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MONEY, FINANCE AND DEMOGRAPHY:

THE CONSEQUENCES OF AGEING

Papers presented at the 26th SUERF Colloquium in Lisbon

Edited by Morten Balling, Ernest Gnan and Frank Lierman

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Money, Finance and Demography: The Consequences of Ageing

A significant ageing trend can be observed in Europe and in other parts of the world. Fertility is decreasing and life expectancy increasing. The impact of migration is growing. The book deals with the implications for financial markets of these demographic trends. Leading economists and financial experts from Europe and the United States evaluate the challenges to public pension systems and the private pension industry. Based on long-term projections of productivity and employment they look at potential growth in GDP per capita and implications for savings and wealth. Pension fund portfolio management is discussed together with the ability of capital markets to serve retirement-financing purposes. Fiscal as well as financial sustainability are analysed in depth. The roles of global imbalances and international capital movements are included. Most chapters also discuss policy implications - in particular with regard to how pension saving incentives and rules and incentives for retirement should be in order to ensure fiscal and financial sustainability. All contributions in the book are based on presentations at the 26th SUERF Colloquium on Money, Finance and Demography – the Consequences of Ageing held on 12-14 October, 2006 in Lisbon sponsored by Banco de Portugal and Millennium bcp and in cooperation with the Universidade Nova de Lisboa.

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Money, Finance and Demography: The Consequences of Ageing

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Abbreviations

ABP	Algemen Burgerlijk Pensioenfonds
ADL	accrued-to-date liabilities
AEX	Amsterdam Exchange index
AOW	Algemene Ouderdomswet (General retirement pensions Act)
AWG	Ageing Working Group of the Economic Policy Committee
BBVA	Banco Bilbao Vizcaya Argentaria
CEE	Central and Eastern Europe
CEPR	Centre for Economic Policy Research
CEPS	Centre for European Policy Studies
CPB	Centraal Planbureau (Netherlands Bureau for Economic Policy Analysis)
CPI	Consumer Price Index
DG ECFIN	Directorate-General for Economic and Financial Affairs (European Commission)
DNB	de Nederlandsche Bank
EC	European Commission
ECOFIN	Economic and Financial Affairs Council of the Council of the European Union
EIB	European Investment Bank
EMU	European Monetary Union
EPC	Economic Policy Committee
ESA95	European System of Accounts 1995
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FMA	Finanzmarkt Aufsicht (Austrian Financial Market Authority)
FTSE	Financial Times Stock Exchange
FY	full year
G7	Group of Seven
G10	Group of Ten
GDP	Gross Domestic Product
HA-SHIW	Historical Archive of the Banca d'Italia Survey of Household Income and Wealth
HMD	Human Mortality Database
ICT	Information and Communications Technology
IFRS	International Financial Reporting Standards
IIP	International Investment Position
IMF	International Monetary Fund

ITL	Italian Lira
KAG	Kapitalanlagegesellschaft
KPN	Dutch telecom company – formerly Koninklijke PTT Nederland
MIT	Massachussetts Institute of Technology
MIUR	Ministero dell'Università e della Ricerca
NAIRU	Non-accelerating Inflation Rate of Unemployment
NBER	National Bureau of Economic Research
NDB	notionally-defined benefits
NDC	notionally-defined contributions
OECD	Organisation for Economic Co-operation and Development
OeNB	Oesterreichische Nationalbank
OGWG	Output Gap Working Group
OLG	overlapping generations models
OPEC	Organization of the Petroleum Exporting Countries
OSL	open-system liabilities
PAYG	pay-as-you-go
R&D	research and development
SHIW	Banca d'Italia Survey of Household Income and Wealth
SIT	Slovene Tolar
TFP	Total Factor Productivity
UBS	Union Bank of Switzerland
UK	United Kingdom
UN	United Nations
US	United States
USA	United States of America
USD	United States Dollar
WTO	World Trade Organization
WWII	World War II
ZPIZ	Zavod za pokojninsko in invalidsko zavarovanje
ZZZS	Zavod za zdravstveno zavarovanje Slovenije

1 Ageing – a Challenge for Economic Policy Makers, Financial Regulators and Financial Markets

Morten Balling, Ernest Gnan & Frank Lierman

The chapters in this volume are all based on contributions to a Colloquium on *Money, Finance and Demography – the Consequences of Ageing* organised by SUERF in October 12–14, 2006 in Lisbon in cooperation with *Universidade Nova de Lisboa*. Chapters 2 to 7 provide a global view of demographic trends in fertility, mortality, migration and retirement behaviour and the implications of these trends for economic growth, public finances and financial markets. Chapters 8 to 12 are country case studies in which the authors look more closely at pension problems, fiscal sustainability, savings behaviour and the financial system in a sample of individual countries.

In chapter 2, Ignazio Visco, (Central Manager for Economic Research, Banca d'Italia) discusses longevity risk and financial markets. The author documents the long-term increase in old-age dependency ratios all over the world. Population ageing affects on public finances, labour markets and corporate strategies. The predicted increase in life expectancy is in most countries being met with higher pension contributions, lower replacement rates and later retirement. The concept of longevity risk refers to uncertainty about changes in life expectancy. In designing appropriate pension systems, accurate mortality projections are important. The author mentions several projections that are applied in company pension schemes as well as in public pension programs.

Applying observed improvements in life expectancy since 1990 as a basis for forecasting extra pension payments in the Italian pension system, the author arrives at an amount of more than EUR 300 billion in net present value terms. Longevity risk of this magnitude should affect portfolio allocation. The question is, however, whether people behave rationally. Do they suffer from myopia? Farsighted individual investors take longevity risk into account. Some work longer and save more. Since many people are not farsighted, mandatory public pension schemes could be important to reduce undersaving. The trends pose challenges to the retirement savings industry and financial markets. Annuities are the classical answer to longevity risk, but not the only one. The author mentions reverse mortgages as another appropriate financial instrument. He concludes with some policy recommendations: Economic growth should be supported, markets for under-supplied financial instruments should be facilitated, regulatory and supervisory frameworks should be developed and ensure better governance of private pension funds and the protection of pension beneficiaries should be improved.

In chapter 3, Barry Eichengreen, (Professor of Economics and Political Science, University of California, Berkeley) looks at the possible impact of demographic factors on global imbalances. He focuses in particular on China and the United States. There is a huge deficit on the US balance of payments current account while China has a large current account surplus. The United States has a more rapidly growing population than Europe and Japan and it has a well functioning financial system. Other things equal, this should make it an attractive place to invest. China has a relatively low old-age dependency ratio and underdeveloped financial markets. Consequently, the country is saving a lot and runs a current account surplus. While the elderly share of the labour force will rise modestly in the United States, it will rise sharply in China less than a decade from now.

The author expresses some scepticism regarding the ability of demographic factors to improve our understanding of global imbalances. Demographic factors are just one among many factors that can influence global imbalances. The decline in public savings in the United States is a consequence of discretionary fiscal policy. Federal tax revenue as a share of GDP has declined while public spending on health care and defence has increased. Private savings have declined partly due to high asset valuations, which increase households' perceived wealth. Regarding the high Chinese savings rate, the author mentions the extraordinary high savings rates of enterprises, which were running in excess of 20 per cent of GDP in 2005. The low exchange rate has boosted the profitability of Chinese manufacturing and the firms' ability to retain earnings.

In the view of the author, the imbalances will have to be corrected. For political reasons, it will be unacceptable if foreigners end up holding half of the country's capital stock. A strong negative reaction against extensive foreign ownership of productive assets in the United States can be expected. Foreign investors, not willing to continue accumulating low-yielding US Treasury bills and not permitted to accumulate claims on productive assets will grow reluctant to finance US deficits. Higher long-term interest rates and slower global growth will follow. Ultimately, the bill for the high level of US absorption and the world economy's dependence on the US consumer will come due.

In chapter 4, Gilles Mourre and his colleagues (Directorate General for Economic and Financial Affairs, European Commission) assess the overall economic impact of ageing for the EU Member States on the basis of long-term macroeconomic projections developed by the Economic Policy Committee and the European Commission. The authors list three main demographic drivers: fertility, life expectancy and migration flows. They describe the methodology of the applied long-term economic projections based on Eurostat data. Projections for the impact of ageing on employment, productivity and potential growth in real GDP and GDP per capita are presented. They analyse labour market characteristics in terms of participation and employment rates.

The projections show that the population in the EU-25 will be both smaller and older in 2050 than it is now. However, the authors remind the readers that projections are not forecasts. The projections just provide an indication on the potential timing and scale of challenges that could result from an ageing population based on a "no policy change" scenario.

In their discussion of policy implications, the authors leave out issues of public finances and focus on general labour market and economic policy implications. The labour market is key to successful policy adjustment. Ultimately, it is the economic output of a country that determines its capacity to sustain high quality welfare systems. Raising employment rates of older workers, including those aged over 65, will remain a critical policy objective for EU Member States. Financial incentives, flexible retirement pathways and policies to tackle age-discrimination are needed. Immigration could be a positive factor in labour market adjustment. It is a key challenge for the EU to better integrate immigrants into the labour market. In order to improve productivity, innovation and R&D activities should be strengthened.

In chapter 5, Vincenzo Galasso (Associate Professor of Economics at Bocconi University, Milan) applies a political economy approach to evaluate decisions concerning postponement of retirement. In democratic countries, it is necessary to obtain the support of a majority of the Parliament or the electorate. Most countries run unfunded pay-as-you-go pension systems which imply that they are financed through taxation. The ageing of the population undermines the financial sustainability of these systems. Ageing societies will have to place larger financial burdens on the working generations or to reform the pension systems. The author provides a quantitative assessment of the future political sustainability of the current pension systems. He asks: Will voters be willing to postpone retirement? Retirees will according to the author always support a system where workers pay through taxes. Other individuals will consider current and future contributions to the system and expected future benefits. The median age among voters is expected to increase monotonously from 2005 to 2050. The political influence of the elderly voters will increase. So will contribution rates. Simulations suggest that a rise in the effective retirement age would be pivotal in reducing the expected increase in pension spending. In his model, the author tries to capture the main economic, demographic and political aspects, and the institutional elements of the different social security systems in France, Italy, the UK and the US. The model is fed with forecast values of relevant variables for the year 2050. The ageing process modifies the demographic balance of the social security as well as the political representation of the different generations of workers and retirees. It turns out that in all countries median voters choose an increase in the retirement age. In all countries, except Italy, the social security contribution rate and the generosity of the pension benefit increase as well.

In chapter 6, Mark Weth (Economics Department, Deutsche Bundesbank) and Sebastien Schich (Directorate for Financial and Enterprise Affairs, OECD) present estimates of future retirement-financing-related bond demand over the next four decades. Volatile financial markets have led managers of defined-benefit pension funds to sharpen their focus on asset-liability management. Pension fund portfolios consist of both bonds and equities. The authors focus on the question of how future bond demand may develop given future demographic developments. They try to estimate potential demand for government bonds for retirement-financing purposes. They use demographic projections and mortality statistics for the G-10 country populations to derive estimates of bond demand until 2050. In the analysis, they apply an overlapping generations model with uncertain lifetime and a rule for portfolio choice between risky and riskless assets. In the model, aggregate bond demand becomes a function of longevity, age of entry into retirement and labour productivity. In the baseline scenario, retirement-financing-related demand for bonds will increase continuously from today until 2050. The authors study the sensitivity of the results to changes in assumptions concerning respectively labour productivity growth, retirement age and longevity.

In chapter 7, Etienne de Callataÿ, (Chief Economist, Bank Degroof) studies private retirement saving. Ageing is likely to increase significantly age-related social expenditures in Europe. There is a broad consensus among economists that structural reforms will have to be implemented in order to widen the funding basis. Proposals to implement a higher effective retirement age and to make health care more selective are discussed in most countries. Younger generations will anticipate both an increasing fiscal pressure and declining social protection. Younger generations will also face uncertainty about the future shape of social security systems and their own long term financial needs. Anticipating at best a stagnating disposable income and facing longevity risk, young generations can be expected to smooth their consumption patterns out by increasing their savings rates. Policy makers can therefore be inclined to promote individual savings and to provide fiscal incentives in favour of private pension schemes. Such a policy seems to be relatively cheap for the Government budget and to be an appropriate way to achieve a rebalancing in pension provision in countries where most of the elderly income is coming from unfunded public schemes. The author emphasizes, however, five caveats:

First, financial markets might fail to transfer purchasing power over time. Large savings aiming at retirement could push asset prices up for some years, which could be followed by an asset meltdown when savers retire. Second, promoting long-term private savings could act as a brake on structural reforms that pension regimes do need. If promotion of private savings is presented as the solution of the ageing challenge, the political pressure for reforming public schemes is alleviated. Third, when reliance on private savings forms the key part of the policy answer to the ageing challenge, consumption patterns may be suboptimal. People do not know for how long they will live and how much they will have to spend on old-age care. Since they are risk-averse they will over-save for the case of becoming very old and being in need for medical care. Fourth, people do not have satisfactory information regarding their long-term savings decisions. A higher aggregate savings ratio can be achieved through a higher budgetary surplus. Fifth, there are drawbacks in the way long term private savings are managed. There are costs in pension fund management and pension funds may abuse their market power. The author concludes that private savings should complement, not substitute fiscal orthodoxy and structural reforms.

Chapter 8 is the first country case study in this volume. The author Martin Werding (Ifo Institute for Economic Research, Munich) studies the implicit pension debt in the German pension system in relation to the existing pay-as-you-go public pension scheme. EU-level authorities are currently working on new sophisticated measures of fiscal sustainability. They are meant to support consultations regarding sound fiscal policies and the observation of the criteria of the Stability and Growth Pact. Unfunded liabilities of public pension schemes are an important ingredient in calculating any of these indicators, but explicit calculations regarding the aggregate size of implicit pension debt are so far not part of these efforts. The author argues that this may change in the future. The EU Commission and international rating agencies have expressed their interest in including measures of the future public pension burden in evaluations of sustainability. Cross-country comparisons of the size of implicit pension debt are difficult partly because there seems to be a conflict between reliability and comparability. If calculation assumptions are harmonized country-specific features of pension systems are lost. In countries with notionally defined benefit systems it is the implicit debt involved in future benefit entitlements that is of highest importance. By contrast, in countries with notionally defined contribution schemes, projecting future contributions is at least equally important. The author distinguishes between two notions of implicit pension debt. “Accrued-to-date liabilities” are the present value of outstanding benefit entitlements of current pensioners plus future entitlements of the active population to the extent that these are linked to their past and current contributions. “Open-system liabilities” include most of the elements mentioned plus the future benefit entitlements of the currently active population that will arise from their future contributions to be paid over the regular course of a working life and future benefit entitlements of all future contributors, estimated with an infinite time horizon. Whatever definition is used, implicit debt can be really sizeable. The author bases his long-term projections on the CESifo Pension Model that covers expenditures and revenues of all branches of the German social insurance system and on official demographic projections by Statistisches Bundesamt spanning the period until 2050. After the 2004 pension reform, the accrued-to-date liabilities and open-system net liabilities are estimated at between 260 per cent and 207 percent of German GDP. The calculations indicate that the recent German pension reforms noticably improved the long-term sustainability of the German public pension scheme.

In chapter 9, Marianna Brunetti and Costanza Torricelli (University of Modena and Reggio Emilia and CEFIN) assess the impact of ageing on household portfolios in Italy. In comparison with other countries, ageing in Italy is exceptional. Elderly people usually have lower saving rates and higher average risk aversion than the rest of the population. Consequently, ageing affects financial markets. The authors utilise historical and forecast data on the structure of the Italian population. Their analysis relies on birth, mortality and immigration rates and on data from a Bank of Italy survey of households' income and wealth. Included are data from the United Nations Population Prospects covering a 100 year long period: 1950 to 2050. They rank countries according to their old-age dependency ratio. In 2050, the highest ratios are expected in Japan, Italy and Spain. The proportion of elderly people has progressively enlarged. The share of the working-age population is shrinking. There has been a strong increase in net migration to Italy.

The evidence on the composition of households' wealth confirms that a large fraction of households holds very few types of financial instruments and tends to concentrate wealth in safe assets. Since 1995, the share of Government bonds in household portfolios has declined. The shares invested in the safest assets (cash and deposits) are particularly high for both very young and very old households. The share invested in stocks is almost negligible in younger-household portfolios, peaks in those of late-middle-age households and shrinks once again when the households reach the retirement age. Managed investments seem to be the investment preferred by any age-class. The data support a life-cycle theory of portfolio behaviour.

In their conclusion, the authors combine the facts on Italian population ageing with the observed age-related portfolio behaviour. On this basis they expect on the Italian financial markets a substantial shift from risky assets such as stocks and corporate bonds, towards safer ones such as managed investments, government bonds and deposits.

In chapter 10, Wim Boonstra, (Chief Economist, Rabobank Nederlands, Utrecht) discusses whether or not it is useful for policymakers to aim at the creation of a large international asset position when preparing for population ageing. The Netherlands have a well-developed capital-based system of old age provisions. The system is compulsory for all employees and implies a high level of collective savings. For decades, the country has had a savings surplus. There has been a surplus on the balance of payments current account most of the years after Second World War. The Dutch system of old age provision is based on the so-called three pillar system. Under capital based pension schemes, working people save for their own old-age provision, leading to savings surpluses and a build-up of pension wealth in the years in which the working group is at its largest. The system can be improved by cross-border investments. If in the future the current account turns into deficit, this can be financed by bringing down foreign assets. As a result of the huge net outflows of capital, one would expect the Netherlands to be an important creditor nation. The importance of the current account balance for the development of the international investment position has, however, declined due to the globalisation of companies. Today, investment flows are much larger than trade flows and certainly much larger than current account balances. Adjustments of the book value of foreign direct investments and gains and losses on cross-border holding of securities do not result in cross-border cash flows and are therefore outside the scope of the balance of payments. Especially for small open economies such as the Netherlands and Finland, the cumulative current account balance is affected by the change in the international investment position. As concerns cross-border holdings of securities, foreign investors have usually realized higher capital gains on their portfolio holdings of Dutch securities than the other way around. Foreigners have benefited from the relatively good performance of the Dutch stock market, while Dutch investors have paid a price for the strength of their currency. According to the author, this is an unintended and irrational way of spending national wealth. The Dutch experience shows that it is far from certain that the creation of extremely large national savings surpluses is of any help in meeting the challenges of ageing.

In chapter 11, Stefan W. Schmitz (Oesterreichische Nationalbank) analyzes the impact of demographic developments in Austria on funded pension provision in Austria. It is well known that demographic changes have implications for the sustainability of public pension systems. The paper questions the implicit assumption that private pension provision would not be negatively affected by demographic change. The author criticizes the so-called "Asset Meltdown" Hypothesis according to which dissaving by pensioners may trigger declines in asset prices. The paper contains an overview over the expected demographic development in Austria until 2050. The share of people above the age of 65 is expected to increase to 28.48 per cent. Since 1999, savings products geared to capital markets have gained in relative importance. That includes tax-subsidized pension saving products. The combined investments of funded pension provision schemes amount to some 25 per cent of GDP. This amount is expected to increase considerably due to increasing coverage and compulsory membership for employees. The author refers to several studies on how ageing can be expected to affect GDP growth per capital and labour productivity. All in all, the quantitative studies of the impact of demographic change on the macroeconomy conclude that demographic change has a negative impact on GDP per capita growth in 2004–2050. The author's own model is based on a number of simplifying assumptions. The economy is supposed to be closed and it excludes monetary policy, inflationary expectations and financial market volatility. The effects of a decline in the rise of the number of economically active persons are studied. The model shows that the impact of demographic change on funded pensions is complex. Demographic developments trigger a decrease in long-term average real interest rates in Austria. Future productivity growth will fall, which will negatively affect funded pension provision. Also an increase in longevity will have a strong negative impact on the level of funded pensions.

In chapter 12, Hana Genorio (Bank of Slovenia) presents estimates of the impact of demographic changes on pension and health care expenditures in Slovenia. Currently, Slovenian Government debt is relatively low by international standards. Data from Eurostat demonstrates that in 2004, Slovenia had the fifth lowest government debt as percentage of GDP in the EU-25. Unfavourable demographic trends endanger, however, debt sustainability in the future. The Slovenian population is expected to become the seventh oldest population in the world by the year 2050. Long-term sustainability is also threatened by low fertility rates, leading to an ever-smaller working-age population to support the increasing number of pensioners. The author calculates debt sustainability coefficients under different scenarios. All the coefficients are calculated under three different pension indexation rules and eight alternative macroeconomic scenarios. The calculations show that demographic changes will have a strong impact on future pension and health care expenditures. Medium-term debt sustainability coefficients show that fiscal adjustments would be needed under almost all scenarios.

* * * * *

Demographic changes are of great importance. Peoples' behaviour changes as they grow older. So do their needs. Together, decreasing fertility, increasing life expectancy and migration explain the ageing trend that can be observed in Europe and in other parts of the world. The papers in the present volume analyze the far reaching implications for the economy and for the financial markets of these demographic changes. We are confident that the readers will appreciate the insight and knowledge that the contributors to this SUERF volume have provided concerning these important issues.

2 Longevity Risk and Financial Markets

Ignazio Visco

"Then the Lord said, 'My Spirit will not contend with man forever, for he is mortal; his days will be a hundred and twenty years'." (Genesis, 6:3)

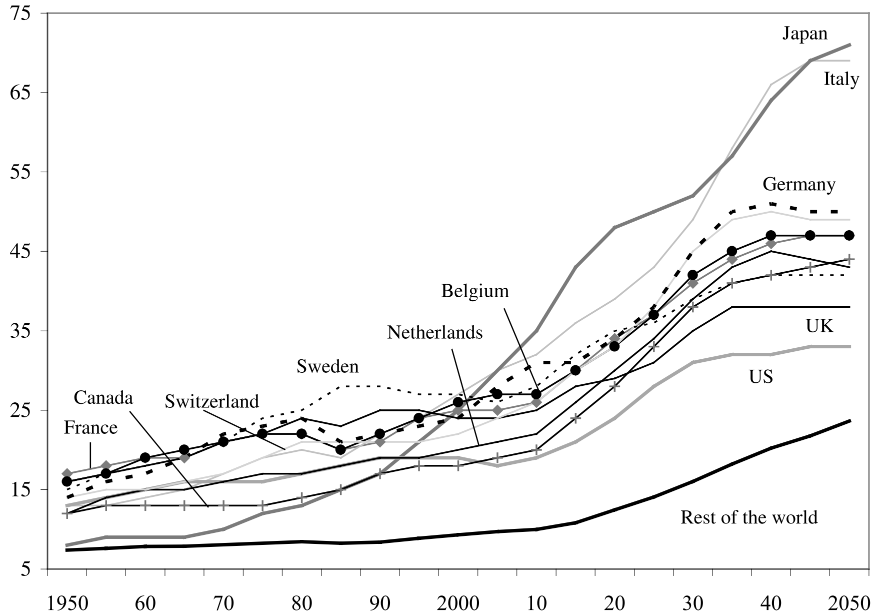
"Youth is sweet and well / But doth speed away! / Let who will be gay, / To-morrow, none can tell." (Lorenzo de' Medici "il Magnifico", Trionfo di Bacco e Arianna; trans. L. de' Lucchi)

"…the average duration of human life is proved to have increased in recent years. The calculations of various life assurance and annuity offices, among other figures which cannot go wrong, have established the fact … it is governed by the laws that govern lives in the aggregate." (Charles Dickens, Hard Times)

2.1 Introduction

In his millennial perspective on The World Economy, the eminent economic historian Angus Maddison underlined the spectacular rise of average life expectation that occurred in the nineteenth and in the twentieth century: from a life of 24 years expected at birth in the year 1000 in Western Europe, the Western Offshoots (United States, Canada, Australia and New Zealand) and Japan, a figure of 36 years is estimated for the year 1820, reaching 46 years in 1900, 66 in 1950 and 78 at the turn of the century. Less spectacular, but still very large, is the progress in the rest of the world, where on average life expectation at birth is currently around 65 years. This result reflects for a large part the dramatic fall in infant mortality. Over the last half a century, however, life expectancy at old age has also increased dramatically. Following this secular rise in longevity, and partly due to the lower fertility rates, as the baby-boom generation reaches retirement the world population is now ageing at a very rapid rate (Fig. 2.1). This is particularly evident in OECD countries, but is also taking place in several emerging economies, most notably in China.

Figure 2.1 Old-age dependency ratios



Ratio of the population aged 65 years or over to the population aged 15 – 64, in per cent

Source: United Nations Population Division, World Population Prospects: the 2004 Revision.

Living longer and in good health is certainly a marvellous achievement, especially if one has the resources to enjoy it. It also poses, however, a series of challenges for public finances and the working of labour markets, with wide-ranging effects on consumer preferences and corporate strategies. With an increasing number of elderly people requiring care and the necessity of reforming pension systems devised in an era of lower life expectancy and higher fertility rates, the consequences on age-related public expenditures might be severe, as many studies by the OECD, the European Commission, national agencies and academic economists have indicated.

Macroeconomic effects of population ageing range from impacts on labour supply and its rate of utilisation to investment, productivity and consumption patterns, external balances and cross-border capital flows. Among them, an educated reading of some recent empirical work suggests that:

- Growth and saving rates might tend to fall relative to trend. However, if rather than relying on increases in pension contributions to balance pay-as-you-go pension systems, contribution rates were held constant, retirement age were gradually increased and replacement rates for new retirees were gradually reduced, savings might increase significantly over the next couple of decades in order for consumption levels to be sustained upon retirement.

- Without substantial changes in retirement age and in other public pension system parameters, strong public spending pressures would be observed, while general government revenues would be depressed. A considerable increase in age-related public spending would also come through the health chapter.
- As industrial countries age faster than younger developing countries, shifts toward current account surpluses might be observed for some time in the former, which would invest in the latter and shift to deficits as ageing becomes more acute. While this fails to match the current constellation of current accounts around the world (the large US current account deficit or the still rising current account in Japan, with China not being an obvious case), the prediction of current accounts moving towards higher surplus in industrial countries is widely shared.
- To the extent that retirees sell their financial assets to a smaller middle-aged generation in order to fund consumption, an increasing old-age dependency ratio may temporarily translate into downward pressure on asset prices, but the size of this effect is likely to be relatively small. Similarly, while changes in population structure may affect potential output growth, real interest rates and the importance of household wealth in the transmission of monetary policy, this should not be such as to require specific policy interventions or framework changes.

On the pension front, the expected increase in life expectancy is being generally met with higher contributions, lower replacement rates and later retirement, even if the process is by no means linear, necessary additional reforms are under consideration, and the generation of sufficient consensus in society has often proved rather laborious. There is no question, however, that if life expectancy continues to grow at the rates we have been experiencing over the last decades, the exceptional rise in well-being that has been achieved so far, in particular since the Second World War, will be maintained only by keeping a balance between the increase in longevity and a higher age of retirement.

This said, overall the changes in public pensions are likely to imply, ceteris paribus, a noteworthy reduction in retirement income relative to wages. Therefore, demographic developments coupled with the growing need to provide for retirement privately will probably prompt an increase in the flow of saving directed to fund retirement, whether or not this is accompanied by an increase in national saving rates. Furthermore, increases in life expectancy seem lately to have consistently exceeded forecasts and life expectancy estimates have been repeatedly updated. This uncertainty over changes in life expectancy, which is a loose definition of longevity risk, must also be considered in order to ensure that the elderly do not experience significant drops in consumption. While changes in life expectation at old ages certainly still call for policy reforms, the longevity risk can be tackled with the help of financial markets, which have already developed an expertise in managing various forms of risk.

In this speech I will first define longevity risk and discuss some measurement issues; I will then illustrate how longevity risk affects individual behaviour, in particular savings patterns, and how this may impact on financial markets; finally I will discuss the availability and development of financial instruments and markets needed to deal with longevity risk. I will conclude by sketching a few policy implications arising from increasing longevity and the associated risk.

2.2 Longevity risk: definition and measurement issues

Demographic changes cause both accidental and systematic deviations of the number of deaths from their expected values. As observed in a fascinating lecture delivered a couple of years ago by Mervyn King on What Fates Impose, the former is a proper insurance risk, the random variation around a fixed known mortality probability. By its very nature it is a pooling risk and can therefore be swept away by increasing the number of policies. The latter, a collective longevity risk, is due to unexpected changes in mortality trends, i.e. a systematic differential between the number of deaths per cohort and its expected value. This longevity risk is non-diversifiable across individuals, since it affects all of them in the same way and affects the whole portfolio of the insurance provider.

The dynamics of mortality over the last fifty years shows a consistent pattern across all high-income economies. In particular, data show:

- An increase in life expectancy at old ages (65 years and older).
- An increase in the mode of the age of death distribution.
- A decrease in mortality rates at old ages.

In terms of the shape of the survival function, which plots the number/fraction of survivors against age, and the curve of deaths, which plots the number/fraction of deaths against age, the following features are worthy of note:

- The survival function tends to shift towards a rectangular shape due to the increasing concentration of deaths around the mode (at old ages) of the curve of deaths.

- The survival function expands to the right, i.e. the mode of the curve of deaths moves towards very old ages.

Basically, the cohorts that show the greatest improvement in life expectancy are steadily moving upwards. Even more striking is the fact that the pace of mortality improvement at older ages seems to be accelerating over time. It is not clear whether this counters the view that assumes biological limits to the human life-span, say a limit of 120 years as postulated by the Bible (after the ages of patriarchs….), and it may very well be that survival rates at old ages gradually approach some positive limit rather than converge exponentially towards zero.

To put numbers in perspective, life expectancy at the age bracket 65–69 was between 13 and 14 years for the French, the Japanese and the Italian populations in 1950, between 16 and 17 in 1980 and between 19 and 21 in 2000. This impressive improvement has been common to most industrialised countries as well as to the developing world (though to a lesser extent and with the grievous exception of Sub-Saharan Africa). In per cent, the ratio of life expectancy improvement between 1980 and 2000 has tended to be larger at older ages (85 years and older).

From a financial point of view, while the concentration of deaths around the mode reduces the variance of the distribution and so the related risk, the expansion phenomenon, i.e. the risk of systematic deviations of mortality from the assumed projected behaviour, together with the accelerating trend of mortality decline at old ages, increases risk. These trends highlight the importance of accurate mortality projections based on stochastic analysis in order to provide reliable measures of mortality and of its uncertainty.

Unfortunately, national statistical agencies in industrial countries seem to have systematically under-predicted life expectancy gains, leading to significant under-estimation of the numbers of the elderly, markedly the oldest old. Official mortality forecasts are traditionally based on forecasters' subjective judgments, in light of historical data and expert opinions. A range of uncertainty is indicated by high and low scenarios, built on the basis of subjective opinions. It is common practice to define some upper bound to improvements in mortality, usually in terms of a maximum level of life expectancy, based on biomedical considerations. This leads to a targeting approach, which consists in interpolating between current mortality rates and targets assumed to hold at a given future date, thus leaving room for subjective judgment, and perhaps excessive sensitivity to short-term trends in mortality. In the actuarial profession parametric methods are also popular: they assume a given distribution law for mortality, fit the parameterised curve to past data and project trends in the parameters forward; of course, parameter uncertainty is crucial. Selecting different values for the parameters, one may construct different scenarios.

Even though multiple scenarios may then be produced, under these two approaches it remains difficult to attribute a probability assessment to each scenario and so obtain measures of uncertainty useful for evaluating financial risks, something akin to confidence intervals. On the contrary, methods of trend extrapolation, i.e. time-series analysis applied to project historical trends in the future, that are widely accepted among demographers, do not suffer from these drawbacks. Particularly popular is the model proposed by Lee and Carter in 1992, where the possibility of age-specific patterns in mortality decline (e.g. that old ages register stronger improvements) is explicitly taken into account. This might prove very useful in forecasting dependency ratios between retirees and active population. Furthermore, this method provides easily understandable uncertainty measures as it allows for a stochastic error term and seems to fit better the actual mortality trend at old ages, not only in terms of life expectancy but also in terms of age distributions of death.

For instance, the Lee-Carter model retroactively applied to US data up to 1925 projects a life expectancy for the year 2000 of 72 years at birth, reasonably close to the actual figure of 77 and much closer than the figure of 65 projected in 1930 by the National Resources Committee of the US Government. Using this method, Tuljapurkar, Li and Boe produced in the year 2000 projections for the G7 countries that show average life expectancy gains by 2050 of about 7 years, twice as large as the average gains in official projections.

The Lee-Carter model assumes a constant rate of decline in mortality, a fact in contrast with the accelerating pattern of mortality improvement. Indeed, new recent research has suggested that the official forecast error might prove even larger than that implied by the Lee-Carter methodology. Indeed, there is strong evidence in favour of a historical linear trend in life expectancy across all high-income/low-mortality countries: life expectancy has increased linearly at a very remarkable pace, with gains exceeding 2 years per decade. At this rate, life expectancy would rise by as much as about 11 years in 2050.

One should also observe that there are not only forecast errors but also lags in the production, adoption and disclosure of mortality tables. The cross-country variations in mortality assumptions used by company pension schemes seem to be too great to be justified by the differences in the profiles of their members, as a recent study at Cass Business School has convincingly shown. Indeed, this may have dramatic consequences on financial markets and institutions: according to a much quoted calculation by UBS, the FTSE 100 companies' combined pension deficit of more than £40 billion would rise to a £63 billion deficit using French mortality tables, but would become a £3 billion surplus using German mortality assumptions. These differences are simply too large, and call for substantial investment to be made in producing and updating timely mortality tables, as well as in better modelling the uncertainty around the projections.

So as the 2005 G10 report concluded: “Regulators should promote transparent disclosure of mortality and disability projections and pension actuaries should determine the extent to which these projections reflect actual plan experience and how they model and allow for the uncertainty surrounding these estimates in their funding strategies”. Indeed, more could and should also come through the market process: in this respect the recent launch of the Credit Suisse Longevity Index for the US population is a major advance.

Obviously longevity risk is not only faced by company pension schemes but by public programmes as well. In order to provide a rough estimate of the longevity risk faced by the Italian pension system, for example, if we take the population aged 50 years and older (assuming that younger individuals would bear most of the cost of pension reforms aimed at correcting the effects of longer life expectancy), we can compute the extra pension payments that they would receive if they lived longer than expected. Applying from 2005 forward the same percentage improvements observed in life expectancy between 1990 and 2002 (year of the latest official mortality table) in net present value terms the cost of the shock would be a little under 320 billion euros, corresponding to about 10 per cent of the present value of pension liabilities implicit in the current system (22 per cent of 2005 GDP, with an average annual flow of about half a percentage point of GDP for the next decade, and one percentage point in the 2020s and 2030s). Note that this is a conservative estimate of the total cost of longevity risk since it does not take into account the fact that households will be bearing more of it in the future owing to the decreasing substitution rates (pensions are projected to decrease from 60–80 to 40–60 per cent of the last wage, with households likely to fill the income gap with proceeds from their investments in second and third pillar instruments).

From this perspective as well, therefore, it is crucial to have better and timely updated mortality tables that would allow timely changes to be introduced in the pension schemes and the projections to be surrounded by an uncertainty band so as to better evaluate the longevity risk. In order to reduce the forecast bias, attention should also be given to smoothing the crude mortality rates published by government statistical agencies on the basis of observed cohort data. After all, we may agree with Charles Dickens’ Mr. Gradgrind in Hard Times when he says “the average duration of human life is proved to have increased in recent years”, while wishing that his faith in the “facts” and especially in the ability of “life assurance and annuity offices” to corroborate them will be reinforced when it is most needed.

2.3 Longevity risk and individual behaviour

When making their saving and portfolio choices, farsighted investors take longevity risk into account. However, their choices are constrained by the size and structure of public pension systems and by the degree of market incompleteness (in particular, by the limited availability of well-functioning annuity markets), which in turn may depend on the level of potential demand and the same longevity risk. Indeed, perfectly rational investors in an economy with complete markets are in any case exposed to the aggregate uninsurable consequences of unexpected changes in average longevity. It has also been convincingly argued that, in general, individuals and households fail to properly weigh the long-run consequences of their own present decisions. Therefore, longevity risk is likely to affect households' behaviour in many ways.

Under certainty, one not so surprising implication of the life-cycle model is that individuals should react to an unexpected increase in longevity by working longer and by saving more. When longevity itself is (perceived as) uncertain, there is empirical evidence showing that the precautionary component of household savings is not negligible. Indeed, it is reasonable to assume that the saving rate of agents increases with the amount of longevity risk that they face. After all, the precaution motive ("to build up a reserve against unforeseen contingencies") was readily recognised by Keynes in The General Theory as one of the main "objects of a subjective character which lead individuals to refrain from spending out of their incomes". The strength of this relationship is also influenced by the institutional characteristics of the economy. In particular, if fairly priced annuities were available, savings would be only modestly affected by longevity risk (or at least its idiosyncratic component). The precautionary motive would also be less strong if a sizeable public pension system were in place (at least if we assume away intergenerational altruism); in countries where the social security system has means-tested elements and/or displays a high degree of progressiveness (as in the USA or the UK) this is especially true for the poorer groups in the population. Even without considering public pensions and privately provided annuities, implicit intergenerational contracts inside the household may act as a substitute for precautionary savings, by allowing the sharing of the parent's longevity risk with the children.

The amount of desired precautionary savings decreases if individuals can change their labour supply and their portfolio allocation. On the other hand, labour market uncertainty and financial market fluctuations can themselves be causes of additional saving. While it is reasonable to expect that an increase in expected longevity increases the desired portfolio share of risky assets, especially shares (as longer lived individuals benefit more from the equity premium), we do not know much about the impact of longevity risk on optimal portfolio allocation. It is plausible, however, to assume that investors should react to an increase in longevity risk with a reduced willingness to take other kinds of risks, even if they are unrelated to longevity. This in turn should imply that, when saving for retirement, investors may demand a greater amount of long-term securities, which have a lower reinvestment risk; the demand for stocks should also go up as short-period fluctuations tend to cancel out in the long run. Using the same logic, one should note that the size and design of social security arrangements determine the amount of risk (and in particular of longevity risk) suffered by workers. As a consequence, social security reform could influence in subtle ways optimal portfolio decisions (a somewhat counterintuitive implication is that shrinking public pensions could actually discourage risk taking).

As has been widely documented, however, investors often behave in less-than-rational ways. This is especially true when economic decisions involve a long time horizon and face several sources of uncertainty, as in the case of adjusting one's saving and portfolio choices to face the risk of an uncertain lifespan. On one side, individuals may not discount future pay-offs at a constant rate. Instead, their discount factor for nearer periods may be larger than the discount factor applied to more remote periods. As a consequence, they may have a tendency to under-save, as saving implies short-term costs in term of consumption, while benefits arise only in the future. On the other side, a tendency to underestimate the role of uncertainty on the realisation of events in the distant future may reduce the perception of the size and impact of longevity risk on one's future needs and means. There is evidence that the decision to save for retirement is indeed plagued by myopia and procrastination, that participants of retirement savings plans rarely alter their contribution levels or rebalance their portfolios, and that default options have long-lasting effects on both variables. As reported by Choi et al. in 2001, in a survey of employees 68 per cent of respondents complain that they save too little for retirement, 24 per cent plan to raise their contributions in the future, but only 3 per cent among them actually do so. Voluntary investment in occupational pension plans seems to be boosted if the plan policy is one of automatic enrolment, and if the matching contribution of the employer is relevant.

As a consequence, mandatory public schemes could be important to reduce under-saving and the effects of inertial behaviour. Furthermore, a widespread presence of myopic saving decisions would imply that government laws and regulations should encourage the setting of default options which minimise the costs of investors' mistakes. In general, however, the understanding of financial products, concepts and risks should be encouraged through the promotion of well-designed programmes of financial education. Surveys of financial literacy and findings of behavioural economics not only show that financial education does not seem sufficient to ensure adequate saving for retirement, but also that the awareness of the need to be financially educated is rather limited.

Under certainty, an economy in which there are relatively more elderly people with respect to the working age population (e.g. due to an increase in average longevity) should have a higher saving rate, a higher steady state level of capital per capita, and consequently higher wage rates and lower interest rates. Under uncertainty, if agents face an increase in uninsurable longevity risk (and if we exclude the very special case of quadratic preferences and certainty equivalence), there should be an additional demand for savings due to the precautionary motive. In the real world both the effects of increased average longevity and those of an increase in longevity risk are likely to be present and to reinforce each other. Market and institutional failures that may limit a proper response then deserve to be investigated in depth and duly removed.

Finally, besides these steady state effects, demographics can also exert transitory (albeit long-lasting) effects on interest rates and asset prices. An example is given by the danger of the so-called asset meltdown, linked to the retirement of the baby boom generation (here the problem would be caused by a transitory increase in fertility, as opposed to a permanent decrease in mortality). While these effects are theoretically clear, their magnitude is likely to be small, due to the two factors we have highlighted in the previous pages: the institutional features of many economies (in particular, sizeable public pension systems and underdeveloped annuity markets) and the myopic and inertial behaviour of many investors. These two effects are likely to be mutually self-sustained: more farsighted individuals would probably vote to shrink or at least to change the structure of social security systems in the face of worrying demographic perspectives; they would also demand more annuities, reducing their costs. Also the general equilibrium effects induced by demographic developments on financial markets are likely to be smaller in an open economy. Indeed, if capital is freely mobile among countries, it will move from ageing to young countries, reducing the volatility of interest rates and asset returns.

2.4 The retirement savings industry and financial markets

Longevity risk then poses a challenge to households that do not rely almost exclusively on public pension schemes to sustain themselves. If a significant fraction of their income is made of returns on real and financial wealth, individuals that live longer than expected may draw down their wealth too soon, thus entering their final years without enough income to support themselves. Privately funded pension arrangements then become a natural answer. Indeed, in several countries a tendency towards privately funded pension arrangements has already been observed, relying more heavily on defined contributions, and in some cases with pension funds becoming the largest class of institutional investors. Insurance companies also play an important role, and in some countries are currently the main provider of funded retirement saving products. A further substantial increase in the size of the pension fund industry will probably be observed in the coming years, accompanied by a greater influence on financial markets. In the G10 countries, aggregate pension fund assets already represent more than 20 per cent and 10 per cent of equity and bond market capitalisations, respectively, albeit with great variability across countries. It is therefore relevant to examine the recent developments and possible prospects of the pension fund industry.

Relaxed liability management experienced during the 1990s stock market growth, in conjunction with increases in longevity beyond earlier actuarial projections, the 2000–02 sharp fall in equity prices and declining bond yields (increasingly used as the basis for discounting liabilities), has led to the emergence of funding gaps in occupational defined benefit plans in several countries. In particular, relevant duration gaps have emerged between pension funds' assets and liabilities, due to the mismatching of maturities and the insufficient hedging of market risks.

Policy initiatives have aimed at increasing the viability of defined benefits pension systems in the longer run, including through strengthened supervisory oversight and the adoption of more rigorous risk-based approaches. A notable trend has been the continued move in several countries towards defined contribution schemes. Market-based, fair value accounting standards have been introduced. On the regulatory front, measures increasingly require pension plan managers to assess more fully the financial cost of the pension benefit promises offered to plan participants, review pension fund investment strategies and increasingly focus on asset-liability management considerations.

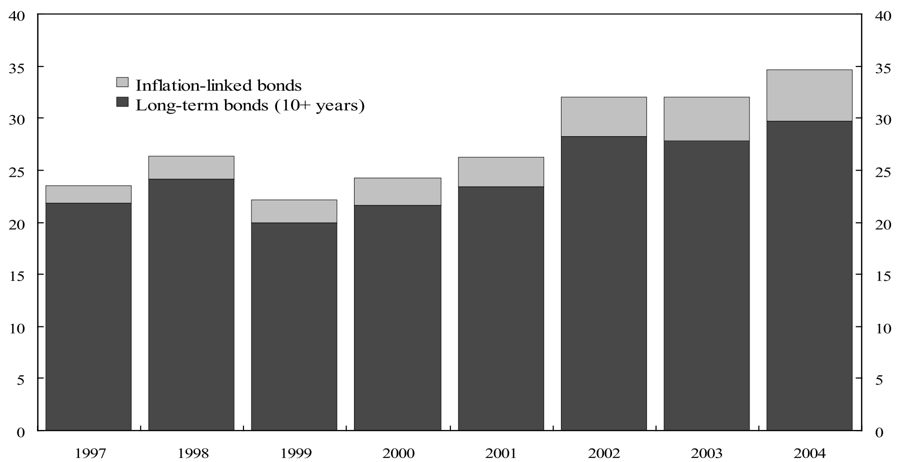
2.4.1 Long-horizon, index-linked and longevity bonds

Currently, however, there is a perceived lack of instruments for pension funds to properly hedge interest rate, inflation and longevity risks. The evidence shows that:

- Most advanced economies' markets for long-dated bonds are still too small relative to the size of pension fund and insurance company portfolios (Fig. 2.2). Even in the United States, the deepest market for long-term bonds, the market size for maturities beyond 10 years is relatively modest. In the most recent years there has been a return of interest in issuing long and ultra long government bonds but, at around 5 years, the duration of public debt in most countries is still rather short. In most mature markets private corporations, such as capital-intensive industries, utilities, and financial services (banks and insurers), may also wish to issue longer-term securities. So far, however, price uncertainty resulting from the lack of public benchmarks, tax disincentives in some countries, as well as more cyclical factors may have been an obstacle.

- As in the case of long-dated bonds, the supply of index-linked bonds also remains insufficient to meet potential demand. The scale of the shortage of indexed securities is illustrated by the fact that occupational pension funds and life insurance companies in the United Kingdom already have 80 per cent of outstanding long-dated and index-linked gilts. This holds even with an asset allocation to bonds at many funds of only 20–30 per cent of their total portfolio. Indeed, the potential demand for pension funds and life insurance providers may exceed current supply by three times or more (Table 2.1). Given the limited supply of long-dated and index-linked bonds, fund managers have increasingly employed derivative instruments in order to improve the consistency between portfolio duration and pension liability structure and/or to obtain protection against inflation or interest rate risks. It is not clear how far trustees are aware of this action.

Figure 2.2 Size of the G10 long-term and inflation-linked bond markets



in per cent of global pension fund assets

Sources: Watson Wyatt; International Financial Services, London; OECD; Barclays; Merrill Lynch; and IMF staff estimates.

- Also, longevity risk management could benefit from the availability of longevity bonds, which could, in turn, encourage insurance and reinsurance companies to increase their supply of annuity products. Mortality-linked securities could also provide some hedge against longevity risk, even if not a perfect one as mortality, while certainly correlated with longevity, is unfortunately not limited to the very old. Another possibility, to date still hypothetical, might be the recourse to macro-swaps, through which (for example) the pension fund and health care industries may exchange their opposite exposures to longevity.

It is a fact that financial institutions which are exposed to longevity risk and need ways to manage it have traditionally been hampered by a scarcity of hedging instruments. The first market instruments suitable for hedging longevity risk have recently been introduced by financial institutions: e.g. the 3-year mortality bond issued by Swiss Re and the 25-year longevity bond presented (but not placed yet) by the European Investment Bank. The first instrument is a bond whose principal payment is tied to an international mortality index. The second is a (group) annuity bond whose annual coupon payment is tied to the survivorship of some reference population; as the members of this population die off, the coupon payment gradually falls.

Table 2.1 Potential demand for long-term and inflation-linked bonds: Selected countries

	Current supply		Potential demand		
	Corporate and government long-term bonds	Inflation-indexed government bonds	Life insurance investments and pension funds total assets	50 per cent asset allocation to bonds, in per cent of long-term and inflation-indexed bonds	75 per cent asset allocation to bonds, in per cent of long-term and inflation-indexed bonds
United States	1,266	233	13,432	451	677
United Kingdom	241	155	2,476	313	469
France	178	92	1,055	195	293
Italy	241	28	370	69	103
Japan	427	22	2,251	251	376

In billions of US dollars; amount outstanding at the end of 2004

Sources: Ageing and Pension System Reform, Report to the G10 Deputies, 2005; Pension Markets in Focus, OECD Newsletter, December 2005.

Although it raised a strong interest in the financial community, the EIB longevity bond did not meet market demand and had to be withdrawn for redesign. This experience has raised a number of issues which must be dealt with in order to create a proper market for longevity risk. Among them, as capital is costly and there are further risks to hedge (e.g. interest rate, inflation, investment risks) which already absorb capital, it might be difficult to stand by the requirement to commit the entire principal. Longevity securities must have a high degree of gearing in order to raise sufficient demand from longevity exposed financial institutions. This makes a case for mortality derivatives like swaps or forwards. Furthermore, demand is potentially large, calling for issues of significant size, suitable to create adequate liquidity (the EIB bond was a mere GBP 540m issue). Also, as longevity risk tends to concentrate in the long term (due to the difficulties of projecting long-term mortality), 25-year maturity bonds might not be long enough. Finally, basis risk (i.e. imperfect hedging capacity) stems both from the maturity mismatch and the imperfect matching between the mortality experience of the reference population for the security and that of the group of annuity or pension fund claim holders. From this experience, however, much has been understood, and this is the foundation of progress.

In order to allow some degree of intergenerational risk sharing, an intriguing proposal (by Boeri et al., 2006) consists in promoting collective pension funds that mix older and younger generations of participants. The main idea is to shift from final-pay with recovery premium schemes (which, by the way, distort labour markets by charging larger contributions in case of a shortfall of assets with respect to liabilities) to career-average with conditional pension rights schemes that allow younger workers to share wage risk with older ones and reduce the increases in contributions that would be needed should the fund experience a shortfall in assets with respect to its liabilities. In essence, older participants would have senior claims on the fund's assets, while younger ones would have equity-type claims. While a difficulty might be raised by the fact that the attribution of participants to the older and younger generations might itself depend on the demographic changes, a question linked to the preceding discussion is that the shift from an equity to a bond portfolio is essentially a shift from a variable to a fixed return. Again, sufficiently deep markets for long-horizon and index-liked bonds would be needed.

2.4.2 Annuities

As observed, households will increasingly face longevity risk, directly or indirectly. Much can be done to provide insurance against its idiosyncratic component, to maximise the share of wealth allocated to face it and to share it with future generations. In general, as individuals and households are increasingly charged with the responsibility of managing their own retirement savings, the availability of a variety of retail products becomes crucial. For instance, "life cycle" funds have been developed that allow portfolio rebalances consistent with the changing risk profile of workers as they age. In principle, structured products (including capital or performance guarantees) offer diversified risk/return profiles; however, given their higher complexity and risk exposure, they are likely to require the introduction or strengthening of consumer protection measures. Increasingly important for individuals and households would then be the existence of well developed markets for annuities, financial contracts that convert long-term savings into dependable income streams after retirement.

Given the magnitude of longevity risk, one would expect individuals to insure themselves against it; however, the markets for annuities, the most widespread instrument devised for this purpose and a product that has been sold for centuries, are generally underdeveloped (especially for individuals) and the number of institutions providing annuity products is declining. For example, in the United Kingdom, a country in which Social Security offers only a small coverage and individuals are expected to live off their (adequately invested) savings, annuities cover less than 10 per cent of longevity risk in the private sector.

There are many possible reasons, on the demand as well as on the supply side, why annuity markets are less developed than expected. Among them:

- The existence of annuitised resources from (public or private) defined benefits plans; bequest motives; lack of understanding of annuity products by households.
- The taxation design; in some countries, for instance, fiscal rules have historically favoured lump-sum withdrawals at the expense of annuities.
- Real or perceived cost issues, due in part to adverse selection effects, although these can be partly overcome via mandatory annuitisation, as suggested by some recent experience, as well as opaque or inefficient pricing by insurance companies.

However, on the money's worth of annuities the evidence is mixed: adverse selection certainly plays a role but the discount on the fair value is not very high in many countries and seems to be shrinking (it is almost never higher than 10 per cent, often lower than 5 per cent). Furthermore, risk averse customers should be willing to pay for a product that does not give back 100 per cent of its money's worth in order to be insured.

A further issue might be that annuities insure against longevity risk but, as they are sold now, they do not protect against other risks, which might be deemed more relevant by many households. For example, most annuities do not protect against inflation risk, while investing one's wealth in equities does, to a large extent. Standard annuities distribute income in an inflexible way and do not provide protection against liquidity shocks, for example related to health issues. Finally, annuities do not give back any upside of higher-than-expected investment returns and are therefore an inferior investment vehicle (although they should really be considered an insurance product).

On the supply side, in order to match assets and liabilities insurance companies should invest in assets with a duration that is comparable to the duration of an annuity. However, the latter is high and, as we have seen, there are not many assets with a similar duration; therefore, insurance companies would be taking on some financial risk on top of longevity risk. A more subtle issue, perhaps, is the systematic nature of longevity risk, which can only be shared across generations. Only the idiosyncratic component is diversifiable, the collective risk has no obvious hedge; sectors that might benefit from increased life expectancy, such as pharmaceuticals or health-care related industries, are much too small compared to the extent of risk carried by the private sector – even if they issued liabilities contingent on longevity they would take on at best a small fraction of risk.

2.4.3 Reverse mortgages

Annuities are the classical answer to longevity risk, but not the only one. In fact, annuities make sense only for people whose financial wealth is sufficient to buy them a significant income, but given that the distribution of wealth is skewed the number of eligible households is relatively small – and composed of the wealthiest ones, which hardly represent a concern in terms of old-age poverty. On the other hand, since real estate is for households both a major savings vehicle and a currently consumed asset, financial instruments that support these two functions may also play an important role. In this regard, the introduction of products that allow price risk to be hedged to protect both existing home-owners (and institutions) and prospective purchasers (saving to buy a home) as specifically as possible, yet providing liquidity as well, might become a fruitful enterprise.

If one looks at Italian data on, for example, households headed by a person aged 65 and up to 80, three things stand out:

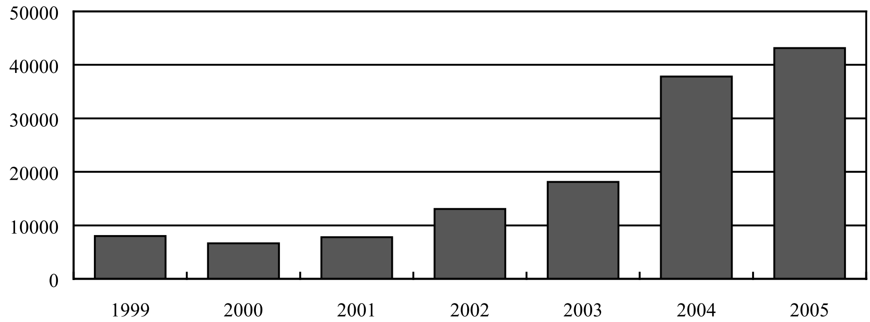
- The share of disposable income derived from a pension is more than two-thirds for 75 per cent of them: in effect they are already annuitised to a large extent.
- Even for the 25 per cent in the highest disposable income quartile, a rough measure of annuitisation of half of their financial wealth (a rule-of-thumb indication of how much they could annuitise) would only yield something around 20 per cent of their disposable income.

- On the other hand, most '65-80 year old' households have substantial wealth invested in real estate: more than 75 per cent of them own some property (55 per cent in the lowest quartile of the disposable income distribution) and a rough measure of annuitisation yields at least 25 per cent of disposable income, even for the households in the lowest quartile (and it could be much more if one assumes that this real estate consists mainly of a home and that it is possible to extract its full equity value).

