economy* 82, 905-926.
- Feldstein, M.S. (1995): Social security and saving: new time series evidence. Working Paper no. 5054, NBER, Washington, D.C.
- Feldstein, M.S., Siebert, H. (eds.) (2002): Social security pension reform in Europe, University of Chicago Press, Chicago.
- Fenge, R. (1995): Pareto-efficiency of the pay-as-you-go pension system with intergenerational fairness. *Finanzarchiv* 52, 357-363.
- Ferguson, N., Kotlikoff, L.J. (2000): The degeneration of EMU. *Foreign Affairs* 79, 101-121.
- Fougère, M., Mérette, M. (1997): Population ageing and economic growth in seven OECD countries. Ministry of Finance of Canada, Ottawa.
- Franco, D., Munzi, T. (1996): Public pension expenditure prospects in the European Union: a survey of national projections. In: *European Economy*, European Commission, Brussels.
- Franssen, W. (2002): Increased labour force participation among older people: Holland's trump card in countering the effects of an ageing population. In: *Social security and changes in the world of work*. ISSA, Geneva, 133-144.

- Futagami, K., Nakajima, T. (2001): Population Ageing and economic growth. *Journal of Macroeconomics* 23, 31-44.
- Gern, K.-J., (2001): Recent developments in old-age pension systems - an international overview. In: Feldstein, M., Siebert, H. (eds.): *Social security pension reforms in Europe*. University of Chicago Press, Chicago, 439-478.
- Group of Ten (1998): *The macroeconomic and financial implications of ageing populations*. Bank for International Settlements, Basle.
- Hebbink, G.E. (1996): Vergrijzing, overheidsfinancien en besparingen: een overzicht van recente literatuur (in Dutch). *Maandschrift Economie* 60, 407-430.
- Heller, P. et al. (1986): Ageing and social expenditures in the major industrial countries, 1980-2025. Occasional Paper no. 47, IMF, Washington, D.C.
- Hemming, R. (1999): Should public pensions be funded? *International Social Security Review* 52/1, 3-30.
- Henkens, C.J.I.M. (1998): *Older workers in transition; studies in the early retirement decisions in the Netherlands*. NIDI, The Hague.
- Heyma, A.O.H. (1990): *Dynamic models of retirement from the labour force: an empirical analysis of early exit in the Netherlands*. Leyden University Press, Leiden.
- Higgins, R. (1999): Demography, national savings and international capital flows. *International Economic Review* 39, 532-574.
- Hillman, A.L. (2002): Immigration and intergenerational transfers. In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 213-226.
- Holzmann, R. (2000): Can investments in emerging markets help to solve the Ageing problem? Social Protection Discussion Paper no. 00/010, World Bank, Washington D.C..
- Hughes, G., Stewart, J. (eds.) (2000): *Pension in the European Union: adapting to economic and social change*. Kluwer, Boston.
- Hviding, K., Mérette, M. (1998): Macroeconomic effects of pension reforms in the context of ageing populations: overlapping generations model simulations for seven OECD-countries. Economics Department Working Paper no. 201, OECD, Paris.
- IBRD (World Bank) (1994): *Averting the old-age crisis; policies to protect the old and promote growth*. Oxford University Press, Oxford.
- ILO (2000): *Social security pensions; development and reform*. Geneva.
- IMF (1990): see Masson, P.R. and R.W. Tryon (1990).
- INGENUE-team (Aglietta, M., Arezki, R., Breton, R., Fayolle, J., Juillard, M., Lacu, C., Cacheux, J. Le, Rzepkowsky, B., Touzé, V.) (2002): *Macroeconomic consequences of pension reforms in Europe: an investigation with the INGENUE world model*. CEPII-CEPREMAP-OFCE, Paris.
- Jacobzone, S., Cambois, E., Robine, J.-M. (2000): Is the health of older persons in OECD countries improving fast enough to compensate for population ageing? *OECD Economic Studies* no. 30, Paris.
- JETRO (Japan External Trade Organization) (2001): *Comparison of systems in Japan, US, Western Europe and Asia*, paper 2nd Policy Summit of the Global Ageing Initiative (Zürich, January 2001), Tokyo.
- Johnson, P., Zimmermann, K.F. (eds.) (1993): *Labour markets in an ageing Europe*. Cambridge University Press, Cambridge.
- Johnson, P. (2002): The impact of ageing: the supply of labour and human capital. In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 111-125.