Obviously today's wealth composition and distribution depends on the current older generation's expectations as to their situation at retirement and is likely to change in the future, but the weight of real estate will probably always be significant. In Italy housing wealth already constitutes the largest part of total household wealth (60 per cent). In other countries such as the United States, the United Kingdom, Japan and the Netherlands, it ranges between 30 and 40 per cent of total net worth. Therefore, if we want households to contribute more towards sustaining themselves after retirement, we must think of ways to extract wealth from where it is: in real estate.

In this respect it is perhaps surprising that reverse mortgages are still rare. Even in the United States, where the market is most developed, the volume of loans is still rather low (Fig. 2.3), even if it has been increasing substantially in the most recent years (from 38,000 in FY 2004 it has risen to 43,000 in FY 2005 and to 56,000 in the first nine months of the current fiscal year). Sound policy would remove whatever regulatory and tax impediments there are to buying and selling them. Furthermore, reverse mortgages presumably offer a stream of income precisely to some of those that need it most, i.e. the elderly that do not have close relatives who could provide assistance. This is because those who do have close relatives would probably like to bequeath their real estate to them in exchange for care (a sort of unwritten social contract), while those who do not have relatives but hold some real estate are reluctant to sell it if their real estate provides housing services. A reverse mortgage would allow this class of elderly to live in their own home while consuming its equity value.

Figure 2.3 Reverse mortgages in the United States



Number of federally-insured reverse mortgage loans, fiscal years

Sources: U.S. Department of Housing and Urban Development; U.S. Mortgage Bankers Association.

With standard reverse mortgages, the issuer faces two risks: longevity risk and housing price risk. On the other hand, the buyer forfeits the possibility of leaving his or her home as a bequest. Longevity risk is not currently hedgeable, but housing price risk could be diversified away, especially if it were possible to trade on housing price indices – some of which are starting to be used in the United States. As for bequests, some companies already offer the possibility of keeping a share of the property's value for this purpose. Making reverse mortgages possible, affordable and desirable would go a long way towards enabling households to insure against longevity risk.

2.5 Policy implications

By way of conclusion, the prospective development of private pension systems, and the increasing need for institutions and individuals to improve management of longevity risk, require a comprehensive and coherent set of policy actions. Policy recommendations can be grouped under four headings:

- Support economic growth, including by increasing national saving and its efficient allocation.
- Facilitate the development and expansion of markets for under-supplied financial instruments that will be useful for retirement savings and the provision of pension benefits.
- Develop regulatory and supervisory frameworks that encourage more rigorous risk management, greater transparency, and better governance at private pension funds, including by ensuring consistent accounting standards and tax rules.

- Provide adequate protection to pension beneficiaries, among other through financial education programmes.

2.5.1 Saving and growth

First of all, in order to offset the possible negative effects of ageing on living standards and fiscal balances, policies should support economic growth and the efficient use of resources. In this regard, measures that promote the supply of labour and increase its productivity are crucial; national saving should be increased and its efficient allocation encouraged (relaxing regulations restricting the amount of foreign assets held by domestic pension funds is an example).

Incentives are essential in order to facilitate later retirement; further increases in statutory retirement ages may also be necessary. Private pension system coverage should be broadened, especially in cases where it is still too low. In this respect, making enrolment mandatory and automatic would be of help, as already demonstrated by the experience of several countries. Tax systems should guarantee a level playing field between different retirement income products; deductions for contributions are important but the exploitation of tax deferrals should be avoided.

2.5.2 Financial instruments and markets

Second, as long-term matching securities are needed, while supply should eventually be forthcoming to meet the emerging demand, policy-makers might consider how to promote the development of markets for the transfer and pooling of investment and longevity risk between private agents. Governments might issue inflation-indexed and ultra-long fixed income securities, also recognising, for market building purposes, that the objective of their issuance strategies goes beyond the minimisation of borrowing costs.

Regarding the difficulty of hedging longevity risk (related to the scarcity of natural buyers), public longevity-indexed bond issues could play a catalytic role in developing the market, by limiting price uncertainty and information costs for potential issuers. Government issuance would not only provide a benchmark but might stimulate the improvement of mortality tables and projections in order to develop better indices. Even if at this stage issues of such bonds do not show evident net benefits from a purely public debt management perspective, governments may have an advantage over the private sector as underwriters, given the benefits of the intergenerational sharing of extreme old-age risk.

Measures that improve the taxation design, favour a higher degree of financial literacy and reduce adverse selection in the market for annuities to provide insurance against idiosyncratic longevity risk would be welcome. Insurance companies are good at pricing risk almost at an individual level, but for some reason they do not do it for annuities. There is a trade-off between encouraging them to apply their industry practices to this market, thus reducing adverse selection, and going too far, thus putting out of the market those most in need of insurance. Some level of cross-subsidy should be allowed in order to keep annuities affordable for everybody. In this perspective, the development of a market for longevity bonds to reduce the systematic component of longevity risk in the market for annuities would probably be helpful.

Policies that would help develop a market for reverse mortgages should also be encouraged. The market for mortgages has greatly benefited from actions such as better data collection on housing prices and default rates, securitisation (which allows mortgage issuers to offload unwanted risk), government guarantees, favourable tax treatment of interest payment. The market for reverse mortgages would benefit from the same set of policies, adapted to this specific product.

2.5.3 Prudential regulation and supervision

Third, it is necessary to strengthen the oversight of pension providers to ensure solvency, satisfactory performance and good governance. Possible gaps with respect to regulation in banking and insurance sectors must be closed. Prudent asset-liability management principles should be encouraged. Mark-to-market valuations to preserve funding targets are generally desirable but may increase the volatility of funding requirements and, in turn, of financial markets. A certain degree of regulatory forbearance, coupled with sufficiently long recovery periods for eliminating funding gaps could alleviate the effect of under-funding on volatility.

The disclosure of mortality and disability projections should be made transparent and better modelling of mortality projections, as well as the uncertainty surrounding demographic estimates, should be promoted. Disclosure of their use in funding plan strategies should also be pursued. Tax incentives and possibly even mandatory provisions should push pension funds to hold buffers above full funding in order to resist adverse variations in assets and liabilities.

The growing savings intermediation role of pension funds and other non-bank financial institutions, while positive for the breadth, depth and efficiency of financial markets, may make it harder for supervisors and policy-makers to assess accurately the distribution of risks and the possible threats to the stability of the financial system. Moreover, regulatory and accounting changes may lead to greater short-term trading activity (with the risk of "herding" behaviour) and the development of dynamic hedging techniques, with potentially destabilising effects on markets. In this regard, policy changes should aim at preserving the long-term perspective of pension funds' investment strategies (which may help dampen rather than amplify volatility).

2.5.4 Protection of pension beneficiaries

I have already addressed the issue of the role that the government might play in addressing market failure, for example with reference to annuities and reverse mortgages, and in providing for a better market response to risk taking, from market building to perhaps some further risk taking in direct issues of ultra-long and index-linked bonds as well as in the case of longevity risk. The role of government as "insurer of last resort" is possibly even more delicate. As investment risks and responsibilities are increasingly shifted to individuals, policy measures should aim at ensuring an adequate level of pension beneficiaries' protection. Prudent funding is the fundamental safeguard against possible plan bankruptcy. Additional protection could be provided by collective pension guarantee arrangements, but premiums charged by guarantee funds should adequately reflect the risks to which they are exposed.

This does not seem to have been the case in recent experience, suggesting that careful design is required. For instance, moral hazard can be reduced by limiting the type and amount of benefits covered, unwarranted cross-subsidies can be avoided by charging risk-based premiums and the investment of the guarantee funds may also need to ensure a good duration match with their liabilities. Special treatment such as call on collateral from the plan sponsor and priority in bankrupt proceedings may also be considered. In general, however, one might argue that providing an insurance against the collective component of longevity risk might be a proper use of public resources. This would call a reduction in the exposure of the government to the more idiosyncratic components of this risk, for instance by encouraging a more balanced composition of pension pillars, limiting the role of the State and encouraging the insurance of idiosyncratic longevity risk in financial markets.

Transparency in the information provided by financial institutions should be enhanced and possible conflicts of interest fully disclosed. Investment in plan sponsor securities should be limited. Correct incentives for sales agents and distributors should be promoted, including through codes of conduct and adequate remuneration. Financial education programmes are useful; they increase consumers' financial consciousness and so help them avoid abuses and fraud, improve their investment choices, and raise their contributions to private pension plans. However, as witnessed with defined contributions plans in several countries, even rational individuals who understand risks and expected pay-offs may exhibit inertia in their decisions and are sensitive to how choices are framed. This may argue for encouraging some degree of automatic enrolment, opt-out requirements and default options.

To conclude, as Lorenzo il Magnifico emphasised over half a millennium ago, it is true that "tomorrow none can tell". However, it is exactly his hyperbolic discounting (if not moral hazard) of just enjoying "youth [that] is sweet and well" without caring for the future that should be avoided. Otherwise, for the average human being, with the obvious exception of the Medicis of our time, and for societies at large the costs of dismissing "what fates impose" might be very high indeed.

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3 Global Imbalances, Demography and China

Barry Eichengreen

In the United States, global imbalances are the Number 1 issue on the minds of financial economists. Are the U.S. current account deficit and Chinese current account surplus sustainable? And if they cannot continue indefinitely at current levels, then for how long will they persist? If adjustment is inevitable, what form will it take? Finally, what are the implications for other regions, not least Europe? These are among the questions that dominate current discussion.

Many reasons are offered for why China should be in surplus and the United States should be in deficit and for why this situation may or may not change. The U.S. has a flexible economy well adapted to the opportunities afforded by new information and communications technologies, making it an attractive place to invest. Or U.S. monetary and fiscal policies have artificially depressed national savings. China's underdeveloped financial markets impose credit constraints that prevent households from borrowing against higher future incomes. Or its corporate sector is singularly profitable, producing high corporate savings, while Chinese households uncertain about future employment prospects in a country undergoing structural change have an incentive to engage in high levels of precautionary saving. In some sense, this last set of observations is the most striking: China's aggregate savings rates of more than 45 per cent are unprecedented for what is still a relatively poor country. Their existence provides the impetus for an important strand of thinking on global imbalances, known as the global-savings-glut view[1].

A final explanation for global imbalances, as participants in this meeting will anticipate, is demography. The United States has a more rapidly growing population than Europe or Japan, which gives it more economic flexibility and, other things equal, makes it a more attractive place to invest[2]. Given the attractions of investing in America, it makes sense that the country should be importing capital and running a current account deficit. China, on the other hand, has a relatively low dependency ratio, and a relatively low old-age dependency ratio in particular. It makes sense, therefore, that the country should be saving a lot and perhaps also running a current account surplus[3].

In thinking about the future, we should also be thinking about the impact of demography. While the elderly share of the labor force will rise modestly

[1] See Bernanke (2005).

[2] According to analysts like Richard Cooper (2006).

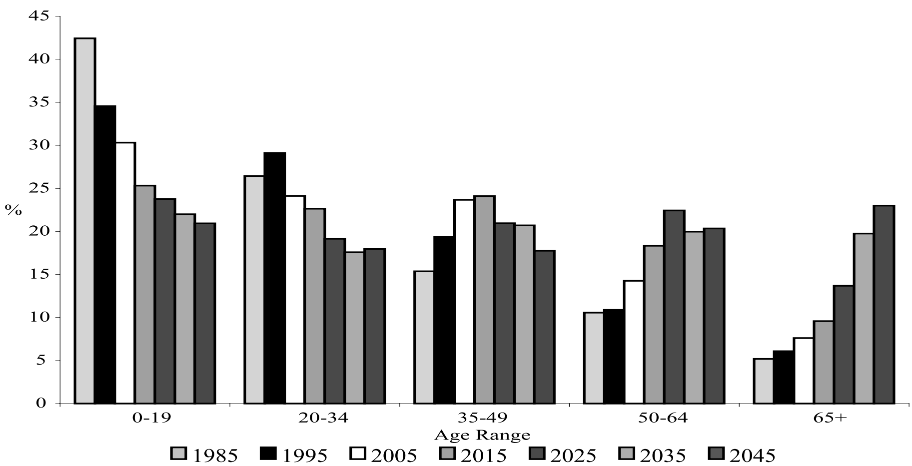
[3] My own view (Eichengreen 2006a) is that the sources of the U.S. and Chinese current account balances are more numerous than simply this, but I defer discussion of this to the last section. There is also an apparent inconsistency in the conventional statements summarized in this paragraph that I return to below.

in the United States, it will rise sharply in China as early as 2015 – that is, starting less than a decade from now. If the life-cycle model is any guide, this should result in a decline in household savings rates, other things equal[4].

Although the literature on these issues is extensive, it is notable for its lack of consensus[5]. Hans Fehr, Sabine Jokisch and Lawrence Kotlikoff (2005) and Luis Kuijs (2006) forecast no significant changes in China's savings, investment, and current account as a result of demographic factors. On the other hand, authors like Matthew Higgins (1998) and Melanie Luhrmann (2003) predict a sharp fall in Chinese savings rates and a sharp deterioration in China's current account, which in turn implies a change in the pattern of global imbalances.

In this lecture I will argue that this disagreement has two dimensions. First, different authors have in mind different time horizons, which naturally influence the conclusions they draw. We can see this in the fact that the share of the Chinese population over the age of 64 is projected to rise from 8 per cent in 2005 to 10 per cent in 2015, 15 per cent in 2025, 20 per cent in 2035, and 25 per cent in 2045[6].

Figure 3.1 Share of Chinese Population by Age Group



Source: Chamon and Prasad (2006).

Over the next decade, in other words, this change is still relatively limited, but over a 40 year horizon it means essentially a tripling of the elderly share

[4] The careful listener will note that the preceding sentence contained two big caveats: "if the life-cycle model is any guide" and "other things equal." I will return to both of them.

[5] In my own effort to survey the literature for purposes of this lecture, I counted upward of three dozen relevant publications, only a subset of which is included in the reference list attached to this manuscript.

[6] I have rounded off the United Nations' Population Forecasts to round numbers, reflecting my assumption that those forecasts are only approximate – see Johnson (2004).

of the population. The time horizon with which we are concerned thus matters greatly for the implications we draw.

Second, different authors draw different conclusions from cross country regressions. Some studies like IMF (2004) focus on the old age dependency ratio, and infer from this that savings rates in countries like China will decline in coming decades. Others like Marcos Chamon and Eswar Presad (2005) – ironically, also of the IMF – supplement this with estimates of the impact of the youth-dependency ratio on savings, and conclude the opposite, namely that household savings may in fact rise insofar as the share of young people in the population declines even faster than the share of elderly rises[7]. In practice it appears to be more difficult to obtain well-defined estimates of the impact of the youth-dependency ratio on aggregate savings, but this is no excuse for ignoring the channel.

In addition, while considerable attention has been paid to the effects of demographic variables on saving, we know less about the impact of those same variables on investment. Most cross country estimates suggest that a higher old-age dependency ratio reduces not only domestic saving but also domestic investment. The argument here is that "some fraction of the capital stock may become obsolete due to shrinking labor force and diminishing returns to scale, making the accumulation of capital…less attractive" (to quote Axel Borsch-Supan, Alexander Ludwig and Joachim Winter, 2001). Capital having less labor to cooperate with, a smaller working-age population means less investment, unless one assumes a very high elasticity of substitution in the aggregate production function. The implication is that a higher old-age dependency ratio will affect savings and investment in the same direction. Both will decline as a population ages, minimizing the impact on the country's capital account. Proper treatment of the youth dependency ratio introduces many of the same issues.

In what follows I will revisit these connections. But a few caveats before proceeding. First, it is important to acknowledge at the outset that none of the conventional explanations provides a totally satisfactory explanation savings behavior in China – or, for that matter, in the United States. Thus, even when the conventional cross section regressions are augmented by nonstandard variables, China and the United States are still outliers – with Chinese savings rates significantly higher than predicted and U.S. rates significantly lower[8]. International comparisons are useful for identifying what is distinctive about U.S. and Chinese experience, but at some level the sources of that distinctive behavior still remain unclear.

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[7] "May" because the estimated impact of youth dependency on savings is typically smaller than the impact of old-age dependency on savings, as we will see below.

[8] For the Chinese case, Kraay (2000) and Kuijs (2006) make this point. On the U.S. case, see Gale and Sabelhaus (1999), Parker (1999), and Marquis (2002).

Second, in what follows I will have relatively little to say about the findings of studies employing global simulation models. An important strand of literature relies heavily on such model simulations. But these simulations, virtually without exception, predict that the advanced industrial countries, not least the United States, should be exporting capital while China and the developing world generally should be importing it, and build their policy analysis on this basis. The baseline is clearly at variance with the facts, which implies that these models are leaving out something important[9].

Third and finally, a more complete analysis would entail considering not only savings-investment balances in China, or in China and the U.S., but also in other regions. A number of similar issues in fact arise in these contexts. For example, it is widely argued that Europe's current account will move into deficit as its population ages and its elderly population saves less. Here, again, the issues are how soon – specifically, soon enough to matter for the resolution of global imbalances? – and whether it is appropriate to assume that population ageing will have little if any impact on investment rates. While these regions are not my focus in this talk, I will at least touch on them in passing.

Analyzing the connections between demography and current account balances involves considering their impact on both savings and investment, since the current account is the difference between these two magnitudes.

In practice, we know considerably more about the demographic determinants of savings. Both the macro and micro evidence – with a few exceptions I will mention momentarily – is convincing on the lower savings rates of the elderly. Studies using panels of macroeconomic data consistently find a negative relationship between saving and the old-age dependency ratio[10].

Controversy centers on two issues. The first of these, whether the elderly dissave or just have lower savings rates than working age individuals, is of second order importance for present purposes. The answer matters for the elasticity of aggregate savings with respect to the old-age dependency ratio but not for the existence of the effect[11]. The second question is whether the pattern applies to China. While studies using aggregate time series (e.g. Franco Modigliani and Shi Cao 2004) tend to answer in the affirmative, authors using survey data are not so sure. Using household surveys, Aart Kray (2000) and Charles Horioka and Jumin Wan (2006) do not find a negative impact of the old age dependency ratio on savings by rural households[12]. Horioka and

[9] Which is presumably why one of the best of these studies, by Brooks (2003), refers to its simulations of "a parallel universe."

[10] The standard reference here is Loayza, Schmidt-Hebbel and Serven (2000). A large additional literature could be cited; my own take on the issues is in Eichengreen and Fifer (2002) and Eichengreen (2006a).

[11] The literature on whether the elderly in fact dissave stems from Hayashi, Ando and Ferris (1988).

[12] If anything, that impact is positive and significant.

Wan explain this by arguing that the elderly in China rely heavily on support from their children and little if at all on their own dissaving. But while this can explain why one does not observe higher savings rates among elderly individuals, one should still see lower savings rates by their households, since households are simply amalgams of the individuals in question[13]. Extended families should tend to save more while Grandpa is still in the labor force and less when he stops working. I conclude that the Chinese data remain a bit of a mystery. But the aggregate evidence of a negative link running from the old-age dependency ratio to national savings is indisputable.

Interestingly, the two sets of evidence – those drawn from macroeconomic analysis of cross country data and household surveys for China – show the opposite for youth dependency ratios. Here household surveys for China (e.g. Horioka and Wan 2006) show a strong negative effect on savings of a higher youth dependency rate. On the other hand, panel-based studies of national aggregates find this result only when estimated by random effects (allowing the error term to differ by country) and not by fixed effects (which removes the country-specific mean). This is the finding both of my 2002 study with Molly Fifer and of a 2006 study by Luis Kuijs[14]. Some studies like IMF (2005) have sought to "finesse" this problem by including only the old-age dependency ratio in their savings equations. Others like Matthew Higgins (1998) have addressed it by distinguishing not just the youth- and old-age dependency ratios but each five year age group, while imposing a polynomial structure on the coefficients. With these additional restrictions they are able to obtain a significant negative impact on savings of the share of the population under the age of ten. My reading of the literature, overall, is that there does exist a negative relationship between youth-dependency and aggregate savings rates, although it is smaller than the effect of the old-age dependency ratio[15].

[13] This is essentially the insight behind the estimates of Hayashi, Ando and Ferris (1988), who assume that saving by the non-aged members of extended families is the same as saving by nuclear families and who then impute the saving by elderly individuals living in extended families as the difference. Horioka and Wan also suggest that the elderly may care more about the bequest motive in China than in other countries. But why this should be the case is not clear.

[14] That fixed effects estimates, which rely on the time series variation in the data, do not yield precise estimates is troubling when one's concern, as here, is to forecast how savings behavior will change over time, as demographic variables evolve. The technical explanation for this problem is probably that the relevant time series are short and the demographic variables in question are slow to evolve, providing little identifying variation – identification is then easier in the cross section, where there is more variation – but this is not reassuring for inference. The relevant Hausman test (applied to the Eichengreen-Fifer data) suggests that the data prefer fixed effects.

[15] The other anomaly evident in these studies is the very strong positive relationship of the aggregate rate of economic growth with the national savings rate. Simple life-cycle theory would suggest a negative relationship, that households expecting higher future incomes would borrow against them now. In part, evidence of the opposite is explicable by cohort effects: young people in the labor force who save do so out of higher incomes than old people who dissave out of wealth accumulated from what were previously lower incomes. This was famously demonstrated by Modigliani (1970). In addition, in countries like China imperfect financial markets and credit constraints may play a role. The young would like to borrow against higher future incomes in order to, inter alia, purchase consumer durables but cannot owing to imperfect markets; hence savings rates are higher than would be the case otherwise. Marcos Chamon and Eswar →

Whether one agrees with this assessment is important. Between now and 2045, China's old age dependency ratio will rise by 17 percentage points. A consensus point estimate of –0.75 suggests that by itself this could shave more than 10 percentage points off of Chinese savings. But, at the same time, the youth dependency ratio will fall from 30 per cent to 20 per cent. A consensus point estimate of –0.5 suggests that this will offset half of the impact on savings of China's aging population. Thus, whether one thinks that demographic change will importantly affect Chinese savings hinges on the confidence one attaches to this last effect.

While we know a good deal about how the age structure of the population affects savings, we know much less about how it affects investment. The analytical argument for why a larger aged share of the population should lead to less investment is that with fewer working age people there will be less labor for capital to cooperate with, and less capital formation assuming an elasticity of substitution between capital and labor of less than one[16]. Consistent with this intuition, cross-section econometrics and fixed-effects panel studies both find a strong negative effect on investment (see e.g. Eichengreen and Fifer 2002); so do Higgins' within estimates, which run off of the time series variation in the data. This is a warning that, in thinking about the impact of demography on the current account, we should not neglect the impact on investment.

But questions arise when we turn to the investment impact of the youth dependency ratio. The standard argument is that countries with high youth-dependency ratios should engage in more investment – specifically, more public investment in education, training, and so forth. Unfortunately, empirical studies do not find much support for this intuition. Kuijs finds zero effect. Higgins does find a lower aggregate investment rate as the youth-dependency ratio rises, at least for those below age 15, but he does not distinguish public from private investment. Where standard logic would suggest that it is public investment where the action should be concentrated, Fifer and I actually find a negative effect of higher youth-dependency ratios on public investment. This effect is not easy to overturn[17]. The most one can do is make the effect go to zero[18]. It could be that we are controlling inadequately for other ways in which countries with rapid population growth

Prasad (2005) show that if credit constraints are severe they can produce a positive correlation between the growth rate and the savings rate. For China this suggests that savings rates will decline both as growth declines from the double digits to more normal levels and as financial markets develop.

[16] But this assumption of a low elasticity of substitution is dubious, especially if we are considering a decade, or even two, three or four, which is what we need in order to get economically consequential effects from slowly moving demographic variables.

[17] Rest assured that I have tried.

[18] Here it would be nice to be able to mention other studies that reach similar conclusions, but in fact I am not aware of other cross-country studies that look at this specific question.

and high youth-dependency rates differ[19]. Typically, these are less developed countries with binding borrowing constraints and weak fiscal systems. The difficulty of financing public investment may be what we are observing.

Again, whether one takes these conclusions at face value is important for the implications one draws. The evidence, such as it is, suggests that the negative impact of higher overall dependency rates on domestic savings will be offset in good part by the negative impact of higher overall dependency rates on domestic investment. Again, the implication is that demographic developments may have a smaller impact on the evolution of global imbalances than sometimes supposed[20].

A question here is whether we are just rediscovering the Feldstein-Horioka (1980) puzzle[21]. If an economy is closed to capital flows, then a variable which shifts the level of saving will also have to shift the level of investment, given the necessary equality of the two. If countries with weak fiscal systems and weak institutions generally find it difficult to access international capital markets, then something that reduces domestic saving – say, a high youth dependency ratio – must also reduce domestic investment in equilibrium. It is of course implausible that countries are completely closed to capital flows in the present environment; countries like Australia, New Zealand, Iceland and, of course, the United States have been able to significantly augment domestic savings by borrowing abroad[22].

The question is whether emerging markets can do the same. As a group, emerging markets have moved away from external borrowing in the last five years. Collectively they are running current account surpluses rather than deficits and paying back external debt rather than adding to it[23]. That said, there is considerable variation among them; at the time of writing, Hungary, Turkey and South Africa, to take three prominent examples, continue to finance investment on the order of 8 per cent of GDP by borrowing abroad.

[19] Although we include a long list of controls.

[20] We can also look at the impact of the old-age and youth dependency ratios on the current account directly. This is tantamount to imposing the constraint that the effect of these variables is the same in the underlying saving and investment equations – which increases power but imposes a restriction that tends to be rejected by the data. For what it is worth, Chinn and Prasad (2003) and IMF (2004), imposing this ancillary assumption, find a negative impact of higher dependency rates on the current account balance – the former attributing this mainly to the youth dependency rate, the latter to the share of the elderly population.

[21] It is often forgotten that Feldstein and Horioka themselves used the dependency ratio as an instrument for the savings rate in the regressions of investment (their dependent variable) on savings. Note, however, that this will satisfy the exclusion restriction for a valid instrument only if it doesn't also affect investment, an assumption on whose validity the preceding discussion casts some doubt.

[22] This is so-called "new economy" view of the U.S. current account deficit (see e.g. Richard Cooper 2004, David Backus and Frederic Lambert 2005, Richard Clarida 2005) pointing to the attractiveness of investment in the U.S. as the explanation for these capital inflows.

[23] The so-called New Bretton Woods view (of Michael Dooley and Peter Garber 2005) argues that, in order to secure FDI, emerging markets must accumulate claims on the creditor countries at least in matching amount to serve as collateral, in order to offset their otherwise limited creditworthiness. As I have argued elsewhere (Eichengreen 2005), I think this argument is exaggerated.

Overall, the evidence suggests that the magnitude of the Feldstein-Horioka savings-investment correlation has declined from 0.9 when they wrote their original article 25 years ago to perhaps 0.6 today. So I do not think that the association of dependency ratios with investment rates evident in the data is simply the Feldstein-Horioka puzzle reborn.

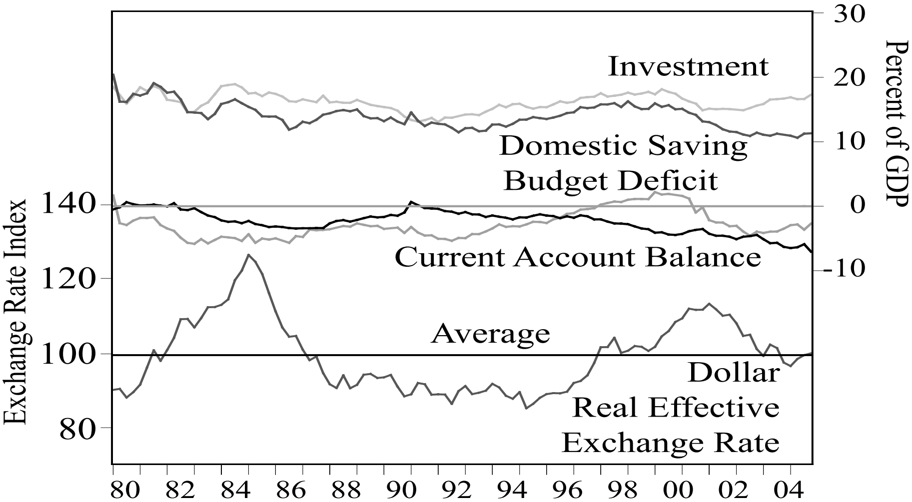
How far, then, can attention to demographic factors take us in understanding global imbalances? Recall the demographic story: the U.S. runs deficits because a relatively fast growing labor force and an elderly share of the population that is lower and rising more slowly than Europe's and Japan's give it economic flexibility and make it an attractive place to invest, while China runs surpluses because its low old-age dependency ratio translates into high savings. The careful reader will already have noted one limitation. This story essentially invokes the same factor – a relatively low old-age dependency ratio compared to Europe and Japan – to explain two diametrically opposing outcomes, namely the U.S. deficit and the Chinese surplus. This already suggests, at a minimum, that demographic factors cannot be all that is going on.

Indeed, there is good reason to think that these other factors, and not demography, dominate in both the United States and China. In the U.S., the aggregate investment rate, adjusted for the cycle, has held stable over the last decade, but the savings rate has fallen[24].

There has been no sudden shift in demographic factors capable of accounting for this. In reality, the sources of the decline in the national savings rate are no mystery. At most recent report, U.S. gross national saving has fallen to 13.6 per cent of GDP on the IMF's measure, down by 3.3 per percentage points from the 1983−2000 average and barely half the level prevailing in the rest of the world. This reflects both a decline in public saving, the fiscal balance from +2.5 per cent of GDP in 2001 to −3.5 per cent of GDP today, and a decline in the personal savings rate, which after having averaged 7 per cent in 1984−2000 has fallen to essentially zero. Together these changes in public and personal savings would imply an even larger decline in national saving than observed. That this has not occurred reflects buoyant corporate savings, reflecting a rapid economic expansion and the strong performance of earnings.

[24] BIS data suggest that it is up by at most 1 per cent of GDP relative to the 1990s decade average, and much of this increase may be explicable by global conditions.

Figure 3.2 US Savings and Investment and their Correlates



Source: Federal Reserve Bank of St Louis, Federal Reserve Board and the Bureau of Economic Analysis.

Note: The exchange rate is the Federal Reserve Board trade-weighted real exchange rate, deflated using PPIs. The dashed line represents the average real exchange over the 1980–2005 period. An increase in the exchange rate represents an appreciation of the dollar.

Source: Yoshitomi (2007)

The reason for the decline in public savings is discretionary fiscal policy. It reflects mainly the decline in the federal tax take as a share of GDP from 22 to 19 per cent in the course of the present decade, together with spending on health care, the Iraq war, and other items. The reason for the decline in private savings is harder to identify, but one factor is certainly high asset valuations, which increase households' perceived wealth. I am inclined to ascribe the behavior of asset prices in the United States to a monetary policy that was unusually accommodative, until recently[25]. Note the absence of demographic factors from this story.

Turning to China, there has been a dramatic increase in both savings and investment rates since the advent of reform at the end of the 1970s and especially in the last ten years. Already between 1978 and 1995, Chinese savings rates averaged more than 35 per cent; since then they have averaged fully 40 per cent. The decline in youth dependency rates since the one-child

[25] This may not be a complete explanation. For one thing, asset prices have been high as well in other countries. While financial markets are linked internationally and a number of other central banks, in addition to the Federal Reserve, followed unusually accommodative monetary policies in the first half of the present decade, not all of them cut interest rates as fast and far as the Fed starting in 2001, which suggests that other factors are also at work. But again, note the absence of a role for demographic factors. In Europe, which has similarly enjoyed a housing boom in recent years, demographic factors work in the wrong direction.

policy implemented in 1979 is part of the savings story, but just a small part. International comparisons suggest that a lower dependency ratio than in the typical country can explain perhaps an additional 3 per cent of GDP in saving in China; this is small potatoes for a country with a national savings rate of more than 40 per cent[26]. For once, time series and cross section evidence point in the same direction; as the one-child policy has kicked in and youth dependency rates have fallen, there has been a modest decline in household savings in the last ten years[27]. Be that as it may, household savings at 16 per cent of GDP is not that extraordinary for a country with such a rapid growth rate, or that hard to understand given imperfect capital markets and credit constraints[28]. What is extraordinary is the high savings rates of enterprises, which were running in excess of 20 per cent of GDP in 2005[29]. Chinese enterprises, including even some state enterprises, are highly profitable. They have generated large retained earnings, more than even the investment-hungry Chinese manufacturing sector can absorb. Again, this is not a demographic story. Rather, it is easier to reconcile with arguments by non-Chinese academics and officials that a low exchange rate that has boosted the profitability of Chinese manufacturing also feeds to the high savings rates and external surpluses contributing to the problem of global imbalances.

If demographic factors do not help much in explaining the emergence of global imbalances, can they help us understand their resolution? Will demographic factors have much impact on the pattern of global imbalances before 2016 (since, as I will explain in a moment, I believe that the relevant horizon is the next five to ten years)? Again, the answer is no: there will be only a modest increase in old-age dependency ratio in China, from 8 to 10 per cent of the population, between now and then. This will be almost exactly offset by a decline in the youth dependency ratio. Even if the old-age dependency ratio has a larger impact on saving than does the youth dependency ratio, it tends to affect investment in the same direction, which means a modest fall in both savings and investment and no net impact on the current account.

In the United States, the old-age dependency ratio (the share of the population 65 or older as a share of the population aged 15 to 64) is expected to rise from 18 per cent currently to 23 per cent in 2016. If we apply standard parameter values, this implies a further fall in U.S. savings rates of 3 to 4 per cent of GDP. This will not help from the point of view of the resolution of global imbalances. If the rise in the dependency ratio means that investment falls as well, then the most we can hope for is no effect on the current account.

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[26] See Kraay (2000). At the end of 2005, the Chinese authorities revised upward their estimates of GDP by some 17 per cent. However, this does little to change estimated savings and investment ratios, since most of the revision reflected faster price increases, which affected consumer goods and investment goods alike.

[27] Again, see Modigliani and Cao (2004).

[28] The time series suggest some.

[29] Kuijs (2006), p.23

So should we be reassured? The sanguine position is that with Chinese savings continuing to run at high levels and the U.S. remaining an attractive place to invest, nothing will have to change. The fundamentals supporting the current constellation of imbalances will remain in place. There is no reason, demographic or otherwise, to worry about their disorderly unwinding.

I am not so sanguine, albeit for political more than economic reasons. Simple accounting suggests that the U.S. external-debt-to-GDP ratio would rise to 150 per cent by 2015 if the country continues running deficits at current levels[30]. For an economy like the U.S. with a capital/output ratio of three, this means that foreigners end up holding half of the country's capital stock. Quite apart from whether foreign investors would be willing to allocate such a large share of their portfolios to claims on the productive capacity of the United States, there is the question of whether Americans would feel comfortable allowing them to do so. The reaction to China's offer to buy the U.S. oil company Unocal and to efforts by Dubai Ports World to purchase the right to manage six U.S. ports suggests there would be a strong negative reaction against extensive foreign ownership of productive assets in the United States[31]. If U.S. foreign investments continue to outperform foreign investments in the U.S., as has been the case historically, the rise in the debt/GDP ratio will be somewhat more moderate – it will reach something closer to 75 per cent by 2015, according to John Kitchen (2006) – but the basic problem will remain[32].

The diagnosis is that something will have to give. Foreign investors, not willing to continue accumulating low-yielding U.S. Treasury bills – authors like Kitchen emphasizing the very fact that they are low yielding – and not permitted to accumulate claims on productive assets will grow reluctant to finance U.S. deficits[33]. The unavoidable result will be a compression of U.S. spending, a combination of less consumption and less investment. The mechanism will be higher long-term interest rates, as foreigners stop supporting the Greenspan Conundrum[34]. And the result will be a slowdown in global growth or perhaps a global recession. Demographic considerations do not modify this diagnosis. Ultimately, the bill for the high level of U.S. absorption and the world economy's dependence on the U.S. consumer will come due.

[30] Assuming a 5 per cent nominal rate of GDP growth and a 7 ½ per cent of GDP deficit. Mussa (2004) shows that the ratio of net foreign liabilities to GDP, denoted n, stabilizes when $c = n \times g$, where c is the current account deficit as a share of GDP and g is the rate of growth of nominal income.

[31] Which are regarded, rightly or wrongly, as essential to the national security in the post-9/11 world.

[32] And I side with those who argue that the historical outperformance of U.S. foreign assets, relative to U.S. foreign liabilities, can not be taken for granted in the future. See below.

[33] This will have to include foreign central banks, of course, since it is they who have been providing the majority of finance for the U.S. deficit in recent years. I myself do not see a change in their attitude as implausible, as I have argued in Eichengreen (2006b).

[34] For evidence that foreign purchases of U.S. Treasury bonds provide a good deal of the explanation for the Greenspan Conundrum, see Warnock and Warnock (2005).

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Table 3.1 Global Saving and Investment: Random-Effects Regressions, 1975–2003

	Saving to GDP				Investment to GDP			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growth of GDP per capita	0.07	0.11	0.11	0.10	0.04	0.05	0.05	0.06
	(2.85)	*(3.30)*	*(3.29)*	*(2.98)*	*(1.63)*	*(1.54)*	*(1.50)*	*(1.82)*
Interest rate	0.67	0.89	0.87	0.79	0.38	0.48	0.42	0.47
	(1.97)	*(2.59)*	*(2.55)*	*(2.32)*	*(1.08)*	*(1.29)*	*(1.19)*	*(1.35)*
Private credit to GDP	0.04	0.05	0.05	0.05	0.02	0.03	0.03	0.02
	(4.22)	*(3.13)*	*(3.16)*	*(2.85)*	*(1.87)*	*(1.78)*	*(2.13)*	*(1.21)*
Δ Private credit to GDP	0.02	−0.02	−0.03	−0.01	0.05	0.03	0.02	0.00
	(0.83)	*(0.75)*	*(0.84)*	*(0.20)*	*(2.22)*	*(0.80)*	*(0.58)*	*(0.06)*
Elderly dependency ratio	−0.26	−0.27	−0.24	−0.33	−0.42	−0.38	−0.33	−3.18
	(2.48)	*(1.81)*	*(1.51)*	*(2.07)*	*(5.64)*	*(3.48)*	*(2.92)*	*(2.95)*
Fiscal deficit to GDP	−0.03	−0.01	−0.01	0.00	−0.02	0.06	0.04	0.03
	(0.81)	*(0.22)*	*(0.27)*	*(0.08)*	*(0.57)*	*(1.13)*	*(0.91)*	*(0.72)*
Terms of trade growth	0.06	0.07	0.07	0.07	−0.02	−0.04	−0.04	−0.04
	(3.12)	*(3.11)*	*(3.05)*	*(3.08)*	*(1.04)*	*(1.46)*	*(1.74)*	*(1.69)*
M2 to GDP		0.03	0.04	0.02		−0.02	0.00	0.03
		(1.15)	*(1.55)*	*(0.60)*		*(0.66)*	*(0.19)*	*(1.25)*
Domestic credit to GDP		−0.04	−0.04	−0.04		−0.04	−0.04	−0.03
		(4.47)	*(4.54)*	*(4.61)*		*(3.91)*	*(3.93)*	*(3.86)*
Mexican-crisis dummy applied to:								
Emerging market			0.00				0.00	
			(0.08)				*(0.47)*	
Asia				0.01				0.01
				(0.95)				*(1.41)*
Latin America				−0.01				0.00
				(0.59)				*(0.14)*
Asian-crisis dummy applied to:								
Emerging Market			−0.01				−0.03	
			(1.68)				*(4.07)*	
Asia				0.02				−0.08
				(1.29)				*(6.13)*
Latin America				−0.03				0.01
				(1.71)				*(0.39)*
Number of observations:	453	351	351	351	454	352	352	352
Wald Chi2:	***44.66***	***73.29***	***76.19***	***87.28***	***52.45***	***45.61***	***72.53***	***91.03***

Note: z-statistics in parentheses.
Source: see text.

Table 3.2 Global Saving and Investment: Fixed-Effects Regressions, 1975–2003

	Saving to GDP				Investment to GDP			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growth of GDP per capita	0.06	0.10	0.10	0.09	0.03	0.04	0.04	0.05
	(2.61)	*(3.11)*	*(3.08)*	*(2.85)*	*(1.35)*	*(1.24)*	*(1.15)*	*(1.42)*
Interest rate	0.66	−0.19	0.85	0.78	0.40	0.45	0.40	0.47
	(1.98)	*(0.90)*	*(2.47)*	*(2.27)*	*(1.18)*	*(1.25)*	*(1.16)*	*(1.36)*
Private credit to GDP	0.03	−0.02	0.05	0.05	0.00	0.05	0.05	0.03
	(2.75)	*(0.34)*	*(2.98)*	*(2.75)*	*(0.16)*	*(2.52)*	*(2.67)*	*(1.72)*
Δ Private credit to GDP	0.03	−0.02	−0.02	0.00	0.06	0.03	0.02	0.00
	(1.17)	*(0.61)*	*(0.67)*	*(0.13)*	*(2.43)*	*(0.79)*	*(0.71)*	*(0.12)*
Elderly dependency ratio	−0.09	−0.19	−0.12	−0.32	−0.64	−0.23	−0.05	0.06
	(0.64)	*(0.90)*	*(0.57)*	*(1.39)*	*(4.40)*	*(1.06)*	*(0.21)*	*(0.25)*
Fiscal deficit to GDP	−0.03	−0.02	−0.02	0.00	0.03	0.02	0.02	0.01
	(0.76)	*(0.34)*	*(0.37)*	*(0.02)*	*(0.60)*	*(0.48)*	*(0.40)*	*(0.16)*
Terms of trade growth	0.06	0.07	0.07	0.07	−0.02	−0.04	−0.04	−0.04
	(3.16)	*(3.09)*	*(3.04)*	*(3.06)*	*(1.17)*	*(1.76)*	*(1.92)*	*(1.88)*
M2 to GDP		0.02	0.03	0.00		−0.09	−0.06	−0.03
		(0.59)	*(1.01)*	*(0.15)*		*(3.15)*	*(2.08)*	*(1.05)*
Domestic credit to GDP		−0.04	−0.04	−0.04		−0.02	−0.03	−0.02
		(3.71)	*(3.87)*	*(3.81)*		*(2.12)*	*(2.57)*	*(2.43)*
Mexican-crisis dummy applied to:								
Emerging market			0.00				0.00	
			(0.03)				*(0.58)*	
Asia				0.01				0.01
				(0.89)				*(0.59)*
Latin America				−0.01				0.00
				(0.49)				*(0.32)*
Asian-crisis dummy applied to:								
Emerging Market			−0.01				−0.03	
			(1.54)				*(3.43)*	
Asia				0.02				−0.07
				(1.43)				(5.62)
Latin America				−0.03				0.00
				(1.64)				(0.28)
Number of observations:	453	351	351	351	454	352	352	352
F-Statistics	4.75	6.32	5.47	5.46	5.83	4.20	5.24	5.92

Note: t-statistics in parentheses
Source: see text

Table 3.3 Global Saving and Investment, with Youth Dependency Ratio: Random-Effects Regressions, 1975–2003

	Saving to GDP				Investment to GDP			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growth of GDP per capita	0.07	0.11	0.11	0.10	0.05	0.06	0.06	0.08
	(2.93)	*(3.50)*	*(3.49)*	*(3.15)*	*(1.87)*	*(1.86)*	*(1.74)*	*(2.32)*
Interest rate	0.68	0.92	0.92	0.84	0.42	0.54	0.48	0.60
	(1.98)	*(2.70)*	*(2.68)*	*(2.45)*	*(1.18)*	*(1.48)*	*(1.36)*	*(1.73)*
Private credit to GDP	0.05	0.06	0.06	0.05	0.02	0.04	0.04	0.03
	(4.48)	*(3.40)*	*(3.39)*	*(3.06)*	*(2.38)*	*(2.32)*	*(2.46)*	*(1.96)*
Δ Private credit to GDP	0.02	−0.03	−0.03	−0.01	0.05	0.02	0.02	−0.01
	(0.76)	*(0.80)*	*(0.92)*	*(0.31)*	*(2.18)*	*(0.72)*	*(0.49)*	*(0.31)*
Elderly dependency ratio	−0.22	−0.15	−0.15	−0.26	−0.28	−0.17	−0.20	−0.09
	(1.85)	*(0.91)*	*(0.90)*	*(1.53)*	*(2.92)*	*(1.36)*	*(1.51)*	*(0.74)*
Youth dependency ratio	0.03	0.07	0.07	0.05	0.08	0.11	0.08	0.12
	(0.89)	*(2.07)*	*(1.74)*	*(1.27)*	*(2.53)*	*(3.21)*	*(2.09)*	*(3.39)*
Fiscal deficit to GDP	−0.03	−0.01	0.07	0.01	0.03	0.06	0.05	0.04
	(0.80)	*(0.13)*	*(0.15)*	*(0.14)*	*(0.65)*	*(1.30)*	*(1.07)*	*(0.89)*
Terms of trade growth	0.06	0.07	0.07	0.07	−0.03	−0.04	−0.04	−0.04
	(3.03)	*(2.99)*	*(2.93)*	*(3.01)*	*(1.20)*	*(1.68)*	*(1.89)*	*(1.86)*
M2 to GDP		0.03	0.04	0.02		−0.02	0.00	0.03
		(1.23)	*(1.46)*	*(0.59)*		*(0.67)*	*(0.01)*	*(1.09)*
Domestic credit to GDP		−0.05	−0.05	−0.05		−0.04	−0.04	−0.04
		(4.74)	*(4.76)*	*(4.75)*		*(4.35)*	*(4.20)*	*(4.16)*
Mexican-crisis dummy applied to:								
Emerging market			0.00				0.00	
			(0.66)				*(0.19)*	
Asia				0.01				0.02
				(1.02)				*(1.55)*
Latin America				0.00				0.01
				(0.22)				*(0.80)*
Asian-crisis dummy applied to:								
Emerging Market			−0.01				−0.03	
			(1.48)				*(3.88)*	
Asia				0.02				−0.08
				(1.32)				*(6.15)*
Latin America				−0.03				0.00
				(1.57)				*(0.06)*
Number of observations:	453	351	351	351	454	352	352	352
Wald Chi2:	47.11	78.51	79.94	90.01	58.48	55.54	76.05	102.92

Note: t-statistics in parentheses
Source: see text

Table 3.4 Global Saving and Investment, with Youth Dependency Ratio: Fixed-Effects Regressions, 1975–2003

	Saving to GDP				Investment to GDP			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growth of GDP per capita	0.07	0.11	0.11	0.10	0.04	0.05	0.05	0.07
	(2.81)	*(3.35)*	*(3.36)*	*(3.13)*	*(1.78)*	*(1.66)*	*(1.60)*	*(2.25)*
Interest rate	0.69	0.91	0.91	0.85	0.45	0.52	0.50	0.66
	(2.06)	*(2.66)*	*(2.66)*	*(2.49)*	*(1.36)*	*(1.50)*	*(1.44)*	*(1.98)*
Private credit to GDP	0.03	0.06	0.06	0.06	0.01	0.06	0.05	0.05
	(3.11)	*(3.31)*	*(3.29)*	*(3.13)*	*(0.96)*	*(3.20)*	*(3.15)*	*(2.88)*
Δ Private credit to GDP	0.03	−0.02	−0.03	−0.01	0.06	0.02	0.02	−0.01
	(1.15)	*(0.67)*	*(0.80)*	*(0.30)*	*(2.43)*	*(0.71)*	*(0.53)*	*(0.32)*
Elderly dependency ratio	0.04	−0.02	−0.04	−0.24	−0.36	0.06	0.07	0.27
	(0.28)	*(0.11)*	*(0.19)*	*(1.01)*	*(2.34)*	*(0.26)*	*(0.34)*	*(1.19)*
Youth dependency ratio	0.07	0.09	0.09	0.07	0.15	0.16	0.13	0.19
	(2.18)	*(2.55)*	*(2.23)*	*(1.90)*	*(4.47)*	*(4.44)*	*(3.31)*	*(4.94)*
Fiscal deficit to GDP	−0.03	−0.01	−0.01	0.00	−0.03	0.03	0.03	0.02
	(0.74)	*(0.27)*	*(0.25)*	*(0.04)*	*(1.51)*	*(0.63)*	*(0.59)*	*(0.33)*
Terms of trade growth	0.06	0.07	0.06	0.07		−0.05	−0.05	−0.05
	(3.01)	*(2.95)*	*(2.88)*	*(2.98)*		*(2.09)*	*(2.19)*	*(2.19)*
M2 to GDP		0.02	0.02	0.00		−0.09	−0.07	−0.04
		(0.61)	*(0.83)*	*(0.03)*		*(3.20)*	*(2.37)*	*(1.41)*
Domestic credit to GDP		−0.04	−0.04	−0.04		−0.03	−0.03	−0.03
		(3.99)	*(4.09)*	*(3.89)*		*(2.64)*	*(2.92)*	*(2.68)*
Mexican-crisis dummy applied to:								
Emerging market			0.01				0.00	
			(0.79)				*(0.66)*	
Asia				0.01				0.01
				(1.06)				*(1.04)*
Latin America				0.00				0.03
				(0.11)				*(1.82)*
Asian-crisis dummy applied to:								
Emerging Market			−0.01				−0.02	
			(1.23)				*(3.00)*	
Asia				0.02				−0.07
				(1.56)				*(5.50)*
Latin America				−0.02				0.00
				(1.44)				*(0.24)*
Number of observations:	453	351	351	351	454	352	352	352
F-Statistics	4.79	6.43	5.49	5.37	7.84	5.98	5.87	7.65

Note: t-statistics in parentheses
Source: see text

4 Looming demographic ageing: A constraint to economic growth and living standard increases in the EU 25

Giuseppe Carone, Declan Costello, Nuria Diez Guardia, Gilles Mourre, Bartosz Przywara and Aino Salomäki

4.0 Abstract

This paper makes an assessment of the overall economic impact of ageing for the EU Member States on the basis of the long-term macroeconomic projections developed by the Economic Policy Committee and the European Commission. The projections point to pressing economic policy challenges for the EU as the growth rates of GDP and living standards are projected to fall to levels below those observed in recent decades. The key issue there will be the projected decline in the labour supply, since the higher share of older age cohorts in the total population will cause a fall in the proportion of the economically active population and the already several decades continued low fertility rates will result in smaller age cohorts entering labour market than those exiting it.

As regards policy conclusions, the paper underlines the critical need for further labour market reforms, and the need for the EU to look beyond the Lisbon employment targets and deadlines. Even if the EU as a whole achieves the Lisbon employment targets, this will not be sufficient to offset the effects of demographic change on the number of the employed persons. Moreover, considerable unused labour capacity would remain in many Member States. The paper argues that raising the employment rates of older workers and increasing effective retirement ages remain a priority in order to increase the labour supply. Migration could also contribute to raising labour supply to some extent. However, boosting productivity will become the major challenge in the future.

4.1 Introduction

Europe's population is to experience dramatic changes in coming decades due to low fertility, continuous gains in life expectancy and large-scale inward migration. Since the launch of the third stage of the Economic and Monetary Union, considerable attention has been paid to the budgetary implications of ageing populations. This paper focuses on the equally important issue of the impact of ageing on the real economy, and in particular on the labour market, productivity, economic growth and living standard, using a new round of long-term economic projections completed in 2005. Most of this analysis rests on the recent work by the Directorate General for Economic and Financial Affairs of the European Commission (henceforth DG ECFIN) and the Ageing Working Group[1] attached to the Economic Policy Committee (AWG) to prepare macroeconomic assumptions used to make age-related expenditure projections. In particular, this paper draws heavily on EPC (2005) and Carone et al. (2005).

While this analysis does not directly deal with the budgetary cost of ageing populations, it nonetheless casts light on prospective developments in the real economy that are relevant when assessing the sustainability of public finances.

The paper is structured as follows:

- Section 4.2 contains a brief description of the methodology of the recent long-term economic projections made jointly by the AWG and DG-CFIN, on the basis of new Eurostat projections. The underlying assumptions used as well as the main caveats are recalled in this section.
- Section 4.3 presents projections for the impact of ageing on employment, productivity and potential growth in real GDP and GDP per capita. To this end, it reviews the main drivers of demographic change and summarises how the size and age structure of the populations of EU Member States can be expected to change. It then analyses the impact of ageing on the labour market: in particular, based on a cohort model, it presents projections for participation and employment rates and discusses the prospects for meeting the Lisbon employment targets. Furthermore, section 4.3 focuses on the impact of ageing on labour productivity, and also contains projections for GDP growth rates and growth in living standard up to 2050 for all 25 EU countries[2].
- Section 4.4 discusses specific aspects which are not fully covered by the projections, given their complexity or the lack of consensus in the economic literature, in particular the effect of ageing on the quality of labour inputs and on innovations and the impact of health on economic growth.
- Section 4.5 draws policy conclusions on the scale and nature of the ageing challenge facing the EU. Particular emphasis is placed on the labour market, and especially the importance of achieving and even surpassing the Lisbon employment targets, raising effective retirement ages and older worker employment rates and designing proper immigration policies.

[1] The age-related expenditure projections cover public spending on pensions, health care, long-term care, education, unemployment transfers and, if possible, contributions to pensions/social security systems for the EU25 Member States. They are being prepared as part of the mandate given by the ECOFIN Council in November 2003 to the EPC to produce budgetary projections for EU Member States for 2004 – 2050: the projection results will be presented to the ECOFIN Council in February 2006, on the basis of the agreed underlying assumptions and projection methodologies, details of which can be found in EPC and European Commission (2005a and 2005b).

[2] The methodology for making the labour force projections is set out in Carone (2005) together with a detailed presentation of the projection results. The approach used regarding assumptions on labour productivity and other macroeconomic variables are set down in Carone, Denis, McMorrow, Mourre and Röger (2006).

4.2. The EPC-Commission economic projection up to 2050

4.2.1 The challenge of making comparable cross-country projections

4.2.1.1 Main requirements for common long-term projections

In the coming decades, the size and age-structure of Europe's population will undergo dramatic changes due to low fertility rates, continuous increases in life expectancy and the retirement of baby-boom generation. There has been a growing recognition at national and European level of the profound economic, budgetary and social consequences of ageing populations. Prompted by the launch of the euro, the Economic Policy Committee (EPC) established the Working Group on Ageing Populations (AWG) to examine the economic and budgetary consequences of ageing, which led to the publication of age-related expenditure projections in 2001 and 2003. In 2003, the ECOFIN Council gave the Economic Policy Committee (EPC) a mandate to produce a new set of age-related public expenditure projections for all twenty-five Member States covering pensions, health care, long-term care, education, unemployment transfers and, where possible, contributions to pensions/social security systems[3]. This section briefly presents the common economic projections, which were used as a basis for the age-related expenditure projections. It covers the EU10 Member States which has enriched the exercise, but also increased its complexity and the heterogeneity of the findings.

The value-added of these projections is that they are produced in a multilateral setting involving national authorities and international organisations. The projections are made on the basis of a common population projection and common underlying economic assumptions that have been endorsed by the EPC.

The projections are generally – and for the reference scenario in particular – made on the basis of "no policy change", i.e. only reflecting enacted legislation but not possible future policy changes (although account is taken of provisions in enacted legislation that enter into force over time). The pension projections are made on the basis of legislation enacted by mid 2005. They are also made on the basis of the current behaviour of economic agents, without assuming any future changes in behaviour over time: for example, this is reflected in the assumptions on participation rates which are based on the most recently observed trends by age and gender. While the underlying assumptions have been made by applying a common methodology uniformly to all Member States, for several countries adjustments have been made to avoid an overly

[3] The projections for the EPC were made by the Ageing Working Group of the EPC chaired by Henri Bogaert and the European Commission's Directorate General for Economic and Financial Affairs.

mechanical approach that leads to economically unsound outcomes and to take due account of significant country-specific circumstances.

4.2.1.2 A production function framework

This framework is presented in details in Carone et al. (2006). A Cobb-Douglas production function with constant returns to scale is used. GDP can be represented by a combination of factor inputs (mainly labour and capital), multiplied by the technological level or total factor productivity (TFP). The parameters of the production function essentially determine the output elasticities to the individual inputs.

This approach was the preferred option of the EPC-AWG given its flexibility and sound analytical basis, especially in terms of understanding the main components driving labour productivity developments. It however requires making some specific assumptions regarding developments in specific labour productivity components, namely TFP and capital deepening in the medium run and in the long-run.

In the long-run, according to the neo-classical growth model (Solow model), the economy should reach its equilibrium (also called steady state or balanced growth path), where both the ratio of the capital stock to labour expressed in efficiency units, and output to labour expressed in efficiency units (or output per effective worker), remain constant over time. As a result, both the capital stock per worker and productivity per worker grow at the same pace as labour augmenting technical progress.

4.2.2 Main underlying assumptions:

4.2.2.1 Population projections

The population projection used to make the age-related expenditure projection was prepared by Eurostat. It is based on, but is not identical to, the EUROPOP2004 projection released by Eurostat in May 2005[4], and hereafter it is referred to as the "AWG scenario". In particular:

- the fertility rate assumptions are the same as those in the baseline of EUROPOP2004 for all 25 Member States;
- for the EU10, the assumptions on life expectancy at birth are the same as those in the baseline of EUROPOP2004. For the EU15, the assumptions on life expectancy at birth are based on an AWG scenario produced by Eurostat;

[4] 'EU25 population rises until 2025, then falls', Eurostat press release 448/2005 of 8 April 2005. For simplicity, the baseline variant of the trend scenario of EUROPOP2004 is referred to as EUROPOP2004 baseline in the text.

- the migration assumptions are the same as those in the baseline of EUROPOP2004 for all Member States, except Germany, Italy and Spain, where specific adjustments were made to the level and/ or age structure of migrants in the AWG scenario.

4.2.2.2 Labour force

The budgetary projections are made on the basis of a labour force projection made by the Commission (DG ECFIN) and extensively documented in Carone (2005). It:

- is based on the age-cohort methodology developed by the OECD and by DG ECFIN and the Ageing Working Group attached to the EPC (see Carone 2005). The methodology explicitly takes into account the evolution of lifetime profiles of participation. It is based on the calculation of the probability of labour market entry and labour market exit for each of the latest cohorts available (based on the average rates observed between 1998 and 2003). These probabilities are kept constant and, in the baseline scenario, reflect a working assumption of "no policy change". In essence, the cohort methodology reflects the tendency for women belonging to any given cohort or generation to have their own specific level of participation, which is usually higher at all ages than the corresponding level of participation of older cohorts. Moreover, the methodology captures the effects of demographic change on the labour force;
- incorporates a projection on the future impact of enacted pension reforms on the employment rates of older workers;
- requires, for a number of Member States, the conversion of labour force projections based on Labour Force Surveys into national account equivalents.

As regards unemployment, unemployment rates converge to their structural level or NAIRU by 2008, remaining constant thereafter. The Commission estimates for the NAIRU are used. The European Commission-DG ECFIN estimates for the NAIRU agreed upon in the Output Gap Working Group of the EPC were used. See European Commission-EPC (2005) and Carone, Denis, McMorrow, Mourre and Röger (2006).The following adjustments will be made to this general rule:

- countries with a NAIRU rate in 2008 higher than the average rate of the EU15 countries can reduce their unemployment rates further to converge to the 2008 EU15 average (7%) by 2015;
- new Member States with a NAIRU above the EU15 average (i.e. Poland and Slovakia) will have 20 years to allow their unemployment rates to converge to the EU15 average;

- to avoid significant changes in the rankings across countries, the estimate of structural unemployment will be adjusted for Belgium, the Czech Republic and Italy.

4.2.2.3 Labour productivity

A production function approach is used to project labour productivity. This means that labour productivity is derived from the calculations based on the labour input projections (explained above) and the assumptions concerning total factor productivity (TFP) and the investment scenario. The detailed assumption are spelled out and analysed in EPC (2005) and Carone et al. (2006). In particular, the EPC and the Commission agreed:

- to take the medium-term scenario designed by the Output Gap Working Group attached to the EPC for the period up to 2009.[5];
- to adopt the following capital deepening assumptions. First, the investment/GDP ratio in 2004 will be held constant until 2010. Second, a transition to the constant capital/labour ratio assumption will be introduced gradually over the period 2010 to 2030, with the ratio of capital deepening to TFP held constant from 2030 to 2050 (steady state)[6];
- TFP growth rates in EU15 countries will converge to 1.1% by 2030, with different speeds of convergence for individual Member States.
- in the new Member States (EU10), TFP will converge to 1.75% by 2030 and converge, at the same pace, to 1.1% in 2050. In order to allow for a faster convergence across the EU10 countries and then between the EU15 and the EU10, three quarters of the convergence towards 1.75% and subsequently to 1.1% is achieved in 2015 and 2035 respectively.

4.2.3 A word of caution: necessary simplification

Caution must be exercised when interpreting the long-run budgetary projections and the degree of uncertainty increases the further into the future the projections go. The projections are not forecasts. Instead, they provide an indication on the potential timing and scale of challenges that could result from ageing population based on a “no policy change” scenario. The projection methodologies employed can not be completely comprehensive, and there are limitations with the data in several respects.

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[5] For the short-to-medium term the EPC-AWG decided to use the same approach as that used to estimate potential output and thus the output gap. These estimates are used in the assessment of the cyclical budgetary position of Member States, within the surveillance framework of the Stability and Growth Pact (SGP). The statistical approach used by DG ECFIN and the Output Gap Working Group (OGWG) is applied to historical (starting in the mid-1960s) and forecast data.

[6] This approach enables to capture the medium-term dynamics better, whilst the assumption of constant K/L ratio from 2030 onwards ensures that the labour productivity projections for all 25 countries (including the New Members States) are converging to the same level at the end of projection period.

The economic projections presented in this document only portray a partial picture of the economic consequences of ageing populations. For example, the projected impact of ageing on the labour market and potential GDP growth rates is based on a partial analysis that does not take account all channels and feedback effects through which an ageing population could impact on real economic activity.

This paper does not cover the impact of ageing on age-related public expenditure and government budgets or long-term sustainability of public finances, although the projections of age-related public expenditure were part of the projection exercise carried out jointly by the EPC and the European Commission. These issues are deserve separate studies.

4.3 How will ageing affect the EU economy? A projection for EUMember States up to 2050

In this section, the economic impact of ageing is explored on the basis of a projection for employment and GDP growth potential covering all EU25 Member States up to 2050.

4.3.1 What is the nature and scale of the ageing challenge facing Europe: demographic prospects for the EU25 up to 2050

4.3.1.1 Three demographic drivers: fertility, life expectancy and migration flows

According to the Eurostat projection, the population in the EU25 will be both smaller and older in 2050, as a result of:

- low fertility rates below the natural replacement rate: from 1.5 for the EU25 in 2004, Eurostat only projects a limited recovery to 1.6 by 2030, with the largest rebound in EU10 countries where fertility slumped during economic transition of the 1990s;
- continuous increases in life expectancy: having increased by some 8 years between 1960 and 2000 life expectancy at birth for males is projected to rise by 6 years to 80.5 in 2050, and by 5 years for females to 85.6. Much of the projected gains in life expectancy will occur at older ages, and life expectancy at 65 is projected to increase by some 4 years by 2050;
- net inward migration inflows to the EU25 currently amount to 1.3 million people, i.e. 0.35% of the population and mostly flowing to EU15 countries, in particular to Spain, which has received about 0.5 million migrants in recent years. While this is projected to fall to 800,000 persons by 2015 (0.2% of the population) – mainly because the immigration to Spain is assumed to come down to a level of 100,000 migrants –, overall inflows will nonetheless cumulate to some 40 million persons by 2050.

Table 4.1 Overview of assumptions on demographic drivers

	Fertility Rate		Life expectancy at birth				Life expectancy at 65				Migration			
			males		females		males		females		000's		% of population	
	2004	**2050**	**2004**	**2050**	**2004**	**2050**	**2004**	**2050**	**2004**	**2050**	**2004**	**2050**	**2004**	**2050**
BE	1.6	1.7	75.5	82.1	81.6	87.5	15.8	20.3	19.7	24.1	24	19	0.2	0.2
DK	1.8	1.8	75.2	81.4	79.6	85.2	15.2	19.3	18.0	21.9	8	7	0.1	0.1
DE	1.4	1.5	76.1	82.0	81.7	86.8	16.1	20.1	19.5	23.4	270	200	0.3	0.3
GR	1.3	1.5	76.4	81.1	81.4	85.9	16.4	19.6	18.5	22.3	43	35	0.4	0.4
ES	1.3	1.4	76.6	81.7	83.4	87.3	16.7	20.0	20.7	23.7	508	102	1.2	0.3
FR	1.9	1.9	76.2	82.3	83.4	87.9	17.0	20.5	21.3	24.5	64	59	0.1	0.1
IE	2.0	1.8	75.5	82.2	80.7	86.8	15.4	20.2	18.6	23.4	16	12	0.4	0.3
IT	1.3	1.4	77.3	82.8	83.2	87.8	16.7	20.4	20.6	24.1	150	150	0.3	0.3
LU	1.7	1.8	75.0	81.8	81.4	86.7	15.7	19.9	19.6	23.4	3	3	0.6	0.4
NL	1.8	1.8	76.2	81.1	80.8	85.2	15.4	18.9	19.0	22.1	21	31	0.1	0.2
AT	1.4	1.5	76.2	82.8	82.1	87.2	16.2	20.4	19.7	23.6	25	20	0.3	0.3
PT	1.5	1.6	74.2	81.2	81.0	86.7	15.6	19.9	19.0	23.1	42	15	0.4	0.2
FI	1.8	1.8	75.3	81.9	81.9	86.6	15.7	20.0	19.5	23.3	6	6	0.1	0.1
SE	1.7	1.9	78.1	82.6	82.4	86.6	16.7	20.0	19.8	23.0	28	21	0.3	0.2
UK	1.7	1.8	76.4	82.4	80.9	86.7	16.1	20.4	19.0	23.3	139	98	0.2	0.2
CY	1.5	1.5	76.3	81.9	80.8	85.1	16.2	19.9	18.3	21.7	6	5	0.8	0.5
CZ	1.2	1.5	72.4	79.7	78.8	84.1	13.8	18.4	17.0	20.9	4	20	0.0	0.2
EE	1.4	1.6	65.5	74.9	76.9	83.1	12.4	17.3	16.9	20.9	1	2	0.1	0.2
HU	1.3	1.6	68.5	78.1	76.8	83.4	13.1	18.6	16.7	21.1	15	20	0.1	0.2
LT	1.3	1.6	66.5	75.5	77.6	83.7	13.3	17.9	17.4	21.5	-6	4	-0.2	0.2
LV	1.3	1.6	64.9	74.3	76.2	82.5	12.3	17.5	16.6	20.7	-2	3	-0.1	0.1
MT	1.7	1.6	76.2	81.8	80.7	85.0	15.2	19.2	18.3	21.6	3	3	0.6	0.5
PL	1.2	1.6	70.5	79.1	78.5	84.4	13.7	18.8	17.4	21.5	-28	34	-0.1	0.1
SK	1.2	1.6	69.7	77.7	77.8	83.4	12.9	17.6	16.5	20.4	-2	5	-0.0	0.1
SI	1.2	1.5	72.6	79.8	80.2	85.1	14.3	18.7	18.4	22.0	6	7	0.3	0.4
EU25	*1.5*	*1.6*	*75.4*	*81.6*	*81.5*	*86.6*	*16.3*	*20.2*	*19.9*	*23.6*	*1343*	*879*	*0.3*	*0.2*
EU15	*1.5*	*1.6*	*75.4*	*82.1*	*82.2*	*87.0*	*13.5*	*18.5*	*17.2*	*21.2*	*1347*	*778*	*0.4*	*0.2*
EU10	*1.2*	*1.6*	*70.1*	*78.7*	*78.2*	*84.1*	*15.9*	*19.9*	*23.3*	*23.3*	*-3*	*101*	*-0.1*	*0.2*

Source: EPC and European Commission (2005).

4.3.1.2 An older and, eventually, smaller population

In 2050 the population in the EU25 will be both smaller and older (figure 4.1) as a result of the abovementioned projected trends in the main demographic drivers. It is projected to rise from 457 million in 2004 to a peak of 471 million in 2027, and thereafter to decline to 454 million in 2050. This aggregate picture hides sharp divergences between individual countries. Whereas the total population is projected to increase in some Member States (e.g. Belgium: +4%, France: +9%, Sweden: +13%, UK: +8%), significant falls are projected in others (Germany: –6%, Italy: –7%, Poland: –12%).

Even more dramatic changes are projected to occur in the age structure of the population. The population pyramids in figure 4.1 below provide a snapshot contrast of the EU25 population in 2004 and 2050. In 2004, the large bulges represent people of working age, with the most numerous age cohorts being that of 39-year-olds. By 2050, an “inverted cone” shape appears, reflecting the passage of baby-boomers into their retirement years in parallel with life expectancy increasing and the effects of prolonged low fertility rates taking hold.

The share of very young people (aged 0-14) in the total population is projected to decline, and their overall number in the EU25 will drop by 19% (30% in EU10). However, from an economic perspective, the most significant change concerns the working-age population (15-64). This will start to fall from 2010 in the EU25 (sooner in some countries), and will drop by 48 million or 16% by 2050. Divergences between Member States are wide, with declines of more than 20 percentage points projected in 13 countries (Germany, Greece, Spain, Italy, Portugal, the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia and Slovenia). In contrast, the elderly population aged 65+ will rise sharply, by 58 million (or 77%), by 2050. The fastest growing segment of the population will be the very old (80+), the number of whom will rise by almost 32 million, an increase of 174%.

4.3.2 The impact of ageing on the labour market

4.3.2.1 A new labour force projection taking account of trends by ageand gender

On the basis of the population projection described in the previous section, a labour force projection has been made where developments are explicitly modelled by gender and age group: this approach is justified as past trends and future prospects differ for each group. The main results of the cohort approach used (which extrapolated forward the trends observed in the past 5 years), can be summarised as follows (see Table 4.2):

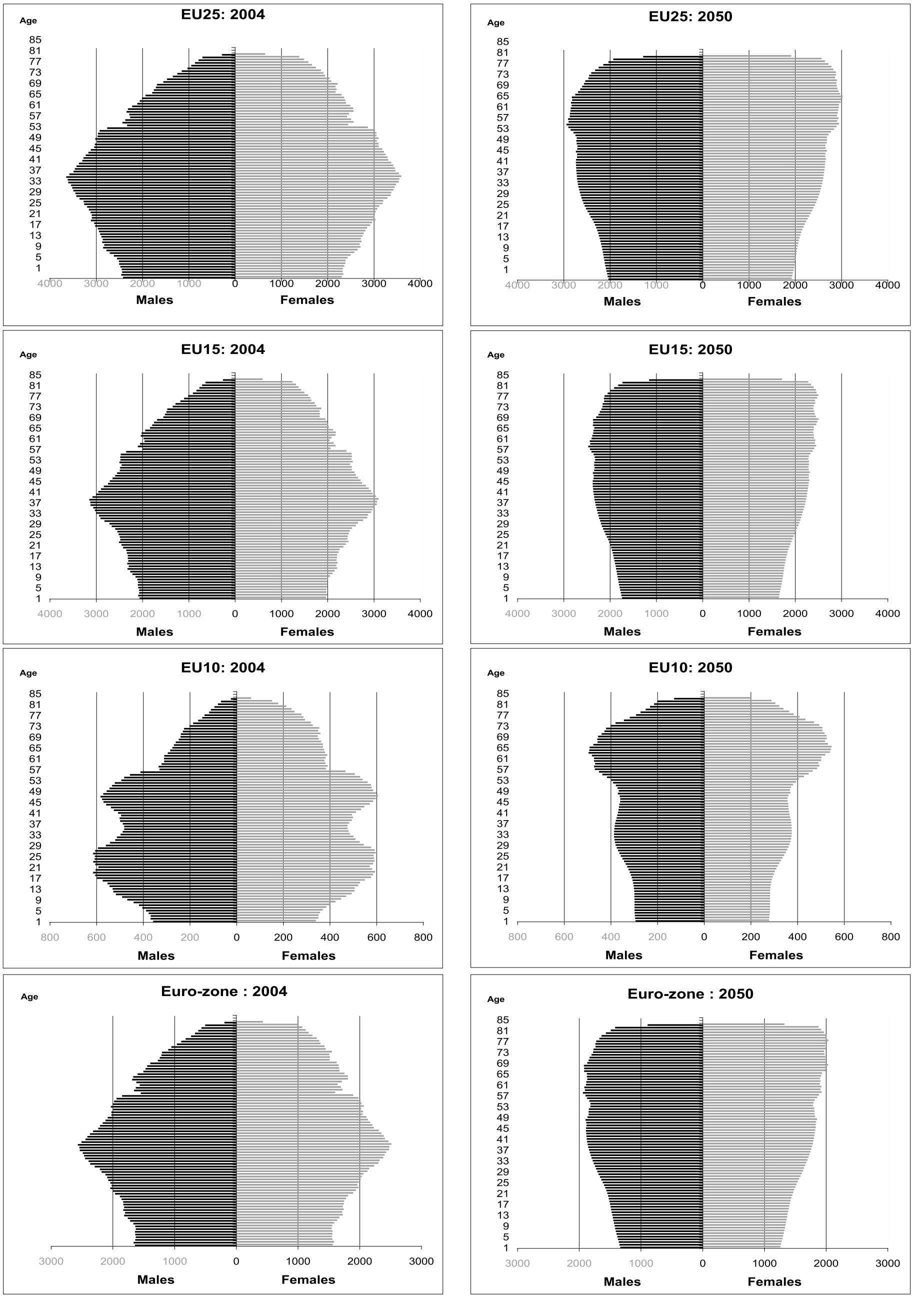
- young people (15-24): whilst in some EU countries the youth employment rate has risen, in many others it has been falling, especially in the EU10. This is a result of more people completing secondary education and enrolling in tertiary studies – a positive trend which enhances human capital formation and future potential labour productivity. Some EU15 countries, meanwhile, are actually considering measures to reduce the length of time spent in third-level education so as to facilitate earlier entry into the labour market while at the same time improving the efficiency of education systems;
- women: the projections show female employment rates rising from just over 55% in 2004 to almost 65% by 2025 and remaining stable thereafter. This increase, which would enable the 60% Lisbon employment target to

be reached in 2010, can be attributed to the gradual replacement of older women with low participation rates by younger women who have a much stronger attachment to the labour force. A trend of rising employment rates among women has been observed for several decades, and is largely explained by rising educational attainment and changing socio-cultural factors. Whether the projected increases in female employment rates materialise in practice, or are even exceeded, may in part depend on supportive public policies or collective agreements being put in place, such as policies to promote access to affordable childcare, to reconcile professional and private lives and to achieve gender equality[7];

- older workers: the employment rate of older workers aged 55 to 64 is projected to increase sharply, by 19 p.p., from 40% in 2004 for the EU25 to 47% by 2010 and 59% in 2050: this is well in excess of the 50% Lisbon target, which is projected to be reached by 2013. The projection reflects the observed increase in employment rates of older workers in recent years (up by 4.4 p.p. since 2000). It also incorporates the expected (albeit uncertain) positive effects of enacted pension reforms. These reforms have, *inter alia*, curtailed access to early retirement schemes, raised statutory retirement ages (including minimum ages when pension income can be drawn) and strengthened financial incentives to remain in the labour force. Note that the increase in the employment rates for older males (by 15 p.p., from 50% to 65%) is less than the projected increase for older females (by 23 p.p., from 30% to 53%). The difference arises from a stronger cohort effect for females. The increase in the participation rate driven by pension reforms is some 10 p.p. for both male and females, whereas the cohort effect for females is almost 13 p.p. compared with 6 p.p. for males.

[7] See chapter 3 in European Commission (2004). Moreover, the rise in female participation may have an impact on fertility rates and working hours, although the magnitude of such effects and the direction of causality remain uncertain.

Figure 4.1 Age pyramids for EU25 population, 2004 and 2050



Source: EPC and European Commission (2005a and b)

Table 4.2 Projected employment rates in EU Member States, 2004 to 2050

	Total (15–64)				Females (15–64)				Older workers (55–64)			
	2003	2010	2025	2050	2003	2010	2025	2050	2003	2010	2025	2050
BE	59.6	62.1	64.7	65.5	51.8	56.0	60.3	61.0	28.1	33.2	42.8	44.4
DK	74.9	76.4	77.3	77.9	70.2	72.0	72.7	73.3	59.8	61.5	65.6	66.7
DE	65.4	70.9	73.2	73.5	59.3	65.8	67.8	68.3	39.5	56.4	65.8	65.7
GR	58.9	62.7	64.9	65.1	44.6	50.0	54.6	55.6	42.1	44.4	51.9	52.9
ES	59.7	66.4	70.3	71.4	46.2	55.6	62.5	64.2	40.6	45.6	59.6	62.5
FR	63.1	64.4	66.7	68.0	57.0	58.9	61.8	63.4	36.3	42.3	49.4	52.9
IE	65.5	70.9	73.6	74.6	55.7	62.7	67.7	69.1	48.8	55.5	66.8	68.9
IT	57.2	61.0	63.6	65.7	44.9	50.0	53.9	56.1	29.4	35.9	49.4	52.9
LU	62.6	64.4	66.7	68.0	51.7	58.9	58.1	63.4	30.3	35.3	40.2	41.8
NL	73.6	75.3	76.5	77.9	66.0	70.1	73.4	75.2	44.4	48.1	53.5	55.2
AT	69.1	73.5	75.1	76.4	61.7	67.8	70.5	71.8	30.1	40.1	54.2	58.0
PT	67.8	71.9	72.9	73.4	61.2	66.4	68.7	69.5	51.4	56.5	63.0	64.7
FI	67.7	70.2	73.8	74.4	65.8	67.9	71.9	72.7	49.4	54.1	62.3	64.9
SE	73.1	74.9	77.4	77.6	71.6	73.5	76.1	76.4	68.8	70.9	75.1	76.6
UK	71.5	72.9	74.2	74.7	65.3	67.3	70.0	71.1	55.4	56.9	62.5	63.9
CY	67.7	73.6	78.2	77.3	59.3	67.0	72.8	72.0	50.2	60.7	65.2	69.1
CZ	64.8	66.8	72.1	69.7	56.6	59.8	66.5	63.8	42.5	48.1	59.8	58.9
EE	62.9	68.4	71.9	70.8	59.3	64.7	68.9	67.4	52.7	55.3	61.7	61.7
HU	56.9	60.8	65.3	63.2	50.7	54.2	60.3	58.6	28.7	39.6	49.8	49.5
LT	61.2	67.3	73.4	71.7	58.4	64.6	71.3	69.0	45.3	53.1	65.1	66.2
LV	61.9	69.9	73.1	71.4	57.8	65.3	69.1	66.7	44.1	53.4	59.2	58.7
MT	54.1	56.7	62.4	61.3	33.7	39.6	49.0	48.6	32.0	29.3	30.3	33.1
PL	51.0	57.0	68.4	66.1	45.8	51.8	64.3	60.9	26.7	35.2	42.7	48.7
SK	57.8	62.1	72.7	68.7	52.2	56.9	68.9	64.3	25.2	38.5	51.7	51.2
SI	62.8	67.7	69.9	69.3	58.0	62.5	65.9	66.4	23.5	40.4	50.0	52.6
EU25	*63.1*	*66.9*	*70.3*	*70.9*	*55.4*	*60.2*	*64.7*	*65.5*	*39.9*	*47.1*	*56.8*	*58.9*
EU15	*64.6*	*68.1*	*70.5*	*71.5*	*56.5*	*61.2*	*64.6*	*66.1*	*41.4*	*48.6*	*58.0*	*60.2*
Euro Area	*62.9*	*66.9*	*69.4*	*70.5*	*54.1*	*59.4*	*63.1*	*64.6*	*37.4*	*46.0*	*56.5*	*58.8*
EU10	*55.7*	*60.7*	*69.4*	*67.1*	*50.0*	*55.2*	*65.0*	*62.1*	*31.7*	*39.8*	*49.2*	*51.9*

Source: EPC and European Commission (2005a and b).

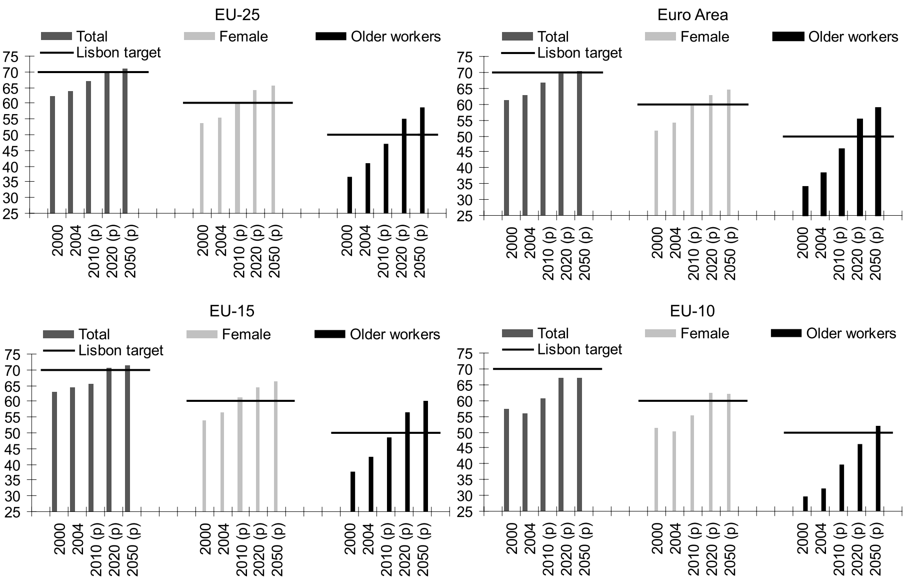
4.3.2.2 The Lisbon employment targets will be met, but behind schedule, especially in the euro area

Figure 4.2 shows the projected employment rates relative to the Lisbon employment target groups[8]. It indicates that the situation is not even across areas within the Union. For instance, the Lisbon target for overall employment is projected to be reached by 2015 in the EU15 but by only 2035 in the euro

[8] At the Lisbon European Council of March 2000, Heads of State and Government set targets of raising the overall EU15 employment rate to 70% overall and 60% for women by 2010. The Stockholm European Council (March 2001) added one additional target – raising the employment rate of older workers to 50% by the same date – and two intermediate targets to be achieved by the mid-term point of 2005: an overall employment rate of 67% and a rate of 57% for women.

area[9], while the EU10 will not reach the target at all, because after attaining a peak at 69.5 in 2025, the employment rate is projected to go down to only 67% in 2050. The relative delay in the euro area is mainly due to the relative poor prospects for youth employment. For the EU10, the projected failure to reach 70% employment will be due to relatively poor employment prospects for prime-age males; the Lisbon target for females will still be reached by 2017 and that for older workers by 2027.

Figure 4.2 Projected employment rates and Lisbon targets



Note: (p) means projected figure; actual figures are given for 2000 and 2004.
Source: EPC and European Commission (2006), Carone et al. (2005).

4.3.2.3 The impact of ageing on labour supply and employment

The projected increases in the employment rates of women and older workers would, as illustrated in Figure 4.3 below, temporarily cushion the effects of ageing on the labour force.

At the aggregate EU25 level, three distinct time periods can be observed:

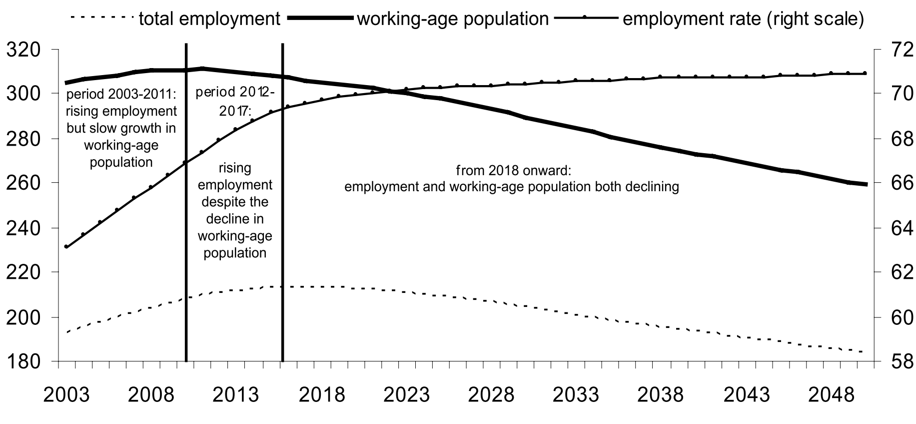
- 2004−2011 – window of opportunity when both demographic and employment developments are supportive of growth: both the working-age population and the number of persons employed increase during this period. However, the rate of increase slows down, indicating that the effect of an ageing population is starting to take hold even if it is not yet visible

[9] For a more focused analysis on the impact of ageing on the euro area, see the December 2005 edition of the Quarterly Report on the Euro Area (European Commission 2005d).

in aggregate terms. This period can be viewed as a window of opportunity, since both demographics and labour force trends are supportive of growth. Conditions for pursuing structural reforms may consequently be relatively more favourable than in subsequent years;

- 2012 – 2017 – rising employment rates offset the decline in the working-age population: during this period, the working-age population will start to decline as the baby-boom generation enters retirement. However, the continued projected increase in the employment rates of women and older workers will cushion the demographic factors and the overall number of people employed will continue to increase, albeit at a slower pace. From 2012 onwards, the tightening labour market conditions (lower labour force growth together with unemployment down to NAIRU) may increase the risk of labour market mismatch;
- the ageing effect dominates from 2018: the trend increase in female employment rates will broadly have worked itself through by 2017, with only a very slow additional increase projected in the period 2018 – 2050. In the absence of further pension reforms, the employment rate of older workers is also projected to reach a steady state. Consequently, there is no counter-balancing factor to ageing, and thus both the size of the working-age population and the number of people employed are on a downward trajectory. Having increased by some 20 million between 2004 and 2017, employment during this last phase is projected to contract by almost 30 million, i.e. a fall of nearly 10 million over the entire projection period of 2004 to 2050.

Figure 4.3 Projected working-age population and total employment, EU25

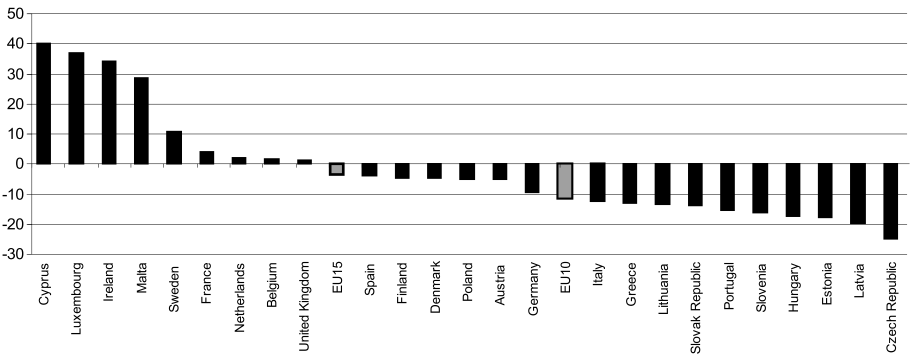


Source: EPC and European Commission (2006), Carone et al. (2005).

Table 4.3 below provides more information on the peaks and troughs as regards the size of the working age population and the numbers of persons employed per Member State.

The broad trends described above are common to many countries, but they are not uniform. As shown also in Figure 4.4, five, mostly smaller, Member States (Cyprus, Ireland, Luxembourg, Sweden, Malta) are projected to experience a pronounced rise in employment between 2003 and 2050, while the change in employment in four EU15 Member States (France, Netherlands, Belgium and UK) is projected to be slightly positive or stable. Eleven Member States are projected to see falls in employment that are well above the EU25 average of −4.6% (DE, GR, IT, PT, CZ, EE, HU, LT, LV, SK, SI). These can be grouped into the EU15 Mediterranean countries and the EU10 Member States that have undergone the transition to a market economy, plus Germany.

Figure 4.4 Employment projections (change in % of people employed aged 15–64 between 2003 and 2050) for the EU25 Member States



Source: EPC and European Commission (2006), Carone et al. (2005).

Table 4.3 Peaks and troughs for the size of the working-age population and the number of persons employed (aged 15–64)

	working-age population (15–64)			Employment (15–64)		
	peak year	% change 2003-peak	% change peak-trough	peak year	% change 2003-peak	% change peak-trough
BE	2011	2.9	−10.0	2017	103	−7.8
DK	2008	0.7	−9.8	2009	2.4	−8.1
DE	2003	0.0	−19.2	2015	10.7	−18.0
GR	2010	1.2	−22.2	2015	10.8	−21.6
ES	2010	6.3	−24.3	2020	24.1	−22.5
FR	2011	3.3	−6.6	2015	7.3	−3.1
IE	2035	23.1	−4.4	2035	39.8	−4.1
IT	2004	0.7	−23.9	2018	8.6	−19.0
LU	2050	30.9		2050	36.8	
NL	2011	2.5	−7.2	2019	6.0	−4.8
AT	2012	2.3	−16.2	2019	11.1	−14.7
PT	2008	1.6	−22.7	2013	7.9	−21.4
FI	2010	1.3	−14.5	2011	5.3	−9.6
SE	2050	4.3		2050	10.9	
UK	2011	3.8	−6.7	2018	7.8	−6.1
CY	2043	26.3	−2.9	2041	44.2	−2.8
CZ	2007	0.8	−30.7	2013	3.4	−27.3
EE	2006	0.2	−26.9	2011	7.2	−23.1
HU	2003	0.0	−25.4	2011	5.5	−21.5
LT	2006	0.1	−26.1	2016	12.7	−23.1
LV	2003	0.0	−30.3	2012	10.5	−27.3
MT	2041	14.5	−0.8	2037	29.8	−0.9
PL	2011	2.4	−28.6	2025	20.0	−21.0
SK	2010	2.7	−29.5	2020	17.4	−26.6
SI	2011	0.9	−24.7	2012	9.0	−23.0
EU25	2011	1.9	−16.7	2017	10.6	−13.8
EU15	2011	2.1	−14.6	2017	10.2	−12.4
Euro Area	2011	1.7	−16.6	2016	11.0	−14.3
EU10	2009	1.3	−27.5	2015	13.1	−21.8

Note: The trough for the size of the working-age population is the last year of projection, that is 2050, for all countries except DK (2044) and NL (2039). Trough for number of persons employed is 2050 for all countries except DK (2041) and NL (2041).
Source: Carone et al. (2005).

4.3.3 Labour productivity growth

4.3.3.1 Productivity assumed to converge to the long-term trend observed in the past three decades

As labour supply is expected to shrink over the next fifty years, labour productivity will have to play a major role in maintaining adequate aggregate economic growth. As explained in section 4.2, the theoretical and empirical literature does not reach a firm conclusion about the impact of ageing on aggregate productivity. Although there is some presumption that average productivity levels may differ across age groups, robust data on the age profile of workers productivity are simply not available.

In developing the macroeconomic assumptions to be used to make age-related expenditure projections, the EPC and European Commission (2005) used a production function approach for projecting labour productivity, a conservative approach that is consistent with the long-run historical trends[10]. Thus, the baseline productivity assumption is a useful starting point for analysis on the economic impact of ageing, but it is not a prediction of future trends. A first key working assumption was to allow Total Factor Productivity (TFP) to converge to 1.1% by 2030 across Member States. This rate was chosen as it is broadly in line with trend TFP growth observed in the US and the EU over the past three decades. This approach, in turn, assumes that there will be a convergence in productivity growth rates (but not in levels). A longer period of convergence to the common 1.1% rate of TFP growth was provided for the EU10 countries to allow for more real catch-up. The assumptions, which are not model-based, when combined with a convergence of capital deepening towards its steady-state level[11], yield an average labour productivity growth rate of some 1.7% in the EU15 for the period up to 2050. Regarding the time profile, productivity growth rates are projected to temporarily pick up in the period 2011 – 2030 due to the capital deepening that is induced by the decline in labour resources combined with the slow adjustment of capital stock. As regards EU10 countries, a much higher productivity rate is projected, on average 3.1% for the period 2011 – 30 and 1.9% between 2031 and 2050.

4.3.3.2 Productivity assumptions need to be interpreted with caution

The productivity projections are very likely the most uncertain of all the projections presented here, since they are based on assumptions. Some may claim that they are over-optimistic. Indeed two caveats apply:

- The productivity projections do not take into account the negative effect of changing demographic structure on productivity and TFP, the magnitude of which is still being debated in the economic literature (see section 2). On the other hand, they also do not take account of the potentially strong positive effect of the European economies' catch-up in ICT towards the US economy. However, the use of these long-term trends which smooth

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[10] Labour productivity growth is estimated with the 'production function approach' (see Carone et al. 2005). Labour productivity (output per worker) is derived from the calculations based on the labour input projections, the assumptions concerning Total Factor Productivity (TFP) and the investment scenario. This approach aims to shed some light on the reasons behind productivity developments and obtain a richer medium-term dynamic including the effect of population growth on labour productivity in the medium run through the change in capital intensity. Combining employment and productivity projections provides GDP and living standard projections.

[11] For details see Carone, Denis, McMorrow, Mourre and Roeger (2006).

out the recent ICT-driven productivity rise seen in the US since the second half of the 1990s means that a potential parallel ICT boom in Europe does not appear in the projections.

- The assumptions *de facto* lead to projections with some real convergence for EU10 countries. However, the experience of the so-called "cohesion countries" (Greece, Ireland, Spain and Portugal) illustrates that the growth path of lagging countries covers the full range between success stories and stagnation. Real convergence is not an automatic outcome of EU membership, and can be affected by the policy-setting or other structural dimensions, which can accelerate, slow down or even block the catching-up process. More generally, the projections are based on the assumption that real convergence is achieved in growth rate rather than in level, except for the "convergence club", i.e. the countries characterised by a very low productivity level (Barrell (2005)). This is consistent with the literature on "conditional convergence" – though the debate about how it is achieved is still going on in the academic community.

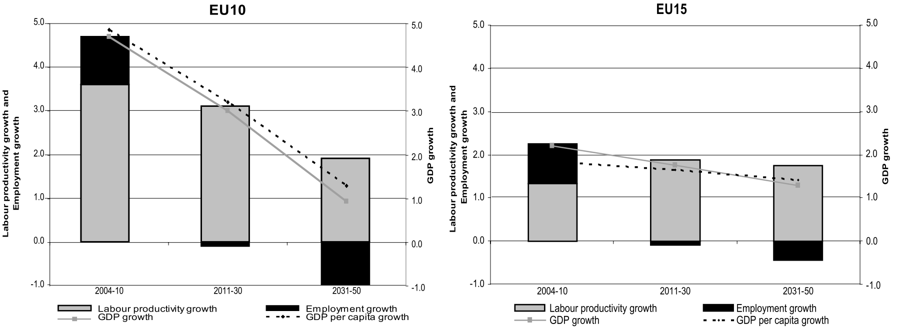
4.3.4 Projected GDP growth rates

4.3.4.1 Lower GDP growth rates as the employment contribution turns negative

By combining the employment and productivity projections, it is possible to obtain a projection for potential GDP growth rates up to 2050, see figure 4.5, tables 4.4 and 4.5). For the EU15, the annual average GDP growth rate is projected to decline from 2.2% in the period 2004–10 to 1.8% in the period 2011–30, and to 1.3% between 2031 and 2050 (see solid line in figure 4.5). An even steeper decline is foreseen in the EU10, from 4.7% in the period 2004-10, to 3% in the period 2011–30 and 0.9% between 2031 and 2050.

In addition to falling GDP growth rates, the sources of growth will alter dramatically. Employment will make a positive contribution to growth in both the EU15 and EU10 up to 2010, but will become neutral in the period 2011-2030 and turn significantly negative thereafter. Over time, productivity will become the dominant source of growth. The projected fall in GDP growth rates is much higher in the EU10 than in the EU15 (see Figure 4.5). This is due to even less favourable demographic developments there, while the convergence process is assumed to be completed and productivity growth rates become equal to those of EU15 countries.

Figure 4.5 Projected (annual average) GDP growth rates in the EU15 and EU10 and their determinants (employment/productivity)



Source: EPC and European Commission (2006), Carone et al. (2005).

4.3.4.2 Large differences in the projections across countries

The dynamic profile of projected potential GDP growth rates for all countries over the period 2004–2050 are shown in Table 4.5. Almost all countries are projected to experience a steady decline. It will start to become apparent from 2010, and will be most significant in countries with the highest starting point, notably the EU10. In many countries, annual GDP growth rates will have dropped to close to, or below, 1% during the period 2031 to 2050. Over the whole period, only a few small countries (Luxembourg, Latvia, Cyprus, Ireland, Lithuania and Estonia) are projected to enjoy an average growth rate higher than 2.5%, while Germany, Greece, Italy, Austria and Portugal are expected to grow at a rate of or lower than 1.5%.

4.3.4.3 A more in-depth decomposition of the projected sources of growth

Table 4.4 uses the standard accounting framework to assess the relative contribution to GDP growth of its two main components, labour productivity and labour utilisation. It can be seen that an increasing employment rate (which on average contributed 0.2 p.p. to average GDP growth in the EU25 and EU15, 0.3 p.p. in the euro area and 0.4 p.p. in the EU10 over the entire projection period) partially compensates for the decline in the share of the working-age population (which is a negative drag on growth by an average of −0.3/−0.4 p.p.).

Table 4.4 Projected GDP growth rate in each EU25 Member States, its sources and GDP per capita growth (annual average 2004–50)

		Due to growth in:							
	GDP growth in 2004–2050	**Productivity** (GDP per person employed)	TFP	Capital deepening	**Labour input**	Total Population	Employment Rate	Share of working age population	**GDP per capita growth in 2004–2050**
	1=3+6	**3=4+5**	4	5	**6=7+8+9**	7	8	9	10=1–7
BE	**1.7**	**1.7**	1.1	0.6	**0.2**	0.1	0.3	–0.3	1.6
DK	**1.7**	**1.8**	1.1	0.6	**–0.1**	0.0	0.1	–0.2	1.6
DE	**1.3**	**1.6**	1.1	0.5	**–0.2**	–0.1	0.3	–0.3	1.5
GR	**1.5**	**1.8**	1.0	0.8	**–0.1**	–0.1	0.4	–0.5	1.5
ES	**1.6**	**1.7**	1.0	0.7	**0.0**	0.1	0.4	–0.5	1.5
FR	**1.8**	**1.7**	1.1	0.6	**0.1**	0.2	0.2	–0.3	1.6
IE	**2.9**	**2.3**	1.5	0.8	**0.6**	0.7	0.3	–0.3	2.2
IT	**1.3**	**1.6**	1.0	0.5	**–0.2**	–0.1	0.3	–0.4	1.5
LU	**3.1**	**1.8**	1.1	0.8	**1.3**	0.8	0.7	–0.2	2.4
NL	**1.7**	**1.6**	1.1	0.6	**0.0**	0.2	0.1	–0.3	1.5
AT	**1.5**	**1.7**	1.1	0.6	**–0.1**	0.0	0.2	–0.4	1.5
PT	**1.5**	**1.9**	1.2	0.7	**–0.5**	–0.1	0.0	–0.4	1.6
FI	**1.8**	**1.9**	1.4	0.5	**–0.1**	0.0	0.2	–0.3	1.8
SE	**2.2**	**2.0**	1.4	0.6	**0.2**	0.3	0.1	–0.2	1.9
UK	**2.0**	**1.9**	1.2	0.7	**0.0**	0.2	0.0	–0.2	1.8
CY	**2.9**	**2.4**	1.4	1.0	**0.7**	0.7	0.3	–0.2	2.3
CZ	**2.0**	**2.6**	1.4	1.2	**–0.7**	–0.3	0.1	–0.5	2.3
EE	**2.7**	**3.2**	1.7	1.4	**–0.5**	–0.4	0.2	–0.3	3.1
HU	**2.1**	**2.5**	1.4	1.1	**–0.4**	–0.3	0.2	–0.3	2.4
LT	**2.8**	**3.2**	1.8	1.4	**–0.3**	–0.4	0.4	–0.2	3.2
LV	**3.1**	**3.5**	1.9	1.6	**–0.5**	–0.5	0.3	–0.3	3.5
MT	**2.4**	**1.9**	1.1	0.8	**0.5**	0.5	0.3	–0.3	1.8
PL	**2.4**	**2.7**	1.7	1.0	**–0.2**	–0.3	0.5	–0.4	2.7
SK	**2.4**	**2.8**	1.7	1.1	**–0.3**	–0.3	0.4	–0.4	2.7
SI	**2.1**	**2.6**	1.4	1.2	**–0.4**	–0.1	0.2	–0.5	2.2
EU25	***1.7***	***1.8***	*1.2*	*0.6*	***–0.1***	*0.0*	*0.2*	*–0.3*	*1.7*
EU15	***1.6***	***1.7***	*1.1*	*0.6*	***–0.1***	*0.0*	*0.2*	*–0.3*	*1.6*
Euro Area	***1.5***	***1.6***	*1.1*	*0.6*	***–0.1***	*0.0*	*0.3*	*–0.4*	*1.5*
EU10	***2.4***	***2.7***	*1.6*	*1.1*	***–0.3***	*–0.3*	*0.4*	*–0.4*	*2.6*

Source: Carone et al. (2005), based on EPC and European Commission (2005a and b).

Table 4.5 Time profile of projected GDP growth rate and its sources in each EU25 Member states (average annual growth rates)

	Potential Growth			Labour productivity growth			Employment Growth		
	2004–10	2011–30	2031–50	2004–10	2011–30	2031–50	2004–10	2011–30	2031–50
BE	2.4	1.7	1.5	1.5	1.8	1.7	1.2	0.0	−0.2
DK	2.0	1.6	1.6	1.9	1.8	1.7	0.4	−0.2	−0.1
DE	1.7	1.4	1.2	0.9	1.6	1.7	0.8	−0.2	−0.5
GR	2.9	1.6	0.8	2.1	1.8	1.7	2.3	−0.1	−0.9
ES	3.0	2.0	0.6	1.1	1.9	1.7	2.9	0.1	−1.1
FR	2.2	1.8	1.6	1.4	1.7	1.7	0.8	0.1	−0.1
IE	5.5	3.3	1.6	3.4	2.5	1.7	2.2	0.9	−0.1
IT	1.9	1.5	0.9	0.7	1.7	1.7	1.3	−0.2	−0.8
LU	4.0	3.0	3.0	1.8	1.9	1.7	2.3	1.0	1.3
NL	1.7	1.6	1.7	1.1	1.7	1.7	0.2	−0.1	0.0
AT	2.2	1.6	1.2	1.5	1.8	1.7	1.1	−0.1	−0.5
PT	1.9	2.1	0.8	1.2	2.4	1.7	0.1	−0.3	−0.9
FI	2.7	1.7	1.5	2.1	2.0	1.7	0.7	−0.3	−0.2
SE	2.7	2.4	1.8	2.2	2.3	1.7	0.8	0.1	0.1
UK	2.8	2.1	1.5	2.1	2.1	1.7	0.3	0.0	−0.2
CY	4.3	3.5	1.9	2.4	2.9	1.9	3.4	0.7	0.0
CZ	3.5	2.6	0.8	3.4	3.0	1.9	−0.5	−0.4	−1.1
EE	6.1	3.0	1.2	5.3	3.6	1.9	0.5	−0.5	−0.7
HU	3.7	2.6	1.1	3.2	2.9	1.9	0.9	−0.3	−0.9
LT	6.5	3.3	1.1	5.7	3.6	1.9	1.3	−0.3	−0.8
LV	7.7	3.4	1.1	6.5	4.1	1.9	1.3	−0.6	−0.8
MT	2.2	2.8	2.0	1.0	2.2	1.9	1.6	0.7	0.0
PL	4.6	3.2	0.9	3.8	3.1	1.9	1.6	0.2	−1.1
SK	4.6	3.4	0.6	3.9	3.3	1.9	1.4	0.2	−1.4
SI	3.7	2.5	1.1	3.3	3.0	1.9	0.9	−0.5	−0.8
EU25	*2.4*	*1.9*	*1.2*	*1.5*	*2.0*	*1.7*	*1.0*	*0.0*	*−0.5*
EU15	*2.2*	*1.8*	*1.3*	*1.3*	*1.8*	*1.7*	*1.0*	*0.0*	*−0.4*
Euro Area	*2.1*	*1.7*	*1.2*	*1.1*	*1.8*	*1.7*	*1.2*	*−0.1*	*−0.5*
EU10	*4.7*	*3.0*	*0.9*	*3.6*	*3.1*	*1.9*	*1.1*	*0.0*	*−1.0*

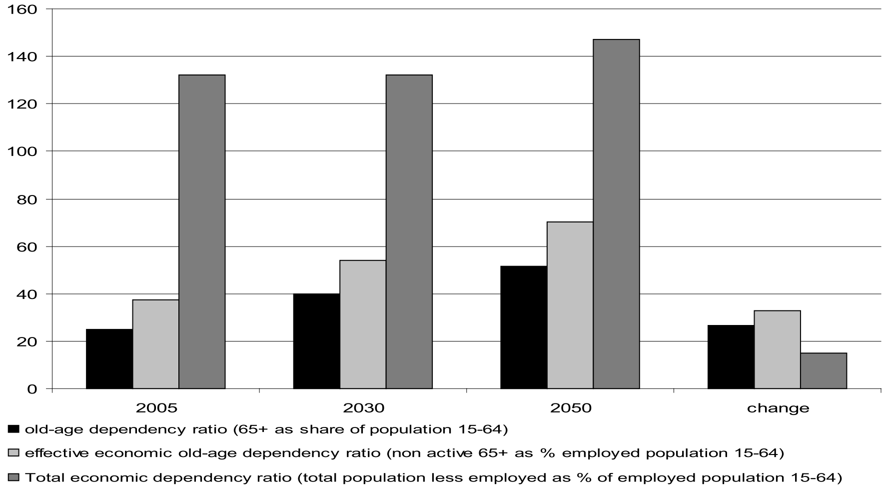
Source: EPC and European Commission (2006), Carone et al. (2005).

4.3.5 Taking stock on the magnitude of the ageing challenge: rising dependency ratio and falling per capita GDP growth

4.3.5.1 Dependency ratios summarise the magnitude of the ageing problem

The projections point to pressing economic policy challenges for the EU as a result of ageing. From an economic perspective, potential growth rates will fall to levels below those observed in recent decades: however, living standards (at least in the EU15) as measured by GDP per capita should hold up somewhat better than the trend in headline GDP growth rate suggests. Fiscal challenges will come from both sides of the budgetary equation. Pressure for increased public spending will result from a higher share of the total population in older age cohorts that require larger public transfers (e.g. pensions) and services (health care, long-term care). The financing side may also be affected, with a decline in the support ratio of contributors to beneficiaries. These developments can best be viewed by comparing the economic dependency ratios reported in Figure 4.6. Over the next decades, the old-age dependency ratio, that is, the number of people aged 65 years and above relative to those between 15 and 64, is projected to double, reaching 51% in 2050. This means that we will go from the current situation of having four people of working-age for every elderly citizen to a ratio of 2 to 1 (even higher in some countries). The 'effective economic old-age dependency' ratio is also informative: this is the number of non-active persons aged 65 and above as a percentage of employed persons aged 15 to 64. As expected, this ratio is higher than the old age-dependency ratio, and is projected to rise sharply for the EU25, from 37% in 2003 to 48% in 2025 and 70% in 2050, raising complex issues relating to the role of public transfers in achieving an appropriate distribution of resources between a smaller active population and a larger inactive retired population.

Figure 4.6 Projected demographic and economic dependency ratios for the EU 25



Source: EPC and European Commission (2005a)

The total economic dependency ratio measures the total inactive population (total population less persons employed) as a percentage of persons employed (aged 15 to 64). It gives an indication of the average number of people which each economically active person ‘supports’, and thus is relevant when considering the prospects for potential GDP per capita growth. For the EU25, this ratio actually falls from 136% in 2003 to 125% in 2025, but thereafter increases to 147% by 2050. Overall economic dependency is projected to decline up to 2025, mostly due to a better labour market performance (especially the projected trend increase in female employment rates), but also due to low fertility (as smaller numbers of young people will reduce the youth dependency ratio). However, these effects taper off after 2025, and the increase in the total economic dependency ratio between 2025 and 2050 is noticeably steeper.

Table 4.6 Projected changes in demographic and economic dependency ratios

	Old-age dependency ratio (population aged 65 or above as a percentage of the population aged 15 – 64)				**Effective economic old-age dependency ratio** (non-active population aged 65 or above as a percentage of employed population aged 15 – 64)				**Total economic dependency ratio** (total population less employed as a percentage of employed population aged 15 – 64)			
	2003	**2025**	**2050**	**change 2003 – 50**	**2003**	**2025**	**2050**	**change 2003 – 50**	**2003**	**2025**	**2050**	**change 2003 – 50**
BE	26	36	47	21	43	55	71	28	156	150	164	8
DK	22	34	42	20	28	42	52	24	101	106	116	14
DE	26	38	52	26	39	50	69	30	127	117	135	9
GR	26	36	60	35	41	52	88	47	150	141	181	31
ES	25	33	66	41	40	45	88	48	144	118	162	18
FR	25	37	46	21	39	53	66	27	144	146	156	12
IE	16	25	45	29	23	31	56	33	125	108	132	7
IT	28	39	62	34	49	60	93	44	162	149	179	17
LU	21	28	36	15	33	42	55	22	138	137	149	11
NL	20	33	41	20	27	41	51	24	101	107	114	13
AT	23	34	52	30	33	45	67	35	113	108	128	15
PT	23	35	59	36	30	43	73	43	118	116	149	30
FI	23	41	47	24	33	54	60	27	121	128	133	12
SE	26	36	41	14	35	45	50	15	111	113	117	6
UK	24	33	45	21	32	42	57	25	113	114	128	14
CY	14	29	43	30	18	35	52	33	120	96	114	–6
CZ	20	35	55	35	29	47	76	46	119	116	154	35
EE	23	31	43	20	35	41	57	22	135	118	137	2
HU	22	34	48	26	39	51	74	35	156	140	172	16
LT	22	29	45	23	35	38	60	25	144	107	134	– 10
LV	23	31	44	21	35	39	58	23	137	113	137	0
MT	19	34	41	22	34	54	66	32	170	154	168	–2
PL	18	33	51	33	35	46	74	40	183	127	163	– 20
SK	16	28	51	34	28	38	73	45	146	105	151	6
SI	21	36	56	35	32	49	77	44	127	124	157	31
EU25	*24*	*35*	*51*	*27*	*37*	*48*	*70*	*33*	*136*	*125*	*147*	*11*
EU15	*25*	*36*	*52*	*26*	*38*	*49*	*70*	*32*	*132*	*126*	*145*	*13*
EU10	*19*	*33*	*50*	*31*	*34*	*45*	*73*	*39*	*159*	*124*	*158*	*– 1*

Source: EPC and European Commission (2006), Carone et al. (2005).