- Jousten, A., Pestieau, P. (2001): Labor mobility, redistribution and pension reform in Europe. In: Feldstein, M., Siebert, H. (eds.): Social security pension reforms in Europe. University of Chicago Press, Chicago, 2001.
- Kandiyoti, D. (1999): Poverty in transition: an ethnographic critique of household surveys in post-Soviet Central Asia. *Development and Change* 30, 499-524.
- Kinsella, K., Velkoff, V.A. (both from US Census Bureau) (2001): An Ageing world. US Government Printing Office, Washington, D.C.
- Kohl, R., O'Brien, P. (1998): The macroeconomics of ageing, pensions and savings: a survey, Economics Department Working Paper no. 200, OECD, Paris.
- Kotlikoff, L.J., Smetters, K., Walliser, J. (2001): Finding a way out of America's demographic dilemma. Working Paper no. 8258, NBER, Cambridge, MA.
- Kuné, J.B. (2000): Issues in Pension Finance. Netherlands Foundation for Pension Studies. The Hague.
- Laczko, F., Phillipson, C. (1991): Changing work and retirement; social policy and the older worker. Open University Press, Milton Keynes.
- Leibfritz, W., Roseveare, D., Fore, D., Wurzel, E. (1996): Ageing populations, pension systems and government budgets: how do they affect saving? In: Future global capital shortages: real threat or pure fiction, OECD, Paris, 47-102.
- Lichtenberg, F.R. (2002): Sources of U.S. longevity increase, 1960-1997. Working Paper no. 8755, NBER, Washington D.C.
- Liedtke, P.M. (2001): Driving potential pension solutions. Working Paper, Geneva Association, Geneva.
- Lindeboom, M. (1998): Microeconometric analysis of the retirement decision: the Netherlands. Economics Department Working Paper no. 207, OECD, Paris.
- Liu, S., MacKellar, L. (2001): Key issues of Ageing and social security in China. Interim Report no. 4, IIASA, Laxenburg.
- MacKellar, L., Reisen, H. (1997): A simulation model of global pension fund investment. Research Paper, OECD, Paris.
- MacKellar, L., Ermolieva, T., Horlacher, D., Mayhew, L. (2002): Economic impacts of population Ageing in Japan. IIASA, Laxenburg.
- MacManus, S.A. (1996): Young v. Old, generational combat in the 21st century. Westview Press, Boulder, Co.
- Mantel, J. (1999): European Pension Reforms; three fundamental questions. Merrill Lynch, London.
- Masson, P.R., Tryon, R.W. (1990): Macroeconomic effects of projected population Ageing in industrial countries. IMF Staff Papers 37, 453-485.
- Masson, P.R. (1991): Effects of long-run demographic changes in a multi-country model. IMF Working Paper no. 91/123, Washington, D.C.
- McMorrow, K., Roeger, W. (1999): The economic consequences of ageing populations. Economic Papers no. 138, DG for economic and financial affairs/European Commission, Brussels.
- McMorrow, K., Roeger, W. (2002): EU pension reform – an overview of the debate and an empirical assessment of the main policy reform options. Economic Papers no.162, DG for economic and financial affairs/European Commission, Brussels.

- Michalski, W., Miller, R., Stevens, B. (1995): Future global capital shortages; some key issues and policy recommendations. In: Future global capital shortages: real threat or pure fiction, OECD, Paris, 7-18.
- Miles, D. (1997): Financial markets, ageing and social welfare. *Fiscal Studies* 18, 161-187.
- Miles, D. (1999): Modelling the impact of demographic change on the economy. *The Economic Journal* 109, 1-36.
- Miles, D. (2002^a): The influence of ageing on capital accumulation. In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 131-154.
- Miles, D. (2002^b): Should monetary policy be different in a greyer world? In: Auerbach, A.J., Herrmann, H. (eds.): *Ageing, Financial Markets and Monetary Policy*. Springer, Heidelberg, 243-276.
- Mueller, D.C. (2002): The political economy of Ageing societies, In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 269-284.
- Mullan, P. (2000): *The imaginary time bomb, why an Ageing population is not a social problem*. I.B. Tauris, London.
- Nimwegen, N., Beets, G. (2000): *Bevolkingsvraagstukken in Nederland anno 2000* (in Dutch). NIDI, The Hague.
- Roseveare, D., Leibfritz, W., Fore, D. Wurzel, E. (1996): *Ageing populations, pension systems and government budgets: simulations for 20 OECD countries*. Working Paper no. 168, OECD, Paris.
- OECD (1996): *Ageing in OECD countries, a critical policy challenge*. Paris.
- OECD (1998^a): *Maintaining prosperity in an ageing society*. Paris.
- OECD (1998^b): see Turner, D. et al. (1998).
- OECD (2000^a): *Reforms for an Ageing Society*. Paris.
- OECD (2001): *Links between policy and growth: cross-country evidence*. Economic Outlook no. 68, OECD, Paris.
- OECD (2001): *Fiscal implications of ageing: projections of age-related spending*. Economic Outlook no. 69, OECD, Paris.
- OECD (2001): *Ageing and income; financial resources and retirement in 9 OECD countries*. OECD, Paris.
- Oksanen, H. (2002): *Pension reforms: key issues illustrated with an actuarial model*. Economic Papers no. 174, DG for economic and financial affairs/European Commission, Brussels.
- Peterson, P.G. (1999): *Gray dawn; how the coming age wave will transform America – and the world*. Times Book, New York.
- Portes, R., Rey, H. (1999): *The determinants of cross-border equity flows*. Working Paper no. 7336, NBER, Washington D.C.
- Poterba, J.M. (1998): *Population age structure and asset returns: an empirical investigation*. Working Paper no. 6774, NBER, Washington D.C.
- Poterba, J.M., Venti, S.F., Wise, D.A. (1998): *Personal retirement saving programs and asset accumulation: reconciling the evidence*. In: Wise, D.A. (ed.): *Frontiers in the Economics of Ageing*. University of Chicago Press, Chicago.
- Reinhardt, U.E. (2002): *Health care for the Ageing baby boomers: how serious a problem?* In: Siebert, H. (ed.): *Economic Policy for Ageing Societies*. Springer, Heidelberg, 235-262.