Table 4.7 GDP per capita growth: growth rates and levels relative to EU15 average

	GDP per capita growth rates (%)			GDP per capita (EU15=100)			Productivity Levels (EU15 =100)		
	2004–10	2011–30	2031–50	2004	2030	2050	2004	2030	2050
BE	2.1	1.6	1.6	108	107	109	122	115	115
DK	1.8	1.5	1.7	110	107	111	98	100	110
DE	1.6	1.4	1.5	101	94	95	94	88	88
GR	2.6	1.6	1.1	72	72	68	84	79	79
ES	2.0	1.9	0.9	85	90	81	91	88	88
FR	1.7	1.5	1.6	105	101	103	113	110	110
IE	4.2	2.5	1.2	132	177	167	128	161	161
IT	1.6	1.6	1.3	100	97	94	116	108	108
LU	3.1	2.1	2.4	194	226	270	129	135	135
NL	1.3	1.3	1.7	108	98	103	93	92	92
AT	1.9	1.5	1.4	116	113	112	109	106	106
PT	1.5	2.1	1.1	68	73	68	60	71	71
FI	2.4	1.6	1.7	108	110	115	104	112	112
SE	2.3	2.0	1.7	112	123	129	104	116	116
UK	2.4	1.8	1.5	104	111	113	95	107	107
CY	2.9	2.7	1.6	81	107	110	77	94	97
CZ	3.6	2.8	1.3	64	89	86	59	87	90
EE	6.6	3.5	1.6	46	86	87	46	82	86
HU	3.9	2.8	1.4	54	76	75	61	81	85
LT	7.0	3.7	1.5	43	86	87	46	80	84
LV	8.3	3.9	1.5	42	93	94	42	88	92
MT	1.3	2.2	1.7	68	73	76	80	81	84
PL	4.7	3.4	1.3	45	75	73	54	76	79
SK	4.7	3.6	1.0	48	83	77	52	76	80
SI	3.6	2.5	1.4	73	94	94	71	96	100
EU25	*2.2*	*1.8*	*1.4*	92	97	97	93	97	98
EU15	*1.9*	*1.7*	*1.4*	100	100	100	100	100	100
Euro Area	*1.8*	*1.6*	*1.4*	99	97	96	101	98	98
EU10	*4.6*	*3.2*	*1.3*	50	80	78	56	80	83

Source: EPC and European Commission (2005a)

4.3.5.2 GDP per capita projected to significantly decline

The effects of an ageing population on living standards can more closely be observed by looking at growth rates in terms of GDP per capita. Given that the total population growth rates are expected to drop over the period 2004–2050 and the populations to shrink during the latter part of the part of the projection period, GDP per capita growth rates in both the EU15 and EU10 are projected to fall (see dotted line in Figure 4.5 and Table 4.7) by less than the projected fall in GDP growth rates. Hence, living standards should hold up better than the trend in headline GDP growth rate suggests. Indeed, the growth in GDP per capita depends on the change in the total population, while potential economic growth hinges primarily upon the change in the working-age population and employment among the demographic factors.

It is also interesting to note from Table 4.7 that per capita income levels in EU10 are projected to increase from 50% of EU15 average in 2004 to 78% in 2050.

In addition to the overall slowdown in living standard increases, a shift could occur in the relative income position of different age cohorts. This, points to the core of the ageing challenge facing policy makers. Ageing raises the complex issue of the role of public transfers in achieving an appropriate distribution of resources between a smaller active population and a larger inactive retired population.

4.4. Additional important aspects not fully covered by the long-term projections

The long-term projections have left aside potentially important effects or transmission channels, on which the economic literature does not provide clear conclusions, namely (i) the impact of ageing on the quality of labour input and innovation, (ii) the effect of health status on economic growth (iii) other miscellaneous channels.

4.4.1 Impact of ageing on the quality of labour input and innovation

4.4.1.1 Does a worker's productivity decline with age?

If an individual's productivity declines with age, then a rising share of older workers in the labour force would reduce overall labour productivity even though age-specific productivity would remain constant over time. Whether productivity is affected by age is a complex issue, since the identification of the age effect is blurred by cohort and selection effects. An additional measurement problem comes from the fact that the age-profile of productivity is calculated on the basis of hourly earnings, and there may be a divergence between wages and productivity in the older age brackets due to the payment of seniority wages (Hellerstein et al. 1999).

The empirical evidence is mixed. Barth et al. (1993) find from a survey of human resource executives that older workers are seen as being more reliable and having better skills and work-friendly behaviour than their younger counterparts. Using an employer-employee dataset for the US, Hellerstein et al. (1999) show that prime-age workers (aged 25 – 54) are just as productive as younger workers, but those aged 55 and over are less productive. Surveying supervisors' ratings, work-sample tests, analyses of employer-employee datasets and other approaches assessing individual productivity across age brackets, Skirbekk (2003) finds evidence suggesting "*that productivity tends to follow an inverted U-shaped profile, where significant decreases take place from around 50 years of age*".

A possible cause of these age-related productivity declines is the reduction in cognitive abilities over a person's life span. While some abilities, such as verbal abilities, show only small changes throughout the working life, others, such as perception speed, display relatively large decreases with age. Although older individuals have longer experience, they may learn at a slower pace and have reductions in their memory and reasoning abilities. This bell-shaped relationship between age and individual productivity is broadly confirmed by Kotlikoff and Wise (1989) and Hansen (1993) for the US, and Meghir and Whitehouse (1996) for the UK, who find that young workers with little experience and older workers are less productive than those of prime age. However, Börsch-Supan (2003) shows that, even when assuming a pronounced bell-shaped relationship, the projected fall in aggregate labour productivity remains fairly small, and is negligible compared with the projected impact of the reduction in labour supply.

Overall, the impact of ageing on productivity remains uncertain, although the effect is suspected to be negative.

4.4.1.2 The quality of labour input will also be affected by rising educational attainment levels

The quality of labour will improve with the rising level of education of the labour force resulting from a cohort effect: younger cohorts are more educated than the older cohorts now approaching retirement, and this is particularly true for women. However, while the average human capital should increase over time, this effect should flatten out when the low-education cohorts are completely replaced in the labour market by the more highly educated cohorts. The importance of human capital for growth has been stressed by De la Fuente and Jimeno (2005), who suggest that the elasticity of output with respect to the stock of human capital almost certainly stands above 0.5, i.e. higher than the most optimistic estimates in the previous literature. Running tentative projections, Montanino, Przywara and Young (2004) suggest that the growth of average educational attainment is likely to slow slightly in the future, compared to recent decades. However, education is set to continue to make a substantial contribution to economic growth in the EU as a whole, though the impact varies widely among Member States.

4.4.1.3 Negative impact on Total Factor Productivity (TFP) and innovation

Some economists claim that an ageing population could hamper innovation and weigh down TFP growth in the medium and long run (e.g. Barrell (2005)[12]. Barth et al. (1993) also show that, notwithstanding their greater dedication at work, longer experience and better skills, older workers are considered by a panel of employers to be less flexible in accepting new assignments and less receptive to training: this may hamper innovation and the full exploitation of technical progress. Skirbekk (2003) notes that older workers are less likely to adapt easily to changing working methods. However, there is no hard empirical evidence to support this claim.

Some scenario-based projections (Jorgenson, Ho, and Stiroh 2004; Jorgenson and Motohashi 2004) speculatively attempt to quantify the effect of ageing on productivity. This "commonsense" view may, however, be questioned as innovation also depends closely upon the organisation of work, which could be reformed so as to better exploit the innovative potential of older workers.

4.4.2 Health as a driver of economic growth in the context of ageing populations

Profound change in the age structure of the population is not the only process related to the demographic and social developments taking currently place in Europe. Similarly dramatic is the change in the health status of the population, driven by two parallel processes. The first one is the change in prevalence and relative importance of different diseases related to the transformation of the age structure of populations. The second one is the evolution in the disease pattern linked to the general trends of increase in disposable income, improvement in the standard of life and the changes in the

[12] Unlike the effect of education and age quality of labour input, which are to disappear in the steady state, the adverse impact on innovation is meant to be dynamic, affecting not only productivity levels and the standard of living in the medium/long run but also the long-term growth in productivity in the steady state.

coverage and quality of health care services provided to the people. Broadly speaking, the first process leads to an increase in the relative importance of old age-related, mainly chronic diseases, while the second one results in the gradual shift from the illnesses related to the poor standard of living (malnutrition, maternal and prenatal conditions) and the communicable diseases towards mainly non-communicable conditions linked to the changing patterns of consumption and lifestyle in the modern societies (cardiovascular diseases, diabetes, injuries, mental health problems etc.)

Although difficult to quantify, the effect of health on economic growth works through a number of channels, on both demand and supply side of the economy [13]. On the demand side, better health affects public and private budgets by reducing the opportunity cost of private and public resources spent to prevent, diagnose and cure the existing diseases. On the supply side, it operates mainly through three mechanisms: increased labour productivity, increased labour supply, and better skills acquired due to higher education and training (Bloom et al. 2001a). Each one of them is a complex issue and calls for a special attention (Suhrcke et al. 2005).

First, healthy workers are normally expected to work more efficiently, thus to produce more output with a given input. Arguably, this argument is valid much more for the less developed countries whose economies are relatively more (physical) labour-intensive, thus – at least theoretically – health deficiencies weigh more on the aggregate productivity. However, given still significant contribution of labour to the GDP in the industrialised high-income countries, as well as the new patterns of diseases, which seem to 'adjust' to the structural changes in the economy, the impact of health on labour productivity should be still considered as an important transmission channel.

Second, it is apparently obvious that a healthy worker works more and loses less working days due to various illnesses. However, the issue is more complicated as in fact an individual's health status affects his or her decision of how much work to supply through its impact on wages, preferences and expected time horizon. Several possible scenarios can be sketched. On the one hand, if wages reflect different levels of productivity and productivity increases with good health, expected higher wages are an incentive for

[13] As an important caveat, it should be borne in mind that causality is two-directional. Health condition of a population is indeed closely interrelated with its economic and social situation. On the one hand, it has been proven that developed high-income societies do not only enjoy considerably longer life than their counterparts in poorer or less developed countries, but are also expected to spend most of their lifespan in good health. On the other hand, the causal link exists also in the opposite direction with health being one of the drivers of economic growth. The theoretical underpinning goes back to the neoclassical growth theory and its further extensions which relate the economic growth to three main factors: the stock of physical capital, the stock of labour and the productivity. Changes in productivity are driven by technological progress and the level of human capital, which depends among others on the level of education, skills, experience and health state of an individual.

healthier workers to provide more work. Moreover, growing life expectancy may influence life cycle savings and the pattern of capital accumulation, as people choose to save a higher share of their income to cover a longer expected spell of retirement in their old age. On the other hand, high enough wages may be an incentive to reduce the number of hours spent in work or to retire earlier if the sufficient lifetime earnings can be gained in a shorter time or if marginal utility of leisure exceeds marginal utility of wages.

Third, it is generally known that healthy individuals achieve on average higher educational attainment in their young age and are more likely to invest in their education and training over the entire lifespan than people with health problems. Therefore, as more educated people are more productive, good health leads again to higher productivity.

As shown, health should be considered as an important driving force behind economic development. Therefore its evolution over time, which is strongly influenced by the demographic and epidemiological changes, will necessarily have an impact on the future state of economy. Potential improvements in health status may alleviate the burden on the public finance and improve the productivity of the labour force. However, while demographical trends can be successfully projected with a high degree of certainty at least one generation ahead, it does not apply to the health status. On the one hand, given the high complexity of the concept of health status and volatility of its components, a simple extrapolation of past trends does not seem a reasonable solution. On the other hand, predicting future changes in epidemiological variables at the aggregate level is a very uncertain venture. Therefore, the debate on the extent to which the health status (or morbidity) of the population may change as life expectancy increases must be limited to the stylised hypotheses, based on the relations between the assumed changes in the mortality and the parallel evolution in the rates of morbidity (or disability).

Traditionally, a decrease in mortality rates was considered to reflect an improvement in the health status of the population, i.e. a decrease in morbidity. However, since reliable empirical evidence (life-tables, precise data on mortality, disability and morbidity) became available, such an assumption has not been valid any more. Three main hypotheses have emerged from the literature (for an overview of existing theories, see Nusselder (2003). The dynamic equilibrium hypothesis proposed by Manton et al. (1995) posits that an increase in longevity is accompanied by a parallel postponement of morbidity and/or disability. Consequently, the number of years (or share of total lifespan) spent in ill-health remains broadly constant over time. The expansion of morbidity hypothesis proposed by Gruenberg (1977), Verbrugge (1984) and Olshansky et al. (1991) posits that as life expectancy increases, older people become more vulnerable to chronic diseases and spend more time in ill-health. In other words, a higher proportion of people with health problems survive to an advanced age. The compression of morbidity hypothesis, proposed by Fries (1980, 1983, 1989, 1993), posits that as life expectancy increases, the onset of disability will be postponed to a later stage in life thanks to improved living conditions, healthier lifestyles and the fact that more and more chronic diseases may be curable. Recent studies have not provided strong evidence in favour of any of the above hypotheses as the results have differed significantly not only over time and across countries, but even between the sexes.

Given mentioned considerations and the scarcity of aggregate data on the relation between health and the economic growth, one must admit the difficulties behind quantitative approach to the issue. While it is practically feasible to project the budgetary effect of stylised changes in health status (see: Economic Policy Committee and European Commission, 2006), any attempts to reflect their overall macroeconomic impact are obviously very risky.

4.4.3 Other effects of ageing

Other effects, such as the specific effect of the life cycle on savings and the international balances of interest rates and the feedback effect of increased pension spending have not been modelled explicitly, as they require specific calibrations associated with a great deal of uncertainty as well as a general equilibrium framework, which is not practicable for dealing with the EU25.

4.4.3.1 The impact on capital intensity

Ageing has three effects on capital intensity: the increasing marginal product of capital, the decline in the savings rate and the international allocation of capital[14].

Overall, ageing should have a small positive impact on capital intensity, albeit only a temporary one. While the theoretical relationship between the dependency ratio and the saving ratio is clear according to the life-cycle hypothesis, the overlapping generations models (OLG) made popular by Auerbach and Kotlikoff (1987) reach different conclusions. OLG models allow the impact of ageing to be simulated using a general equilibrium framework and taking due account of various economic interactions, often neglected by partial equilibrium approaches. Simulations with an overlapping generations model (e.g. Miles (1999)) suggest that the positive effect of capital deepening on economic growth (due to a higher marginal return of

[14] An additional negative impact could be an ageing capital stock if the ageing of the workforce leads to slower rates of capital accumulation. The "vintage" effects (i.e. changes in technical progress depending on changes in the average age of the capital stock) will induce lower TFP.

capital and despite declining savings rates) will be fairly marginal compared with the projected drop in labour supply. Even in the event of a 14% rise in the capital/labour ratio, productivity is projected to be only 3.3% higher by 2050 on the basis of a constant population structure. An exogenous rise in Total Factor Productivity would then be needed to compensate for the loss in output resulting from a fall in the working-age population.

4.4.3.2 Labour supply shortages could aggravate mismatches in the labour market

The projected change in the age structure of the workforce could alter the composition of consumption and domestic demand (Börsch-Supan 2003). This might imply large reallocations between sectors, which require a rise in job mobility. Failing this, population ageing could lead to increasing labour market mismatches with even lower employment than that projected. Lastly, it should be noted that the rise in labour participation needed to increase labour supply might cause a dip in productivity growth in the short term if a significant proportion of the newcomers to the labour market have relatively low skills (Wasmer 2002, Mortensen 2005)[15].

4.4.3.3 Financing future age-related expenditures is an economic as well as budgetary challenge

There are also indirect and feed-back channels through which an ageing population can affect economic growth. The sharp projected increase in pension spending and other age-related expenditure may require considerable rises in taxes and social security contributions, which to some extent will distort labour supply and economic decisions and thus adversely impact on GDP growth. Therefore, as stressed by Ehrlich and Kim (2005), the funding of age-related expenditure is not only a budgetary problem but also a crucial economic issue.

4.5 Policy implications

As this paper is limited to the labour market and economic impacts of ageing, not discussing issues of public finances, also this section on policy implications deals only with general labour market and economic policy implications.

[15] This is not a cause for policy concern as there is no genuine trade-off in the long run between policies to raise the employment rate and policies to foster productivity growth. A higher employment rate unambiguously raises growth in GDP per capita in the long run. For a deeper analysis, see chapter 3 in European Commission (2004).

Section 4.3 presented the results of the long-term projections of the impact of ageing. These are witnessed with the rise of old-age and economic dependency ratios as well as the projected decline in per capita GDP growth. Unambiguously, these findings point to pressing economic policy challenges for the EU in order to respond to ageing. Section 4.4 stressed a great deal of uncertainty behind the projections, which cannot take into account all the economic effects of aging. As a consequence, the ageing challenge might be at the end even worse than projected.

4.5.1 Lisbon strategy: crucial but not ambitious enough in the face of ageing?

A comprehensive set of policy actions will be needed to ensure that Europe's economies can meet the ageing challenge. The projections confirm the validity of the approach adopted by the EU in the Lisbon strategy. They show that the achievement of the overall Lisbon employment rate targets (although only by 2020 for the EU25) are possible but also imperative in order to mitigate the effects of ageing populations on the number of employed persons and economic growth.

The labour market is the key to successful policy adjustment, since ultimately it is the economic output of a country that determines its capacity to sustain high quality welfare systems. Although employment rates and levels are projected to continue rising for at least a decade, temporarily offsetting the decline in the size of the working-age populations, this will provide only a narrow window of opportunity to undertake necessary reform measures.

The projections also illustrate the effects of successful structural reforms, and show that policy action can make a big difference to the capacity to meet the challenge of ageing. The projections indicate that pension reforms already enacted by Member States could lead to a 10 p.p. increase in the employment rate of older workers, to levels well above the Lisbon employment targets. However, even if the EU as a whole achieves the Lisbon employment targets (albeit later than the original target date of 2010), this will not be sufficient to offset the effects of demographic change. The EU may therefore need to look beyond the current Lisbon employment rate targets and not stop short at the existing targets or deadlines. Moreover, substantial unused labour capacity will remain in many Member States. More precisely, the following aspects should be investigated:

- the average number of hours worked per person employed is low in some countries in Europe, especially compared with the US. Although this might partly reflect a stronger preference for leisure in Europe, it may also be caused by institutional distortions which could be removed with appropriate policies;

- many countries will still have wide gender employment gaps, suggesting further scope for increasing female employment rates. In addition, the better integration of migrants, measures to tackle the grey economy, the tightening of access to disability schemes, and efforts to address social exclusion, which leads to lasting inactivity, could further raise the labour supply;
- it should be borne in mind that reaching the 60% employment target for older workers in 2020, while certainly representing a dramatic turnaround compared with the trend of recent decades towards ever earlier retirement, will only bring the EU up to the level of older-worker employment observed in the US today. A significant number of people will continue to withdraw early from the labour force despite increasing life expectancy and improving health at older ages.

As regards the other aspects of the Lisbon strategies, the projections indicate that the sources of economic growth will alter over time, with productivity becoming the dominant source. This confirms the need for policies to raise productivity potential, as mentioned in the Lisbon strategies. Higher levels of investment in physical and human capital, together with efforts to strengthen innovation and R&D activities, could yield substantial productivity gains over the long run, especially against a background of a knowledge-based society. There is for instance strong evidence that higher educational attainment leads to enhanced labour productivity and adaptability to a knowledge-based economy. The higher enrolment rates in second- and third-level education observed in many countries, coupled with a greater focus on quality and efficiency, may contribute to improved productivity in the future, albeit with a lag of several years, or even decades. The interaction between labour market and product reforms is worth highlighting in this context, as more flexibility in these markets facilitates resource reallocation to more innovative and productive activities.

4.5.2 Raising the employment rates of older workers and increasing effective retirement ages remain a priority

Raising the employment rates of older workers, including those aged over 65, will remain a critical policy objective for EU Member States. Achieving the necessary extension in working lives will not be easy. It not only requires that tax/benefit and wage systems provide financial incentives for people to remain economically active and invest in building their own human capital, but also means that there must be job opportunities for older people with appropriate skill sets. Policies to tackle age-discrimination and to promote life-long learning, flexible retirement pathways and healthy work conditions also need to be considered.

Perhaps the most challenging aspect of efforts to rise effective retirement ages is the need to change the expectations and behaviour of employers and employees alike. Moreover, the concept of ageing is evolving, and with life expectancy projected to continue rising, retirement behaviour may also need to adjust continuously.

Despite the fact that life expectancy is projected to increase by some 6 years between 2004 and 2050 (having already increased by some 8 years from 1960), the threshold for categorising a person as being of working-age (15 – 64) and as older (65+) remains unchanged. This is not simply a matter of ensuring constancy in a statistical indicator. It is reflected in public policies: for example, statutory retirement ages in most countries are fixed at 65. It is also reflected in the expectations and behaviour of citizens as demonstrated by the effective retirement age, which is closer to 60. While people appear to have adjusted their life course at younger ages in response to increased longevity (e.g. longer period spent in education; later entry into the labour market, family formation and the birth of the first child), the same does not appear to have occurred with respect to what is considered as a 'normal' age to retire. There is an incompatibility between the continuous gains in life expectancy, the apparent demand for early withdrawal from the labour force and the desire for adequate and secure retirement income[16]. This neatly illustrates the ever-evolving nature of the retirement challenge. Notwithstanding recent pension reforms aimed at increasing the average age of retirement, the percentage of adult life spent in retirement is projected to increase in all Member States, with the exception of Slovenia (for both males and females) and Poland and Slovakia (for females). This is the combined result of the projected significant gains in life expectancy, which outweigh the prospected increases in the average age of exit from the labour market. In order to keep the percentage of adult life spent in retirement constant, some countries need to postpone the exit age by a substantial number of years. Table 4.9 suggests that the exit age should be put off by almost 2 years for males in the EU15, euro area and the EU10, and by just over 2 years for females in the EU15 and the euro area (but only one year in the EU10). The situation appears particularly critical in a number of specific countries such as Greece, Portugal, UK and Hungary (although these are countries that start from a relatively lower percentage of age spent in retirement), where the average exit age should be deferred by 3 – 4 years in order to keep constant

[16] For illustrative purposes, DG ECFIN has calculated an adjusted old-age dependency ratio which adjusts the age at which one is considered older in line with projected gains in life expectancy. The threshold for being classified as elderly would rise from 65 in 2004 to 69 in 2050. Instead of doubling from 24% in 2004 to 51% in 2050, the 'life expectancy adjusted' old-age dependency ratio would increase to 36%. In other words, one half of the demographic ageing effect would 'disappear' if expectations of being elderly and taking retirement adjusted in line with gains in life expectancy. In practice, effective retirement ages would not need to rise by the same number of years as life expectancy in order to keep pension schemes in financial balance. Rather, a less than proportionate increase is needed – one which maintains the ratio of years in work relative to years in retirement.

the percentage of adult life spent in retirement. However, *a priori*, there is no economic rationale for favouring a constant share of adult life spent in retirement, and indeed a preference for a longer period of leisure time in retirement could be justified on the basis of rising living standards. However, it must be economically and financially viable. Achieving a rising share of adult life spent in retirement could be an interesting challenge for retirement policy in the future.

Table 4.8 Percentage of adult life spent in retirement: projected levels

	Males							Females						
	Average exit age		Life expectancy at retirement		% of adult life spent in retirement		Years of exit deferral to keep the % of life spent in retirement constant	Average exit age		Life expectancy at retirement		% of adult life spent in retirement		Years of exit deferral to keep the % of life spent in retirement constant
	2003	2050	2003	2050	2003	2050		2003	2050	2003	2050	2003	2050	
BE	59.3	60.2	21.5	25.3	32.7	35.9	2.3	59.3	60.4	25.4	29.4	36.5	39.3	2.1
DK	63.3	63.5	17.0	20.1	26.0	29.3	2.3	62.9	62.4	20.1	23.1	29.6	32.8	2.2
DE	62.7	63.7	18.4	21.4	27.8	30.5	1.9	62.0	62.3	22.5	26.2	32.3	35.6	2.4
GR	65.2	62.5	16.1	21.8	24.3	31.5	5.0	64.2	62.1	19.4	24.2	28.2	34.0	4.1
ES	63.0	63.3	18.7	21.8	28.1	28.1	2.1	62.3	62.3	23.3	26.9	33.0	36.3	2.4
FR	60.6	61.7	21.4	24.4	32.0	34.3	1.6	60.5	61.4	25.7	29.3	36.1	38.7	2.0
IE	63.7	64.3	16.6	21.0	25.4	29.9	3.1	64.4	64.6	19.2	23.9	27.9	32.5	3.4
IT	59.7	62.3	22.0	23.5	33.0	33.1	0.1	60.7	61.3	24.9	28.5	35.2	38.1	2.2
LU	58.7	59.7	22.0	25.2	33.5	36.0	1.8	59.7	59.3	25.0	29.3	35.8	39.8	2.9
NL	62.1	62.3	18.3	20.4	28.0	30.1	1.4	60.8	61.0	23.2	24.9	33.6	35.1	1.1
AT	60.1	62.2	21.1	23.7	31.9	33.4	1.1	58.8	60.8	25.9	28.2	37.2	38.1	0.7
PT	64.5	64.2	16.1	20.6	24.6	29.5	3.4	61.1	63.4	22.9	24.5	33.2	33.6	0.3
FI	61.6	63.4	19.1	21.6	29.0	30.8	1.3	60.6	62.5	23.9	25.8	34.4	35.3	0.6
SE	63.5	64.6	18.2	20.4	27.3	29.1	1.3	62.7	63.9	22.0	23.8	31.6	32.8	0.9
UK	63.8	63.8	17.3	22.0	26.2	31.1	3.5	62.7	63.2	21.3	25.1	30.8	34.2	2.5
CY	64.6	65.3	16.5	19.6	25.0	28.1	2.1	61.0	61.7	22.3	24.9	32.6	34.8	1.5
CZ	62.0	63.1	16.8	20.3	26.3	29.7	2.3	60.0	61.0	22.0	24.9	32.9	35.1	1.6
EE	61.8	63.0	15.6	19.3	25.0	28.7	2.5	61.0	62.1	20.9	23.8	31.2	33.5	1.6
HU	61.5	62.2	16.6	21.4	26.4	31.3	3.4	62.0	61.0	19.7	25.0	29.5	35.2	4.1
LT	63.1	63.5	15.2	19.4	24.0	28.6	3.2	63.3	62.0	19.1	24.5	28.3	34.3	4.2
LV	61.6	63.1	15.7	19.3	25.2	28.7	2.4	60.9	61.9	20.8	23.8	31.2	33.7	1.8
MT	59.9	60.3	20.3	24.0	31.2	34.6	2.4	56.3	56.1	27.0	30.5	39.5	42.6	2.2
PL	60.5	62.7	18.2	21.1	28.6	30.6	1.4	57.1	59.9	25.3	26.6	37.6	37.2	−0.3
SK	60.6	61.6	17.4	21.0	27.6	31.0	2.3	56.5	59.5	25.0	25.9	37.6	36.7	−0.6
SI	57.6	62.0	21.7	21.7	33.7	31.6	−1.4	55.8	60.6	27.5	26.4	40.3	36.6	−2.6
EU25	*61.9*	*62.9*	*19.0*	*22.1*	*28.8*	*31.6*	*1.9*	*61.1*	*61.9*	*23.3*	*26.6*	*33.6*	*36.2*	*1.9*
EU15	*62.1*	*63.0*	*19.3*	*22.4*	*29.0*	*31.8*	*1.9*	*61.6*	*62.1*	*23.3*	*26.7*	*33.3*	*36.2*	*2.1*
EU10	*61.0*	*62.7*	*17.6*	*20.9*	*27.6*	*30.5*	*1.9*	*58.7*	*60.4*	*23.5*	*25.9*	*34.9*	*36.3*	*1.0*
Euro Area	*61.7*	*62.7*	*19.7*	*22.6*	*29.7*	*32.1*	*1.7*	*61.3*	*61.8*	*23.8*	*27.2*	*33.9*	*36.8*	*2.1*

Note: percentage of adult life spent in retirement is given by life expectancy at retirement/ retirement age plus life expectancy at retirement minus 15.

4.5.3 Migration could also be used to raise labour supply

Ageing might stimulate migration, which would increase labour supply and stimulate growth provided the skills of the migrants broadly match the economic needs of the host country (e.g. Fehr et al. 2004). European countries already rely on migrants to fill shortages for certain skilled and unskilled tasks (e.g. in the health care sector). Immigration could be a positive factor in labour market adjustment.

It has also been argued that migration could bolster, at least temporarily (as immigrants contributing to pension schemes will be future pensioners as well), the financial sustainability of public (pay-as-you-go) pension schemes. However, for these benefits to materialise fully migrants must be employed in the formal economy (thus contributing to the tax and social security systems) and the skill structure of migrants must match labour market needs[17]. In practice, these conditions are often not met: immigrants tend to have lower employment rates than natives in many EU countries, and their unemployment rates are roughly two to three times higher on average. Therefore, a key challenge for the EU is to better integrate immigrants into the labour market[18].

4.5.4 Boosting productivity is another major challenge

Productivity growth is expected to be the main driver of economic growth. Higher levels of investment in physical and human capital, together with efforts to strengthen innovation and R&D activities, could yield substantial productivity gains over the long run, especially against a background of a knowledge-based society.

There is for instance strong evidence that higher educational attainment leads to enhanced labour productivity and adaptability to a knowledge-based economy. The higher enrolment rates in second- and third-level education observed in many countries, coupled with a greater focus on quality and efficiency, may contribute to improved productivity in the future, albeit with a lag of several years, or even decades. The interaction between labour market and product reforms is worth highlighting in this context, as more flexibility in these markets facilitates resource reallocation to more innovative and productive activities.

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[17] European Commission Green Paper of January 2005 on managing economic migration (COM (2004) 811 final).

[18] For recent work on labour migration, see European Commission (2005b).

4.6 Concluding remarks: the need for moving forward right now

Ageing populations will have broad-ranging and far-reaching repercussions for our labour markets and economic growth. These effects start to materialise during the next decade, as the ECFIN-Commission projection shows. Thus, the window of opportunity for reforms is closing fast.

However, ageing is not a "tsunami" that will cause a sudden drop in economic growth and living standard when large numbers of baby boomers start to retire. It is a massive challenge, but one which is slow-moving and progressive. Ageing is largely predictable and thus manageable provided we act in an efficient and timely manner.

The Lisbon Strategy seems to go in the right direction but might not be sufficient to respond to the ageing challenges. It should also be pursued well after 2010. Raising the employment rates of older workers and increasing effective retirement ages remain a priority in order to increase the labour supply and to contribute to sustainable economic growth in the face of adverse demographic developments. This also helps ensure that retirement behaviour takes due account of future increases in life expectancy. While migration flows could also be used to raise labour supply, boosting productivity is a key challenge.

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5 Postponing retirement: the political push of aging

Vincenzo Galasso

5.0 Abstract

Conventional economic wisdom indicates that the aging process will cause large financial unbalances to the PAYG social security systems, unless contribution rates increase drastically. A commonly advocated reform measure – at least by economists and international institutions – that may help to cope with this financial sustainability is to postpone retirement. According to the political economy approach, however, decisions on pension policy go beyond economic theory into the realm of politics. The crucial insight of this literature is that pension systems need not be welfare enhancing, but rather politically feasible. In democratic countries, this amounts to obtaining the support of a majority of the Parliament or, more directly, of the electorate. This intuition carries an additional, powerful, consequence: normative analysis and policy recommendations may not be useful, unless they lead to the design of politically sustainable reform packages.

This paper analyzes the impact of the aging process on the political sustainability of current PAYG pension systems. How do political constraints shape the social security system in six OECD countries under population aging? Aging increases the dependency ratio, thereby reducing the average profitability of an unfunded pension system, but it leads also to an older electorate, thereby increasing the relevance of pension spending on the policy-makers' agenda. The simulations presented in the paper suggest that the political aspect dominates, as the contribution rates are set to increase. These simulations deliver a strong policy implication: an increase in the effective retirement age always decreases the size of the system chosen by the voters, while often increasing its generosity.

Yet, will this policy measure be feasible in OECD countries? Simulations of the political feasibility of postponing retirement under aging in France, Italy, the UK, and the US for the year 2050 suggest that retirement age will be postponed in all countries, although social security contribution rates will still rise in all countries, but Italy. The political push to increase the retirement age is mainly due to a negative income effect induced by aging, which reduces the profitability of the existing social security system, and thus the individuals net social security wealth.

5.1 Introduction

Virtually all countries in the world feature a pension system. An overwhelming majority of these countries runs a pay-as-you-go (PAYG), or unfunded, scheme. Contributions are collected from current workers and are shared among current retirees as pension benefits. Most PAYG pension systems share some common features. They are financed with a special payroll tax, rather than – say – through general taxation; eligibility to old age pensions does not depend on agents' wealth, e.g., on asset income, and benefits are paid as life annuities. Moreover, as argued by Mulligan and Sala-i-Martin (1999), the evolution over time of several pension systems, and of their characteristics, is similar in many respects. For instance, the size of these schemes has increased with economic growth; several systems have introduced provisions that induce early retirement, while the official retirement age did not keep up with the increase in life expectancy and health status. Pension systems do, however, differ across countries in several relevant features, such as contribution rate, benefit formula, benefit indexation, eligibility requirements and official retirement age.

A wide body of literature has prized the introduction of these systems (see Diamond, 1996 and Gramlich, 1996). According to a paternalistic view, a pension scheme that forces individuals to transfer resources from youth into old-age is needed since agents are shortsighted, they may lack information about their future and hence they may not save enough for old age consumption. Moreover, even if individuals were able to look after their old-age needs, there may not be reliable saving instruments to transfer resources into the future[1]. Private insurance markets may also fail to provide the life annuity characteristic featured by the government-run PAYG systems, due to usual adverse selection problems.

Indeed, pension systems have recently been criticized for introducing several inefficiencies in the economy. High contribution rates, i.e., payroll taxes, especially if almost unrelated to pension benefits, have been blamed for reducing employment (Daveri and Tabellini, 2000). The existence of early retirement provisions has been shown to reduce employment among the elderly, by inducing middle-aged workers to retire early (Gruber and Wise, 1999 and Brondal and Scarpetta, 1988). Finally, both the high tax burden and the early retirement provisions may reduce the accumulation of physical and human capital, thereby decreasing economic growth (Conde-Ruiz and Galasso, 2004).

[1] Historically, several systems have been transformed from fully-funded to PAYG, after that the existing savings had been wiped out, either by stock market crashes or by high inflation, as in the US after the Great Depression, and in France and Italy after World War II.

However, the recent utmost attention of economists, media and policymakers to pension systems is mainly due to the aging process, which undermines the financial sustainability of these systems. Aging has a direct impact on pension systems, because it increases the proportion of recipients from the system – the retirees – while reducing the proportion of contributors – the workers. In most OECD countries, under current rules, the amount of revenue will not be sufficient to cover the pension benefits to be awarded. Hence, in order to honor their commitment to pay pension benefits to the future retirees, our aging societies will have to place larger financial burdens on the working generations or to reform the systems. Several international institutions – such as for instance the World Bank (1994) and the European Commission (2003) – have provided detailed normative analysis with the aim of designing sensible reform measures in an attempt to cope with the aging process. A good PAYG pension system should be financially sound – vis à vis the expected demographic dynamics – retain economic efficiency – by avoiding waste of resources, for given collected revenues, and by minimizing individual distortions – and be equitable. Additionally, the system should be designed to hedge demographic, economic and political risks.

Regardless of one's view on the reasons for the initial introduction of the PAYG pension systems, it is widely agreed that current pension reform's measures have to meet the political support to be implemented. The political economy literature on social security may help to explain how to design reforms that are politically feasible. This literature acknowledges that decisions on pension policy, from the initial design of the system to later modifications, go beyond economic theory into the realm of politics. Contributions to political campaigns, lobbying, votes of vested interest groups induce career-oriented policy-makers to sacrifice economic principles for their political objectives.

The crucial insight of the political economy literature is that pension systems need not be welfare enhancing in order to be in place, they exclusively need to be sustained politically. In democratic countries, this amounts to obtaining the support of a majority of the Parliament or, more directly, of the electorate. This intuition carries an additional, powerful, consequence: normative analysis and policy recommendations may not be useful, unless they lead to the design of politically sustainable reform packages.

This paper follows this approach and provides a quantitative assessment of the future political sustainability of the current systems. Specifically, political sustainability identifies the existence of political majority willing to support the pension system in all its current features (retirement age, contribution rate, benefit calculation method, etc.). If the social security system is mainly viewed as a saving mechanism – transferring resources from young into old age – the aging process has a major economic and political effect on social security. The economic effect consists of the increase in the ratio of retirees to workers – the dependency ratio. Since the average long run return of a PAYG social security system is given by the sum of population and productivity growth, aging reduces the profitability of the system, thus leading the agents to downsize the system. Yet, aging has also a direct political impact, by making the electorate older and thereby increasing the relevance of pension spending on the agenda of the policy-makers.

The simulations of the political economic model (see Galasso and Profeta, 2004) indicate that the political effect dominates the economic effect, so that the size of the social security system is expected to increase in all countries, albeit with some differences. Spain, the fastest aging country, faces the largest increase in the social security contribution rate, although the largest contribution rate, 50%, emerges in Italy. These simulations deliver a strong policy implication: an increase in the effective retirement age always decreases the equilibrium social security contribution rate, while often increasing the system generosity.

This policy implication is thus in line with the conventional economic wisdom. Population aging needs to be accompanied by an increase in the retirement age. Yet, will voters be willing to postpone retirement? The simulations of our political economic model provide a positive answer. Postponing retirement may become feasible in the future because of the political push of aging. In countries with large social security systems, such as most developed economies, which also feature generous early retirement schemes, aging may provoke a major negative income effect by reducing the individuals' pension net wealth. In fact, the increase in the dependency ratio reduces the profitability of systems for all future generations, who hence obtain a worse deal from the social security. Furthermore, if the reduction in the social security return takes the form of lower pension benefits, a substitution effect also arises, since the pecuniary incentive to retire decreases, which pushes toward postponing retirement.

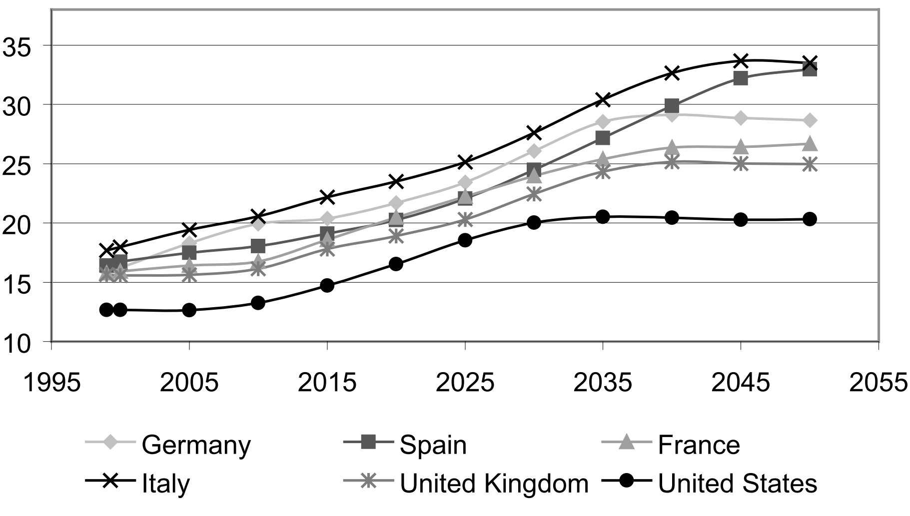
The paper is organized as follows. Section 5.2 discusses the aging process and the forecasted impact on the social security systems; Section 5.3 briefly reviews the literature on the political economy of pension systems, and then provides a quantitative assessment of the future political sustainability of the pension system in six OECD countries. The role of the early retirement provisions is examined in section 5.4, which evaluates also the political feasibility of increasing the retirement age in four OECD countries. Section 5.5 concludes.

5.2 Aging and Social Security

The current aging process is mainly due to the combination of an increase in life expectancy and a decrease in fertility rates. While fertility rates are believed to recover – at least partially – their post-war levels, OECD countries expect to enjoy a further increase of life expectancy at birth, moving from an average of 74.1 year for males and 80.6 for females in 2000 to respectively 79.3 and 84.7 years in 2050.

These two elements will induce a substantial increase of the share of elderly people. Figure 5.1 shows that the proportion of elderly individuals, i.e., those older than 65 years, over the total population will rapidly increase until 2035; while remaining almost constant or increasing at a lower rate after that date. This aging process will be especially accentuated for Italy and Spain, and less dramatic in the UK and the US.

Figure 5.1 Percentage of Elderly in the Total Population



Another measure of the aging process is provided by the old age dependency ratio – defined as the ratio of persons aged 65 or more to the persons aged 20 to 64. According to OECD projections, the average old age dependency ratio in the OECD countries will increase from 23.8 in the year 2000 to 49.9 in 2050. This demographic process does, however, differ across countries: as shown in table 5.1, Spain and Italy experience the largest growth of the dependency ratio, France and Germany are close to the OECD average, while the UK and the US are well below average.

Table 5.1 Old-age Dependency Ratios

Country	2000	2050
France	27.2	50.8
Germany	26.6	53.2
Italy	28.8	66.8
Spain	27.1	65.7
United Kingdom	26.6	45.3
United States	21.7	37.9
OECD Average*	**23.8**	**49.9**

* Average of main OECD Countries
Source: Eurostat, US Census and EC (2000)

The old age dependency ratio, however, does not correspond to the ratio of retirees to workers, due to the existence of early retirement provisions. Retirement policies are a crucial element to determine the structure of the labor market and the design of the pension systems. In the majority of countries around the world, there exists a legal retirement age at which the elderly are induced or required to exit the labor market before they can collect their pensions (see Social Security Throughout the World). However, this official retirement age does not correspond to the effective retirement age, due to the existence of early retirement schemes. Interestingly, the data suggest that this early retirement phenomenon has been timely related to the aging of population, that is, the labor force participation of the elderly has decreased over time, as population has aged (Costa, 1998). As a consequence, this labor market trend – extensively studied by Gruber and Wise (1999) and Brondal and Scarpetta (1998) – exacerbates the aging process, as the proportion of retirees per workers becomes even higher than the old-age dependency ratio, and thus raises an additional element of concern vis-à-vis the fiscal sustainability of the social security systems. According to Latulippe (1996), in 1990 the average effective retirement age for males in OECD countries was 62.2 years, down from 68.5 years in 1950.

5.2.1 Projected Pension Spending

Despite the aging process, governments are confident that the reform measures implemented in the 90s are sufficient to achieve the long run financial sustainability of the system. This is what emerges from an EC and OECD joint effort – with the member countries – to produce projections of pension spending as percentage of GDP over the next fifty years. Table 5.2 shows the official projections provided by each country's government, as reported in OECD (2002), and disentangles the different effects of demographic, employment and policy factors. Italy stands out as the most striking case: despite having the largest demographic effect – capable of increasing spending by 10% of GDP – pension spending is expected to decrease in the year 2050, due to the projected increase in the employment rate of elderly workers and thanks to the measures introduced by the Amato-Dini reforms. Also the UK is expected to reduce its pension spending, as policy measures counterbalance a mild aging effect. All other countries forecast an increase in the amount of resources devoted to pensions. In Spain, a strong demographic effect is even magnified by a policy that extends pension eligibility, while in Germany and France the reform measures are not strong enough to neutralize the aging process. Not surprisingly, in the US the increase in spending is below the OECD average.

Table 5.2 Official Projections of Old Age Pension Expenditures over GDP

			Contributions to changes from 2000 to 2050, of:			
Country	2000	2050	Old Age Dependency Ratio	Employment Rate	Benefit Formula	Eligibility
France	12.1	15.9	7.6	−0.5	−3.4	0.4
Germany	11.8	16.8	6.4	−0.7	−2.7	2.1
Italy	14.2	13.9	10.1	−3.2	−5.5	−1.5
Spain	9.4	17.4	8.6	−2.6	0	2.0
United Kingdom	4.3	3.6	1.7	0.1	−2.5	0.1
United States	4.4	6.2	2.4	−0.1	−0.2	−0.3

Source: OECD (2002)

5.3 The Political Sustainability of Social Security

5.3.1 An Overview

The main contributions in the literature on political economy of pension systems analyze the institution of the unfunded pension systems and their development into the most widespread instrument of social insurance. The main challenge in this line of research is to understand why pension programs – transferring resources from young and middle-aged workers to the elderly – exist; why some of them are so generous; why they differ widely across countries at similar stage of economic development; and – last, but not least – how they will react to the current aging process, and hence which pension reforms will be politically feasible.

The building block of these political economic models consists in determining the individual preferences over the pension system, by characterizing how the system affects the individual agent's economic well-being. Then, a political mechanism – typically a direct or political election – will provide an aggregation of these preferences into a policy. This paper concentrates on a voting model, in which pension systems arise if there are sufficient economic reasons for at least a majority of the electorate to support them; and may be reformed if a majority of voters decides to do so.

While retirees clearly support pension systems, which award them a benefit at no (current) cost, according to Galasso and Profeta (2002), there exist at least four economic factors that may lead young and/or middle aged agents to support a pension system: (i) dynamic inefficiency; (ii) reduced time horizon in evaluating the pension program; (iii) within-cohort redistribution elements; and (iv) crowding-out effects of the aggregate savings by the pensions.

Since Samuelson's (1958) and Aaron's (1966) seminal work, it is known that pensions may improve the welfare of every individual if the economy is dynamically inefficient. In other words, every young agent would find it more convenient to invest in a PAYG system than in alternative saving mechanisms, if the implicit rate of return from pensions – determined as the sum of the population growth rate and the per-capita growth of the economy – is larger than the real rate of return from capital accumulation.

In a seminal paper, Browning (1975) argued that, even in a dynamically efficient economy, adult individuals may support pensions, since they only value current and future contributions to, and benefits from, the system, while taking past contributions as a sunk cost. In other words, adult individuals do not consider the entire cost of their pensions, since they only focus on a reduced time horizon.

Tabellini (2000), and later Casamatta et al. (1999) and Persson and Tabellini (2000), suggested that some young individuals may favor positive pensions because of a within-cohort redistribution element. In fact, although pension systems provide on average a lower rate of return than alternative saving mechanisms, some (low-income) individuals may face a higher return, due to the existence of this element of redistribution within generation. With (near-to) flat pension benefits, agents obtain different returns from the pension system, depending on their income. In particular, high-income agents pay large contributions – and enjoy a below average return from the system – while low-income agents pay lower contributions and their return is above average.

Finally, Cooley and Soares (1999) and Boldrin and Rustichini (2000) claimed that individuals evaluating social security policies are sufficiently aware to be able to take into account the effects of the policies on the stock of capital, and thereby on factor prices. They argue that the existence of intergenerational redistribution schemes, such as public debt or pensions, tends to crowd out capital, and thus reduces real wages and increases real returns to capital. This creates a redistribution in favor of assets-holders (“capitalist”) and against individuals who rely on labor income (“workers”).

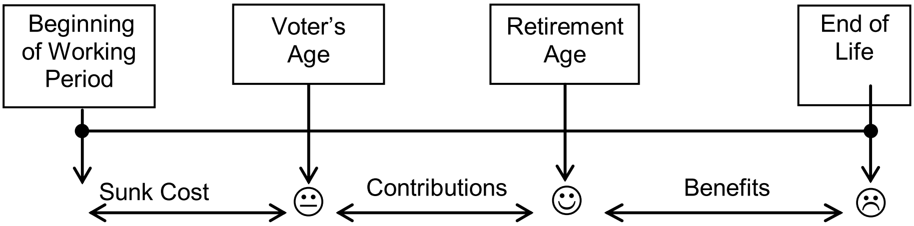
5.3.2 Individual Preferences and Voting Behavior

The political support to pension systems depends on the decision of every individual, who, as a political agent, votes over the size of the system – that is, over the contribution rate. According to the political economy literature surveyed above, this choice will typically depend on her individual characteristics, such as age and income, and on the main features of the system.

How do individuals vote to express their preferences over social security? Consider a one-time election, whose outcome is binding in all future periods (see Galasso and Profeta, 2002, for a discussion of repeated elections). A PAYG pension system imposes a cost to the young – the contribution – and provides a transfer – the pension benefit – to the elderly. Retirees will hence always support such a system, whereas workers may be willing to incur in a current cost only if they will be sufficiently compensated by future pension benefits. More generally, every individual, in taking her voting decision over the size of the system, will consider her current and future contributions to the system and her future benefits in order to evaluate the effectiveness of the pension as a saving instrument. In particular, every voter determines the amount of resources that she would like to transfer into the future through the pension system – her most preferred size of the system – by comparing her overall return from the system to the returns available on the capital market from assets with comparable risk.

As previously argued, and initially suggested by Browning (1975), past contributions to the system do not affect the agents’ voting decision, since they could not be appropriated by the voters, were the system to be abandoned. Thus, they represent a sunk cost. Hence, middle aged and elderly individuals are more favorable to social security systems, as they will almost exclusively enjoy benefits in their remaining time horizon. Figure 5.2 describes the individual’s residual horizon when taking her voting decision.

Figure 5.2 Voter's Time Horizon



These individual voting decisions are then aggregated in a simple majority voting. To the extent that preferences are single-peaked, the equilibrium outcome of the voting game coincides with the most preferred size by the median voter[2].

5.3.3 The Economic and Political Effects of Aging

Conventional wisdom suggests that pension expenditure – as a fraction of GDP – increases as population ages, since the number of individuals who may claim old-age pension benefits increases. This evidence is supported by several studies – see Tabellini, 2000, Perotti, 1996, Breyer and Craig, 1997 among others – describing how the size of pension system increases with the proportion of elderly people in the population[3].

Political economy models address the effect of the aging process on the size of pension spending under a different perspective. According to these models, pension systems are determined by a political game among successive generations of voters, who may be willing to support the system depending on some economic factors, as argued in the previous section. Aging affects these economic determinants as well as the relative political power of the individuals in the different age groups.

The first three economic factors analyzed in section 5.3.1 deal with the internal rate of return from the pension system for the individual voters. The average long run internal rate of return of a PAYG pension system is given by the sum of the population and the productivity growth rate. Hence, a decrease in the population growth rate, associated to an increase in the survival probability for the elderly, leads to an older population, and reduces the profitability of the system as a saving device. Individual voters would then have to reduce the size of the system, by substituting their claims

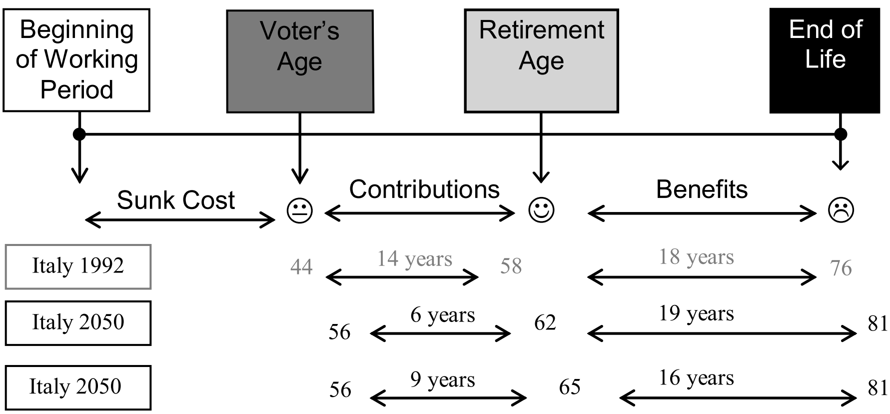
[2] See Galasso and Profeta (2002) for a detailed description of the majoritarian voting game on pensions, as well as of other political institutions.

[3] This result is particularly strong when the size of social security is measured as the share of social security expenditure of GDP (Breyer and Craig, 1997), or as the share of social security and welfare expenditure of GDP (Tabellini, 2000, Perotti, 1996), or as the proportion of social security and welfare expenditure on total government spending (Tabellini, 2000). See also recent evidence by Disney (2007).

towards future pensions with more private savings. According to this effect, the contribution tax rate – and hence the average size of a pension benefit – should decrease.

As population ages, however, so does the electorate (see the next section). This indirect effect of population aging may have important repercussion on the political sustainability of pension system, as it leads to an increase in the political influence of the elderly voters, and hence in the relevance of pension spending on the agenda of the policy-makers. In fact, in a majoritarian voting game, the increased relevance of the elderly voters translates into more political power – as measured by their share of votes – to individuals who are close to retirement age, and hence who will only consider a reduced time horizon in evaluating the social security program (Browning, 1975). According to this effect, the pivotal voter will become an older person, who will favor an increase in the contribution tax rate. In this case, however, the average size of a pension benefit needs not to increase, as aging leads to a contemporaneous increase of the dependency ratio. In other words, despite the increase in the tax rate, there will be fewer workers and more recipients – i.e., retirees – and the pension benefit per retiree may indeed decrease. Figure 5.3 summarizes this effect by reporting the length of the contribution and of the benefit periods for Italy in 1992 and in 2050 for different retirement ages.

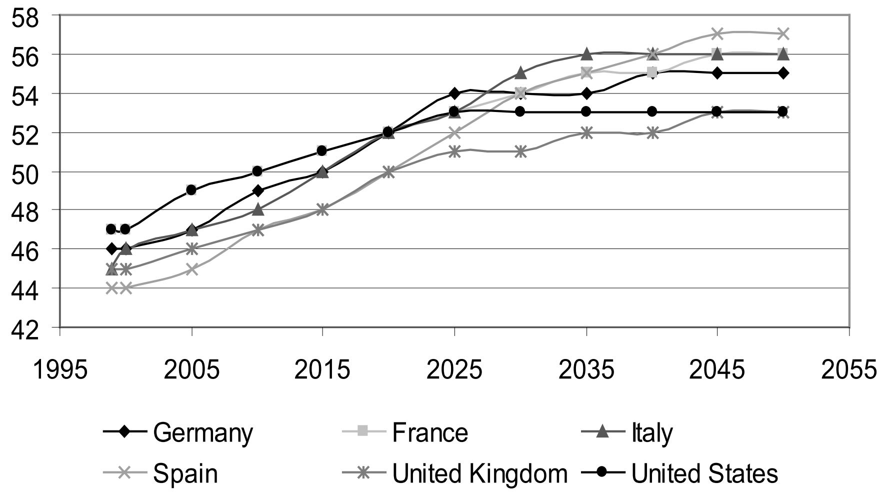
Figure 5.3 Voter's Time Horizon



5.3.4 Aging of the Electorate

A synthetic measure of the aging of the electors is given by the median age among the voters. In 1999, the median age among electors – adjusted for the different turnout rates at election by age – was between 44 years in Spain and 47 years in France and the US. The evolution over time of the median age among voters is displayed in figure 5.4. The expected increase is striking. In 2050, the median age will be between 53 years – in the UK and the US – and 57 years in Spain. Unsurprisingly, Spain and Italy, which undergo the most dramatic aging process, face the largest change in the median age, respectively 13 and 11 years, while in the US and in the UK, where the demographic dynamic is less extreme, the median age increases by 6 and 8 years respectively.

Figure 5.4 Median Age among Voters



5.3.5 Some Results on the Political Sustainability of OECD Pension Systems

This section builds on previous work by Galasso and Profeta (2004) to present a quantitative assessment of the effects of the aging process on the political sustainability of the current pension systems in six OECD countries: France, Germany, Italy, Spain, the UK and the US.

As previously argued, two aspects of the aging process are crucial to the analysis of the political sustainability of pension systems. On one hand, the rise of the dependency ratio reduces the average long term returns from the pension system. Agents are thus induced to decrease the size of the system, by reshuffling their portfolio in favor of more private savings. On the other hand, aging increases the political influence of the elderly voters, and hence the relevance of pension spending on the agenda of the policy-makers. The latter effect leads to larger systems.

The simulations of the politico-economic model (for a description of the theoretical model and its calibration, see Galasso and Profeta (2004)) suggest that the political effect dominates. The increased political influence of the elderly voters will lead to a larger pension system, albeit not necessarily to more generous pension benefits, due to the increase in the dependency ratio[4]. In fact, the replacement rate would decrease everywhere but in the UK and the US. With no changes in the retirement ages, which remain at their 2000 levels, the contribution rates would raise in all countries: in Spain – one of the fastest aging countries – the contribution rate would raise the most, although the largest tax rate would still be in Italy (50%).

Interestingly, the effects of a change in the retirement age on the size of the systems would be sizeable. An increase in the effective retirement age leads to a reduction of the contribution rate, since it increases the contribution period for the median voter, while reducing the period during which she will draw the pension benefits (see figures 5.2 and 5.3). An increase in the retirement age to 65 years is particularly effective in France and Italy – where the initial effective retirement age was only 58 years – with a reduction in the contribution rate of around 12%. In the other countries, the decrease would be more moderate, but still sizable in Germany and Spain. Notably, despite reducing the contribution rate, this policy also manages to increase the generosity of the system, i.e., the replacement rate, in all countries but the US. This is because the social security dependency ratio, i.e., the ratio of retirees to workers, is reduced. Germany and Italy would enjoy the largest effect.

5.4 The Role of Retirement

5.4.1 An Overview

The results of the simulations examined in the previous section suggest that a raise in the effective retirement age would be pivotal in reducing the expected increase in pension spending. Postponing retirement has a double effect in a politico-economic environment: it counterbalances the aging process, by reducing the ratio of retirees to workers, and thus increases the overall profitability of the system; but it also decreases the continuation return from the system for each individual, since it rises the number of working years – and thus the remaining contribution period, while reducing the residual life at retirement – and thus the period during which pension benefits are collected.

According to the simulations' results in table 5.3, the latter effect dominates. Moreover, the extent to which contribution rates are reduced by an increase in the retirement age depends on the magnitude of the shift taking place between the contribution and the benefit period. On average, an increase

[4] For a detailed discussion of the country-specific features of the social security system, and of their evolution, see Galasso (2006a).

of one year in the effective retirement age reduces the equilibrium tax rate by around one and half percentage point.

Several studies – see among others Gruber and Wise (1999) and Blöndal and Scarpetta (1998) – showed that individuals' decisions to retire early represent the rational response to the incentives provided by the pension systems: most individuals leave the labor market as soon as they are entitled to collect a pension benefit, due to the large implicit tax imposed on continuing to work after early retirement age.

Other studies have tried to quantify the cost of these provisions in terms of the lost output, because of the lower labor participation rates. According to Herbertsson and Orszag (2003), in 1990, the potential output lost due to male early retirement ranged between 0.1% of GDP in Iceland and 12.7% in Belgium, with a OECD average loss of 5.3%. They estimate these costs to set between 1.3% in Iceland and 15.9% in Belgium in 2010, with a OECD average of 7.4%

Table 5.3 Contribution Rates, Results of Simulations

		Median Voter's Age	Effective Retirement Age	Social Security Contribution Rate	Replacement Rate
France	2000	47	58	22.4%	49.2%
	2050	56	58	31.3%	41.9%
	2050	56	65	19.7%	47.9%
Germany	2000	46	61	23.8%	68.3%
	2050	55	61	37.7%	55.4%
	2050	55	65	32.6%	81.2%
Italy	2000	44	58	38.0%	73.6%
	2050	56	58	50.0%	55.5%
	2050	56	65	38.0%	74.2%
Spain	2000	44	62	21.3%	67.9%
	2050	57	62	45.5%	64.6%
	2050	57	65	40.7%	77.3%
United Kingdom	2000	45	63	14.5%	75.8%
	2050	53	63	33.2%	95.2%
	2050	53	65	31.1%	114.3%
United States	2000	47	63	9.7%	41.9%
	2050	53	63	21.6%	55.7%
	2050	53	65	18.3%	53.9%

Source: Galasso and Profeta (2004)

Early retirement provisions[5] have thus complemented the aging process in increasing the ratio of retirees per worker, and ultimately in exacerbating the financial distress of the pension systems. Moreover, they may be held responsible for a sizeable output loss.

Why then there has been such a wide spread adoption of the early retirement, despite these negative impacts? Understanding the reasons behind their introduction represents the initial step to examine how these provisions may be amended in order to increase the effective retirement age.

Some explanations have recently been put forward. Gruber and Wise (1999) suggest – albeit not endorse – that early retirement may have been created to encourage elderly people's exit from the labor force in an attempt to provide more job opportunities for young workers – a popular justification among politicians. Alternatively, these provisions may have been adopted to accommodate a secular pattern of decreasing labor force participation. Following Caballero and Hammour (1998), it could be argued that early retirement represented an instrument to increase the share of the production appropriated by the labor factor, in particular in the late sixties, when Europe experienced a period of tensions and strikes.

Conde-Ruiz and Galasso (2003 and 2004) suggest instead that the adoption of early retirement was due to labor market shocks, which gave rise to the appearance of a significant group of redundant or unemployed elderly workers, who were not yet entitled to an old age pension. These individuals were allowed to withdraw from the labor market on a pension transfer, through different instruments, such as formal early retirement provisions, disability pensions (with weaker eligibility criterion) and "unemployment pensions" for unemployed elderly workers.

Data provided in 1986 by the Economic Commission for Europe at the United Nations on the institutional features (retirement age, eligibility criterion) of the initial early retirement provisions in fifteen OECD countries (see table 5.4) seem to confirm this view. Almost everywhere in Europe, between 1961 and 1977, generous early pathways from the labor market were offered to redundant or unemployed elderly workers, who were allowed to collect benefits under a wide array of welfare schemes, such as special pensions to unemployed elderly workers (UP in table 5.4), disability benefits awarded on the basis of labor market considerations (DU) and special contracted pensions for redundant workers (RW). In the 70s and 80s, new

[5] The term early retirement should be considered quite extensively. In fact, in several countries, such as Germany, Sweden or the Netherlands, early exit from the labor market occurs by drawing on disability or unemployment benefits, whose eligibility is often made contingent on labor market conditions, rather than on the official early retirement pension. According to Gruber and Wise (1999), the proportion of men receiving disability or unemployment benefits at age 59 is 21% in France, 22% in Belgium, 24% in Sweden, 27% in the Netherlands, 33% in the UK and 37% in Germany, as opposed to only about 12% in Japan and the US.

eligibility criteria were introduced, namely early retirement in exchange for the employment of young unemployed worker (YE).

Conde-Ruiz and Galasso (2003 and 2004) also suggest that the political support in favor of early retirement hinges on the existence in these provisions of an element of intragenerational redistribution, due to the utility from leisure. While we may expect leisure to be equally valued across ability types, the foregone labor income is lower for less productive individuals, who therefore find it more convenient to retire early. This retirement behavior leads to the continuous creation of groups of workers with incomplete working history, which guarantees the future political constituency for this provision. In particular, even young and middle-aged workers may be willing to support early retirement, as they expected to benefit from these early pathways from the labor marker later in their working carrier. The increase in the effective retirement age analyzed in the simulations at section 5.3.5 would hence break this implicit intergenerational social norm, and would be opposed by low-income young and middle-aged workers, i.e., the perspective early retirees, and by actual early retirees.

This section analyzes the individual preferences over the effective retirement age – for a given level of the social security contribution rate. Economic theory suggests that agents should form their preferences by evaluating several elements. First, they will consider the individual labor-leisure trade-off of the retirement decision, as described above. Second, they need to assess the aggregate impact that a change in the mandatory retirement age of all individuals has on the pension benefits, by modifying the dependency ratio. Finally, possible general equilibrium effects of a change in the retirement age on rate of return and on wages should also be considered.

According to these motivations, elderly workers or retirees will clearly choose the retirement age in order to maximize their pension benefits. For every retiree, this amounts to be the youngest pensioner, so as to minimize the number of people with whom to share resources. The preferences of younger individuals are more complex to determine as all the elements described above need to be considered. In particular, young individuals may be induced to set low retirement ages in order to anticipate their retirement period, although this would lead to obtaining a smaller pension at retirement. Since the factor that prevails cannot be determined a priori, individual preferences over retirement age cannot be ordered according to age. Unlike in section 5.3.2, the median voter over the retirement age does not typically coincide with the median age among the voters.

Table 5.4 Early Retirement Institutions

Country	Retirement Age (male) Normal	Retirement Age (male) Early	Programme (Year of Adoption)	Condition for eligibility
Austria	65	55	UP (1961)	unemployed 1 year for economic or structural reasons
		60	RW (1961)	in certain sectors after 35 years of service
Belgium	65	55	RW (1974)	unemployed for at least 1 year (in certain cases ER age below 55)
		60	YE (1976)	employer must replace the worker with a young one who must work for at least 1 year.
		60	UP (1978)	unemployed for at least 1 year
Canada	65	60	ER (1987)	
Denmark	67	18	DU (1977)	earning capacity that is permanently reduced (ill health or social circumstances)
Finland	65	60	UP (1961)	person who has received UB for 200 days in previous 60 weeks (ER age reduct temporarily to 55)
		63	YE(1979)	retiree is replaced by unemployed under 25
France	65 (until 1983) – 60 (from 1984)	60	RW (1962, 1972)	workers made redundant for economic reasons
		55	RW (1977, 1979, 1980)	workers made redundant for economic reasons
		55	YE (1982)	youth or unemployed must be hired for 2 years.
		55 (50 in certain cases)	RW (1984)	protection of workers in the steel industry undergoing restructuring
Germany	63 – 65	60	UP (1973)	unemployed for at least 52 weeks
		60	DU (1973)	35 years of contributions and unable to work also for market reasons
		63	ER (1973)	35 years of contributions
		59 – 58	RW (1979, 1981, 1982)	applied to certain sectors (steel, automobile, metal chemical)
		58	YE (1984)	vacancy must be filled by a person outside the firm

Country	Retirement Age (male)		Programme (Year of Adoption)	Condition for eligibility
	Normal	Early		
Italy	60		ER (1965)	35 years of contributions
			DU (1965)	related to market contributions
		55	RW (1979)	unemployment due to economic crisis or industrial reoganization
		58	YE (1984)	company signs a collective agreement to increase employment acoordingly
Japan	65	60	ER (1973)	
Norway	67	18	DU (1971)	working capacity reduced by at least 50%, account is also taken of likelihood of finding employment
Spain	65	60	AF (1967)	
		<60	DU (1972)	related to labor market conditions
			YE (after 1972)	employer must replace with youth seeking first job
Sweden	65	60	AF (1963)	
		60	DU (1970)	working capacity 1/2 also on grounds of redundancy
		60	UP (1972)	unemployment benefit has been paid for a maximum period
		60	RW (1975)	collective agreement with large firms and some industries
United Kingdom	65		FPP (1970s)	depends on specific plan
		62 – 64	YE (1977)	employer must replace retiree by someone from unemployment register
		60	UP (1981)	men unemployed for at least 1 year
United States	65	62	AF (1961)	
		55	FPP (1970s)	depends on specific plan
		62	ER (1977)	note: new calculation of benefits increases generosity

Sources: Economic Commission for Europe (1986), Gruber and Wise (1999), Casey (1992).

Legend: **RW** = pension to workers made redundant for economics reasons; **UP** = awarding of the pension requires a period of unemployment; **DU** = disability pension awarded also according to labor market conditions or to unemployed workers; **AF** = actuarially fair ER provision; **ER** = general early retirement provision; **FP** = firms' pension plans; **YE** = awarding of the pension requires the employment of a young worker.

Clearly, the individual preferences on the retirement age are largely affected by the social security contribution rate. In particular, a change in the size of the system tends to produce income and substitution effects that modify the voters' decision over the retirement age. A higher contribution rate reduces the workers' net income, and – through the budget constraint – increases the total amount of resources available to the retirees and thus the pension benefits. This will hence reduce the opportunity cost of retirement, and will lead more voters to reduce the effective retirement age. However, a raise in the contribution rate leads also to another income effect, which counterbalances this reduction in the retirement age. In fact, since social security represents a saving device, which is dominated by alternative assets, savers (especially young individuals) would prefer to have little social security and more private assets. An increase in the contribution rate goes instead in the opposite direction and decreases the overall income of the young, thereby making them poorer and hence inducing them to postpone retirement. Again, which among these opposing effects will prevail cannot be established a priori. The quantitative evaluation at the simulations in section 5.4.4 indicates that the retirement age is decreasing in the social security contribution rate in all countries but the UK.

5.4.3 The Political System[6]

In this new political environment, individuals express their preferences over both the social security contribution rate and the retirement age. Individual preferences are then aggregated through a simple majority voting model, as in section 5.3.

Clearly, the politics of pensions involve more complex decision processes than a simple majority voting model may mimic. Yet, a simple median voter model is in line with the view that electoral concerns represent the key factor for policy-makers dealing with large welfare programs (see Pierson, 1996). As such, simple majority voting represents the minimal political environment where to analyze these electoral concerns. Moreover, it has the clear advantage of providing a coherent and transparent analysis of the impact of the demographic dynamics on the political process.

However, the complexity of the voting scenario, when the policy space is bi-dimensional, may prevent a simple solution of the voting game to arise. To ensure that the voting game has interesting properties, following Shepsle (1979), some institutional restrictions on the political system needs to be imposed. This political scenario is characterized by a set of institutional arrangements (a committee system, a jurisdictional arrangement, and an assignment rule) – that allows all the voters to have jurisdiction on the two issues – social security contribution and retirement age – but only issue-by-issue. This notion of issue-by-issue voting (see Shepsle, 1979,

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6 For a recent political-economy likterature on early retirement see Fenge and Pestieau (2005), Lacomba and Lagos (2000), Casamatta et al. (2002), Cremer and Pestieau (2000) and Cremer et al. (2002).

for a detailed description) allows to capture the electoral concerns by the politicians, and to retain the flavor of the median voter theorem.

By creating an issue-by-issue voting, the policy space is separated into two issues and one median voter may be identified for each issue. Effectively, this bi-dimensional voting game amounts to characterizing two reaction functions for the two median voters. A reaction function describes the decision of the median voter over the social security contribution rate for a given retirement age; while another reaction function characterizes the decision of the median voter over the retirement age for a given social security contribution rate. The intersection of these two reaction functions identifies a political equilibrium[7].

5.4.4 Some Results on the Political Sustainability of Postponing Retirement

The methodology used to provide a quantitative evaluation of the political feasibility of postponing retirement in graying societies consists of two stages. In the former stage, the political economic model is calibrated to capture the main economic, demographic and political aspects, and the institutional elements of the different social security systems in France, Italy, the UK and the US, around the year 2000, which is taken to represent the initial steady state. In the latter, the calibrated version of the model is simulated, given the forecasted values of demographic, economic and political variables for the year 2050, and the effective retirement age which arises as a new political equilibrium, as well as the social security contribution rate, are calculated.

For each country, the model is calibrated to match some long standing economic regularity (the capital-output ratio), the equilibrium social security contribution rate and the equilibrium effective retirement age in 2000, with the contribution rate and the effective retirement age chosen by the median voter on the respective issue.

During the simulation exercise, the calibrated model is fed with forecasted values of economic, demographic and political variables for the year 2050 in order to capture closely the aging process. With this new set of parameters, the model evaluates the political feasibility of postponing retirement and the political sustainability of the social security system – by calculating the retirement ages and social security contribution rate chosen by the respective median voters in 2050.

The driving force of the differences between the 2000 and the 2050 steady states is thus the aging process that modifies the demographic balance of the social security as well as the political representation of the different generations

[7] For a technical description of the political economy model and of its calibration, and for a more detailed comment on the simulation results' see Galasso (2006b).

of workers and retirees. The impact of population aging on the determination of the social security contribution rate has been discussed in section 5.3.3. Although two opposing economic and political effects emerge (see Razin et al., (2002), and Galasso and Profeta, (2004 and 2007)), the simulation results reported in table 5.3 suggest that the political push dominates. Hence, aging increases the social security contribution rate for a given retirement age[8].

When evaluating how aging affects the individual preferences over retirement (for a given the social security contribution rate) two main effects arise. On one hand, aging has been shown to reduce the average rate of return of the social security system. Due to the large size of the system, this generates a large negative income effect – a reduction in the lifetime income for all generations – which induces individuals to postpone retirement. Moreover, for a given level of the social security contribution rate, aging will reduce also the pension benefits' replacement rate, as fewer resources will have to be shared among more retirees. This negative substitution effect reduces the pecuniary incentives to retire early and leads again to an increase in the retirement age, thereby reinforcing the previous effect[9].

The results of the simulations on the political feasibility of postponing retirement in an aging environment are shown in table 5.5. For the four countries examined here – France, Italy, the UK and the US – the year 2000 calibration is reported at the first line; while the following line(s) characterize the political outcomes for the year 2050.

Table 5.5 Retirement Age and Contribution Rates. Results of Simulations

		Age of the median voter over contribution rate	Effective retirement age	Social security contribution rate
France	2000	47	58	22.4%
	2050	56	67	27.1%
Italy	1992	44	58	38.0%
	2050	56	67	34.9%
United Kingdom	2000	45	63	14.5%
	2050	53	70	27.1%
United States	2000	47	63	9.7%
	2050	53	68	13.5%
	2050	53	69	11.9%

Two crucial results emerge. First, there is everywhere a large raise in the retirement age chosen by the median voter, with respect to the initial

[8] In the context of this issue-by-issue voting game, this amounts to an upward shift of the reaction function of the contribution rate with respect to the retirement age.

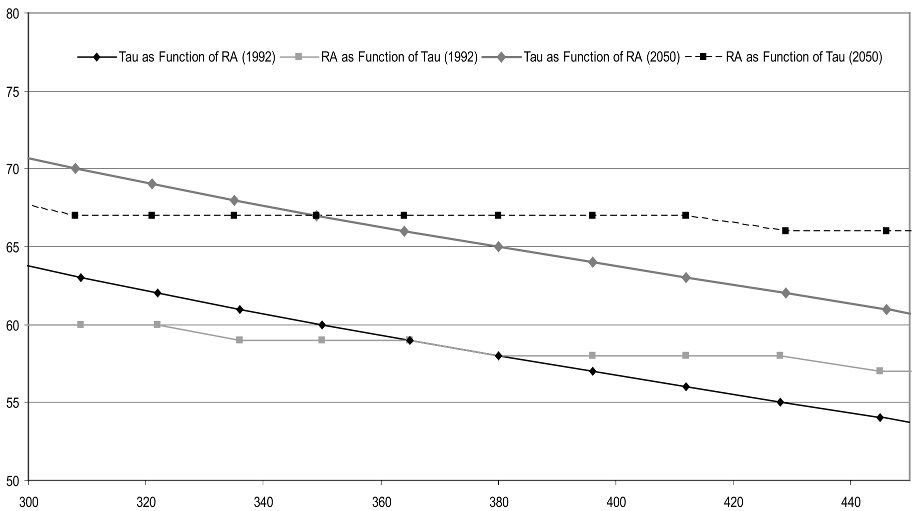
[9] In the context of this issue-by-issue voting game, this amounts to an upward shift of the reaction function of the retirement age with respect to the contribution rate.

equilibrium in 2000. Second, in all countries, but Italy, the social security contribution rate and the generosity of the pension benefit increase as well.

Unsurprisingly, France and Italy are forecasted to feature the largest increase in the effective retirement age – from 58 to 67 years. In Italy, this is mainly due to strong aging process, which gives raise to a large negative income effect. Interestingly, the large increase in the retirement age carries with it a reduction in the social security contribution rate, which drops to 34.9%. This reduction in pension spending – and in the replacement rate – is in line with the EC-OECD estimates (see table 5.2). Figure 5.5 provides a graphical representation of the outcome of the political process in Italy in 1992 and in 2050, but displaying the reaction functions in the initial and final steady state. The dots indicate the points where these reaction functions cross – and thus the equilibrium outcomes of the political game.

In France, pension spending will increase from 22.4% to 27.1%, due to the impact of the aging process on the median age, despite retirement age being largely postponed. Also in the United Kingdom, the aging of the electorate will produce a large increase in the social security contribution rate to 27.1%, while retirement age will increase by seven years. In the United States, the aging process, and its negative income effect, are expected to be more moderate. The equilibrium retirement age will range from 68 to 69 years, and the corresponding contribution rate between 11.9% and 13.5%.

Figure 5.5 Political Equilibria in Italy



5.5 Conclusion

According to the political economy approach, decisions on pension policy go beyond economic theory into the realm of politics. This new literature carries some crucial insights. First, pension systems need not be welfare enhancing in order to be in place, they only need to be sustained politically, which, in democratic countries, is equivalent to obtaining the support of a majority of the Parliament or, more directly, of the electorate. Second, and perhaps more importantly, normative analysis and policy recommendations may not be useful, unless they lead to the design of politically sustainable reform packages.

In the context of this political economy approach, the effects of the aging process on the PAYG pension systems are analyzed. Conventional wisdom suggests that aging affects the financial sustainability of these systems, since it induces an increase in the proportion of retirees – i.e., the recipients from the system – while decreasing the proportion of workers – i.e., the contributors to the system. Systems are not financially sustainable since under the current rules, revenues will not be sufficient to cover the pension benefits. Hence, either contribution rates will have to be raised, in order to pay pension benefits to the future retirees, or pension benefits will have to be cut. The political economy approach to pension suggests that this decision will be determined by the voters through the political process. Stated differently, any reform to current pension systems will have to meet the political support of the electorate to be implemented.

The aging process affects the political sustainability of current PAYG pension systems through two channels. On one hand, aging increases the ratio of retirees to workers, the dependency ratio, thereby reducing the average profitability of the pension system. On the other hand, the entire electorate becomes older, and hence the relevance of pension spending on the policy-makers' agenda increases.

Simulations' results on how political constraints shape the social security system in six OECD countries under population aging suggest that the political aspect will dominate, hence leading to an increase in pension spending. In particular, the size of the systems, as measured by the contribution rates, will increase, while their generosity, as measured by the pension's replacement rates, may decrease, due to the increase in the dependency ratio.

A clear policy implication emerges from these simulations. An increase in the effective retirement age always decreases the size of the system chosen by the voters, while often increasing its generosity. The paper discusses the political feasibility of this policy measure, by analyzing the political role of the early retirement provisions since their initial institution during the late 60s and early 70s, and by forecasting the future political feasibility of this policy.

The simulations on the simultaneous political determination of social security contribution rate and retirement age indicate that – when all political constraints are considered – the retirement age is expected to increase in all countries, thereby reducing the increase in the social security contribution rates usually associated to the aging process (see for instance Galasso and Profeta, 2004). The political demand for postponing retirement is mainly due to the aging process. In fact, population aging leads to an increase in the retirement age because of a negative income effect. By reducing the profitability of social security, aging decreases the individual net social security wealth – thereby inducing them to retire later.

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6 A Note on Demand for High-Quality Fixed-Income Bonds: What Demographics may imply

Sebastian Schich and Mark Weth

6.0 Abstract

Our note uses existing demographic projections and mortality statistics for the G-10 country populations to derive estimates of future retirement-financing-related bond demand over the next four decades. The underlying theoretical framework is a stylised life-cycle investment model in which households optimally save by investing in either a risky or a riskless asset. Demand for the latter is our empirical measure of future demand for high-quality fixed-income bonds. Under a set of restrictive assumptions, the note finds that demand for such bonds will grow continuously from today, to almost one and a half times the current level in 2050. Demand growth will decelerate until 2030, however, then remain flat for a few years before accelerating during the last decade under consideration here. This pattern mainly reflects the entry of baby boom generations into retirement. Should there be gradual longevity improvement beyond that already assumed in current demographic projections, there would be higher bond demand. The increase in demand due to such a shock would be small, however. If there were only a small increase in the age of mandatory entry into retirement – which appears to be a realistic assumption – the effect of the longevity shock on bond demand would be essentially undone.

6.1 Introduction

Pension funds place an increasingly sharper focus on risk management. This development has been ongoing for some time, but was reinforced by the experience of the post-2000 financial market developments, which included an equity market correction and a decline in interest rates, which led to significant funding difficulties at corporate defined-benefit pension plans. These experiences, together with recent regulatory and accounting changes, which tend to make funding difficulties more transparent, have led managers of defined-benefit pension funds to sharpen their focus on asset-liability management. While the debate about the relative merits of bond versus equity-investments remains ongoing, there is growing recognition that asset-liability matching considerations imply that bonds may provide a better investment for defined-benefit pension liabilities than equities. But it has been recognised for some time now that there may be a “scarcity” of suitable pension fund investments. In this context, attention has focused especially on government bonds, given their limited credit risk.

While most of that discussion has been couched in qualitative terms, recent empirical estimates by the G-10 (2005) illustrate that under a number of simplifying assumptions such "scarcity" can indeed be large, as current potential demand from pension funds and life insurance companies may exceed the current supply of G-10 country government bonds by a wide margin. In a related empirical study, Schich and Weth (2006) find that potential "scarcity" may be greatest in the segment of long-term bonds with terms-to-maturity from 10 to 30 years. The present note is related to that empirical work, focusing on the empirical question of how future bond demand may develop given expected future demographic developments. More specifically, it provides a first attempt to addressing questions such as: Given current demographic projections, will demand for high-quality fixed-income instruments increase and, if so, by how much? How would improvements in longevity affect the demand for such instruments? How would these estimates vary if parameters such as the assumed (effective) age of entry into retirement are changed? The note does not focus on "scarcity" per se, however, as it is based on an equilibrium modelling approach, where demand for and supply of riskless assets are equilibrated through the interest rate. The present note goes beyond these earlier studies, however, in that it uses a dynamic approach to estimating potential demand for government bonds for retirement-financing purposes. By contrast, the approach taken in the earlier paper was essentially a static one that compares estimates of current pension promises with G-10 government bonds outstanding. The present note uses demographic projections and mortality statistics for the G-10 country populations to derive estimates of (retirement-financing-related) bond demand until 2050, using a stylised life-cycle investment model as a theoretical framework. In particular, it uses a simplified version of an overlapping generations model following Auerbach and Kotlikoff (1987) and augments it by uncertain lifetime and a rule of (portfolio) choice between a risky and riskless asset, as suggested by Campbell and Viceira (2002). The latter asset is assumed to represent high-quality fixed-income instruments such as government bonds.

Under a set of restrictive assumptions, the note finds that demand for such bonds will grow continuously from today, to a level one and half times the current one in 2050. Demand growth will decelerate until 2030, however, then remain flat for a few years before accelerating during the last decade under consideration here. This pattern reflects the entry of baby boom generations into retirement. Should there be a longevity improvement, there would be higher bond demand. The increase in demand due to such a change would be small, however. If there were only a small increase in the age of mandatory entry into retirement – which appears to be a realistic assumption – the effect of such a gradual longevity-shock on bond demand would be essentially undone. The most important driver of bond demand in our estimates are changes in the age structure of populations, with baby boomers moving out of the labour force (with bond demand assumed to be a positive function of output). The portfolio shift by ageing populations from risky into riskless assets may be empirically less important.

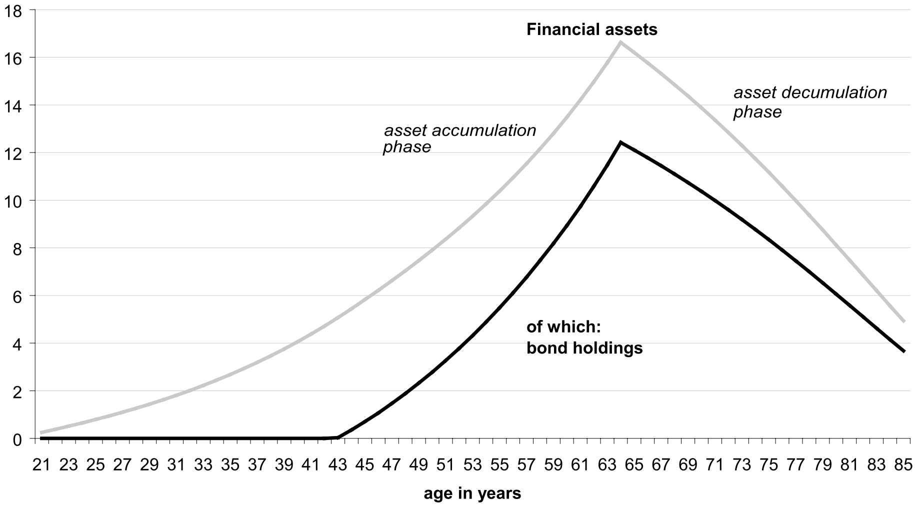
6.2 Estimation approach

To model portfolio investment of households over their life cycle and expected growth of bond demand, we follow Auerbach and Kotlikoff (1987) in using a multi-period overlapping generations framework where future economic variables are perfectly foreseen by households and firms in competitive markets.[1] The model is a simplified version of the economy of Auerbach and Kotlikoff (1987) in that we restrict preferences to a constant relative risk aversion utility function and assume that utility is derived from consumption but not from leisure, in that workers of different ages supply the same amount of labour, and that the economy essentially consists of a production sector and a household sector.[2] We augment the model, however, by introducing lifetime uncertainty and a rule of portfolio choice between a risky and riskless (one-period-lived) asset, following Campbell and Viceira (2002). Current and future conditional probabilities to survive are assumed to be known. A system of nonlinear equations is solved which relates predetermined variables (e.g. demography-driven labour supply, mortality-driven span of life) as well as technological and taste parameters to endogenous behavioural variables such as consumption or saving in the form of either a riskless or a risky asset. Risky asset holdings are, on aggregate, assumed to constitute productive capital. The demand for the riskless asset is the main focus of our note. It provides us with an estimate for demand for high-quality fixed-income instruments such as government bonds. Figure 6.1 illustrates the pattern of bond demand as a function of the age of an individual.

[1] In our framework, there are 75 overlapping generations: each year one cohort leaves the labour force to enter retirement, a new generation of 20-year-old takes its place, and the surviving part of the 95-year-old retirees dies. Some specific parameter assumptions are shown in the annex. More details on the theoretical model and simulation assumptions are not shown here to save space, but they are available on request from the contact author.

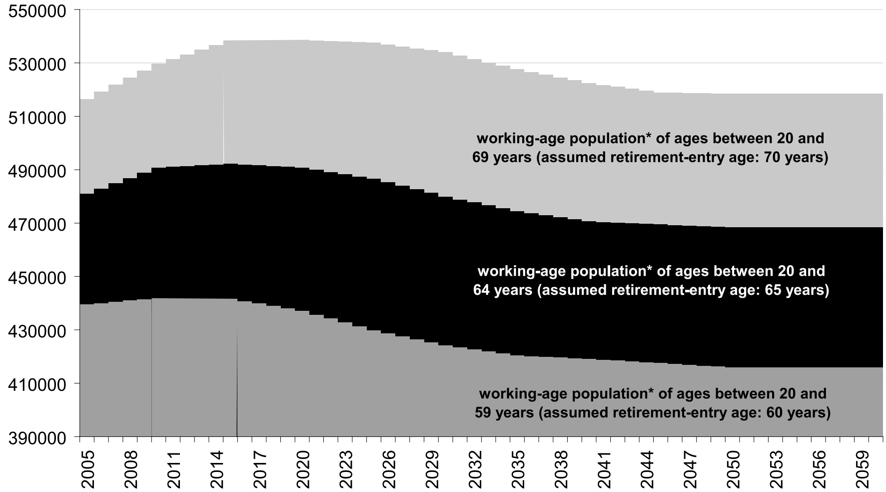
[2] The role of government is limited to issuing bonds and paying interest on them by imposing taxes on labour income. Thus, there is no explicit pension, insurance or social security system. This assumption is made to keep the model simple.

Figure 6.1 Illustration of the pattern of individual households' bond holdings over their life-times



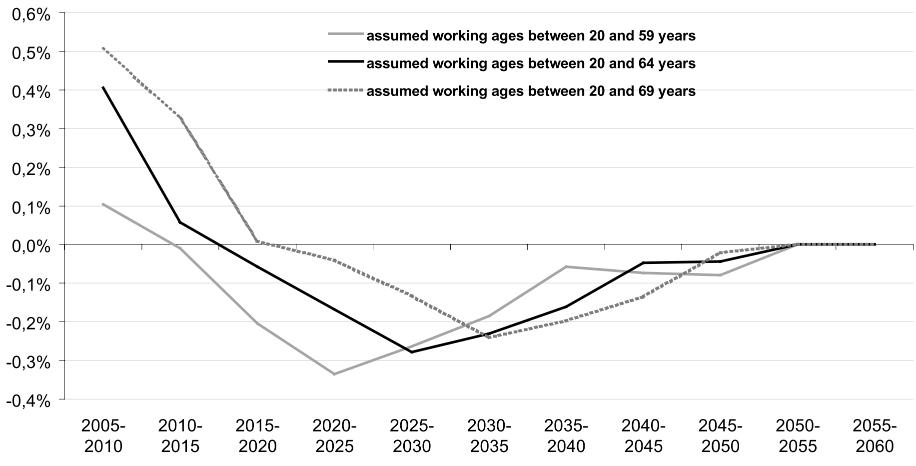
Aggregating over all individuals of a cohort and over all cohorts alive, we obtain a measure of aggregate bond demand, which is a function of longevity (e.g. past, current and expected future conditional probabilities to survive), age of entry into retirement and labour productivity. We use demographic data for the Group of Ten (G-10) countries obtained from the 2004 revision of the United Nations (UN) *World Population Prospects* in their medium variant projections. Based on these data and on information on conditional probabilities to survive available from the *Human Mortality Database* (HMD), we estimate the relative weights of all generations (cohorts) alive today and in future years. The resulting estimates of the future working-age population labour force developments in levels and growth rates under different assumptions regarding the effective age of retirement are shown in Figures 6.2a and 6.2b.

Figure 6.2a Estimates of future labour force in G-10 countries (levels)



*) Data for 2005 to 2050 according to United Nations (2004) medium variant projections for the G-10 countries. After 2050, a constant working-age population is assumed.

Figure 6.2b Estimates of future labour force in G-10 countries (growth rates)

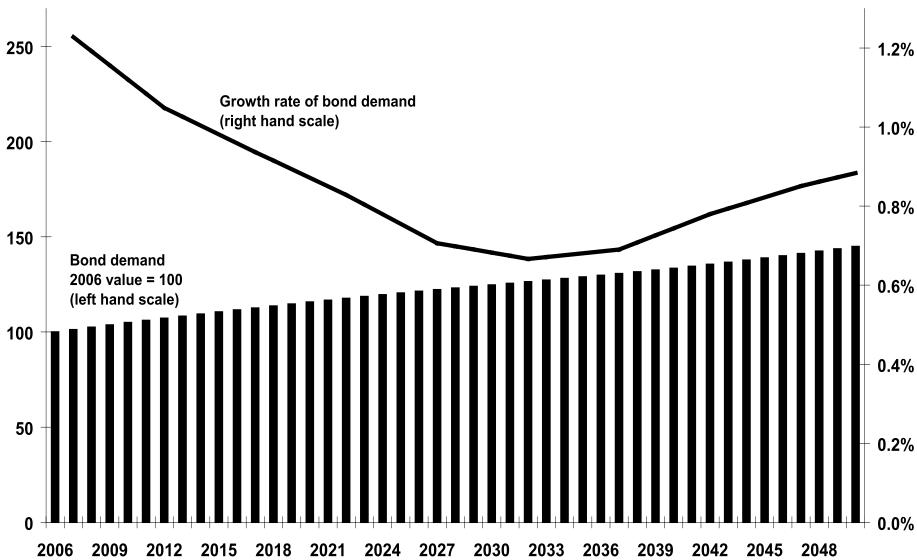


*) Data for 2005 to 2050 according to United Nations (2004) medium variant projections for the G-10 countries. After 2050, a constant working-age population is assumed.

6.3 Results

Figure 3 shows the estimated pattern of equilibrium bond demand in the baseline scenario until 2050[3]. It illustrates that under the specific assumptions made here retirement-financing-related demand for bonds will increase continuously from today over the next several decades. By 2030 demand is projected to exceed current demand by about one quarter. Growth rates of demand will, however, gradually decline over the next three decades, mainly reflecting the entry of baby boomers into retirement. Specifically, as the contribution of employment to output growth is projected to decrease from around 2020 onwards, as a result of the entry of baby boomers into retirement, bond demand will decelerate in line with output. Around 2030, most baby boomers will have entered retirement (assuming a retirement entry at 65 years) and are assumed to start their capital decumulation (dissaving). Thereafter, this baby boomer-related factor will gradually become less important as a determinant of output growth, with such growth being increasingly determined by labour productivity growth (which is exogenous to our model). In 2050, bond demand is projected to exceed current demand by almost one half. Next, the effect of various shocks to this baseline scenario are discussed.

Figure 6.3 Projected future bond demand (in levels and growth rate) Assumption: constant ratio of bond supply to output



[3] In the baseline scenario it is assumed that labour productivity grows constantly at an annual rate of one per cent, working households enter retirement at the age of 65 years, and mortality rates are fitted to the United Nations medium variant projections for life expectancy at birth.

To see how a variation in labour productivity growth assumptions affects the equilibrium values in our model, we run simulations for a "low" (0.5 per cent) and a "high" (1.5 per cent) productivity growth scenario (as opposed to 1 per cent as is assumed in our baseline scenario). Figures 6.4a and 6.4b show that when labour productivity growth is high, the growth rates of bond demand are higher than in the baseline scenario, which is based on the assumption of more moderate productivity growth. By contrast, when productivity growth is low, growth rates of bond demand are lower. Also, the variation in growth rates of bond demand over time is more limited when productivity growth is high, as the effect of baby boomers entry into retirement (and thus on output growth) is less pronounced. By contrast, when labour productivity growth is low, growth rates of bond demand vary more noticeably as a function of demographic developments. For example, in the latter scenario bond demand growth decelerates substantially and it reaches a trough close to zero around 2035, before accelerating again.

Figure 6.4a Bond demand for different labour productivity assumptions (levels)

Assumption: constant ratio of bond supply to output

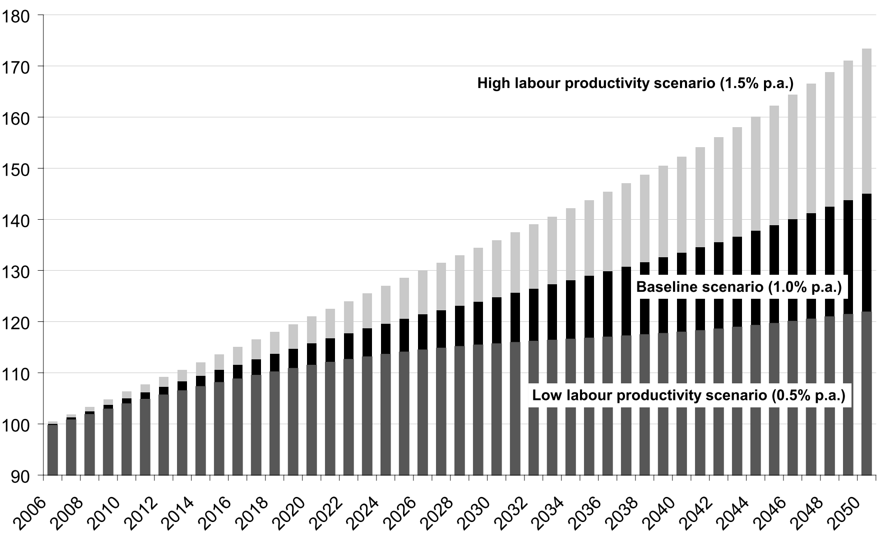
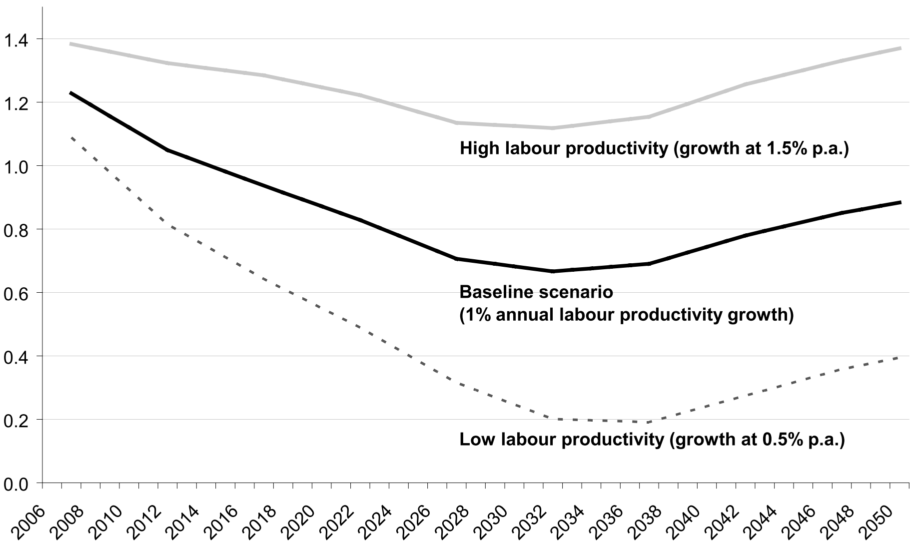


Figure 6.4b Bond demand for different labour productivity assumptions (growth rates)



As the date of entry of baby boomers in retirement influences the estimated pattern of bond demand, different assumptions regarding the effective age of entry into retirement are considered next. Figures 6.5a and 6.5b illustrate the change in bond demand estimates as a function of variations of the assumption regarding the effective age of entry into retirement. The baseline scenario assumes entry into retirement at 65 years, while the alternative scenarios consider either 60 or 70 years (with such changes becoming effective immediately rather than gradually). When individuals expect to enter retirement only at the age of 70 years rather than at 65, they will reduce their retirement savings, as they expect to spend less time in retirement (i.e. five years less). Unlike in the case of a productivity shock (as described before), the effect of such a "retirement-entry shock" on the level of bond demand is immediate. Current bond demand would be about 5.6 per cent lower than in the baseline scenario in the case of later entry into retirement, and bond demand in 2050 would be about 8 per cent lower. Note that a reduction in the effective retirement age by the same number of years, i.e. from 65 to 60, would imply a relatively more important change in bond demand, as the latter would increase by 8 per cent today and 13 per cent in 2050.

Figure 6.5a Bond demand for different assumptions regarding effective age of entry into retirement (levels)
Assumption: constant ratio of bond supply to output

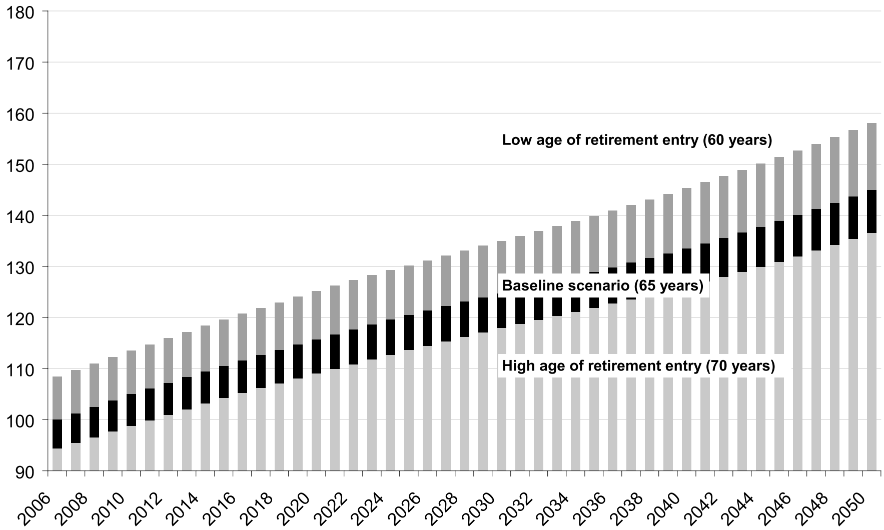
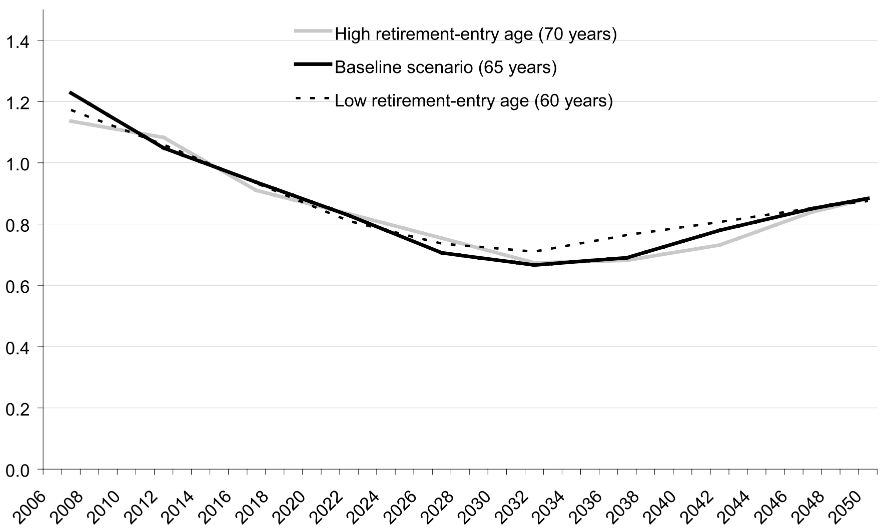
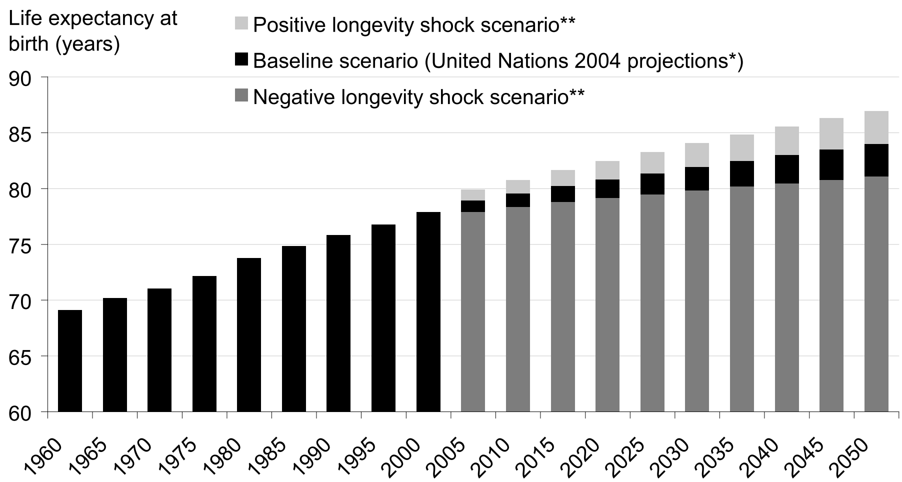


Figure 6.5b Bond demand for different assumptions regarding effective age of entry into retirement (growth rates)



Varying our assumptions regarding longevity allows us to consider the effect of what could be considered "longevity shocks". Expected mortality or longevity is assumed to correspond to the United Nations (2004) projections over the projection period in our baseline scenario, but in the following we consider the effects of positive and negative changes to this scenario. Two modelling approaches are adopted. The first one is perhaps more realistic than the second one, as it would be consistent with rather gradual effects of possible medical progress. First, this shock is modelled as a shift in (expected) mortality rates that implies an immediate shift in life expectancy at birth by one year and a gradual increase afterwards[4]. Figures 6.7a and 6.7b illustrate that a positive (negative) shock to longevity entails a somewhat larger (smaller) demand for bonds. The increased demand in the case of a positive longevity shock reflects the longer period of time spent in retirement, which necessitates higher savings before retirement and thus also higher savings in form of bonds. The effect on bond demand of such a longevity shock is rather limited, however, and the patterns of growth rates are close to each other (Figure 6.7b). Moreover, the bond demand impact of this longevity shock could be offset by a change in the retirement-entry age of less than one year. This difference reflects that variations in longevity have a more limited effect on the size of the labour force than variations in the effective retirement age do, as labour force variations are the major driver of bond demand.

Figure 6.6 G-10 Life expectancy at birth in baseline scenario and in the case of a longevity shock



* Baseline scenario based on population-weighted averages of United Nations (2004) country-specific medium variant projections for the Group of Ten (G-10) countries. Source: United Nations World population prospects – The 2004 revision.
**) Shift in mortality rates that implies an immediate deviation in life expectancy at birth (in 2005) by one year, and a gradually increasing deviation from the baseline scenario thereafter.

[4] Current life expectancy at birth as reported by the United Nations (2004) lies at 78.9 years for the population-weighted average of the Group of Ten countries.

Second, we assumed a sudden "drop" in expected mortality rates that corresponds to an immediate improvement in life expectancy at birth by almost five years, perhaps, as a result of radical medical advances. In this case, the impact on bond demand would be substantial. Indeed, to "neutralize" the effect of such a shock on bond demand by changes in effective retirement age, the latter would have to rise by almost five years. We conclude that should expected longevity increase, bond demand growth would accelerate over the next decades compared to the baseline scenario. In the – perhaps – more realistic case of a gradual improvement, only a small increase in effective retirement age (by less than one year) would suffice to bring bond demand back close to a situation without a longevity shock, so there would be no change in the relative prices of bonds.

Figure 6.7a Bond demand for different longevity assumptions (levels)
Assumption: constant ratio of bond supply to output

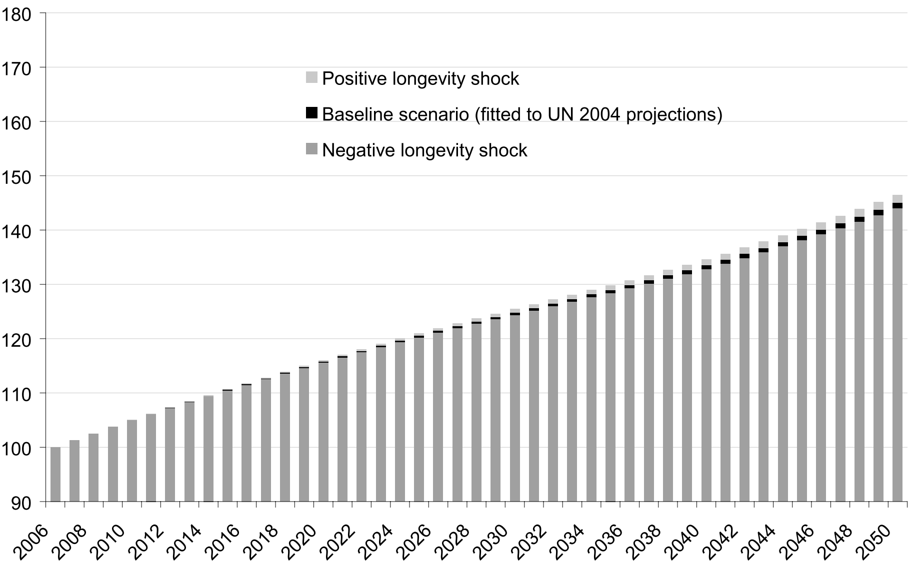
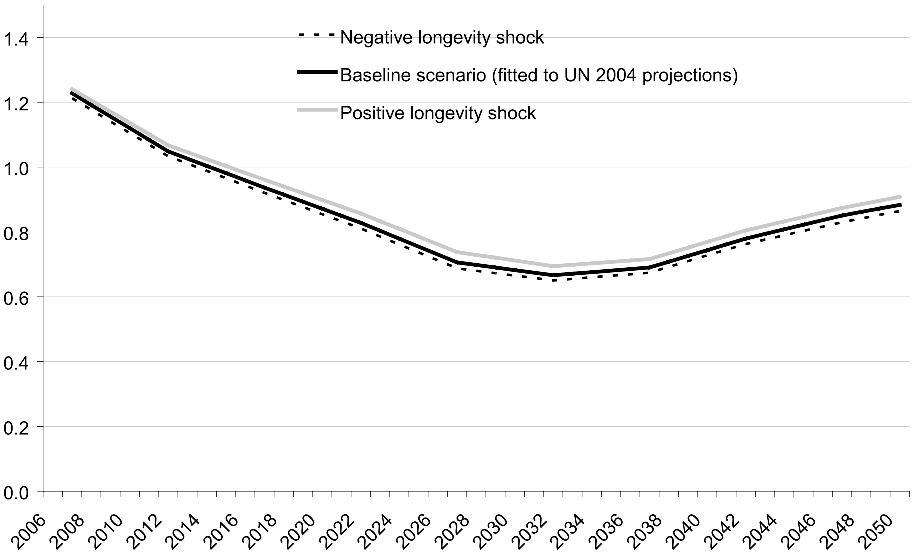


Figure 6.7b: Bond demand for different longevity assumptions (growth rates)



6.4 Concluding remarks

There is a view that demand for high-quality assets such as G-10 government bonds is likely to increase over the next few decades, especially given current demographic developments, quantitative evaluations of such effects are not readily available. In this context, a recent major study on ageing, pension systems and financial markets produced by a G-10 working group (Group of Ten, 2005) concluded that in the future “more resources are being channelled to capital markets to provide for retirement”. The study also highlighted that managers of pension funds emphasise that additional financial instruments, including bonds, are needed to help them better manage ageing-related risks. It did stop short of providing empirical assessments of these issues, however, although it included estimates of potential “scarcity” of pension fund investments. The present note complements the G-10 study by providing a quantitative assessment of potential future demand developments. It is based on the view that it is useful to adopt a life-cycle framework as a theoretical basis and data on demographical projections to derive estimates of future retirement-financing related bond demand. The results presented here are preliminary, however.