- Roseveare, D., Leibfritz, W., Fore, D., Wurzel, E. (1996): Ageing populations, pension systems and government budgets: simulations for 20 OECD-countries. Working Paper no. 168, OECD, Paris.
- Schieber, S.J., Shoven, J.B. (1997): The consequences of population Ageing on private pension fund saving and asset markets. In: Schieber, S.J., Shoven, J.B. (eds.): Public policies towards pensions. MIT Press, Cambridge, MA, 219-246.
- Schultz, J.H., Borowski, A., Crown, W.H. (1991): Economics of population Ageing, the "graying" of Australia, Japan and the United States. Auburn House, New York, 1991.
- Siebert, H. (ed.) (1998): Redesigning social security. Mohr Siebeck, Tübingen.
- Sociale Verzekeringsbank (2001): Grenzen aan de premie (in Dutch). Economisch-Statistische Berichten, D8-9.
- Spillman, B.C., Lubitz, L. (2000): The effect of longevity on spending for acute and long-term care. New England Journal of Medicine 342, 1409-1415.
- Stowe England, R. (2002): The fiscal challenge of an Ageing industrial world, CSIS, Washington, DC.
- Stowe England, R. (2002): Global Ageing and financial markets; hard landings ahead?, CSIS, Washington, DC.
- Stowe England, R. (2002): The macroeconomic impact of global Ageing, CSIS, Washington, DC.
- Thompson, L.H. (1995): The advantages and disadvantages of different social welfare strategies. International Social Security Review 48, 59-73.
- Thompson, L.H. (1996): Principles of financing social security pensions. International Social Security Review 49, 45-63.
- Thompson, L.H. (1998): Older and wiser: the economics of public pensions. The Urban Institute Press, Washington, D.C.
- Tinker, M., Nossek, V., Elgeti, R., O'Sullivan, M. (2002): Pension reforms in Europe; Europes' Enron: implications for equities, bonds and alternative investments. Commerzbank, Frankfurt.
- Turner, D., Giorno, C., De Serres, A., Vourc'h, A., Richardson, P. (1998): The macroeconomic implications of ageing in a global context. Economics Department Working Paper no. 193, OECD, Paris.
- UN (2000): Replacement migration: is it a solution to declining and ageing populations? UN Population Division, New York.
- Vandenbroucke, F. (2001): Sustainable social justice through European coordination? Tinbergen lecture, Koninklijke Vereniging voor de Staatshuishoudkunde, Amsterdam.
- Vandenbroucke, F. (2002): Social justice and open coordination in Europe, reflections on Drèze's Tinbergen lecture. De Economist 150, 2002, 83-93.
- Vatter, H.G., Walker, J.F. (1998): Support for baby-boom retirees - not to worry. Journal of Economic Issues 32, 79-86.
- Visco, I. (2001): Economic policy for Ageing societies. Conference Paper, OECD, Paris.
- Walker, A., Naegele, G.(eds.) (1999): The politics of old age in Europe. Open University Press, Buckingham.
- Walker, A. (2002): A strategy for active ageing. International Social Security Review 55(1), 121-139.
- Wallace, P. (1999): Agequake, riding the demographic rollercoaster shaking business, finance and our world. Nicholas Brealey Publishing, London.

Wigger, B.U. (2002): Public Pensions and Economic growth. Springer, Heidelberg.

World Bank, see IBRD.