Acknowledgements

This note represents the authors' personal opinions and does not necessarily reflect neither the views of the OECD nor those of the Deutsche Bundesbank, although its purpose is to explore possible avenues for future work that would be of interest to the OECD´s Committee of Financial Markets. The note has benefited from discussions with Ulrich Grosch, Yu-Wei Hu, Catherine Lubochinsky and Stephen Lumpkin. All remaining errors are ours.

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Annex 6.1 Model Calibration

This appendix briefly describes key parameter assumptions and settings which are underlying the simulations that are presented in this note[5]. Table 6.A1 lists the variables which are endogenous to our model. They comprise behavioural variables such as consumption and holdings of riskless asset (bonds) and risky assets (equity or capital employed in the production function) as well as asset returns, the portfolio share that is invested in the riskless asset, and output. Table 6.A2 lists key parameter assumptions and predetermined variables. Note that with respect to labour productivity, mortality, and the age of entry into retirement, different parameter constellations are considered which form our scenarios (Table 6.A3).

Table 6.A1 Endogenous variables[6]

$B_{agg,\tau}$	Aggregate bond demand (aggregate bond holdings) in year τ
$K_{agg,\tau}$	Stock of aggregate private capital (aggregate equity holdings in year τ
Y_τ	Output of the production process in year τ
$C_{k,\tau}$	Individual consumption of a member of cohort k in year τ
$B_{k,\tau}$	Individual holdings of one-period-lived riskless bonds in year τ
$Eq_{k,\tau}$	Individual holdings of the risky asset (equity) in year τ
$H_{k,\tau}$	Individual human wealth in year τ
$1-\alpha'_{k,\tau}$	Weight of one-period-lived riskless bonds in year τ in the financial portfolio of a member of cohort k
$1-\alpha_\tau$	Weight of one-period-lived riskless bonds in year τ in the total portfolio of a member of cohort k
$r_{k,\tau+1}$	Rate of return on the individual financial portfolio from year τ to year τ+1
$r^{eq}_{\tau+1}$	Rate of return on the risky asset* from year τ to year τ+1
$r^{b}_{\tau+1}$	Rate of return on one-period-lived riskless bonds** from year τ to year τ+1

* We set the initial rate of return on the risky asset at 7%
** We set the initial rate of return on the riskless asset at 3%

[5] Details on the theoretical framework and on the simulation assumptions are not shown here to save space. They are available on request from the contact author.

[6] For all years τ under consideration with $\tau \geq 2005$

Since the riskless rate of return is endogenous, an assumption is required regarding the time path of bond supply. To equilibrate supply and demand for riskless bonds, we assume that the supply of riskless bonds grows at the same rate as output in the production sector, corresponding to a constant debt-to-output ratio. This assumption is made in all simulations carried out in this study.

Table 6.A2 Parameters and predetermined variables

$\gamma = 2$	Coefficient of relative risk aversion
$\delta = 0.96$	Subjective discount factor
$\eta = 0.3$	Constant returns to scale
$\lambda = 0.06$	Rate of depreciation of private capital (equity)
$\sigma_{eq}^{2} = 0.07$	Variance of the rate of return on risky asset (equity)
cov()=0.005	Covariance between the rate of return on the risky asset and the marginal rate of substitution
cov() = 0	Covariance of the rate of return of the risky asset and wages (human wealth regarded as non-tangible safe asset)
$N_{workforce,\,\tau}$	Labour supply determined by (projected) demographics, mortality and by the assumption on the mandatory age of entry into retirement
$p_{k,\tau}$	Probability of a member of cohort k to survive from year τ to year $\tau+1$, conditional on having survived up to year τ
T^{r}	Age of entry into retirement
A_{τ}	Efficiency level of labour (depending on assumed labour productivity growth)

Referring to lifetime utility, the coefficient of relative risk aversion γ and the subjective discount factor δ are exogenously set at $\gamma = 2$ and $\delta = 0.96$. Referring to the production process, we set the rate of capital depreciation in the production process at $\lambda = 0.06$ and the returns to scale at $\eta = 0.3$. Referring to the portfolio decision, we regard human wealth as a riskless asset, implying a zero correlation between labour income and the return on equity.

As we claim that bond demand is a function of productivity (A_{τ}), longevity – e.g. conditional survival rates of different cohorts at different points in time ($p_{k,\,\tau}$) – and the age of entry into retirement (T^{r}) as a policy variable, we compare the simulation results for different scenarios. Table 6.A3 briefly describes our (alternative) assumptions regarding labour productivity growth, mortality, and the mandatory age of entry into retirement.

Regarding labour productivity, we assume a growth rate of one per cent annum in the baseline scenario. Since this assumption could be debated – we compare this baseline scenario to a pessimistic (0.5%) and an optimistic (1.5%) growth scenario for labour productivity the G-10 aggregate, where the latter is closer to the European Commission (2006)[7]. Unlike the European Commission we hold, however, the growth assumption on labour productivity constant over time.

With respect to the age of entry into retirement, we compare the outcomes in the baseline scenario (65 years prevailing throughout the next decades) to an immediate switch to a five years higher (lower) retirement age of 70 (60) years. Similar to our productivity scenarios, our setting disregards the case of a gradual change in the retirement-entry age over the next decades.

As regards longevity[8], we fitted the conditional probabilities to survive to the projections for life expectancy at birth as reported by the United Nations[9], which serve as a baseline in our framework, assuming that rational agents expect these probabilities to be true. We define a positive (negative) longevity shock as a gradually increasing deviation from this baseline projection. It is modelled as a shift in expected mortality rates that implies an immediate upward (downward) shift in life expectancy at birth by one year (in 2005) and a gradual increase afterwards.

Table 6.A3 Scenarios

1. Growth of labour productivity	
Baseline scenario:	1.0% p.a.
“Low productivity” scenario:	0.5% p.a.
“High productivity” scenario:	1.5% p.a.
2. Age of entry into retirement	
Baseline scenario:	65 years
"Low entry age" scenario:	60 years
"High entry age" scenario:	70 years
3. Longevity (conditional probabilities to survive)	
Baseline scenario:	fitted to 2004 projections of the UN
“Negative health shock”:	life expectancies lower than projected by UN
“Positive health shock”:	life expectancies higher than projected by UN

[7] In its early 2006 Special Report on the impact of ageing on public expenditure, the European Commission projects an increase in labour productivity growth in the EU15 from 1.3 per cent to 1.7 per cent over the next 25 years

[8] Note that the probabilities to survive $p_{k,\tau}$ imply that expected longevity is a function of time and of the age structure of the population.

[9] United Nations (2004): World Population Prospects – The 2004 Revision.

7 Sensible individual behavior, wrong collective policies – Why promoting private savings is only part of the right ageing public strategy

Etienne de Callataÿ

I'm all for progress; it's change I don't like
Mark Twain

7.0 Abstract

Given uncertainties about the long-term financing of age-related social outlays, citizens may set aside savings for the old days. While such a behavior is most sensible at the individual level, it does not mean that promoting individual long term savings plan has to be the cornerstone of the public policy strategy to cope with ageing. Increased individual savings would face major shortcomings if it was to be the sole or key answer to the collective ageing challenge. The purpose of the paper is not to provide a global, balanced assessment of the role private pensions should play but to present and discuss the shortcomings of fully funded schemes from a non technical, policy-making point of view, and leaving aside their merits.

7.1 Introduction

Given uncertainties about the long-term financing of age-related social outlays, citizens may set aside savings for the old days. This behavior is sensible at the individual level but it does not mean that promoting individual long term savings plans has to be the cornerstone of the public policy strategy to cope with ageing. Increased individual savings face indeed major limits as sole or key answer to the collective ageing challenge. The purpose of the paper is not to provide a global, balanced assessment of the role private pensions should play but to present and discuss the limits of fully funded schemes from a non technical, policy-making point of view, and leaving aside their merits. The structure is as follows. Section 7.2 provides the policy framework derived from long term projections. Sections 7.3 to 7.7 do briefly present and discuss the aforementioned shortcomings. Section 7.8 gives the conclusion.

7.2 The challenge

Ageing is likely to increase significantly age-related social expenditures in Europe. In the EU-25 area outlays for pensions, health care and long-term care are expected to increase by 2.5 pp of GDP by 2030 and 4.4 pp by 2050. In the Euro area, figure are even slightly higher respectively at 2.8 pp and 4.6 pp, with increases by 2050 in excess of 7 percentage points in Belgium, Ireland, Luxembourg, Portugal, and Spain (table 7.1). Other recent sources points towards even higher increases such as +6% in Europe over 2005–2050 estimated by Standard & Poor's (Kraemer & Mates (2006)).

Table 7.1 Projected changes in selected age-related public expenditure between 2004 and 2030/2050 (in percentage points of GDP)

	EU-25 2004/2030	2004/2050	Euro area 2004/2030	2004/2050
Pensions	+ 1.3	+ 2.2	+ 1.6	+ 2.6
Health care	+ 1.0	+ 1.6	+ 1.0	+ 1.5
Long-term care	+ 0.2	+ 0.6	+ 0.2	+ 0.5
Total	+ 2.5	+ 4.4	+ 2.8	+ 4.6

Source: Economic Policy Committee and European Commission, 2006.

There is a broad consensus among economists that structural reforms will have to be implemented in order to widen the funding basis, mainly through a higher participation rate, and slow down the trend increase in outlays, through higher effective retirement age and health care selectivity. While the population is aware that pay-as-you-go social security schemes are put under strain when fertility rates and life expectations are changing radically, political support for structural reforms is hard to get. Problems will have to become even more tangible before such a support can be gathered and even once reforms will be seen as politically possible they will most likely be spread over time with grand-fathering clauses protecting retired and close to retire voters. Grand-fathering clauses will be presented as a fair way to handle past social security commitments and individuals' expectations but as a matter of fact will be driven by the political weight of older citizens, knowing that the age of the median voter and of the median trade union member are largely above 40 and increasing.

As needed social security and labor market reforms are likely to be neither rapidly decided nor frontloaded, the aging burden on younger generations will be even heavier than what demographics would require from rigid PAYG systems. In turn, with the prospect of "not enough, too late" reforms, younger generations will anticipate both an increasing fiscal pressure and declining social protection. The latter would mean, as far as health care is concerned, the development of queues in the public regime, higher personal co-payments, and/or increased selectivity in the public coverage, and for pensions, declining replacement rates, postponed official retirement age and/or higher penalties in case of early retirement. In addition, younger generations will also face the uncertainty about the future shape of social security system and their own long term financial needs, as the financial risks of dying very old and/or having to rely on long term care over a very long time span life will increase with life expectancies.

Young generations, being risk averse, anticipating at best a stagnating disposable income and facing the longevity risk, will smooth their consumption patterns out by increasing their savings rates. Given that such a behavior is most sensible at the individual level, policy makers could be inclined to focus the answer to be given to the ageing challenge on promoting individual savings, either through employer sponsored schemes or through individual private schemes. Additional fiscal incentives in favor of private pension schemes do not require political courage, appear as relatively cheap for the budget and seem to be an appropriate way to achieve a rebalancing in pension provision in countries where most of the elderly income is coming from unfunded public schemes.

For the authorities to promote through tax incentives private, funded schemes to be combined with unfunded public schemes may make senses, in particular in terms of risk diversification, but caveats of private savings have to be taken into account. The purpose of this paper is to provide a non-technical overview of these caveats.

7.3 Shortcoming #1: the asset meltdown issue

The most popular limit of private savings as a way to address the ageing challenge is that financial markets could fail to transfer purchasing power over time. An increase in the savings rate would be self-defeated through a decline in the rate of return. Using a ebbs and flows image, it is feared that the baby boomers would be all saving simultaneously, pushing asset prices up and yields down, and that they would draw on savings also simultaneously, leading towards an asset price meltdown.

Such a fear appears overstated. Between 2000 and end 2002 (in the US)/ early 2003 (in Europe), equity markets have collapsed without any demographic factor being at play. This development and all the large swings observed on the financial markets over short lapses of time show that demographics is not the key driver for asset valuation. The risk premium observed on equity markets between 2003 and 2005 cannot be considered as stretched, such that investors would not all be buying at too expensive prices. That baby boomers turning 60 would all sell their assets at about the same time leading towards an asset price meltdown is dismissed by Poterba (2004) on the basis of the rather large standard deviation in subjective life expectancies and expected future expenditure patterns and the uncertainty relating to family support, payment of public pension, provision of public health care, and taxation of income, assets, and consumption. Nowadays, in the US, the net wealth does not decline after the age of 65 but is rather stable. Nevertheless, the risk of some asset price pressure, in particular if the annuity markets were to grow, cannot be entirely neglected (De Leus (2006)).

The asset meltdown theory has recently received support from the fixed income market where what appeared as low long term real interest rates in the US at a time of economic expansion was explained by large savings in Japan, OPEC countries and emerging markets chasing USD T-bills and depressing yields. As more savings would imply lower interest rates, there would be a brake on the intergenerational transfer of financial savings (but not on the transfer of physical and human capital).

7.4 Shortcoming #2: brake on structural reforms

To promote long-term private savings could act as a brake on structural reforms pension regimes do need. Current pension systems suffer from various fundamental problems. The most common ones are as follows:

– a lower labor participation rate: most public pension schemes lack actuarial neutrality, as the penalty for those retiring early do not fully reflect the social cost of early retirement; it leads to early retirement, that is jeopardizing the financing of the social security system and contracting the labor force;
– discriminations across regimes; for instance, civil servants do often enjoy a privileged retirement regime such that their life-cycle income is higher than in the private sector but without that such differential helps attracting and retaining the best human resources due to liquidity constraints and shortsightedness; financial resources are not properly allocated;
– inter-generational inequality, given that the non sustainability of the current regime will lead towards a declining rate of return on pension contributions that cannot be justified as a way to smooth out lifetime disposable income over the cohorts;
– a tax on labor; pension financing is based on labor income but pension benefits do not provide a market conform rate of return for large chunks of the labor force; as a result social contributions for pensions are partly labor income taxes; it leads towards a larger tax wedge on labor; it implies unemployment traps and other forms of labor supply retrenchment, a decline in labor demand and a loss of international competitiveness.

Ageing makes current public pension schemes not sustainable. This long term challenge should push for reforming them thoroughly, with immediate positive effect on potential output.

If the promotion of private savings is presented as the answer to the ageing challenge, the pressure for reforming public schemes is alleviated.

7.5 Shortcoming #3: suboptimal consumption pattern

The macroeconomic effect on savings and growth of fully funded schemes and of the transition from PAYG schemes towards such schemes has been an issue for much debate since the equivalence principle put forward by Samuelson (1958). Macroeconomic issues such as the impact of additional savings on interest rates and exchange rates will not be discussed here.

When reliance on private savings forms the key part of the policy answer to the ageing challenge, consumption patterns may be suboptimal. It derives from the longevity risk. People do not know how long they will live and how much they will have to spend for old-age care (health-care related outlays, nursing homes, etc). Being risk averse, people will over-save for the case of living very old with large health and dependence related expenditures. Consumption will not be properly smoothed over the life cycle, bequests will be too large and economic growth may be slowed down. The problem would not arise if financial markets were providing efficient ways to share the risks of getting very old and dependant among private individuals. Annuities could be even indexed against a cost-of-living index specific for the elderly. Unfortunately, existing annuities and care insurance schemes are far from being satisfactory, even when looking at the product offering for rather young cohorts where the adverse selection phenomenon should not be an issue.

While relying more on private savings would require better risk-sharing arrangements, the current trend within the pension fund industry is to transfer back the longevity risk from corporations to the individual. Indeed, corporations are increasingly replacing defined benefits schemes by defined contribution schemes. It is understandable that it is not up to any private company to bear the longevity risk of its workforce but it is an even worse situation, from a welfare point of view when individuals have to bear it personally. Indeed individuals cannot rely on company-wide risk sharing and have no possibility, when cashing in their private pension capital at time of retirement, of transforming it into an annuity on reasonable terms.

The underdevelopment of the annuity market may be explained by the following factors:

– information asymmetry and adverse selection made supplier reluctant or the pricing of annuities unattractive;

– prudential authorities supervising financial intermediaries may deter the supply of such products given that they are risky;
– tax rules may discourage annuities, for various reasons, one being the frontloading of tax receipts (a flat rate one-off tax on capital at time of retirement instead of recurrent tax revenue spread over the time span of annuities)[1];
– tax uncertainties may discourage annuities, when individuals anticipate that future budgetary imbalances may lead to higher taxes on pension income and/or more selectivity in outlays, based on official incomes (e.g., subsidies on nursing care restricted to those with pension income below a given threshold);
– shortsightedness and liquidity constraints may also lead to a preference for capital vs. annuities.

Not only the tax distortion against annuities should be abolished but there is even ground for having positive discrimination in favor of annuities. Annuities provide the collectivity the guarantee that the pensioner will be financially self-supporting, not having to rely on social assistance financed by the taxpayer or the worker.

There is a logical link between this shortcoming and the previous one. Structural reforms send the citizens the reassuring message that long-term issues are being addressed in order to make sure that pensions and health care regimes will be sustained. As a result, individuals may lower their precautionary savings. In the absence of reforms, savings may be excessive. The potentially disruptive effect of private pension schemes on life-cycle consumption patterns can therefore play not only through the longevity risk when annuities are underdeveloped but also through the brake on structural reforms of the labor market and the social security system.

7.6 Shortcoming #4: the cost of altering behaviors

A forth limit against making from the promotion of individual savings, through employer schemes or directly, the cornerstone of the ageing policy is that the policy tools that could be used to promote long-term private savings are unsatisfactory.

Individual behaviors regarding long term savings could be currently biased by a lack of information. It can be the case if citizens do underestimate the magnitude of the globalization and ageing challenges; in that case, if they had perfect foresight or were better informed, they would save more

[1] Tax frontloading can also be observed with real estate annuities: in Belgium the high real estate transaction tax (10% in 12.5% in most cases) is always due upfront, irrespective of the purchase being made plain vanilla or through annuities contingent on the vendor staying alive.

in order to smooth their consumption over their life cycle. In such a setting the first best solution for the government remains to implement the desirable structural reforms in order to properly address these challenges but if reforms are deemed impossible a second best solution for the government would be to increase the aggregate savings ratio. How to reach a higher savings ratio has to be discussed in order for the policy measures not to become detrimental.

What matters from an economy-wide perspective is overall national savings, made of government, corporate and household savings. A higher aggregate savings ratio can be achieved through the budget or through private savings[2]. The first way for the authorities for boosting savings is through smaller deficits or even surpluses. Of course, what matters is the fiscal balance adjusted for physical and human investments that are effectively generating future returns. A higher budgetary surplus, excluding investments, appears to be the safest way for promoting savings as it is directly under the control of the authorities but the so called Ricardian equivalence with public savings crowding out private savings has to be taken into account.

A second way for the authorities to promote savings is through information. People may be underestimating their lifetime expectancies, overestimating the public pension they will receive when they retire, underestimating age-related outlays (how much does it cost for a room in a nursing home?), exaggerating their wage increase and savings potential before retirement, etc. Governments should proper inform citizens about all these parameters. The purpose is not to create panic as panicking is utterly inefficient (why to act if anyway it is too late?) but to avoid altogether the Coué method, or the healing power of autosuggestion, governments may be tempted to apply to please shortsighted voters while creating a feel good factor.

A third way to promote savings is through compulsion. Indeed information may not be enough to overcome shortsightedness and liquidity constraints. If somebody at age 30 is convinced that his wage will increase by 10% in real terms per annum until he retires despite information about the average wage increase in the economy and about the impact globalization may exert on wages, he is unlikely to save much. Mandatory savings increase savings by the poor (Kohl and O'Brien (1998)). Compulsion may have some positive effects, as for instance making school attendance mandatory for children. In the case of long term savings, next to the compulsory social insurance for all wage earners, we could have compulsory occupational or individual private schemes.

However such compulsion would fail to take into account the large diversity of the population. While school education may be thought to be good for – almost – any child, mandatory private savings may not be appropriate

[2] "The United States is working to raise national saving by cutting the fiscal deficit and increasing private saving." (John Snow (2006))

for those who own already enough assets (or do expect large inheritance) or those who are facing hard liquidity constraints, such as households investing heavily into education or housing. It can be said that compulsory savings either do change the savings pattern but not the savings level or do increase savings but for those who may have good reasons for not saving more for the time being[3].

Even the simple questions of the compulsory savings being a flat amount or a percentage of income and being based per capita, per household or per wage-earner are hard to answer. Obligations fail to take into account all individual specificities … and if obligations are fine tuned in order to accommodate for some specificities they create distortions and red tape. For instance mortgage repayments would have to be deducted from the amount of the compulsory long-term savings but such an exemption would have to be calibrated (what about low quality housing that would fall apart or require major repair work after a couple of decades?) and controlled.

A forth way to promote savings is through incentives. In many industrial countries households' long-term private savings, being not only occupational and individual pension schemes but also real estate investment, enjoy a favorable tax treatment. However tax incentives, while being popular, are a very poor policy instrument. As compulsory measures they fail to take into account individual specificities and distort inter-temporal individual preferences but in addition they have an opportunity cost in terms of lost tax revenues and are regressive from an income distribution point of view. As it is common with tax incentives, incentives in favor of long term savings can be captured by intermediaries, in this case financial institutions, that could be charging higher transaction and management fees. On top of that, as with compulsory measures, tax incentives appear to have more impact on the composition of savings than on the overall size of savings (Kohl and O'Brien, (1998)).

Instead of granting ad hoc tax incentives for savings, governments could revisit the way public outlays are financed. As a matter of fact, current policies are often schizophrenic, with tax incentives for long-term savings co-existing with a large part of the budget being financed by income taxes that are taxing savings twice. A rebalancing from income tax towards consumption tax would support savings.

Tax rules may also alter the financial structure of corporations. In most countries debt financing is de facto promoted vs. equity financing. On the one hand, to base a savings strategy on corporations is difficult to consider given that corporation net savings are hard to control and volatile, as experienced over the last decade, and given that large corporations are transnational while

[3] In Australia, since compulsory superannuation was introduced, the national savings rate appears to have actually declined slightly.

tax rules are set at the domestic level. On the other hand, business-friendly policies and tax neutrality are favorable to corporation savings.

7.7 Shortcoming #5: the drawbacks of how private long term savings are channeled out

A fifth limit is that the way long term private savings are managed has drawbacks. These drawbacks are of four different kinds: (i) their influence on financial markets; (ii) their governance; (iii) their administrative costs; and (iv) their interaction with other policies.

There is a concern that pension funds could interfere with a proper functioning of financial markets. If pension funds have great merits in allowing professional management, risk diversification, and favorable transaction fees and in empowering shareholders to pressure for better corporate governance, they do at the same time present the risk of promoting herding behavior and market concentration (Bini Smaghi, (2006)). At this stage there is no strong evidence about herding behavior. It is hard to claim that a recent episode of financial turmoil on the markets originated from a brutal shift in asset allocation by pension funds driven by markets mood more than by facts. Institutional investors may be more “patient investors” than private individuals due to a heavier decision process, less liquidity due to their larger size, and more rationality in the investment process. It can be added that brutal shifts could also be generated by changes in regulation decided by prudential authorities. If for instance the latter ones were to impose a shift out of equities towards bonds in the aftermath of an equity market crash, tensions would be exacerbated. However it is fair to acknowledge that an agency problem may arise from interests of managers not being aligned with those of investors. For instance, asset managers may be prone to take more risks as their reward structure may be biased towards short term performance. A way to avoid this misalignment is through benchmarking but then there is a risk of herding behavior.

Along the same line the case for pension fund abusing their market power is not established[4]. There are numerous claims in the popular press that large pension funds have pushed for restructurings leading towards socially painful lay offs but the role of pension funds as active shareholders with interest well aligned with those of smaller shareholders can be seen positively with strong arguments in favor of promoting an even more active role. What is true is that pension funds, if becoming too large, can affect the direction of the markets in which they are operating.

[4] At the end of 2004, the European Federation for Retirement Income represented more than EUR 3.3 trillion managed for future second pillar pension payments (EFRP (2006)). It is said that 40% of outstanding government bonds are held by pension fund (Bini Smaghi (2006)).

An important issue at stake is the guarantee public authorities do or do not provide to pension funds, with the risk of moral hazard in case of guarantee and of social problems and possible confidence crisis in case of no guarantee (Bodie and Merton, (1993)). The case for no State guarantee but with control through transparency and clear and enforceable investment and governance rules appears as the most compelling.

Regarding the governance, the Maxwell case and other affairs have been much commented. Thanks to the IFRS accounting principles, assumptions about valuation of assets and liabilities have now to be made transparent. Rates of returns, the methodology for computing them, fees, and other key features of all long term savings instruments have to be transparent to promote competition.

Regarding administration costs, while the public sector is barely a model of efficiency in many countries, private pension schemes could suffer not from political ills but from their size and their need to compete for customers. There are fixed costs in setting up, managing and controlling pension funds, pooled assets could be managed more efficiently (more expertise, lower transaction costs), and marketing expenses can be significant, as evidenced in Chile.

Finally pension funds can interfere with public policies as the interests of pension funds may not be aligned with the general interest. The European Commission has promoted the transnational portability of pension rights but nowadays defined benefits schemes still have an adverse effect on workers' mobility. For too long defined benefit schemes have acted, intentionally or not, as a loyalty program as the acquired rights accumulation process is not strictly correlated with contributions but does speed up over time, i.e. with the number of years serving the same employer. Another case of conflict of interest is the retirement age. In Belgium, for instance, private pension schemes do not penalize early retirement as they should based on actuarial fairness (de Callataÿ (2002) and de Callataÿ and Wouters (2005)). It comes from the fact that unit labor costs are higher for older workers as wages increase with age or seniority while productivity is exhibiting a bell-shape form over the worker's career. As a result, employers have no incentive in designing pension funds in a way to retain older workers at work while the cost of early retirement is largely borne by the society.

7.8 Conclusion

Ageing has to be addressed through a combination of means. Vocational and individual long term savings plans have definitely a role to play and financial risk-sharing instruments are desirable. However the paper has shown the shortcomings of relying excessively on private savings. While most critics of the role private savings can play have focused on the asset meltdown scenario, there are other dangers policy makers have to be aware of. Private savings should complement, not substitute fiscal orthodoxy and structural reforms, their design should not lead to distortions that would go against the general interest, and their promotion should be based more on information than on compulsion or tax privileges. In addition authorities should address the issues of the possible brakes they themselves put on the development of the annuity markets.

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8 Implicit Pension Debt and Fiscal Sustainability: An Assessment for Germany

Martin Werding

8.0 Abstract

Implicit pension debt involved in existing pay-as-you-go public pension schemes is nowadays seen as an important determinant of the long-term sustainability of general government finances. Explicit updated calculations regarding its size are however largely lacking. The present paper takes up the lessons that emerge from the relevant literature and estimates the amount of implicit pension debt for the German Statutory Pension Scheme under its current legal framework as well as over the series of reforms that have been enacted during the last fifteen years. It is demonstrated that, through these reforms, implicit liabilities have been substantially reduced but are nevertheless still sizeable. Even if future contribution rates are increased as prescribed by current rules, there will be a notable gap in the German public pension scheme's total balance sheet.

8.1 Introduction

Conventional economic wisdom has it that a public pay-as-you-go pension scheme inevitably involves an implicit type of government debt (for early references that received much attention at an international level, see van den Noord and Herd (1993, 1994))[1]. This debt is introduced when the system is phased in and, by definition, starts to pay out benefits immediately based on current contributions. During an initial phase, benefits accrue to individuals of retirement age who have not – at least, not over their entire active life span – contributed to financing the scheme. In the extreme case of a pure pay-as-you-go scheme, funding for these benefits fully exhausts the contributions collected among those who are currently active, and none of the contributions are accumulated. Instead, early contributors are given the promise – or, in most cases, a legal entitlement – that they will receive a pension later on. As these outstanding benefits will, in turn, be financed from future contributions that are collected using the coercive power of public authorities, they fully conform to the notion of public debt.

Once the system is matured, meaning that all existing pensioners have a full life-time record of contributions, the implicit debt will be simply rolled over from one generation to another. Within an overall system of revolving

[1] We are well aware that, probably all over the industrialised world, economists have brought forth similar ideas much earlier at a national level, when existing pay-as-you-go pension systems were inaugurated or extended to an almost universal coverage after or even before the Second World War.

loans, part of the debt is continuously redeemed by paying out pension benefits, while current contributions always turn into fresh debt (see Sinn (2000) or Fenge and Werding (2003) for further details). There is thus always a certain amount of benefit entitlements that will become effective only in the future, but arise from contributions that have already been made.

Within the total balance sheet of a given public pension scheme, there are mainly two types of “assets” by which the implicit pension debt is effectively covered. First, in a partially funded system, where some fraction of the contributions is continuously accumulated to prefund for future benefits, there can be a substantial stock of financial reserves. Second, whatever the remainder of the implicit debt, it should be next to automatically covered by future contributions. However, calling these contributions an asset is an elusive concept, and accounting for them in any practical calculations regarding the size of the implicit pension debt requires a lot of care to avoid tautological conclusions and to allow for meaningful comparisons. We will keep this in mind and return to a number of details involved throughout the following considerations.

8.2 Lessons from the literature and the discussion so far

Early attempts at measuring the size of implicit pension debt for a limited number of industrialised countries were relatively rough in their methodology (see Hagemann and Nicoletti (1989), van den Noord and Herd (1993, 1994), or Kuné et al. (1993)). Not surprisingly, the results turned out to be a multiple of current GDP in most cases and often dwarfed the figures for explicit government debt and the debt ratios officially recorded. There has been a limited number of follow-up studies, some conducted at an international level[2] and a larger number dealing with single countries only[3]. At the same time, other authors pointed to ambiguities and possible sources of misinterpretation in any of the approaches taken in this strand of literature (see, e.g. Haveman (1994), Franco (1995) or Disney (2001)).

Most of the subsequent work therefore turned to developing other indicators to address the role of public pay-as-you-go pensions, now amended by other types of government expenditure, for the long-term sustainability of public finances[4]. For instance, EU-level authorities are currently working

[2] See, for instance, Chand and Jaeger (1996) or Frederiksen (2001).

[3] For a survey, see Franco et al. (2005, Section 5, especially Table 4).

[4] See, e.g., Leibfritz et al. (1995) and Roseveare et al. (1996) whose work was extended, and much refined, for the comparative study documented in OECD (2001, ch. 4, 2002). This latter study was prepared in co-operation with the EU Economic Policy Committee (2001) and, unlike all earlier work done in this area, is based on country-level projections prepared by national experts.

The host of studies based on the “Generational-accounting” methodology suggested by Auerbach et al. (1991) is based on a parallel idea. Yet, like in the more recent OECD projects, numerous government budget items other than pension expenditure enter the notions of implicit debt and fiscal sustainability applied there, and the results are condensed to form other, more complex indicators of intergenerational →

on new, sophisticated measures of fiscal sustainability (see EU Economic Policy Committee (2003)) that are meant to support the EU-wide consultation process regarding sound fiscal policies and the observation of the criteria of the "Stability and Growth Pact", with a particular focus on the Eurozone countries. Unfunded liabilities of public pension schemes are an important ingredient in calculating any of these indicators, but explicit calculations regarding the aggregate size of implicit pension debt are so far not part of these efforts.

To some extent, this may have to change in the future, mainly because not including this type of debt within the accounting framework for the public sector creates opportunities to manipulate official figures on current public deficits and debts wherever these are under external surveillance. For instance, on several occasions during the last years the EU had to deal with cases where national governments took over unfunded pension liabilities from private, often formerly state-owned, corporations against the payment of a notable lump sum. With current accounting standards, such lump-sum payments reduce the current budget deficit, while the additional liabilities are nowhere recorded[5]. This may be part of the reasons why, in a current initiative, the EU Commission is preparing a report, due by the end of 2006, on how implicit liabilities could be included in the monitoring devices related to the Stability and Growth Pact (see EU Commission (2006), Section 2.2.2). Another, and probably more important, aspect is that international rating agencies have recently stressed their interest in including the amounts and future trends of implicit pension debt in the criteria for their country credit ratings (see Kraemer et al. (2005); Kraemer and Mates (2006)). If these are serious ambitions, relevant not just in cases of obvious fiddling with explicit debt figures, then national governments themselves might become interested in determining and publishing the relevant data.

At the same time, one has to acknowledge that accounting for implicit pension debt is not as straightforward as it may seem from our introductory remarks. The discussion that has unfolded over the last fifteen years provides

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equity. See Auerbach et al. (1999) or Kotlikoff and Raffelhüschen (1999) for collections and surveys of applied work in this area.

[5] In a news release of 21 October 2003, Eurostat confirmed that this incomplete, hence misleading, accounting procedure is fully in line with the existing rules. Changing these rules might therefore be the only way out if the practice sketched above were adopted on a larger scale. Note that, while misperceptions of annual deficit figures could be avoided by not accounting for the lump-sum payment, misleading changes in accumulated debt were still next to inevitable if one would not want to introduce multiple time series regarding actual vs. notional public debt.

In a sense, the practice sketched here runs counter to one of the standard objections to officially accounting for implicit pension debt, namely that, in contrast to government bonds recorded as explicit debt, entitlements to receive unfunded pensions cannot be traded (Franco 1995). While this may be true for individuals who are future beneficiaries, it does not equally apply to the government or other sponsoring bodies.

a number of important lessons that will have to be dealt with in any related effort.

First, there are effectively different notions of implicit pension debt (see Holzmann et al. (2000)), at least two of which are really important: those based on accrued-to-date liabilities (ADL) and on open-system liabilities (OSL). ADL is essentially what was sketched in the introduction of this paper, viz. outstanding benefit entitlements linked to past and current contributions, to be determined "as if" the scheme under scrutiny were closed for new accruals starting, say, the next year. Among the alternative definitions, ADL is certainly closest to the notion of explicit government debt. On the other hand, the concept may fail to fully capture larger shifts in future pension finances that can be due to massive changes in the population structure ("demographic ageing") or, no less important, to policy responses that become effective only gradually, over a long transition period. For this reason, other measures have been devised that address the expected continuation of the scheme and augment ADL measures by benefits linked to future contributions. In the limiting case, long-term projections regarding the pension scheme's budget can be extended to cover an infinite ("open") time horizon, in order to fully spell out the implications of current pension law in terms of OSL-type measures[6].In this paper, for reasons that should become clear as we go along, we will present estimates regarding both kinds of measures for the German Statutory Pension Scheme.

Second, international comparisons regarding the size of implicit pension debt are very difficult to make. The problem is not so much that, in attempting to do so, one has to deal with lots of specific details of each of the pension schemes covered when preparing projections of future benefits (and contributions) – a point suggesting that one should involve national experts in one way or another in order to obtain reliable results. The main obstacle is that there is a deep-rooted conflict between reliability and comparability of projections for pension schemes in different countries. Going a long way in harmonizing assumptions regarding a host of relevant aspects of individual behaviour and macroeconomic developments is likely to yield implausible, if not misleading, projections for some of the countries involved. On the other hand, with assumptions that are not fully harmonized to take care of country-specific features, it is difficult to assess what is effectively compared in such exercises: cross-country differences in institutions, such as the legal framework of national pension schemes, or differences in behaviour and in general economic conditions. What can be accomplished much more easily are comparisons that cover just one country over time, capturing the impact

[6] An alternative is to estimate the size of ADL not only for the current year, but as a time series of annual ADL figures over an extended time period into the future, as in Oksanen (2005). With the detailed simulations entering our ADL calculations below, however, this would be a difficult task.

of changes in the legal framework, including the potential effects of future reforms. Therefore, this is what we will effectively restrict our attention to in this paper, assuming that our observations from Germany may involve some lessons, direct or indirect, for other countries as well. Hopefully, this is still true even if we acknowledge a further lesson that arises from the existing literature.

Third, when attempting to measure implicit pension debt, the appropriate perspective to be taken and the issues and subissues to be looked at vary substantially by systems and, hence, by countries. For instance, in a pay-as-you-go pension scheme with notionally defined benefits (NDB), such as the German one, it is really the implicit debt involved in future benefit entitlements that is of highest importance. By contrast, in notionally defined contributions (NDC) schemes, such as those in place in Italy and Sweden following major reforms enacted in these countries in the 1990s[7], projecting future contributions is at least equally important. In the former case, contributions basically have to adjust to meet existing liabilities – and one may ask, whether this appears to be realistic –, while in the latter case, future pension benefits are the main political variable that has to adjust to expected revenues – and one might be interested in whether these benefits are likely to be adequate. In other words, setting up a full-scale balance sheet including a projected "contribution asset" makes a lot more sense for the new NDC-type public pension schemes (see, for instance, Settergren 2005) than for traditional NDB schemes. In the following, we will therefore primarily focus on implicit (AD and OS) liabilities involved in the German public pension system, accounting for expected future contributions only to the extent that this is needed – in a way that is hopefully instructive, even though some of our findings turn out to be highly country-specific.

In the remainder of this paper, we will discuss in some more detail the conceptual issues involved in estimating implicit pension debt (Section 8.3) and then present updated estimates for the German Statutory Pension Scheme as it has evolved over a series of consecutive reforms taken since the early 1990s (Section 8.4). Section 8.5 concludes with a summary of our main observations.

[7] For relevant descriptions, see Franco (2002) and Palmer (2002).
Note that the distinction between DB-type and DC-type schemes was originally developed for private, funded schemes, mainly for employer-based pension plans. However, the discussion about the Italian and Swedish pension reforms has shown that it can be meaningfully applied to unfunded pension schemes as well, with the additional qualification that the relevant links are just "notional" in this case.

8.3 Conceptual issues

8.3.1 Definition of liabilities

The calculations we will present in this paper are based on two different notions of implicit pension debt, viz. accrued-to-date liabilities as well as open-system liabilities. The definitions of these two concepts are as follows.

Accrued-to-date liabilities (ADL) are given, for each point in time, by the present values of (a) outstanding benefit entitlements of current pensioners plus (b) future benefit entitlements of the active population to the extent that these are linked to their past and current contributions. Here, "benefit entitlements" refer to the full package of benefits – disability pensions, old-age pensions and survivor pensions – that regular contributors are entitled to receive simply by paying the standard rate of contributions. Determining the extent to which future benefits are "linked to" contributions already made is relatively easy in ("Bismarckian") pension schemes with an explicit, and largely proportional, link between earnings or contributions on the one hand and benefit entitlements on the other. But even in the other limiting case of so-called flat-rate (or "Beveridgean") pensions, benefits are usually assessed based on periods of contributions (or residence, if nothing else) on a simple pro-rata basis, so that existing accruals can be identified in some sense.

Open-system liabilities (OSL) include parts (a) and (b) of the definition of ADL. They add the present values of (c) future benefit entitlements of the currently active population that will arise from their future contributions, to be paid over the regular course of a working life, and (d) future benefit entitlements of all future contributors, estimated with an infinite time horizon. Against the ADL definition, the inclusion of future benefit entitlements that are not yet accrued is meant to reflect the expectation that the scheme under scrutiny will be continued based on the current legal framework – without an arbitrary choice of the relevant time horizon, that is, virtually forever. Note that the extension to an infinite time horizon does not raise fundamental technical problems: even if benefits are expected to grow on real terms, their discounted present values will usually decline and converge towards zero, so that the sum of all future benefit entitlements should be finite.

By their definition, ADL measures correspond to acute liabilities that are very close to any conventional definition of explicit government debt. When assessed on relative terms, for instance, as a percentage of current GDP, they are mainly a function of the "system participation rate", that is, the fraction of the active population that is actually covered by the public pension scheme, and of the "quasi-replacement rate" of average benefits over average wages (for further details, see Fenge and Werding (2003)). For instance, the implicit pension debt in terms of ADL should be lower for categorical systems, covering only part of the labour force, than for universal systems that cover the entire labour force, or even the entire population. At the same time, ADL debt should be higher for relatively generous, earnings-related pension schemes than for basic pension schemes that guarantee only a minimum level of old-age income. Interestingly, features by these two dimensions are usually combined in such a way that comparing ADL measures across countries does not necessarily lead to patterns that are easily predictable. Also, note that changes in the ADL-to-GDP ratio that are a result of demographic ageing do not have a clear sign[8]. Their movement mainly depends on how labour productivity, hence wages, respond to changes in the population structure and on how this feeds through to current and future benefits. While the former is a matter of technology and economic conditions, the latter is an institutional feature that can be manipulated deliberately in order to contain the amount of implicit pension debt.

By and large, all of these properties also extend to the OSL definition of implicit pension debt. As was already mentioned, the main advantage in using this broader definition is that the ADL measure may be too narrow to fully capture the impact of long-term demographic change, or of policy responses that take effect only over long transition periods. The timing of prospective changes still matters for the present values entering OSL-type debt measures, but important parts of future developments are no longer cut off based on a strict "accrued-to-date" rule. An important difference is that, while estimating ADL based on outstanding benefits can be meaningful in itself, OSL measures are obviously incomplete if they are not accompanied by parallel estimates regarding future contributions. Note that, if future contributions are taken into account as well, the analysis of OSL measures, then called "open-system net liabilities", effectively tries to exploit the inter-temporal government budget constraint that is at the core of recent sustainability analysis (see Blanchard (1990), Auerbach et al. (1991)). As was already mentioned, however, this should be done in a non-tautological way, i.e., not just highlighting the simple ex-post identity of benefits and contributions that the pay-as-you-go mechanism ultimately rests on.

8.3.2 Accounting for contributions

From a technical point of view, estimating future contributions is no more difficult than estimating future benefits is[9]. In doing so, however, one

[8] Only if demographic ageing comes about as a large group of "baby boomers" gradually working them-selves through the age distribution, it is highly likely that ADL per GDP increases substantially in the years when the relevant age cohorts are approaching retirement.

[9] Accounting for future contributions is, of course, difficult if benefits are tax financed, using revenues from the general government budget. The ADL definition of implicit pension debt that is based on out-standing benefits alone is unaffected by this difficulty. To determine OS net liabilities, one could forecast the revenues needed to fund future benefits based on the percentage of GDP which is currently spent on this purpose.

has to be careful regarding what kinds of results can be used for meaningful comparisons to the size of outstanding pension liabilities and for meaningful comparisons across different scenarios. Here, we will first discuss a more fundamental issue, then the application to both ADL and OSL measures of implicit debt.

In some countries, current contribution rates are fixed by law, and any changes in these would require new legislation. These contribution rates can certainly be used as a benchmark to see whether the respective pension scheme is viable at current parameter values or, conversely, what portion of future benefits cannot be covered at current contribution rates. In other countries, however, the current law does not fix the contribution rate but, instead, defines a rule by which the rate has to be adjusted if otherwise the annual budget would be unbalanced. A naïve "current policy scenario" would then conclude that implicit pension liabilities, whatever their size, are always covered and that net liabilities are zero. Results of this kind could never be compared across countries, even not across different scenarios constructed for the same scheme. Again, keeping the contribution rate constant at its current level offers a useful benchmark and leads to results that are much more telling.

Parallel estimates regarding pension liabilities and future contributions are possible for ADL-type measures of implicit pension debt. Here, they make sense if the results are to be compared at an international level. At least, for reasons explained in the preceding section, directly comparing ADL-to-GDP ratios across countries may be less instructive than comparing only those parts of ADL that are not covered by contributions at current rates. With the ADL definition of implicit pension debt, one has to take into account that, the more one moves into the future, an increasing fraction of contributions will be needed to finance for benefits other than those already accrued at present. Proportional corrections are thus needed in order not to overstate the present value of relevant future contributions.

Parallel estimates for implicit liabilities and future contributions are actually required with respect to OSL-type measures. Interpreting the sum of all future benefit entitlements that will potentially arise in an existing public pension scheme over an infinite time horizon as an unconditional measure of current implicit public debt would not make sense. Estimating the present value of all future benefits is thus useful only if one is also able to determine the extent to which these liabilities can be covered at some benchmark rate of contributions collected over the same, infinite time horizon. Again, current contribution rates offer an obvious benchmark that can be used for this purpose.

8.3.3 Estimating implicit pension debt

What are the main ingredients needed to calculate the size of implicit pension debt, and of future contributions that could be used to cover it, for a given pension scheme? It should be clear that most of the information entering such calculations is forward-looking, spanning relatively long periods of time, so that the final results are effectively based on a host of assumptions and involve a high degree of uncertainty. The results should be based on reliable long-term financial projections for future expenditure and revenues of the pension scheme under scrutiny, probably covering a multitude of baseline, sensitivity and policy scenarios. These projections, in turn, require long-term demographic scenarios, information regarding labour-force participation and actual coverage of the pension scheme both among the active and the retired population as well as assumptions regarding future developments in any of these areas. Assumptions regarding future wage growth and a proper modelling of benefit assessment and relevant indexation rules are also very important for the estimation of implicit pension debt.

To estimate ADL-type measures of implicit pension debt, long-term projections regarding the pension scheme's budget actually have to be more detailed than for OSL measures. The reason is that, according to the narrower definition of ADL, one has to distinguish throughout between benefit entitlements already accrued at the time the calculation refers to and entitlements that will accrue only in the future. Therefore, information regarding benefits already awarded has to be related, in some way, to the age structure of those in retirement. Ideally, a detailed record is also needed of past and future work biographies of members who are still active. Assumptions regarding their future work biographies are at least relevant to determine transitions into retirement. Also, to isolate the existing insured – those still active and those already retired – from future members of the pension scheme in broader projections, one also needs a demographic scenario with zero-immigration that reaches about 60 years into the future.

Estimating OSL measures of implicit pension debt requires rougher projections only, covering annual flows of all future benefits and contributions at an aggregate level, regardless of whom they accrue to or who is paying for them. However, any long-term projection necessarily has some maximum time horizon. The final year should be in a sufficiently remote future that expected future changes – mainly those regarding demographic aspects, labour-force participation and institutional features of the pension scheme – are fully captured. Ideally, there should even be a fictitious no-further-change period during which the economy and the pension scheme can be expected to adjust to something like a new "steady state". Using the textbook formula for converting infinite geometrical progressions that are converging towards zero into finite numbers, final year results for benefit expenditure and contribution revenues can then be used to estimate their open time-horizon present values, taking as given the discount rate as well as the (ideally, next to constant) growth rates of these aggregates over the final decade.

Note that assumptions regarding interest rates are very important for estimating the size of implicit pension debt. Usually, they are not so much relevant for the financial projections themselves, at least not if the pension scheme under scrutiny does not entail any substantial reserves that could earn compound interest over time. Yet, the present values of projected future benefits and contributions are highly sensitive to the discount rate which enters these calculations. Basically, the rate that is used for this purpose should correspond to the interest rate paid on long-term government bonds. As this rate does usually not fluctuate a lot in the short and medium term, its current value may offer an acceptable proxy. In any case, the longer the time horizon covered by the estimates, i.e., with OSL-type measures more than with ADL measures, the more the final result will be influenced by this particular assumption.

8.3.4 Interpreting the results

An important aspect to note is that, whatever definition is used, implicit pension debt can be really sizeable. With the narrow ADL-type definition, the amount of implicit debt involved in a broad-based pension scheme, covering a substantial fraction of the labour force of a given country, or even the entire population, corresponds to a projected stream of old-age income, based on benefit entitlements already accrued, for all current pensioners and workers, or for the entire adult population, over their remaining life time, that is, a period of about 60 years or more. With extended definitions that are more forward-looking, the size of implicit pension debt increases much more. Even "net" liabilities corrected for future contributions to be collected at current rates can exceed current GDP by factors much larger than unity in cases of rapid population ageing.

Up to a point, if accounting for implicit pension debt in official statistics of public-sector finances were adopted as a new standard, politicians, the public administration, all kinds of outside observers and the greater public would simply have to get used to such high figures and to new levels of total public debt. In itself, including implicit debt in official records does not at all change the current and prospective situation of public finances. It just makes visible what was already there and, perhaps more importantly, renders any hidden transfers from explicit deficits and debts to implicit ones impossible. However, some attention is needed regarding precisely what definition of implicit pension debt can be used for determining amended figures on total public debt.

Calculating OSL-type measures of implicit debt is useful for reasons explained earlier on. But, by their definition, they are not comparable to existing explicit debt. ADL measures, net of any financial assets included in the pension scheme's balance sheet, are actually the only candidate for such amendments. The fact that their size is, so far, mostly estimated by researchers and inofficial bodies using long-term projections for the pension scheme's budget that are sometimes more, sometimes less rough in their construction should not be a real obstacle to taking this concept to official use. At least in the case of the German public pension scheme, it should be no problem for the pension administration, with unrestricted access to a rich set of administrative data, to start calculating very hard figures regarding current ADL on a yearly basis using a very limited amount of assumptions that could be determined publicly and monitored externally.

However, in spite of all the similarities that have been pointed out so far, there are also important differences between explicit government debt and implicit pension liabilities. The main difference is not, or not in the first place, that implicit pension debt is based on mandatory arrangements, not on voluntary contracts (see Franco (1995)). Yet, one of the implications is that, in sharp contrast to explicit debt, the amount of implicit debt can be altered through one-sided decisions of the debtor. We will see in the following that simply by changing pension law, estimated amounts of implicit debt of the German Statutory Pension Scheme have been reduced substantially over the course of the last fifteen years. For industrialised countries, defaulting on (part of) their explicit liabilities in a similar fashion is hardly an option. There are thus good reasons always to keep figures for implicit debt separate from those for explicit government debt. Still, providing reliable information regarding the former type of figures would definitely be useful, if only to demonstrate the necessity of reforms and to highlight their effects.

8.4 Implicit pension debt in Germany

8.4.1 The German Statutory Pension Scheme: some basic features

The German Statutory Pension Scheme is a prototypical social insurance scheme based on "notional individual accounts", with a strong link between individual contributions – or, rather, earnings – and individual benefit entitlements. Furthermore, it is of the traditional NDB-variant of pay-as-you-go public pension schemes where, in the absence of pension reform, benefits are assessed and annually up-rated based on pre-determined rules, while contribution rates are then adjusted year by year to meet the resulting obligations. After a long period of depleting small amounts of funds that were meant to isolate the scheme against business-cycle fluctuations of current contribution revenues, it nowadays holds virtually no financial reserves[10].

The Statutory Pension Scheme is a "categorical scheme" that does not cover the entire labour force. There is a separate public scheme for civil servants[11]; private, but mandatory, schemes exist for some groups of the self-employed[12]; individuals in dependent employment with earnings below the social insurance threshold (about 15 % of average wages of the insured) have no insurance cover at all and may be entitled to receive means-tested social assistance benefits at old age if they never moved out of this status over their entire active life-span. Currently, the Statutory Pension Scheme covers about 70 % of the active labour force. About 85 % of the population that has completed the statutory retirement age, being 65 or older, has at least some amount of benefit entitlements in this scheme.

The link that the German public pension scheme establishes between individual earnings and individual pension benefits is largely linear across all earnings brackets as well as over the period covered with contributions. In each year, individual earnings that are subject to contributions – between a lower and an upper earnings threshold – are converted into "pension points" reflecting their ratio to average earnings of all insured individuals in the same year. When individuals enter retirement, the sum of these pension points, which then represents an up-rated average of life-time earnings, is simply multiplied with a current nominal "pension value" to obtain monthly benefits. Disability pensions are assessed in a similar fashion, based on fictitious extensions of the benefit entitlements actually accrued until age 60. Survivor benefits are basically some percentage of benefit entitlements of the deceased spouse or parent, with additional rules governing reductions if survivor benefits coincide with own, non-derived benefit entitlements of the survivor. All in all, there is thus little redistribution involved in the system, and expected future benefit entitlements can be related very clearly to individual contributions made in each year of active labour-force participation[13].

The nominal value attached to pension points is subject to annual up-ratings that can be basically described as wage indexing. The general set-up of the scheme described here has been largely unchanged since 1957, when the scheme was redefined for the post-war period. Later on, it took

[10] According to latest official figures, reserves were about EUR 1.8 bn at the end of 2005, just enough to cover pension expenditure for three days.

[11] Note that, in Germany, civil servants form a particular sub-group of public-sector employees. "Regular" public employees are also covered in the Statutory Pension Scheme.

[12] Other groups of the self-employed are compulsory members of the Statutory Pension Scheme for a limited number of years. All other individuals in self-employment have to seek private cover on a voluntary basis.

[13] Of course, for the sake of simplicity, we leave out many details here. A comprehensive description of the German Statutory Pension Scheme, together with lots of comparative information regarding the systems in other EU countries, can be found in the European Commission's database MISSOC_online (via http://europa.eu.int/comm/employment_social/social_protection/missoc_en.htm).

German politicians a while to address the fact that their country is now among those hit most strongly by demographic ageing. Since the early 1990s, however, there has been a series of reforms, becoming effective in 1992, 2001 and 2004, that were meant to make the scheme more sustainable in the face of expected long-term changes in the population structure. In these reforms, a number of measures were taken – limiting options for early retirement, tightening access to disability pensions, reducing survivor benefits, etc. – that contribute to their total effect. However, what really makes a difference across the several steps to reform are the precise indexation mechanisms applied to annual benefit up-ratings. Since we will look at the effects of any of these reforms in the following, Table 8.1 lists the indexation rules entailed in the different arrangements.

Table 8.1 Indexation rules involved in the past and current legal framework

Legal Framework	Indexation mechanism
Pre-1992 law	Pure gross-wage indexation
Pension reform act 1992	Pure net-wage indexation (gross wages minus average tax rate and all employees' social insurance contributions)
Pension reform act 2001	Modified net-wage indexation (gross wages minus pension contributions and a "recommended" rate of precautionary savings)
Pension reform act 2004	Modified net-wage indexation augmented with a "sustainability factor", to reduce up-ratings if the "system dependency" (i.e., pensioner-to-contributor) ratio has increased

Source: Author's compilation.

Another change that is important for our estimates is that, starting from 1999 at the latest, the Statutory Pension Scheme is no longer exclusively financed from contributions. Before, the scheme had received a subsidy from the federal government's budget meant to cover a limited amount of non-contributory benefits[14]. Over the entire 1990s, there were discussions whether the subsidy was actually large enough to fully cover these kinds of benefits, and it was increased repeatedly on an ad-hoc basis, also removing up-ward pressure on the contribution rate. In 1999, this policy was put on a firmer footing, accompanied by another substantial increase of the subsidy. It nowadays covers about 20 percent of total benefit expenditure, so that current cost rates (needed to cover regular benefits) are well above current contribution rates. At the same time, consumption taxes and, mainly, energy taxes were increased to raise the additional tax revenues needed. The rationale

[14] For instance, pensions paid to "war victims" who are now quickly dying out or "minimum pensions" guaranteed for individuals with at least 35 years of (very low) contributions, a programme that was phased out starting from 1992.

behind these changes was to reduce non-wage labour costs implied in higher contribution rates, thus limiting unfavourable incentive effects regarding employment. While this idea may be defendable in itself, it is a strategy exactly opposite to the introduction of "demographic buffer funds", such as the OASDI Trust Funds in the US, that has been chosen in other industrialised countries.

In the 2004 reform, the government postponed decisions regarding another element of reform that had been strongly recommended by an official reform commission (see Kommission (2003)), viz. an increase in the statutory retirement age. After the 2005 election, however, it is now highly likely that this plan will be adopted in Spring 2007, while the new "grand" coalition has indicated no other plans for further pension reform. The schedule that had been suggested, a gradual increase from age 65 to 67 between 2011 and 2035, may even be speeded up a bit, now being likely to unfold between 2012 and 2030. We will include this option, based on the revised schedule, in our following projections and estimates as an additional reform scenario.

8.4.2 Long-term projections: methodology and assumptions

The long-term projections entering our estimates regarding the size of implicit pension debt involved in the German Statutory Pension Scheme are prepared using the CESifo Pension Model (2006 version), a comprehensive accounting model that meanwhile covers expenditure and revenues of all branches of the German social insurance system. Among other things, it provides all the information that is needed to estimate ADL and OSL-type measures of implicit pension debt (see Section 8.3.3)[15]. Calibration of the model is based on observations taken from past and current data that is available for up until 2005. The demographic scenario that enters the simulations is taken from official projections prepared by Statistisches Bundesamt (2003), spanning the period until 2050. Also, assumptions regarding future developments of labour-force participation rates (differentiated by gender and age) and unemployment rates imply that any expected changes in these parameters eventually level out until 2050. Explicit projections then cover the period until 2100, the time from 2050 onwards essentially being a period of convergence. Table 8.2 summarises the main assumptions and, in addition, a number of intermediate results regarding labour market outcomes and economic performance. All in all, for the period until 2050, these assumptions are meant to reflect a meaningful "baseline" scenario for the future development of the German economy and for the German social insurance system that is neither particularly optimistic nor pessimistic.

[15] The richness in details covered in this model has its cost. Most importantly, it does not capture gen-eral-equilibrium effects and, in particular, it does not include any endogenous labour-supply responses to expected large increases in social insurance contributions. In this sense, any of the long-term scenarios derived from this model could be regarded as overly optimistic.

It has been demonstrated through earlier applications that the results obtained from the CESifo Pension Model are not too sensitive to changes in assumptions regarding productivity growth – at least, if results are expressed on relative terms: as future levels of pension benefits, future contribution rates, or future expenditure-to-GDP ratios, etc. (see Werding and Blau (2002) or Werding and Kaltschütz (2005)). The reason is that, in the current legal framework, pension benefits still are basically indexed to wages, so that any growth in the latter simply feeds through to the former. Also, in themselves, projected developments of pension benefits and contributions should not be affected by different assumptions regarding real interest rates[16], simply because the scheme does not hold any financial reserves. However, changes in interest-rate assumptions – or, speaking more generally, changes in the difference between interest rates and productivity growth – are very likely to affect both the size and level of implicit pension debt. In the following, we will therefore address the sensitivity of our final results to this particular assumption. At the same time, we will refrain from conducting a larger set of sensitivity analyses – based on changes in assumptions regarding life expectancy, migration, labour force participation, unemployment, and so forth – as these would lead to results that are easily predictable and, with changes in single parameters only and with plausible ranges of variation, never make a fundamental difference.

Last but not least, the CESifo Pension Model can be easily adjusted to reflect the various legal arrangements that the German Statutory Pension Scheme has been subjected to over the last fifteen years. Important intermediate results of our projections – those regarding future benefit levels and contribution rates – that enter our calculations regarding the size of implicit pension debt in Germany are summarised in an Annex to this paper. It is immediate from these results (see Figures 8.A.1 through 8.A.3) that, over the course of the next four decades, the Statutory Pension Scheme's budget will be under substantial pressure which mainly arises from the projected consequences of demographic change. At the same time, the reforms enacted over the last fifteen years make a huge difference with respect to how the burden involved in population ageing is allocated to pensioners and contributors, implying that there is also a massive impact on the intergenerational distribution.

From a public pension scheme that may have been overly generous in terms of future benefit levels under the pre-1992 law, the Statutory Pension Scheme has now evolved into a system where adequacy of benefits may really become an issue in the period after 2025. For this reason, the 2001 reform also introduced a new framework for supplementary private

[16] The real interest rate assumed in our "baseline" scenario, a constant 3.5 percent p.a. throughout the projection horizon, is based on an average of actual observations made from 1991 onwards. This conforms with the expectation that currently low interest rates will move up again in the near future.

Table 8.2 Assumptions used for the long-term projections

	2005	2010	2020	2030	2040	2050	2075	2100
				Population:				
Total Fertility Rate	1.36	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Life expectancy at birth (years)								
males:	75.4	76.1	77.4	78.6	79.9	81.1	81.1	81.1
females:	81.2	81.9	83.1	84.3	85.4	86.6	86.6	86.6
Net immigration (000s)	270	230	215	205	200	200	200	200
Total population (m)	82.8	83.1	82.8	81.2	78.5	75.1	65.3	56.8
Old-age dependency[a)] (%)	27.6	30.0	33.8	43.7	49.1	50.5	51.4	51.3
				Labour market and employment:				
Labour-force participation (%)								
males (15–64):	81.2	82.2	81.4	81.4	82.5	82.4	82.8	83.1
females (15–64):	67.5	69.6	70.8	71.7	73.0	72.6	73.3	73.7
Total employmnt (m)	38.8	39.4	38.6	36.0	34.4	32.6	28.6	25.2
Unemployment rate[b)] (%)	9.1	7.3	7.1	6.6	6.3	6.0	5.2	4.5
				Macro-economic performance:				
Labour-productivity growth[c)] (%)	+1.2	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5
GDP growth[c)] (%)	+1.0	+2.0	+1.1	+0.9	+1.1	+0.9	+1.0	+1.0
Interest rate[c)] (%)	1.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5

a) Population 65+ per population 15–64. b) In % of the total labour force. c) On real terms p.a.

Sources: Statistisches Bundesamt; CESifo Pension Model (2006 version).

savings that were meant to partly compensate for the benefit reductions, encompassing subsidies, tax incentives and new regulation regarding suitable financial products. In addition, a major effect of an increase in the statutory retirement age which may be enacted in the near future would be to secure future pensioners a higher level of benefits that they are entitled to receive for a shorter period of time, not so much a further reduction in total benefit expenditure. In spite of all the reforms, however, contribution rates and, even more so, current cost rates must still be expected to increase substantially over the next thirty to forty years.

8.4.3 Implicit pension debt: accrued-to-date liabilities

Building on the financial projections summarised in the Annex, we are able to calculate estimates regarding the size of implicit pension debt involved in the German Statutory Pension Scheme under the different legal arrangements mentioned above. In doing so, we will first look at implicit debt in terms of accrued-to-date liabilities (ADL). In Section 8.3.2 it was pointed out that, in this case, it is really the entire present value of outstanding benefit entitlements already accrued, net of the very limited amount of financial reserves of the German public pension scheme (see footnote 10), that can be interpreted as an additional stock of public debt. Table 8.3 reports the main results.

Table 8.3 Accrued-to-date liabilities, 2006

	Implicit pension debt[a)]	
	EUR bn	**per GDP[b)]**
Pre-1992 law	6,992	304.5%
Pension reform act 1992	6,444	280.6%
Pension reform act 2001	6,163	268.4%
Pension reform act 2004	5,939	258.7%
2004 reform + pension age 67	5,873	254.2%

a) Net present value of pensions already awarded and pension entitlements accumulated until 2006, incl. disability and survivor benefits, over the remaining benefit period, minus existing reserves.
b) Per GDP in 2006 as predicted by the Ifo Institute in Summer 2006, amounting to EUR 2,296.2bn.

Source: CESifo Pension Model (2006 version).

The results included in table 8.3 confirm that the long-term fiscal risks associated with the Statutory Pension Scheme under the conditions of expected demographic change in Germany have been substantially reduced through the reforms enacted since 1992. Estimated values for implicit pension debt in terms of ADL measures have gone down from over 300% of current GDP to about 260%[17], i.e., by about one seventh, through a series of adjustments in the indexation mechanism and a number of other changes in the legal framework. An interesting observation is that, on top of the latest reform, an increase in the statutory retirement age would have only a small effect on the ADL debt measure. The reason is not only that the suggested schedule is very gradual. Furthermore, for those affected, this reform essentially means they receive higher benefits for a shorter period of time – two effects that appear to almost cancel out each other.

As was explained in section 8.3.2, we may compare these implicit liabilities, which are effectively all unfunded, to revenues that would be available for covering the relevant benefit payments if the contribution rate were held constant, thus approaching the definition of a comprehensive balance sheet of the German Statutory Pension Scheme (see figure 8.1). Keeping the contribution rate constant (at its current level of 19.5%) is required in such calculations in order to make the gaps between implicit pension liabilities and future contributions comparable across the different scenarios[18]. Again, we can see how the consecutive reforms have contributed to closing these gaps. Also, there are small differences in the shares of total annual revenues which can be used for financing benefit entitlements already accrued, so that the present values of future contributions entering these calculations are not perfectly equal across scenarios. Still, with an NDB-type scheme like the German one, the most interesting piece of information obtained here relates to the full level of outstanding, unfunded liabilities.

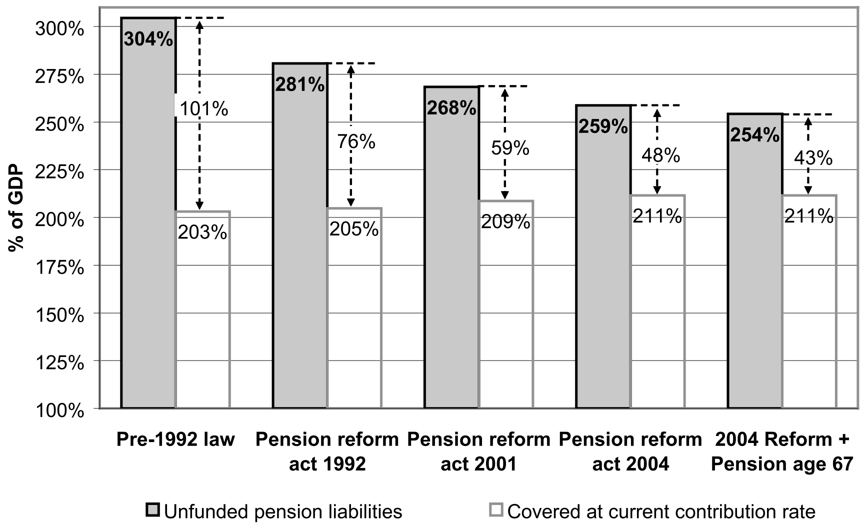
Nevertheless, we would like to highlight an important implication of the difference between official contribution rates and actual cost rates implied in the current law (see Section 8.4.1 and the annex of this paper). Before, we have argued that, for a pure pay-as-you-go public pension scheme with a closed budget, comparing existing liabilities to future revenues at projected contribution rates would not make sense: by definition, the two figures should

[17] To check for sensitivity of these results with respect to the interest rate assumed, we can also report results for the alternative case where the real interest rate is set to 3% (in brackets: 4%) throughout the entire projection horizon. Implicit debt in terms of ADL is then 330% (283%) of GDP for the pre-1992 law, and 279% (241%) of GDP for the current legal framework, as after the 2004 reform.

[18] Since there are rules by which contribution rates will effectively have to rise, at different speeds, the results shown in Figure 1 do not necessarily imply that the Statutory Pension Scheme's budget has been, or still is, unbalanced in the sense that an important fraction of outstanding benefits will not be covered by future contributions. We will return to this interesting aspect in a minute. Whether it is plausible that the projected contribution rates shown in Figure 8.A.2 would have materialised, or will materialise, is a different issue, though.

exactly cancel out. Things are different with the German public pension scheme under the current law. Figure 8.2 shows that, even if contribution rates were increased as projected by our model (see Figure 8.A.2), there would be a gap between benefit entitlements already accrued and future contributions that will be available for covering these entitlements. Under to the current law, this gap will have to be filled by annual tax-financed subsidies from the federal government's budget.

Figure 8.1 Accrued-to-date liabilities and future contributions, 2006

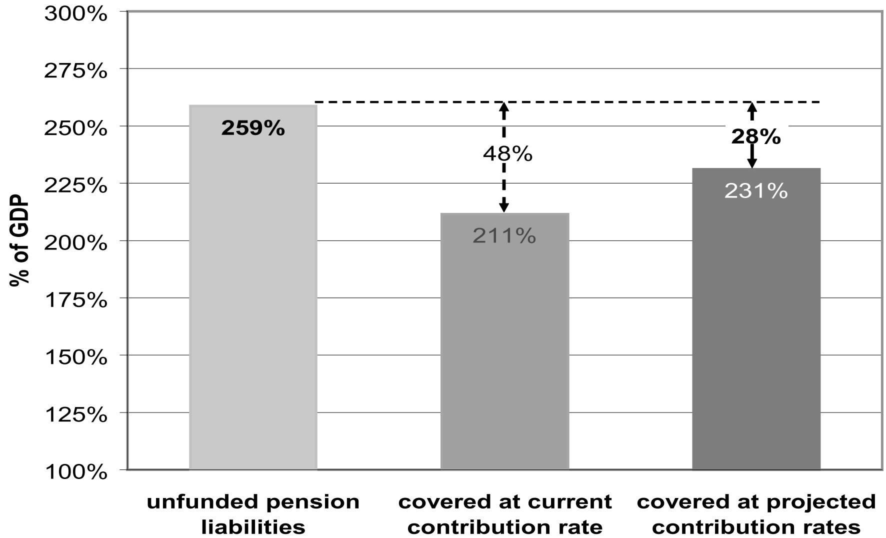


Source: CESifo Pension Model (2006 version).

In spite of some similarities, one might be reluctant to account for implicit pension debt – currently around 260% of GDP for Germany, according to the estimates presented here – in exactly the same way as one does for explicit government debt – about 68% of GDP by the official, or explicit, German government debt ratio. At least, one should certainly not simply add up or confuse these two numbers. However, the ratio of about 28% of GDP[19] that we have now identified as a fraction of total implicit pension debt, based on benefit entitlements already accrued, which will not be covered by future contributions is very closely akin to explicit debt measures. According to the current law, it creates a liability for future tax-payers who will have to fund the federal government's budget so that it can continue to subsidise the German public pension scheme. The only difference is, once more, that the relevant laws could be changed in such a way that the burden is shifted on to future contributors or pensioners.

[19] With alternative assumptions regarding the future real interest rate (see footnote 17), this figure varies between 25.5% and 30% of GDP.

Figure 8.2 Accrued-to-date liabilities and future contributions under the current law

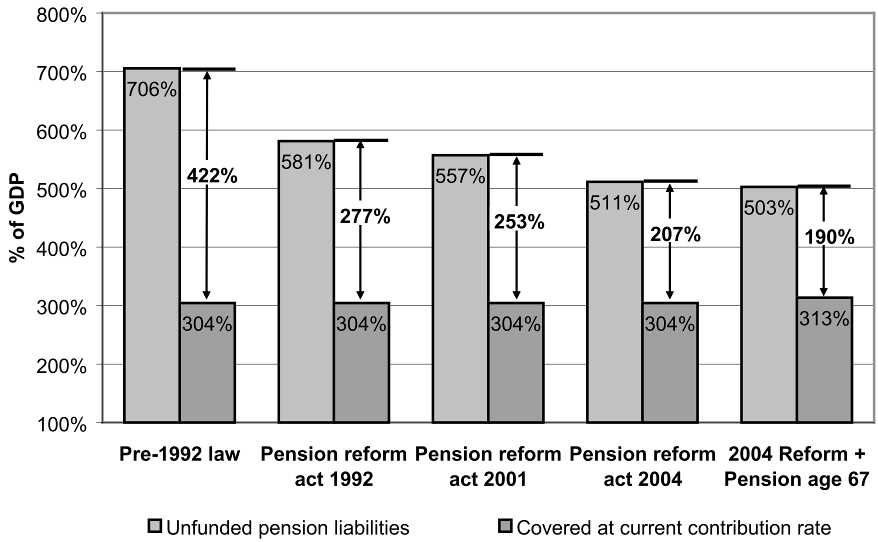


Source: CESifo Pension Model (2006 version).

8.4.4 Implicit pension debt: open-system liabilities

In line with the reflections made in Section 8.3.1, we can also proceed to calculating the size of implicit pension debt in terms of open-system liabilities (OSL). In doing so, we are moving away from producing implicit debt measures which, at least conceptually, can be compared to current explicit government debt. On the other hand, we obtain a more complete picture of the long-term implications of pension reforms. In this case, we indeed have to compare implicit liabilities to future contributions (collected at current rates) and focus on net liabilities (see also Section 8.3.2). Following the procedures for estimating open-system liabilities over an infinite time horizon described in Section 8.3.3, we arrive at the final results illustrated in Figure 8.3.

Figure 8.3 Open-system net liabilities, 2006



Source: CESifo Pension Model (2006 version).

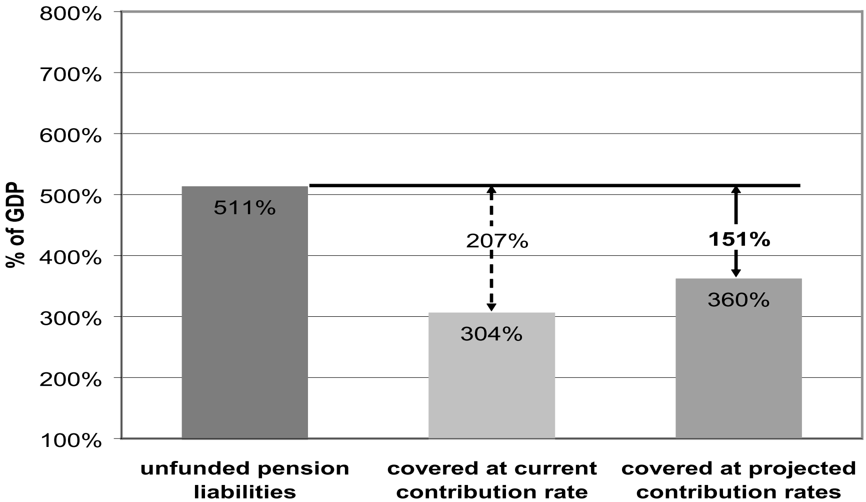
The picture we obtain is basically the same as with ADL-type measures, but total ("gross") debt measures as well as changes across the different scenarios become a lot higher now. Implicit gross pension debt in terms of OSL measures now varies between 706% and 503% of current GDP, by between one fourth and one third, that is[20]. Net pension debt – i.e., gross debt net of future contributions that could be collected at current rates – varies between 422% and 190% of GDP, by more than one half. These OSL debt results are a clear indication that pension reforms already enacted have had a sizeable impact on the long-term sustainability of the German public pension scheme.

Also, our calculations now show a modest effect of increasing the statutory retirement age which is due to the fact that, at each point in time until infinity, there will be fewer pensioners than under the current law. In addition, the net present value of future contributions increases against the other scenarios because all individuals have to pay contributions, at constant rates, for a longer period of time now. When compared to the results for the 2004 law, however, the additional effect of an increase in the retirement age is a lot weaker than was predicted by the German Council of Economic Advisors (Sachverständigenrat (2003)) in their annual report for 2003–04. The estimates presented there are probably missing the fact that, when

[20] If, alternatively, the real interest rate is set to 3% (in brackets: 4%), implicit debt in terms of OSL is 890% (583%) of GDP for the pre-1992 law, and 640% (425%) of GDP for the current legal framework. Interest-rate assumptions obviously make a huge difference over the infinite time horizon.

combined with the "sustainability factor" introduced in the 2004 reform, increasing the retirement age implies stronger benefit up-ratings. The reason is that the future pensioner-to-contributor ratio tends to grow more slowly, so that the mechanism for moderating annual pension indexation that has been intentionally created through this factor becomes less effective.

Figure 8.4 Open-system liabilities vs. future contributions under the current law



Source: CESifo Pension Model (2006 version).

As with implicit pension debt in terms of ADL, we may also compare future pension liabilities to contributions that, under the current law, could be collected if rates were regularly adjusted in line with our earlier projections (see Figure 8.4). Again, there is a gap between future benefits and contributions even under these assumptions, which should usually imply a balance sheet in full equilibrium. According to our estimates, this gap amounts to no less than 151% of current GDP[21]. On the other hand, because of the infinite projection horizon and the conceptual differences between acute explicit government debt and the extremely forward-looking, OSL-type measures of implicit debt, this should not be considered a similarly "hard" number of additional public debt falling on the federal government's budget and future taxpayers as the parallel result based on the ADL measure.

[21] With alternative assumptions regarding the future real interest rate (see footnote 17), this figure varies between 124% and 193% of GDP.

8.5 Conclusion

This paper was motivated by a two-fold ambition. First, we wanted to take up some of the lessons emerging from the literature on implicit pension debt. In spite of some limitations and ambiguities, we do think that explicit calculations regarding its size are useful to obtain a fuller picture regarding the long-term sustainability of public finances. Calculations of this kind may actually be needed in the light of recent practices of shifting public liabilities between the categories of explicit and implicit government debt. Institutions that have an interest in externally monitoring national public finances – such as the EU Commission under the EMU's Stability and Growth Pact or international rating agencies – may therefore push national governments in the direction of including implicit debt figures in their official public sector accounting systems.

Towards this end, agreements may have to be made regarding the precise concept of implicit liabilities that should be covered by such calculations, as well as regarding common procedures, comparable assumptions and the application of any of these to different national public pension schemes. Here, we tried to describe some of the major issues that may become relevant and made suggestions for some of the fundamental choices that will have to be made. Things may in fact become much more complicated, if calculations of this kind are to be extended to cover not only public pension systems, but a larger array of social protection schemes, including national systems of financing health care and long-term care. Yet, most of the issues raised here will most likely reappear in this broader context in one way or another.

Second, we wanted to demonstrate that calculations of this kind are feasible, and that their results can be really telling. To this end, we used up-dated and rather detailed estimates regarding the size of implicit debt involved in the German Statutory Pension Scheme as an illustrative example. In fact, we may have generated an irritating amount of results in the applied part this paper, keeping track of several changes in the legal framework of the German pension scheme and going through a number of differing definitions and perspectives. Two results and an observation may actually be worth keeping in mind.

The two main results of our calculations are that, given all the assumptions for our projections regarding the future development of the pension scheme's budget (and a "baseline" discount rate set at 3.5% p.a.), implicit pension debt in Germany under the current legal framework is either about 260% of GDP when assessed in terms of "accrued-to-date" liabilities, or about 207% of GDP when assessed in terms of "open-system net liabilities". Actually, these two figures do not differ substantially, while both of them compare rather unfavourably to the official ratio of explicit debt to GDP of close to 70%. In addition, one of our main observations is that the size of implicit pension debt in Germany has been notably reduced by pension reforms already enacted during the past 15 years. It could still go down a bit more by another reform that is close to being legislated – viz., an increase in the statutory retirement age. One should, however, keep in mind that, considering the strong trend of demographic aging in Germany, there is now little room left for further adjustments within the current system that could reduce implicit pension debt and improve the pension scheme's long-term sustainability even more. The reason is that, following the latest reform, adequacy of annual pension benefits may become an issue as soon as the German baby boomers enter retirement.

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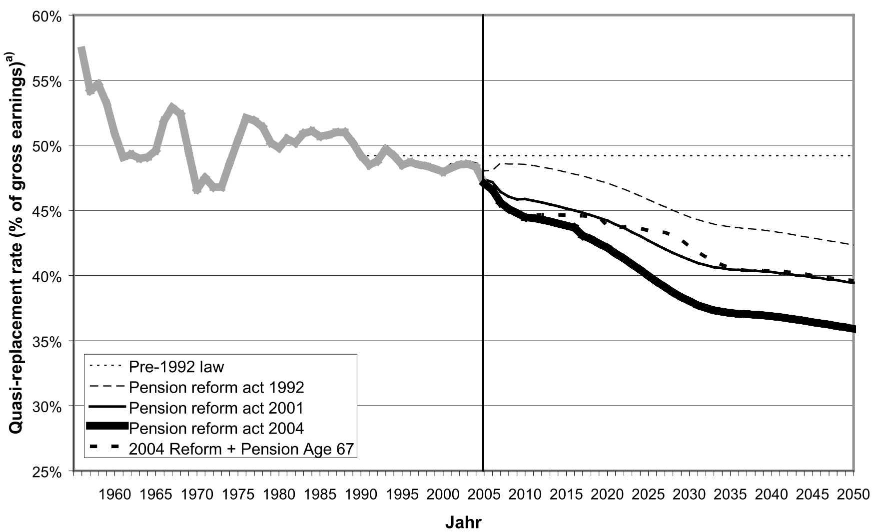
Annex 8.1 Long-term projections for the German Statutory Pension Scheme – Intermediate Results

Our estimates regarding the size of implicit pension debt in Germany are based on long-term financial projections for the Statutory Pension Scheme prepared with the CESifo Pension Model (see Section 8.4.2). The following figures highlight the most important intermediate results obtained from the model with respect to (i) future trends in benefit levels (or "quasi-replacement rates" comparing standardised benefit entitlements to current average gross wages; see Figure 8.A.1), (ii) pension contribution rates (as officially determined for each year; see Figure 8.A.2) and (iii) actual cost rates (which would be required to actually cover the pension scheme's contributory benefits and balance its annual budget; see Figure 8.A.3) under any of the different policy scenarios considered in this paper. In these figures, we effectively concentrate on the time period until 2050 for which we are actively making assumptions and are not just keeping track of further internal adjustments.

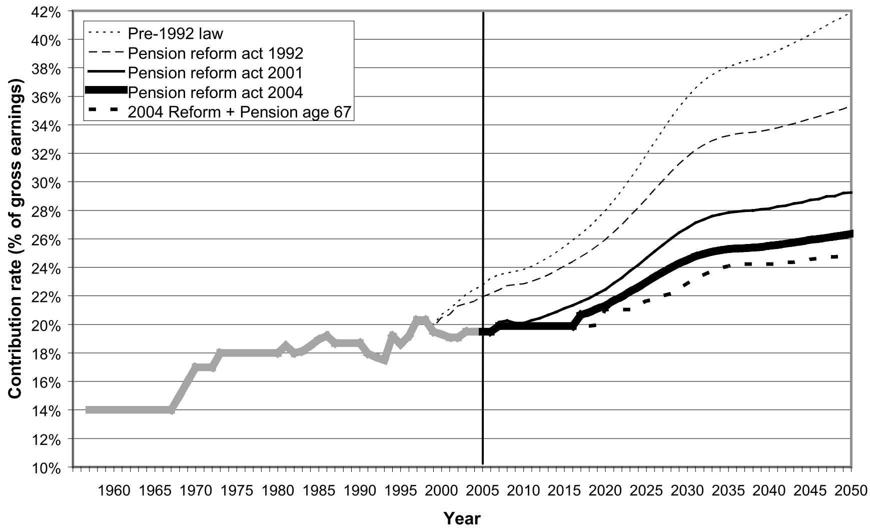
Figure 8.A.1 Level of pension benefits, 1957–2050



a) Based on standardised benefit entitlements that are derived from a full life-time work record with average earnings throughout and on current average wages of the active insured, all gross of income taxes and social insurance contributions. (Note that, for obvious reasons, pensioners are exempted from paying contributions to the public pension scheme and to unemployment insurance, but have to pay contributions for public health insurance and public long-term care insurance.)

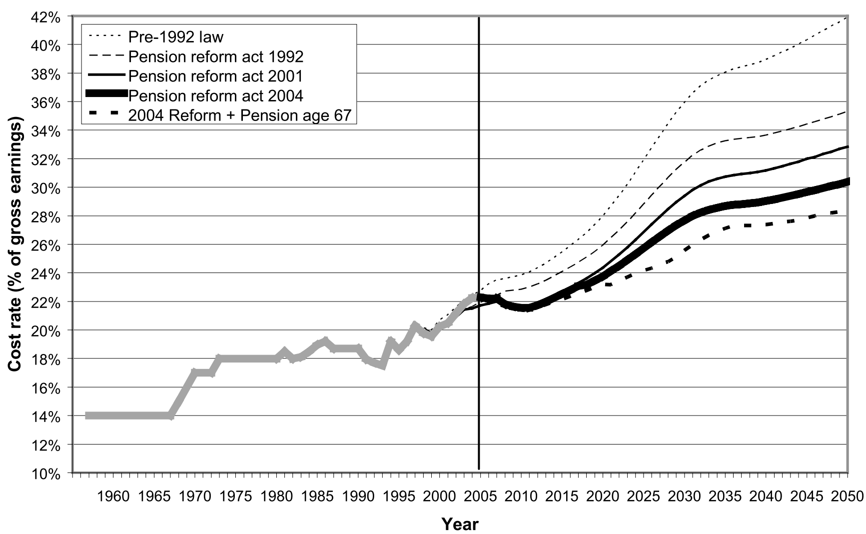
Source: Deutsche Rentenversicherung; CESifo Pension Model (2006 version).

Figure 8.A.2 Contribution rates, 1957–2050



Source: Deutsche Rentenversicherung; CESifo Pension Model (2006 version).

Figure 8.A.3 Annual cost rates, 1957–2050



Source: Deutsche Rentenversicherung; CESifo Pension Model (2006 version).

9 The Population Ageing in Italy: Facts and Impact on Household Portfolios

Marianna Brunetti and Costanza Torricelli

9.0 Abstract

This paper aims to assess the impact of ageing on household portfolios in Italy and hence ultimately on financial markets. To this end, the analysis is carried out in two steps. First, the dimension of population ageing in Italy is assessed by means of both historical and forecast data on the structure of Italian population. Second, based on data taken from the Banca d'Italia Survey of Household Income and Wealth (SHIW) over the last decade, we analyse the average household portfolio in relation to demographic characteristics. The main findings are: first, Italy turns out to be one of the countries most affected by ageing; second, financial choices of Italian households are sensibly affected by age. Thus, the exceptional ageing in Italy might have relevant consequences on the Italian financial market.

9.1 Introduction

Ageing can sensibly affect financial markets, since elderly people usually have lower saving rates and higher average risk aversion. Thus, ageing is going to bring about a progressive evolution of financial needs and investment requirements, which may in turn translate into changes in prices and returns of existing financial instruments and in the need for new ones. A lively debate on the financial effects of ageing is ongoing among both academics and practitioners and has originated a vast literature constituted by both theoretical and empirical contributions. The latter in particular have sensibly increased over the last few years, also fostered by the increasing availability of suitable survey-datasets. Furthermore, a particular strand of this empirical literature has recently focussed on the effects that ageing may have on financial asset returns and portfolio allocations: see, among others, Yoo (1994), Poterba (2001, 2004), Davis and Li (2003) and Ameriks and Zeldes (2004).

These works are far from being homogeneous with regards to both the methodology used and the results obtained. As for the methodology, the empirical investigations are carried out using different approaches, which in the present paper are grouped into three main categories and are addressed as follows: (i) the “explorative approach”, which analyses and interprets trends in survey data; (ii) the “econometric approach”, which runs time-series or panel data analyses; and (iii) the “simulation approach”, which performs empirical simulations on suitably structured overlapping-generation models.

As for the results, while some authors report significant effects of ageing on financial markets (e.g Yoo, 1994), others find only a weak, if any, relationship between demographic and financial variables (e.g. Poterba 2001, 2004). Moreover, up to date empirical studies analyse the Italian case only rarely and quite marginally and this despite Italy is, together with Japan, one of the countries where the ageing phenomenon is more accentuated.

Based on the latter observation, the specific aim of this paper is to asses the impact of ageing on household portfolio allocation in Italy. To this end, the analysis is carried out in two steps.

First, the ageing in Italy is analysed by means of both historical and forecast data on the structure of Italian population. More specifically, the phenomenon of ageing is described using data on the evolution of median age as well as dependency ratios over the last fifty years. In addition, data on birth, mortality and immigration rates are employed to better identify the main causes of the demographic evolutions occurred in Italy.

Second, the effects that the demographic characteristics of Italian households may have on their financial portfolios are studied. We follow Guiso and Jappelli (2001) and employ data taken from subsequent issues of the Banca d'Italia Survey of Household Income and Wealth (SHIW). Our analyses differ from the previous one by Guiso and Jappelli (2001) in three extents: first, we consider a subsequent period of time; second, we propose a different risk-classification of financial assets and third, we refine the analyses by separating households by both age-classes and Net Wealth quartiles, thereby testing the robustness of age-effect on financial choices.

The paper is structured as follows. In the next section the main stylized facts about ageing in Italy are analysed and discussed at a comparative level with respect to the rest of the world and in particular with Europe. The investigation over the effects of ageing on household portfolios in Italy is presented in section 9.3. The final section concludes.

9.2 Population ageing around the world and in Italy

Although population is a world-wide phenomenon, its size sensibly differs across countries. The first step of our research assesses the magnitude of the phenomenon in Italy with respect to other developed countries and in particular to the European ones. Data are taken from two international databases, namely those provided by United Nations (UN), for the comparison with the major world-regions, and Eurostat, used instead for the analyses specifically focussed on Italy[1].

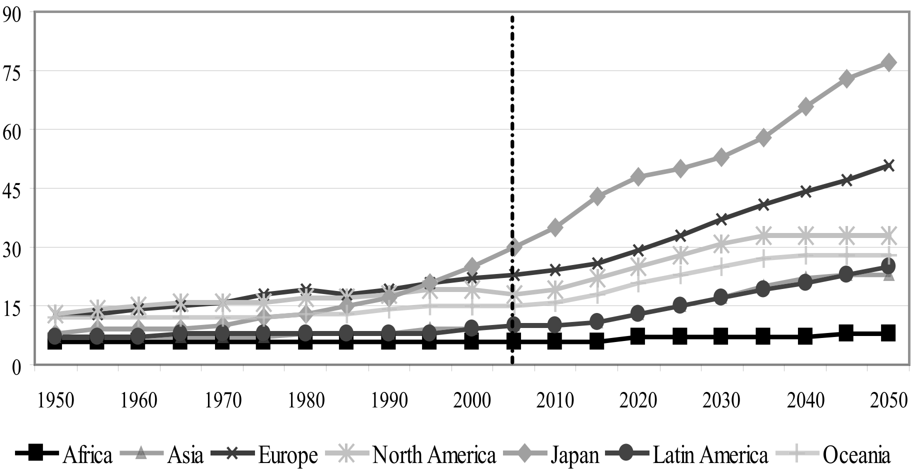
[1] Data are available on the United Nation Population Division website: http://esa.un.org/unpp/ and on the Eurostat website: http://epp.eurostat.cec.eu.int/

The changes in the population age-structure can be assessed by means of different measures, which can either relate only to the demographic structure of the population, and are thus univocally defined, or depend also on institutional factors (e.g. pension systems) beside the demographic ones. As for the former type of measure, the most widespread ones are: the median age, the average age and the life expectancy at birth. As for the latter, the most well known is probably the old-dependency ratio that is the relative amount of retired people to the working-age population.

9.2.1 A comparative analysis

The comparative analysis of the demographic evolution occurring in Europe and in the rest of the world is performed using data over the period 1950 – 2050 and taken from the UN demographic dataset[2]. In particular, here we focus on the following demographic measures: (i) median age; (ii) life-expectancy; and (iii) old-dependency ratio, defined as the ratio of aged 65 or more to aged 15 – 64. Main findings are summarised in Figure 9.1 and in table 9.1.

Figure 9.1 Old-dependency ratio from 1950 to 2050: major world-regions.



Data Source: United Nations Population Prospects.

[2] Both UN and Eurostat databases provide several demographic "projections variants", obtained combining different hypotheses on fertility, mortality and net migration rates. Data used in the following analyses refer to the variants refereed to as the most likely for the future in the two databases, namely "Constant-fertility" for UN and "Baseline" for Eurostat.

Table 9.1 Past, present and future demographic measures: major world-regions

World-Zone	Years	Median Age	Life Expectancy	Old-dependency ratio
Africa	1950	19	38.4	6
	2005	18.9	50	6
	2050	18.6	65.3	8
Asia	1950	22	41.4	7
	2005	27.7	68.7	10
	2050	32.8	76.9	23
Europe	1950	29.7	65.6	13
	2005	39	74.3	23
	2050	50.1	80.7	51
Latin America	1950	20.2	51.4	7
	2005	25.9	72.9	10
	2050	33.1	79.4	25
North America	1950	29.8	68.8	13
	2005	36.3	78.2	18
	2050	40	82.7	33
Oceania	1950	28	60.4	12
	2005	32.3	75	15
	2050	35.9	80.5	28
Japan	1950	22.3	63.9	8
	2005	42.9	82.8	30
	2050	56.2	88.3	77

Data Source: United Nations Population Prospects.

The most severe population ageing is being experienced by Japan and Europe: in both countries median age and old-dependency ratios have increased much more than in the rest of the world. We thus restrict our attention to these two areas and we disaggregate the analysis for the 25 countries of the European Union to further focus on the case of Italy. For reasons of space we report only the old-dependency ratio: Table 9.2 ranks countries according to the value expected for this demographic indicator in 2050[3].

[3] Similar tables made according to other demographic measures (available upon request) are consistent with table 9.2

Table 9.2 Old-dependency ratios.

Country	1950	2005	2050	Country	1950	2005	2050
Japan	8	30	77	Lithuania	15	23	52
Italy	13	30	75	Malta	10	20	52
Spain	11	24	72	Belgium	16	27	50
Czech Republic	12	20	64	France	17	25	48
Slovenia	11	22	64	Estonia	17	24	47
Austria	16	25	58	Finland	11	24	47
Greece	11	27	57	Netherlands	12	21	45
Portugal	11	25	57	Sweden	15	26	44
Slovakia	10	17	57	Ireland	18	16	43
Latvia	18	25	55	United Kingdom	16	24	40
Poland	8	18	55	Cyprus	10	18	38
Germany	14	28	54	Denmark	14	23	38
Hungary	11	22	53	Luxembourg	14	21	36

Data Source: United Nations Population Prospects.

Two observations are in order. First, the process of population ageing seems to be quite strong in several of the new EU members, especially Slovenia and Czech Republic[4]. Second, Italy is the sole country whose projections are as high as Japan's.

In fact, Italy is first together with Japan for the future value of median age, which by 2050 is expected to attain the value of 56.2 in both countries. The same holds for old-dependency ratio, whose value is second only to Japan. As for life expectancy in 2050, Italy (85.1) is third after Japan (88.3) and Sweden (85.5), whereby the latter already experiences one among the highest life expectancies in Europe.

In sum, two separate conclusions can be drawn. First, Europe emerges together with Japan as one of the world areas most afflicted by population ageing. Second, within Europe Italy definitely emerges for the strength of the undergoing transformations of its age-structure.

[4] A huge debate is currently ongoing on the population ageing in the Eastern European countries and on the policy implications that it may have on the whole European Union. See, among others, Kucera et al. (2000) and the studies performed within the research program "Demographic & Social Change in Eastern Europe" carried out by the Department of Development Sociology of Cornell University, the Demography and Geodemography Department of the Charles University of Prague and the Department of Sociology of the University of Bucharest in Romania together with the Universities of Central Florida and Kansas State and the Echo Survey Sociological Research Institute (Hungary).

9.2.2 What is peculiar in Italy?

In order to better understand the peculiarity of the Italian case we analyse in deeper details the following features:

1) the past and future dynamics median age, life expectancy and old-dependency ratio;

2) the distribution of different age-classes over the entire population at different points in time, namely 1950, 1975, 2005, 2025 and 2050. Initially, the standard three age-classes are considered, i.e. young, middle-aged and old, whereby the definitions of each category are as in the previous section. Then, the population age-structure and its evolution are further detailed and twenty 5-year age-classes are considered rather than the three macro-classes considered so far.

3) the factors that typically underlie demographic transitions, i.e. fertility, mortality and migration. The trend of each factor is observed over the last 50-year period, in order to see if and to what extent each element has a role in the Italian ageing. Note that for this point we turned to Eurostat dataset as it supplies more detailed demographic measures.

As for the first point, Table 9.3 reports the past (1950), the current (2005) and the projected future values (2050) for Italian median age, life expectancy at birth and old-dependency ratio.

Table 9.3 Main demographic measures for Italy, 1950 – 2050.

Demographic Measure	1950	2005	2050
Median Age	29	42.3	56.2
Life Expectancy	66	80.6	85.1
Old-dependency Ratio	13	30	75

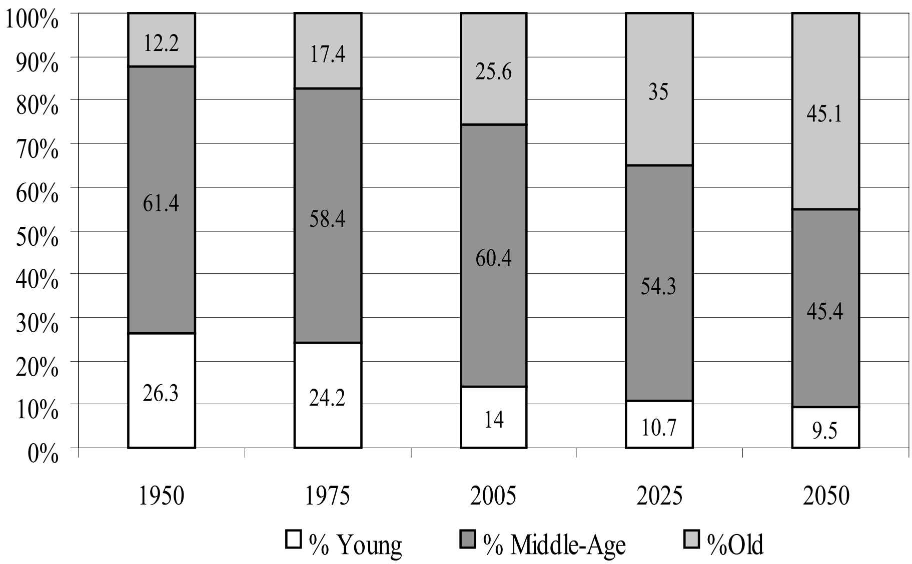
Data Source: United Nations Population Prospects.

Since the mid of last century Italian median age has risen from 29 to 42.3 years and a similar increase is expected to occur by 2050, when it is projected to reach 56.2 years. Analogously, life expectancy has also increased (on average three months every year) and a further enhancement is estimated over the next 50-year period. The most remarkable change has been recorded by the old-dependency ratio, jumped from 13 in 1950 to 30 in 2005 and expected to more than double by 2050 when, according to UN projections, in Italy there will be around 75 retired every 100 working people.

As for the dynamics of different age classes, the dramatic Italian demographic evolution is highlighted by Figure 9.2, where the shares of young, middle-aged and old people over the entire Italian population are plotted at five different points in time, two in the past (1950 and 1975), one current (2005) and two in the future (2025 and 2050).

During the last 50 years, the share of middle-aged has remained almost unchanged while young people have decreased by more than 10 percentage points. Conversely, the proportion of elderly has undergone a progressive enlargement, raising from the 12.2% of the total Italian population of 1950 to the 25,6% reached in 2005. The projections for the next 50-year period point towards a further enhancement of the phenomenon. The working-age population is likely to shrink more and more relatively to inactive individuals and in particular to elderly people: the greying population is enlarging up to 35% in 2025 and to more than 45% by 2050, when they will be nearly as numerous as middle-aged people.

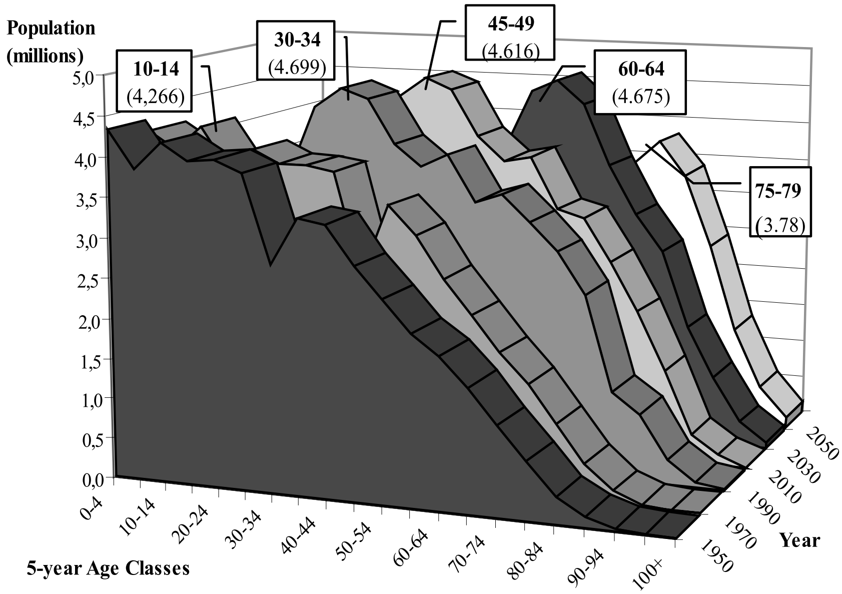
Figure 9.2 Shares of young, middle-aged and old individuals in Italy.



Data Source: United Nations Population Prospects.

Figure 9.3 represents the Italian demographic evolution more in detail as smaller age-classes, of 5 years each, are used. The distribution of Italian population is represented at various points in time, namely 1950, 1970, 1990, 2010, 2030 and 2050. The baby boom, occurred in Italy during the 1960s, is clearly visible as the population peak, which represents the baby boomers generation, moves as a wave: in 1970s it corresponds to the very young (around 10–14 years old) part of the population, at the beginning of the new century it represents the middle-aged (30–34) and late-middle-aged (45–49) and at the end of 2050s those aged around 75–79: thus, up to the mid of this century the baby boomers will still represent the most conspicuous age-class of the population, being almost 4 million people.

Figure 9.3 Italian population distribution by age-classes: evolution.



Data Source: United Nations Population Prospects.

Finally, in order to single out the major causes of this exceptional demographic transition, we examine the three main factors that drive demographic changes: i.e. fertility, mortality and migration flows. In fact, population ageing might stem from a relative decrease in fertility, a relative lower mortality (i.e. greater longevity) and/or a relative decline in the net migration. The directions that each factor is expected to take to lead to population ageing are summed up in the third column of Table 9.4.

In order aim to clarify which among them has played the major role in the Italian ageing experience, the historical evolution of each factor is observed over the last 50-year period (15-year for migration) by means of different measures. More specifically, fertility is assessed by means of birth rate (ratio of births to average population) and total fertility rate (average number of children born to a woman), mortality by means of life expectancy and death rate (ratio of deaths to average population) and migration flows by net migration (difference between immigrants and emigrants) and net migration rate (net migration to country population)[5].

[5] Others measures could have been considered. Fertility measures include the absolute number of births and the net (gross) reproduction rate, i.e. the average number of daughters that would be born to

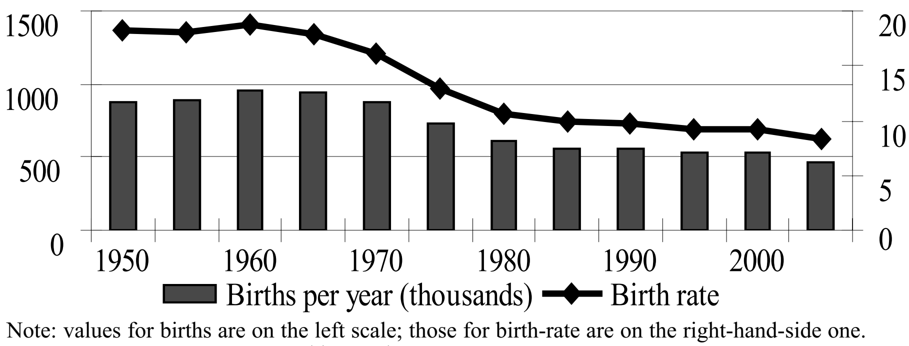
Table 9.4 Factors underlying ageing: theoretical and effective changes.

Factor	Measure	Expected change	Effective Change (1950–2005)
Fertility	Birth rate	↓	–10.1
	Total fertility rate	↓	–1.04
Mortality	Death rate	↓	+ 0.8
	Life expectancy	↑	+ 14.6
Migration	Net migration flows	↓	+ 170,000
	Net migration rate	↓	+ 0.3%

Note: data for migration refer to the period 1985–2000 only.
Source: authors' computations on Eurostat Demographic Database.

Figure 9.4 plots the evolution of absolute number of (live) births and of the birth rate from 1950 to 2005. Both births and birth rate follow an "s" pattern. First, a peak is highlighted between 1955 and late 1960s, which clearly denotes the baby boom occurred in Italy after the Second World War. Immediately after, there is a substantial drop which makes the birth rate more than halve before stabilizing around the current level of 8.2. A very similar pattern is followed by the total fertility rate (see Figure 9.5). According to the expectations, all the indicators examined point towards a substantial decline in fertility.

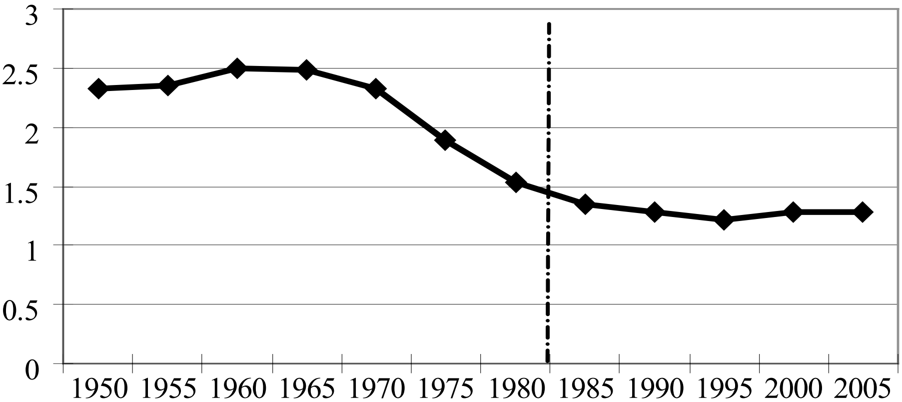
Figure 9.4 Absolute number of births and birth rate in Italy, 1950–2005.



Note: values for births are on the left scale; those for birth-rate are on the right-hand-side one.
Data Source: Eurostat Demographic Database.

a woman subjected to the current fertility and (neglecting) mortality conditions. Similarly, mortality can be assessed by means of the absolute number of deaths. Here, we select relative rather than absolute and complete rather than partial measures (e.g. reproduction rates consider the number of daughters only).

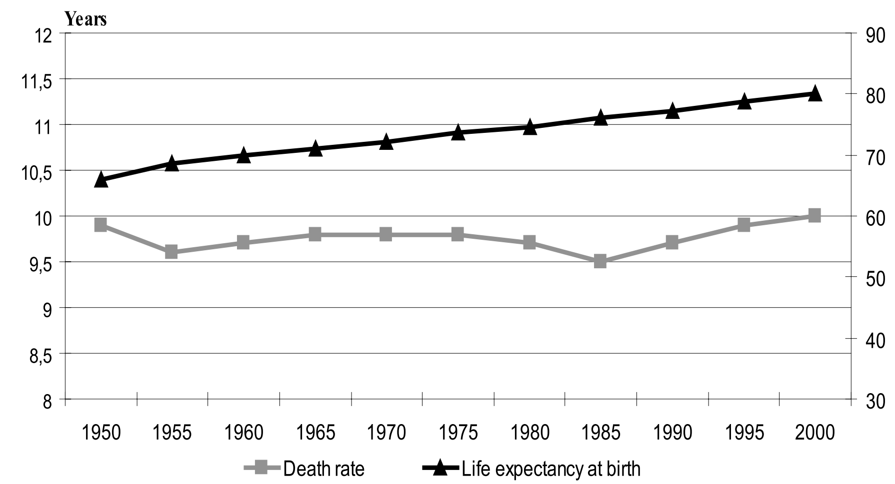
Figure 9.5 Total fertility rate in Italy, 1950–2005.



Data Source: Eurostat Demographic Database.

Figure 9.6 plots life expectancy and the death rate in Italy over the period 1950–2005. While the latter has only slightly increased over the last 50 years (by 0.8 percentage points), life expectancy has risen form the 66 years that a newborn in 1950 was expected to live to the current 80.6 years, thereby more than offsetting the negative effects that the death rate increase could have had on population ageing.

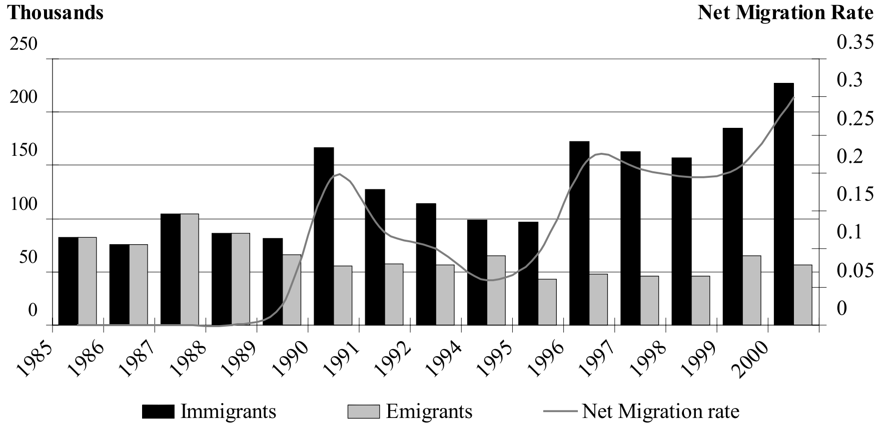
Figure 9.6 Life Expectancy and death rate in Italy, 1950 to 2005.



Data Source: Eurostat Demographic Database.

Finally, the number of immigrants, the number of emigrants and the net migration rate over the period 1985–2000 are plotted in Figure 9.7. While the number of emigrants has remained almost unchanged, the number of immigrants has progressively increased, reaching more than 200,000 units. As a result, net migration flows have boosted from around zero in the late 1980s to more than 170,000 net migrants recorded in 2000. As a consequence, net migration rate jumped from zero to 0.3.

Figure 9.7 Immigrants, emigrants and net migration rate in Italy, 1985–2000.



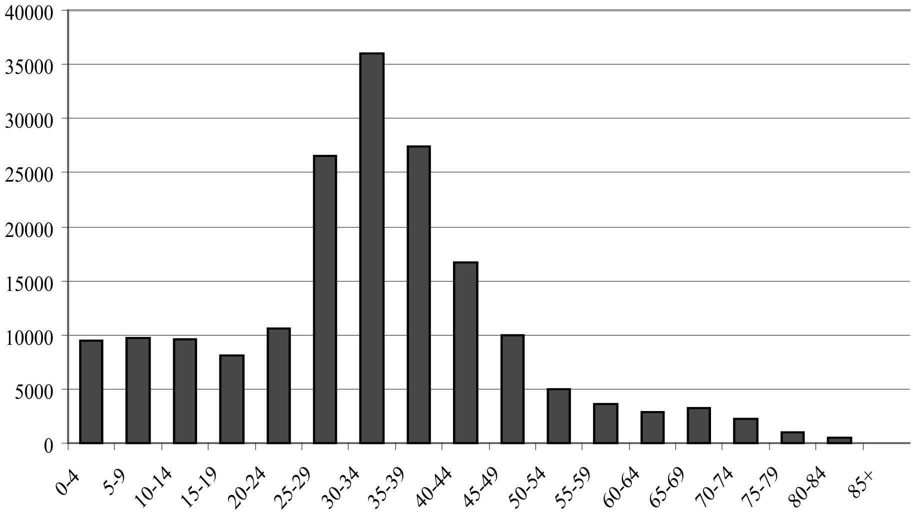
Note: values for immigrants and emigrants (columns) can be read on the left scale; those for the net migrants (line) on the right-hand-side one.
Data Source: Eurostat Demographic Database.

The distribution of immigrants and emigrants by 5-year age-group has been examined for each year of available data (from 1989 to 2000 included). However, since the distribution seems to remain unchanged across all years, in what follows we report only the results referred to the most recent data, i.e. 2000.

As reported in Figure 9.8, net migration typically occurs during working-age: in effect, in 2000 the most conspicuous group of net migrants was aged between 30 and 34 years, and more than 68.5% of all net migrants were between 25 and 50. According to this evidence, the increase in net migration flows recorded in Italy in the last years has mitigated the effects of population ageing by widening the working-age population[6].

[6] The mitigating effect that an increased net migration has on population ageing is only temporary. As time goes by in fact immigrants grow older and join the domestic retired population. Additionally, evidence suggests that immigrating households tend to adapt their fertility choices to those of the destination country, thereby cancelling out the initial dampening effect on ageing. On this issue and specifically for Italian case see, among others, Martire and Zincato (2005) and reference therein.

Figure 9.8 Net migrants in Italy in 2000, by 5-year age-classes.



Data Source: Eurostat Demographic Database.

To sum up, in the last 50-year period (restricted to a 15-year period for migration) in Italy: net migration flows have sensibly increased, mortality has undergone only a small decline (death rate has increased but life expectancy has also considerably lengthened) and fertility has recorded a significant drop. Based on this evidence, the reduced fertility is thus recognised as the main determinant for the unique Italian population ageing.

9.3 Ageing and portfolio choices of Italian Households

In this section we present some evidence on the relationship between demographic dynamics and household financial portfolio in Italy. To this end, we first frame our analysis within the existing literature and then we illustrate methodology, dataset and results.

9.3.1. The approach and the literature

In order to test the relationship between demographic changes and household financial portfolio three different approaches are in principle possible: (i) the "explorative approach", in which trends in survey data are analysed and interpreted; (ii) the "econometric approach", which essentially runs time-series or panel data analyses; and (iii) the "simulation approach", which carries out empirical simulations on suitably structured overlapping-generation models. In this paper we take the first approach to depict what has changed so far in the financial portfolios of Italian households and whether these changes can be traced back to demographic factors.

The literature on the issue is not yet vast and, as far as we know, Guiso and Jappelli (2001) is the only empirical contribution specifically focussed on the Italian case. As a first step, the authors provide a detailed account of Italian household portfolio evolution since the beginning of 1990s, using data from the 1989, 1991, 1993, 1995, 1998 editions of the Banca d'Italia Survey of Household Income and Wealth. Next, they try to depict the primary determinants of its composition. The authors group the various financial assets in three main categories: safe (e.g. bank accounts), fairly safe (e.g. T-Bills and similar) and risky (e.g. stocks, long-term government bonds and mutual funds) and use this classification in both the “explorative” and the “econometric” analyses. As for the former, they observe the trends of the portfolio shares invested in each category along the period under analysis and report that the composition of Italian household portfolio has dramatically changed. More specifically, the share of safe and fairly safe assets has reduced from 45.7% to 25% while that of risky assets is higher than ever before: at the beginning of 1990s stocks represented around 16% of total financial wealth while at the end of the decade they represented around 47%. According to the authors, several “macroeconomic” circumstances may have taken part in these changes: the decline in short-term bond nominal yield coupled with the increase of equities returns that characterize the entire 1990s, the liberalization of capital market which encouraged international diversification starting from 1989, the birth of mutual funds in 1984 and the privatisation in 1992 which most likely boosted market capitalization, as well as the social security reforms which fostered the development of life insurances and pension funds. Nevertheless, specific household features, such as wealth, education and age may also have affected these changes in portfolio allocation. Guiso and Jappelli (2001) thus focus on the 1989 – 1995 period and study whether or not these factors played a role in determining the riskier portfolio allocation. They distinguish between the decision concerning whether or not to hold risky assets, referred to as “participation decision”, and the (subsequent) one regarding the final portfolio allocation, named “allocation decision”. The authors report that that age, wealth and education may actually have determined the participation decision. As for age in particular, they report hump-shaped profile: the share of people investing in risky assets increases from around 15% of the young (i.e. those aged less than 30) to almost 20% of the middle-aged (between 30 and 59 years old) and then falls once again to around 10% for the 60 – 69 and to less than 7% for the over-70s. Conversely, the decision concerning the final portfolio allocation seems to be affected by none of these factors. The authors turn then to an econometric analysis based on both cross-sectional and panel data. Both descriptive and regression analyses prove that age, together with wealth and education, may have a substantial influence on the choice concerning whether or not to invest in risky assets, while once this decision is taken these factors only slightly affect the final portfolio allocation[7].

9.3.2 Methodology

Data span over the 1995–2004 decade and are taken from the Historical Archive of the Banca d'Italia Survey of Household Income and Wealth (HA-SHIW). Among other things, the dataset offers a detailed picture of the financial portfolio held by the interviewed households, as it provides the amounts (expressed in Italian lira until 2000 and in Euro thereafter) invested in a variety of financial assets.

In order to allow a better comparability across time, we translate amounts into percentages. Furthermore, all the assets are grouped into different classes according to their risk profiles, in order to avoid reporting residual items separately and to allow thus a clearer exposition. In the risk classification, the focus is centred on two kinds of risks only, namely credit risk and market risk.

As for the former, we distinguish two different levels. Specifically, the "Lower" level is assigned to financial assets issued by both the domestic sovereign (i.e. Italian government) and by banks, securities firms and cooperatives, based on the always more stringent supervising regulations introduced by the Basel II Accord and of the several security provisions provided for by the law specifically aimed to make banks and financial systems as safe as possible. The "Higher" level is instead associated to all the assets issued by the remaining agents, basically corporations. Foreign activities are treated separately as the amounts provided by the HA-SHIW are not distinguished by resided and non-residents issuers, so that a more precise credit-risk classification for these assets is not possible.

As far as market risk is concerned, three main forms are considered, i.e.:

- Exchange-rate risk, concerning the foreign activities only
- Interest-rate risk, associated with all bonds securities
- Price risk, associated to stocks and shareholdings

[7] Guiso and Jappelli (2001) argue that participation costs, such as minimum investment requirements, transaction and information costs are quite substantial in Italy and may thus interpret these results. Participation costs do not directly change with age; however, only investors who are holding risky assets for a relatively long time will actually face them. Conversely, those who need more liquid assets, i.e. those with a higher probability of liquidating risky assets, will be more reluctant to buy. As a consequence, households with short-term liquidity needs are less likely to buy assets that require fixed entry costs. Typically, households with liquidity needs are either those young facing liquidity constraints or high income variability, or those retired, who face uninsured health risks. In sum, health risk and credit market imperfections, which single out retired and young households respectively, may be at the base of the hump-shaped participation.

In addition, a fourth market-risk category, referred to as "mixed", is created for those kinds of investments where bonds (interest-rate risk) and stocks (price risk) are mixed together (see Table 9.5).

Table 9.5 Financial assets classification, by credit and market risk

Credit \ Market	–	Interest Rate	Mixed	Price	Exchange Rate
Lower	Current accounts Savings deposits Certificate of deposits Postal deposits Cooperative loans	Postal bonds BOT CCT BTP CTZ Other government bonds	REPO Investment Funds Personal asset managements Life insurances Non-life insurances Health insurances Pension Funds		
Higher		Bonds		Stocks SRL shares Partnerships' shares	
–					Foreign Assets

Note: Shaded cells indicate comparable risk-profiles: light grey denotes safer assets, more intense grey indicates fairly safe assets and dark grey gathers the risky ones.

Six main financial-asset groups beside cash are thus identified[8]:

1. DEPOSITS: lower credit risk and no market risk
2. GOVERMENT BONDS: lower credit risk and interest-rate risk
3. CORPORATE BONDS: higher credit risk and interest-rate risk
4. MANAGED INVESTMENTS: lower credit risk and mixed market-risk
5. STOCKS: higher credit risk and price-risk
6. FOREIGN ASSETS: exchange-rate risk

Two observations are in order. First, in the following analyses values for life-insurances and pension funds will be presented separately, as the focus of this study makes their single evolutions particularly interesting. Second, following Guiso and Jappelli (2001) financial assets will be in some cases

[8] This classification is only indicative as it neglects all the other forms of risk that actually characterize financial assets, such as liquidity risk. On the other hand, a more rigorous classification was not possible because of lack of information. As an example, the risk profiles of government bonds may be high or low depending, among other things, on their time-to-maturity. The data however do not provide any information about the duration of these instruments, so that all government bonds have to be placed in the same risk-class. Nevertheless, this simplification seems consistent with the perceptions of the majority of households, which typically associate a comparable level of risk to all government bonds.

further grouped in three risk-categories: “clearly safe”, “fairly safe” and “risky”. Differently from the previous study, clearly safe assets include cash and deposits, fairly safe assets include government bonds and managed investments and risky assets comprise corporate bonds, stocks and foreign activities (see Table 9.5)[9].

The survey data analysis will thus be articulated into three phases.

As a first step, the evolution of the average portfolio of Italian households is observed across all the five waves considered. The aim of this first step is twofold: on one hand, it will highlight the main features of the average Italian household portfolio and in particular its low degree of diversification. On the other, it allows examining whether and to what extent the average allocation of financial wealth has actually changed over the last decade.

In order to depict a possible age-effect on Italian household portfolio, the households are then divided into six age-classes (<30, 30 – 39, 40 – 49, 50 – 59, 60 – 69 and >70) and for each of them the average portfolio is examined. The placement in the age-classes is made according to the age of the head-of-the-household[10].

Household financial choices are affected by many other elements beside age: among these, the overall economic condition certainly plays a focal role. Based on this observation, we further refine the analysis in Guiso and Jappelli (2001) by dividing the households into both age-classes and Net Wealth (NW) quartiles, whereby NW is defined as the sum of real and financial activities net of the financial liabilities[11]. In this way, the robustness of the age-effect on household financial portfolio is tested even under different economic conditions. In addition, the top 5% richest households are separately studied, in order to see whether the age-effect persists also in extremely favourable economic conditions. Dividing the households into quartiles has a twofold utility. On one hand, it keeps the grouping comparable across time, without requiring adjustments for inflation or for the shift Italian lira – Euro occurred in the middle of the decade under analysis. On the other, it creates four groups with the same sample numerousness, so that statistics computed on household average financial portfolios are all equally statistically significant. In sum, the last step of our analysis consists in examining the average portfolio

[9] Further details on the financial asset risk-classification are reported in the Annex.

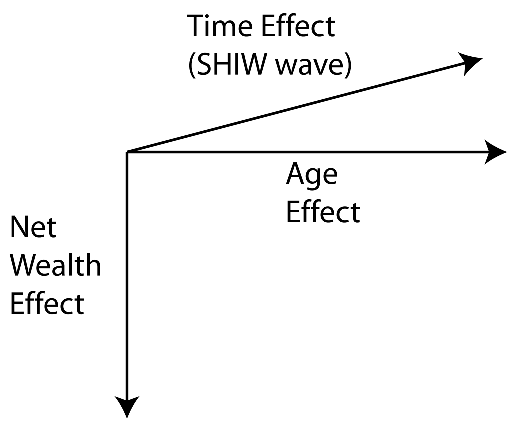
[10] According to the HA-SHIW, the head of the household could be either: the person who is the “most responsible of the financial and economic choices of the household” (“declared” definition), the person who earns the highest income (“income” definition), or the person who represents the reference point to establish the relationships among all members of the household (“Eurostat” definition). Here, the first definition is preferred as it is probably the most appropriate for the analyses performed.

[11] Alternatively, the “household income” could have been used, defined as the sum of the personal incomes of all the members, including capital and labour income as well as public transfers. Nevertheless, including real activities as well as eventual liabilities, the NW definitely provides a more complete measure of the actual economic condition of the household.

composition of all the interviewed households divided by age-classes and net wealth quartiles and to observe their evolution across the last decade.

The data presented in this phase of the study can be read in three directions (see Figure 9.9): (i) if read "vertically", the data highlight the differences in financial allocations of households belonging to the same age-class but to different NW quartiles; (ii) reading the data "horizontally" allows depicting the possible effect of age on the composition of household financial portfolio, since the compositions are compared across different age-classes but comparable economic conditions; (iii) finally, reading the data "transversally" across the SHIW waves might highlight whether the average portfolio allocation of households of the same age-class and net wealth quartile has modified or not, depicting in this way a possible time-effect. This intertemporal reading can be particularly interesting as it might reveal "indirect" effects of ageing, e.g. those induced by the several radical reforms brought to the social security system during the last decade and called for by the striking ageing of the Italian population.

Figure 9.9 SHIW data: effects depicted by different reading directions.

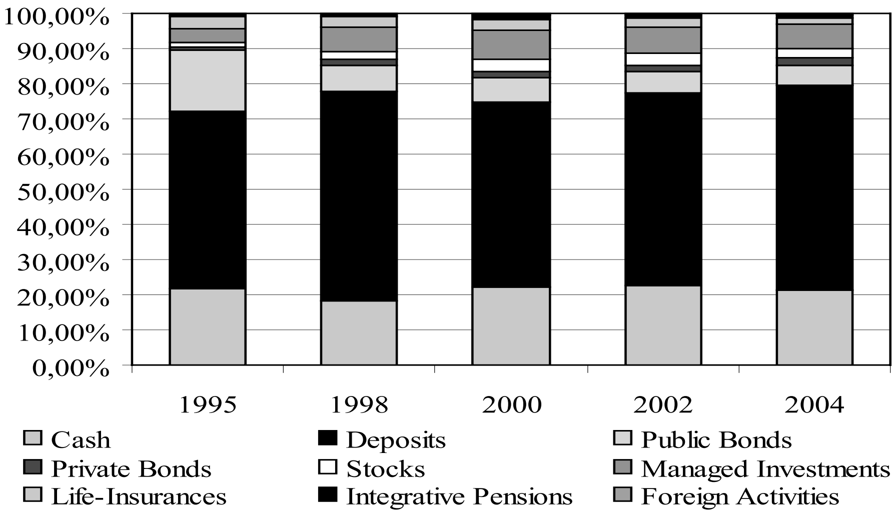


9.3.3 Main results

9.3.3.1 The Italian household average portfolio in 1995–2004

As a first step, the survey data are used to determine the average portfolio of Italian households in each of the five waves available in the HA-SHIW for the decade 1995–2004. From this preliminary inspection it immediately emerges the scarce degree of diversification of Italian household portfolios: during all the decade in fact Italian households hold on average more than 70% of their financial wealth in cash and deposits (see Figure 9.10).

Figure 9.10 Average Household Portfolio by SHIW wave.



Source: own elaborations on HA-SHIW data.

This peculiarity was already mentioned by Guiso and Jappelli (2001), who for the 1989–1995 period reported that "*the portfolios of Italian households span few assets. A large fraction of the sample holds very few types of financial instruments and tends to concentrate wealth in safe assets*". This observation is thus confirmed also for the decade 1995–2004 (see Table 9.6)[12].

Table 9.6 Households holding liquidity only, by SHIW wave.

	1995	1998	2000	2002	2004
Households in sample:	8,126	7,146	7,993	8,011	8,012
Of which holding:					
Cash only:	1158 (14.25%)	875 (12.24%)	1318 (16.49%)	1360 (16.98%)	1286 (16.05%)
Cash and deposits:	3291 (40.49%)	3167 (44.31%)	3867 (48.38%)	4323 (53.96%)	4325 (53.98%)

Data Source: HA-SHIW.

Table 9.7 reports the average shares invested by Italian households in each financial-asset category as from the waves available between 1995 and 2004.

[12] Ameriks and Zeldes (2004) perform similar analyses on US household portfolio and discard those units with such a low degree of diversification. As the limited diversification is a typical feature of Italian households' portfolios, in this study all households are kept into the sample in order to get the outline of the average portfolio as realistic as possible.

Table 9.7 Average household portfolio by SHIW, various editions.

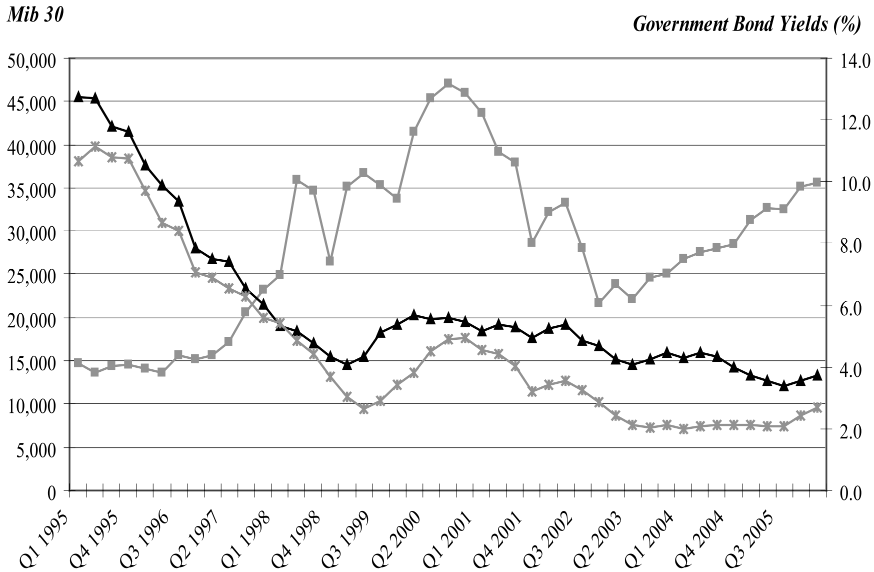
Financial Assets	1995	1998	2000	2002	2004
Cash	21.75	18.15	22.20	22.57	21.12
Deposits	50.41	59.80	52.45	54.90	58.41
Government bonds	17.51	7.43	7.29	5.88	5.88
Corporate bonds	0.83	1.54	1.72	2.07	2.10
Stocks	1.14	2.40	3.49	3.19	2.61
Managed Investments	4.20	6.95	8.22	7.46	6.78
Life-Insurances	3.14	2.67	2.88	2.65	1.79
Pensions Funds	0.97	0.91	1.49	0.99	1.03
Foreign Activities	0.10	0.14	0.25	0.29	0.28
Total	100.0	100.0	100.0	100.0	100.0

Note: for each asset group, the table reports the share over total financial assets. Shares are computed as weighed averages using sample weights as from HA-SHIW.

Several observations are here in order. First, the share of cash has remained almost unchanged over the entire decade (around one fifth of the average portfolio). By contrast, the incidence of government bonds has drastically reduced: in 2004 their share was only one third of the average value observed a decade before. Most likely, this change can be ascribed to the drastic reduction of Italian government bonds yields: in 1995 yields on short-term and long-term government bonds were respectively 10.7% and 12.7%, four years later they were respectively 2.7 and 3.7 and, after a first recover around 2000−2001, both kept gradually decreasing during all the following years(see Figure 9.11). On the other hand, investments in corporate bonds have progressively increased, especially starting from 1998. The privatization process in this case might have played an important role: although started in 1992, in effect, the peak of privatizations occurred at the end of 1990s[13].

[13] For more details on the Italian major privatizazion see, among others, Goldstein (2003).

Figure 9.11 Mib30 and Government Bonds Yields over 1995–2005.



Note: values for Mib30 (left scale) are in index points while government yields (right scale) are percentages.
Data Source: Datastream

Survey data also prove that the average investment in stocks has undergone several changes, which in large part occurred according with the major market fluctuations of the last decade. Stock share has progressively increased until 2000, up to more than doubling in 5-year time, and then it has shrunk again, along with the contraction of Italian stock market (see Mib30 trend in Figure 9.11).

The same holds for managed investments, whose share increased from 4.2% in 1995 to 8.22% in 2000 and then shrunk back to 6.78% in 2004, although their weight has overall increased during the last decade.

As far as precautionary savings are concerned, survey data highlight how the share invested in life-insurances has progressively reduced (from 3.14% in 1995 to 1.79% in 2004). The average share of pension funds shows instead a particular increase around 2000: in fact, although they were introduced by the Dini Reform in 1995, they were enforced by appropriate laws only a couple of years later. Nevertheless, the launch of this form of complementary social security does not seem to have worked particularly well in Italy: after the initial increase, the pension fund share has reduced back to around 1%, i.e. the very same value recorded in the year of their introduction. Furthermore, although during the last decade the gap between life insurances and pension funds has progressively thinned, the former are still somehow preferred with respect to the latter.

9.3.3.2 The average portfolio by age

Tables 9.8 to 9.12 report the average Italian household financial portfolios by age-class for every wave available for the last decade in the HA-SHIW.

Table 9.8 Average portfolio by age-class, 1995.

	<30	30–39	40–49	50–59	60–69	>70
Cash	19.18	18.06	16.17	17.08	24.28	32.67
Deposits	58.45	52.55	50.20	51.59	47.18	48.96
Government bonds	11.01	15.35	18.59	18.96	21.05	14.98
Corporate bonds	0.84	0.65	0.94	0.99	0.92	0.62
Stocks	0.32	1.04	1.11	2.06	1.00	0.64
Managed Investments	5.01	5.75	5.62	4.67	3.52	1.57
Life-Insurances	3.53	4.97	5.48	3.51	1.57	0.38
Pension funds	1.66	1.59	1.73	0.96	0.42	0.11
Foreign Activities	0.00	0.04	0.17	0.16	0.06	0.08
	100.00	100.00	100.00	100.00	100.00	100.00

Table 9.9 Average portfolio by age-class, 1998.

	<30	30–39	40–49	50–59	60–69	>70
Cash	16.78	12.27	13.70	14.93	20.62	27.47
Deposits	67.09	62.02	61.08	59.81	56.31	58.67
Government bonds	3.23	5.42	7.43	7.82	9.26	7.79
Corporate bonds	2.49	1.84	1.54	1.42	2.06	0.86
Stocks	0.94	2.83	2.79	3.12	2.31	1.43
Managed Investments	4.93	8.73	7.85	8.79	7.47	3.13
Life-Insurances	3.79	4.57	4.04	3.04	1.48	0.52
Pension funds	0.76	2.05	1.42	0.87	0.41	0.08
Foreign Activities	0.00	0.28	0.15	0.21	0.07	0.06
	100.00	100.00	100.00	100.00	100.00	100.00

Table 9.10 Average portfolio by age-class, 2000.

	<30	30–39	40–49	50–59	60–69	>70
Cash	26.03	18.02	20.09	21.02	22.68	27.04
Deposits	47.28	55.31	53.40	50.64	50.83	53.34
Government bonds	5.61	5.93	6.65	8.04	8.64	7.30
Corporate bonds	0.93	1.92	1.80	1.91	2.30	1.00
Stocks	5.09	4.00	3.96	4.08	2.95	2.38
Managed Investments	9.02	8.38	8.19	9.61	8.86	6.28
Life-Insurances	3.11	3.83	3.90	2.88	2.33	1.77
Pension funds	2.38	2.30	1.71	1.52	1.22	0.77
Foreign Activities	0.56	0.31	0.31	0.30	0.18	0.11
	100.00	100.00	100.00	100.00	100.00	100.00

Table 9.11 Average portfolio by age-class, 2002

	<30	30–39	40–49	50–59	60–69	>70
Cash	26.77	18.86	16.87	19.14	21.54	33.17
Deposits	57.45	58.13	56.73	52.99	55.61	51.54
Government bonds	3.43	3.97	4.42	7.09	7.48	6.76
Corporate bonds	1.65	1.64	2.04	2.81	2.24	1.76
Stocks	1.15	4.09	4.19	3.59	3.61	1.29
Managed Investments	4.49	6.72	9.03	10.26	7.92	4.48
Life-Insurances	4.32	4.37	4.59	2.66	0.97	0.71
Pension funds	0.74	1.83	1.61	1.28	0.30	0.17
Foreign Activities	0.00	0.39	0.52	0.18	0.33	0.12
	100.00	100.00	100.00	100.00	100.00	100.00

Table 9.12 Average portfolio by age-class, 2004.

	<30	30–39	40–49	50–59	60–69	>70
Cash	22.37	15.91	19.36	16.29	22.22	29.00
Deposits	66.41	63.96	58.85	57.96	54.40	56.07
Government bonds	2.27	3.80	4.87	7.39	6.11	7.42
Corporate bonds	1.04	1.80	1.88	2.34	3.09	1.80
Stocks	0.27	1.97	3.43	3.16	3.58	1.62
Managed Investments	4.32	7.12	7.28	8.68	8.83	3.63
Life-Insurances	1.25	3.64	2.42	2.16	1.08	0.27
Pension funds	2.07	1.60	1.62	1.28	0.51	0.11
Foreign Activities	0.00	0.20	0.28	0.73	0.17	0.08
	100.00	100.00	100.00	100.00	100.00	100.00

With no exception, the average shares invested in each asset category vary across the age-classes according with the risk-attitude changes suggested by the life-cycle theory. More specifically, the shares invested in the safest assets (i.e. cash and deposits) are particularly high for both very young and very old households: the former having not yet accumulated wealth enough to afford a more diversified portfolio, the latter preferring less risky and more liquid assets to finance their retirement consumption. In addition, as households grow older the weights of government bonds tend to increase constantly, proving that older generally prefer fairly safe rather than risky assets.

Conversely, the path followed by corporate bonds across the age-classes is humped-shaped: their shares are smaller in both young- and older-household portfolios and higher in those of middle-aged. The age-effect is even more evident when even riskier financial activities are considered, namely stocks and foreign assets. The latter in fact appear in the financial portfolios of middle-aged household only. Similarly, the shares invested in stocks are almost negligible in younger-household portfolios, peak instead in those of late-middle-age households, and shrink once again when the households reach the retirement age. The sole exception occurs in 2000, when the highest share invested in stocks does not belong to middle-aged rather to households aged 30 or less. The exceptional boom experienced by the Italian stock market in those years may have fostered the investments in these kinds of assets both at a general level and specifically for very young households.

Especially in the last years, managed investments seem to be the investment preferred by any age-class. They in fact provide a good compromise for the younger households and their typical trade-off between a higher risk-tolerance and a lower level of available wealth. On the other hand, the high diversification that they offer makes them quite appealing also to middle-aged households. Overall their shares gradually decrease only with the retirement age and in three out of five waves (i.e. 1990, 2000 and 2004) their average shares reduce substantially only in the very last age-class.

Life insurances and pension funds are particular forms of managed investments. Their specific precautionary motive however affects substantially their distribution across the different age-classes: their weights are in fact larger for young and middle-aged households and lower for older ones, who receive from rather than pay out contributions to these instruments. Besides, the predominance of life insurances on pension funds is generally maintained: with the sole exception of households aged 30 or less in 2004 life insurance shares can be from 2 to 5 times those of pension funds, although the gap between the two forms of precautionary savings has significantly reduced in the last years.

In sum, the data provide evidence in favour of the life-cycle theory over the whole past decade. Risky assets are in fact preferred by middle-aged investors while older households tend to disinvest risky financial instruments, abandon specifically focussed managed investments, such as life insurances and pension funds, and turn to less risky assets, such as government bonds and liquidity. Thus, despite the numerous changes occurred in the last decade (e.g. the reduced profitability of both government bonds and deposits or the big fluctuations of the Italian stock market), the financial choices of Italian households seem to have kept consistent with the life-cycle theory, thereby proving the very important effect of age on the household financial choices.

Our results are not directly comparable with Guiso and Jappelli (2001). In fact, when analysing the age-effect on portfolio the authors pool 1989–95 data and focus on risky assets sorted according to their classification. Nevertheless, the conclusion drawn is fully consistent with what observed by Guiso and Jappelli (2001), who report that “Over the life cycle the unconditional share of risky assets has a hump-shaped profile”.

Combining this conclusion with the facts on Italian population ageing presented in the previous section, for the next decades one may expect a progressive but substantial shift from risky assets towards safer ones.

9.3.3.3 The average portfolio by age and Net Wealth

The last step of our study aims to take into account one of the aspects that, besides age, most significantly affect the final household portfolio: its overall economic situation, here measured by means of the Net Wealth (NW).

Tables 9.13 and 9.14 report the average household portfolios by net wealth quartile and age-classes for 1995 and 2004 wave respectively[14].

As expected, NW plays a focal role in household portfolio choices. The average financial portfolio of households below the first NW quartile has quite low degrees of diversification and riskyness. In 1995, at all age-classes more than 80% of financial wealth was held in pure liquidity, i.e. cash and deposits. The remaining 20% was invested mainly in government bonds and, to a lesser extent, in managed investments and precautionary savings, i.e. life insurance and pension funds. The same holds for 2004, whereby the only difference is that managed investments (around 3–4% depending on the age-class) tend to prevail on government bonds (2–3%). Riskier activities such as corporate bonds, stocks and foreign activities generally remain outside these portfolios. Most likely, the financial choices of households in the first NW quartile are mainly shaped by the financial constraints they face, which force them towards very safe and liquid financial activities.

Turning to households falling within the two central quartiles, both the average degree of diversification and riskyness progressively increase. In both

[14] The intermediate waves have also been examined and generally lead to very similar conclusions. Missing tables are available upon request.

waves reported the aggregate share of cash and deposits reduces of around 10 percentage points. Conversely, both government and corporate bonds become more relevant: note however that while in 1995 government bonds were also the 18–20% of the total financial wealth, in 2004 they merely reach 6–8%.

The incidence of managed investments also increases in the intermediate household portfolios, reaching for younger households peaks of 8% in 1995 and of 11% in 2004. Besides, the weight of the precautionary savings increases too: in both waves in fact, the aggregate share of life insurances and pension funds increases by a couple of percentage points with respect to the first quartile. Nevertheless, two important differences arise comparing data for 1995 and those for 2004: first, the gap between the average shares of life-insurances and pension funds has generally reduced; second, the aggregate share of these two forms of complementary social security has overall reduced (from around 6–7% in 1995 to no more than 3–4% in 2004).

The highest degrees of diversification and riskyness are displayed by the portfolios of households above the third quartile. Financial resources are in this case drained from totally safe activities, i.e. cash and deposits, and directed instead towards riskier activities, such as stocks, whose shares for the first time go beyond the 2%. Yet, managed investments are those that generally increase the most moving upward across NW, reaching for richer households also 10–14% of the total financial wealth. Finally, note that the relative weights of life insurances and pension funds turn back to be unbalanced: across the whole decade in fact richer households seem to prefer life-insurances to pension funds.

Guiso and Jappelli (2001) also examined the wealth-effect on portfolio. However, they sort households into wealth (financial plus non-financial activities) rather than NW quartiles. Accordingly, they include into the portfolio also non-financial assets. On the other hand, they focus only on the effect of wealth, while in this step of our analysis portfolios are examined distinguishing by both NW quartile and age-class. Hence, a straight comparison is not really feasible. Yet, the evidence found is qualitatively consistent: financial allocation is affected by the level of wealth and, in particular, the wealthier the household, the riskier and more diversified the portfolio.

The "horizontal" reading of the data highlights how, despite the observed discrepancies due to different economic conditions, age can still have a relevant effect on the allocation of household financial wealth (see Figures 9.12 and 9.13).

Table 9.13 Average portfolio by Net Wealth quartile and age-class, 1995. Data Source: HA-SHIW.

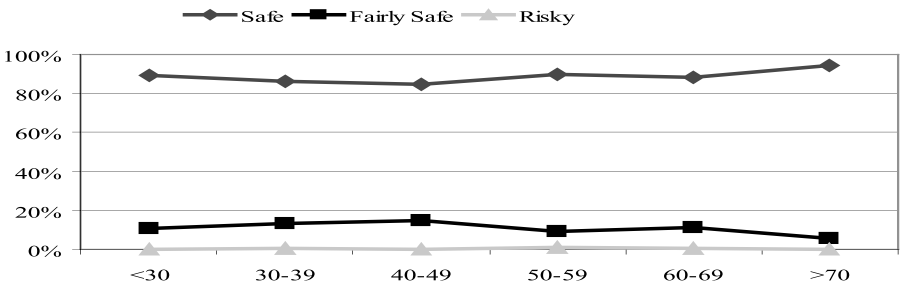
Quartile	Assets	<30	30–39	40–49	50–59	60–69	>70
Below 1st	Cash	28.19	35.84	35.26	41.60	47.23	47.37
	Deposits	61.21	50.43	49.53	48.04	41.24	46.89
	Government bonds	5.29	5.02	5.73	3.94	8.01	5.03
	Corporate bonds	0.00	0.29	0.00	0.17	0.00	0.00
	Stocks	0.00	0.07	0.20	0.85	0.37	0.00
	Managed Investments	1.96	1.53	2.00	2.21	0.72	0.61
	Life-Insurances	2.68	5.59	4.90	2.55	1.79	0.10
	Pension funds	0.67	1.23	2.38	0.63	0.64	0.00
	Foreign Activities	0.00	0.00	0.00	0.00	0.00	0.00
Between 1st and 2nd	Cash	18.86	14.81	19.67	24.77	32.38	36.51
	Deposits	44.02	54.31	52.62	52.79	50.07	45.32
	Government bonds	18.51	17.82	16.86	14.72	13.65	15.35
	Corporate bonds	3.58	0.60	0.15	1.36	1.27	0.78
	Stocks	0.36	1.13	0.13	0.14	0.16	0.69
	Managed Investments	8.55	4.82	2.50	1.66	1.07	1.19
	Life-Insurances	2.80	5.11	6.77	4.10	1.33	0.15
	Pension funds	3.32	1.31	1.31	0.47	0.07	0.02
	Foreign Activities	0.00	0.08	0.00	0.00	0.00	0.00
Between 2nd and 3rd	Cash	10.17	10.14	11.55	12.25	14.27	18.42
	Deposits	67.80	55.81	52.75	57.45	56.51	59.19
	Government bonds	9.99	19.74	20.67	19.57	24.07	18.92
	Corporate bonds	0.13	0.84	1.12	0.65	0.47	0.18
	Stocks	0.67	1.07	1.06	1.88	0.30	0.70
	Managed Investments	4.81	5.93	6.21	3.16	2.70	1.38
	Life-Insurances	4.53	4.62	5.05	3.47	1.02	0.59
	Pension funds	1.89	1.85	1.54	1.40	0.65	0.41
	Foreign Activities	0.00	0.00	0.06	0.17	0.01	0.22
Above 3rd	Cash	2.85	6.35	5.01	5.48	7.63	7.13
	Deposits	57.77	49.33	47.84	50.12	43.54	49.56
	Government bonds	20.45	21.97	27.38	27.92	35.65	34.97
	Corporate bonds	0.00	1.06	1.05	1.13	1.65	1.36
	Stocks	1.03	2.15	1.79	2.82	1.45	1.38
	Managed Investments	10.42	12.61	9.75	7.76	7.48	3.73
	Life-Insurances	5.27	4.11	4.82	3.55	1.98	1.61
	Pension funds	2.20	2.29	1.81	1.07	0.41	0.17
	Foreign Activities	0.00	0.13	0.55	0.15	0.21	0.09

Table 9.14 Average portfolio by Net Wealth quartile and age-class, 2004. Data Source: HA-SHIW.

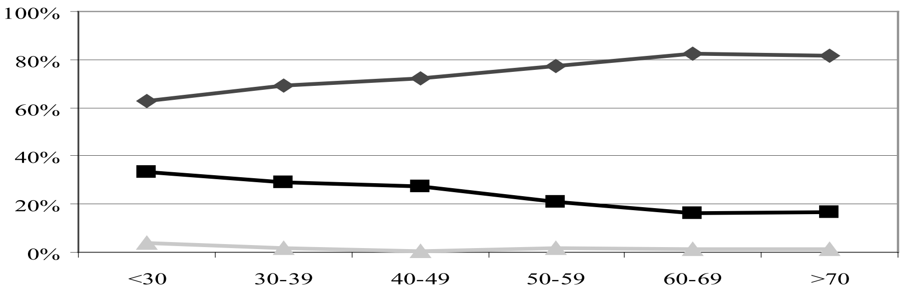
Quartile	Assets	<30	30–39	40–49	50–59	60–69	>70
Below 1st	Cash	29.32	25.82	35.48	35.06	45.34	38.65
	Deposits	59.40	61.40	55.52	55.31	47.49	56.18
	Government bonds	3.07	1.82	1.76	2.80	1.99	3.07
	Corporate bonds	0.00	1.18	0.29	0.03	1.16	0.14
	Stocks	0.00	1.39	0.64	0.24	0.54	1.17
	Managed Investments	3.94	4.32	4.09	3.29	2.38	0.70
	Life-Insurances	0.87	3.05	1.43	2.34	0.76	0.04
	Pension funds	3.39	0.99	0.80	0.84	0.34	0.06
	Foreign Activities	0.00	0.03	0.00	0.09	0.00	0.00
Between 1st and 2nd	Cash	16.60	9.75	18.17	20.74	26.71	35.30
	Deposits	73.26	75.42	63.64	61.85	55.68	54.10
	Government bonds	0.63	2.89	3.81	7.45	4.89	7.10
	Corporate bonds	2.40	1.20	1.80	0.67	2.83	0.60
	Stocks	0.12	1.24	1.26	0.50	1.29	0.97
	Managed Investments	4.23	5.22	6.02	5.52	7.08	1.76
	Life-Insurances	1.84	2.07	3.30	1.51	1.13	0.09
	Pension funds	0.92	2.18	1.60	1.50	0.18	0.04
	Foreign Activities	0.00	0.02	0.40	0.25	0.22	0.04
Between 2nd and 3rd	Cash	21.89	9.48	15.77	12.70	15.82	24.38
	Deposits	72.17	63.48	61.50	64.89	60.45	59.04
	Government bonds	0.26	6.92	7.06	6.78	6.93	8.30
	Corporate bonds	0.52	1.54	1.96	2.43	2.73	2.11
	Stocks	1.28	1.50	2.75	2.52	4.18	0.71
	Managed Investments	2.97	11.03	6.05	6.86	7.64	4.71
	Life-Insurances	0.09	3.53	2.34	2.24	1.15	0.44
	Pension funds	0.82	1.95	2.17	1.48	0.94	0.23
	Foreign Activities	0.00	0.58	0.39	0.10	0.17	0.09
Above 3rd	Cash	13.17	13.27	7.80	6.80	10.13	12.12
	Deposits	72.50	54.41	56.12	53.82	56.00	58.83
	Government bonds	1.94	4.80	6.37	11.13	9.10	11.78
	Corporate bonds	0.09	4.59	2.98	4.24	4.44	4.90
	Stocks	0.00	3.50	8.75	4.89	5.60	3.44
	Managed Investments	7.98	10.63	12.70	14.36	12.91	7.75
	Life-Insurances	3.08	6.60	2.97	2.42	1.00	0.83
	Pension funds	1.23	1.76	1.87	1.16	0.63	0.09
	Foreign Activities	0.00	0.45	0.44	1.19	0.19	0.27

Figure 9.12 Asset shares grouped by riskyness, by NW quartiles and age-class, 1995

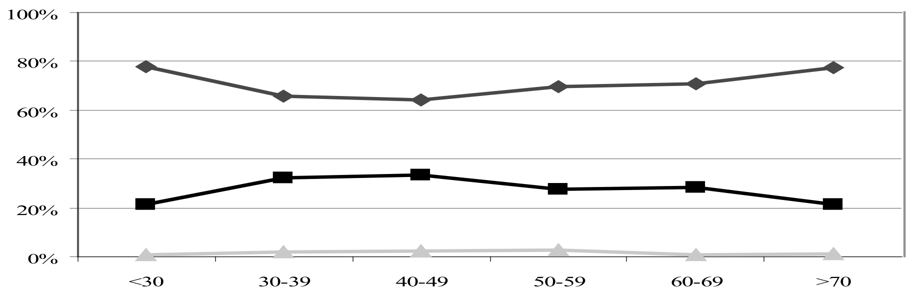
Below 1st quartile



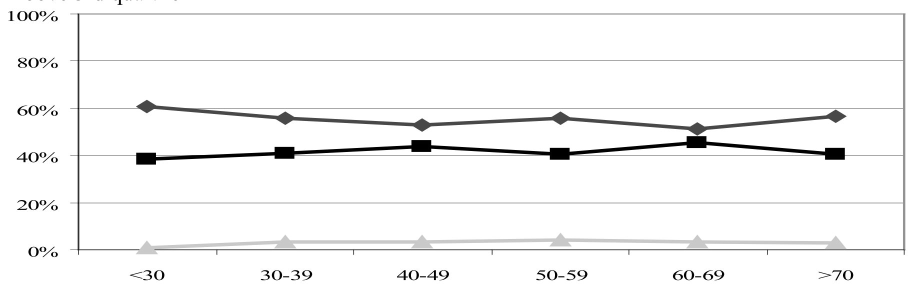
Between 1st and 2nd quartile



Between 2nd and 3rd quartile



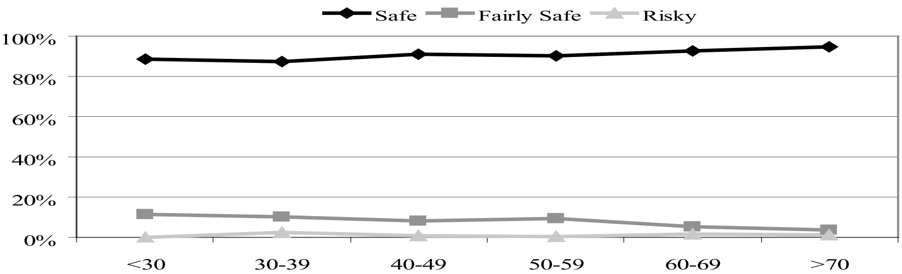
Above 3rd quartile



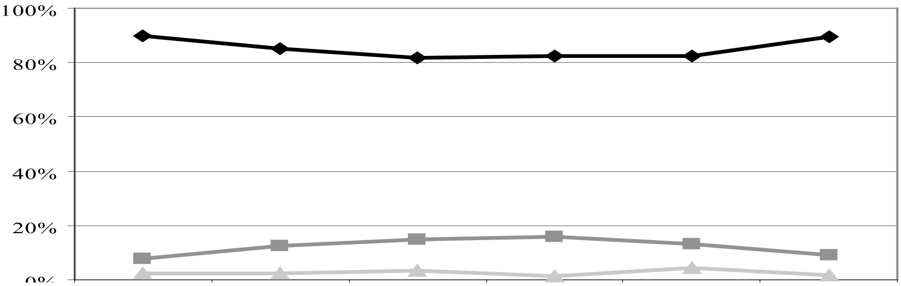
Source: own elaborations on HA-SHIW.

Figure 9.13 Asset shares grouped by riskyness, by NW quartiles and age-class, 2004

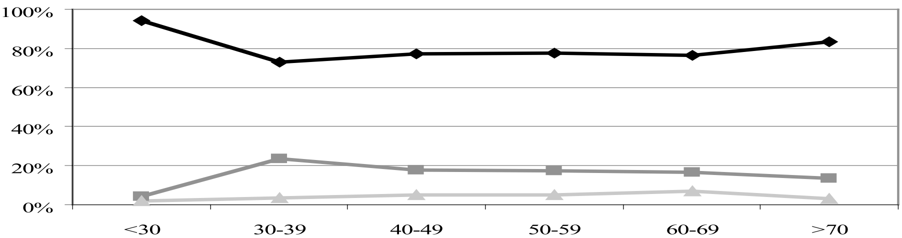
Below 1st quartile



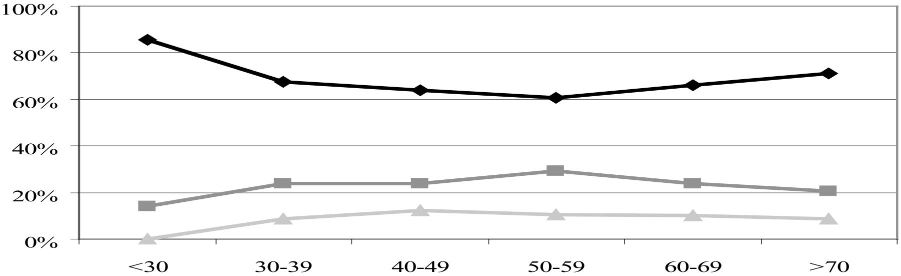
Between 1st and 2nd quartile



Between 2nd and 3rd quartile



Above 3rd quartile



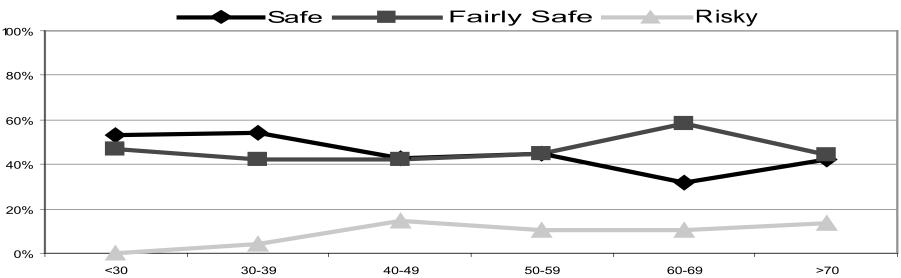
Source: own elaborations on HA-SHIW.

In both waves and regardless of the NW quartile, the aggregate share of the cash and deposits (safe assets) undergoes a decline during the middle-age, when resources are generally drained from safer assets to finance riskier and more rewarded investments. As from the retirement age-class (60–69) however the weights of safe assets progressively increase. Consistently, the aggregate shares of riskier activities, such as corporate bonds, managed investments, stocks and foreign activities display a humped-shaped pattern. On the other hand, the average shares held in government bonds gradually increases along with the age-class, substantiating the stronger preference of these assets by older rather than younger households.

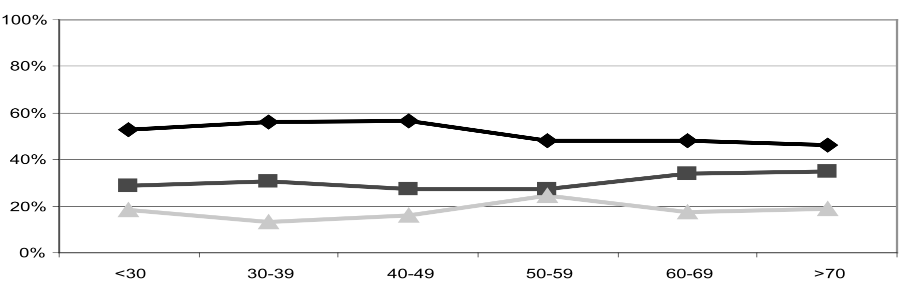
A separate situation arises instead for the top 5% richer households (see Table 9.15 and Figure 9.14). Their average portfolio does not reflect the predictions of life-cycle theory. As the household grows older cash, deposits and government bonds reduce rather than increase. Furthermore, corporate bond share behaves irregularly: in 1995 they literarily boost in the portfolios of households aged 70 or more, and in 2004 they first drop between the first and second age-class and then progressively increase along with age. In addition, the shares of managed investments and stocks remain quite high during the whole life-cycle and do not significantly shrink with the retirement age.

Figure 9.14 Top 5% households: asset shares grouped by riskyness across age-classes.

1995



2004



Source: own elaborations on HA-SHIW.

Table 9.15 Top 5% richer households: average portfolio of by age-class in 1995 and 2004.

1995	<30	30–39	40–49	50–59	60–69	>70
Cash	1.11	3.87	5.64	3.68	1.80	2.34
Deposits	51.76	50.21	37.13	41.23	29.72	39.85
Government bonds	24.75	20.67	21.66	27.55	40.48	31.41
Corporate bonds	0.00	0.34	7.61	2.18	1.90	7.44
Stocks	0.00	3.65	6.90	7.45	8.18	5.32
Managed Investments	11.92	14.03	11.23	12.12	14.51	12.33
Life-Insurances	10.45	6.83	7.66	3.77	2.81	0.38
Pension funds	0.00	0.40	1.90	1.10	0.35	0.03
Foreign Activities	0.00	0.00	0.28	0.93	0.25	0.90
2004	**<30**	**30–39**	**40–49**	**50–59**	**60–69**	**>70**
Cash	3.00	1.93	3.67	3.55	6.84	2.45
Deposits	49.79	54.21	53.07	44.55	41.49	43.72
Government bonds	23.89	8.74	8.42	6.61	8.72	17.39
Corporate bonds	17.18	1.82	5.82	5.99	6.06	9.62
Stocks	1.38	11.19	10.04	14.45	11.19	9.05
Managed Investments	1.87	11.42	14.53	16.75	23.31	16.93
Life-Insurances	0.20	9.67	2.09	2.49	1.87	0.10
Pension funds	2.68	1.02	2.25	1.42	0.16	0.51
Foreign Activities	0.00	0.00	0.10	4.19	0.36	0.22

Data Source: HA-SHIW

Most likely, for these households the net-wealth effect more than overcomes that of age on financial assets allocation. As highlighted by Table 9.16 in fact the NW of these households is extremely high: falling within the top 5% in 1995 (2004) meant have a NW of almost ITL 950m (EUR 700,000).

Table 9.16 Net wealth quartiles boundaries, by SHIW wave.

Quartile	1995	1998	2000	2002	2004
I	29,871,950	41,700	50,500	23,000	30,500
II	157,993,890	181,232,370	197,204,440	108,500	138,026.37
III	335,224,250	353,075,000	380,000	215,814.76	262,813.22
Top 5%	936,125,840	1,005,278,240	1,100,100	589,965.62	689,105.05

Note: values up to 2000 are expressed in Italian lira while those for 2002 and 2004 are in Euro.
Data Source: HA-SHIW.

In sum, with the sole exception of top 5% richer households, for which most likely financial choices are mainly shaped by net-wealth rather than age, the average composition of Italian household portfolios seems to be significantly influenced by age. Furthermore, the evidence suggests a double robustness of this result. On one hand, age-effect on financial asset allocation is maintained even under significantly different economic conditions, as it is observed across all the Net Wealth quartiles examined. On the other, it has endured through time despite the numerous changes occurred on the Italian financial market during the last decade, since the influence of age on the average portfolio is revealed by all the waves considered.

9.4 Conclusions

This paper focuses on the dynamics of population ageing in Italy and on its impact on the household portfolio allocation, with the final aim to provide indications about the evolutions that the Italian financial markets may face in the years to come. The analysis has been carried out in two steps.

First, we examined the phenomenon of ageing in Italy and its main causes. It turned out that Italian population is undergoing the most pronounced ageing in the world after Japan (projections for 2050 point towards the amazing picture of 75 retired every 100 working people) and that it probably stems from a drop in fertility.

Based on this, we turned to the effects that ageing might have on the average portfolio of Italian households. As in Guiso and Jappelli (2001) data are taken from five waves of the Banca d'Italia SHIW. As highlighted in the paper, this study differs from Guiso and Jappelli (2001) in three extents: (i) a subsequent period of time is considered; (ii) a different risk-classification of financial assets is proposed; and (iii) the analysis is refined by separating households into age-classes and Net Wealth quartiles at a time, thereby testing the robustness of age-effect on financial choices under different economic conditions. Going throughout the average portfolio allocation it emerged that several changes occurred over the period 1995–2004: government bond share reduced while corporate bonds have generally increased, especially since 1998. Most likely, the reduction of Italian government bonds yields on one hand and the privatization process on the other might be at the basis of these portfolio adjustments. Besides, while the incidences of stocks and managed investments have in large part oscillated according to the major market fluctuations of the last decade, life-insurances and pension funds have recorded constant but opposite trends: the former have shrunk in favour of the latter, thereby reducing (but not annulling) the gap between the two forms of complementary social security.

Examining the average portfolio by age-classes it turned out that the average shares invested in each asset category tend to be consistent with the risk-attitude changes suggested by the life-cycle theory. Middle-aged households hold riskier portfolios, while older ones tend to disinvest risky financial instruments and turn to safer assets, such as government bonds and liquidity. Thus, the financial choices of Italian households remained significantly affected by age despite the numerous changes occurred between 1995 and 2004. Although the results obtained here are not directly comparable with that reported by Guiso and Jappelli (2001), a comparison with their results is in order. On the whole, the evidence found is qualitatively consistent, although a few differences in the average allocations emerge. Generally, in fact, Guiso and Jappelli (2001) report shares for cash remarkably lower than ours (up to 10 percentage points); on the contrary, they generally report as higher life-insurances shares.

Finally, the average portfolio is further examined dividing the Italian households by both age-classes and NW quartiles, in order to take into account also the influence that the overall economic condition of the household has on its financial choices, which was already observed by Guiso and Jappelli (2001). With the sole exception of extremely rich households (i.e. top 5% richer ones), the age-effect seems to persist even under significantly different economic conditions. We thus conclude that the age-effect on financial choices seems to be robust to both different economic situations and to the market changes occurred during the decade under analysis.

Combining this conclusion with the facts on Italian population ageing, we expect for the next decades several changes on the Italian financial market. In particular, it is likely a progressive but substantial shift from risky assets, such as stocks and corporate bonds, towards safer ones, i.e. managed investments, government bonds and deposits.

Unfortunately, a more precise forecast on what is going to happen can not be obtained from this kind of analyses. Probably, an "econometric" approach, such as that taken by Poterba (2004) or Davis and Li (2003) would be more appropriate to complete our analysis. In fact, it could help to assess quantitatively the relationship between demographic and household portfolios changes and thus to estimate how the projected demographic structures might modify future financial asset returns. This issue is thus left to further research.

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Annex 9.1 Clearly safe, fairly safe and risky financial assets.

In analysing the composition of Italian household portfolio over the period 1985 – 1998, Guiso and Jappelli (2001) find it useful to group financial assets according to their risk-profile. In particular, they distinguish: (i) "clearly safe" financial assets, including currency, transaction accounts and certificates of deposit; (ii) "fairly safe" financial assets, gathering Treasury bills and the life insurances; and (iii) "risky" assets, including stocks, long-term government bonds, corporate bonds, defined contribution pension plans, mutual funds and other forms of managed investments.

Here, a different sorting is proposed. In Table 9.A.1 we recall the six major categories attained by joining together assets sharing similar credit and market risks (see Section 9.3.2) and shade the cells to indicate the three different risk-profiles: light grey denotes "totally safe" assets, more intense grey "fairly safe" assets and dark grey "risky" assets.

Table 9.A.1 Financial assets groups, by credit and market risk.

Credit \ Market	–	Interest Rate	Mixed	Price	Exchange Rate
Lower	Cash and Deposits	Government Bonds	Managed Investments		
Higher		Corporate Bonds		Stocks	
–					Foreign Assets

Cash and Deposits are considered "totally safe" because both are subject to a relatively lower level of credit risk and are free of market risk, whereby the latter is intended as the risk of changes in price and thus disregards the risk of a change in the interest rates at a macroeconomic level. Government Bonds and Managed Investments are instead gathered into the "fairly safe" group, given that the credit risk is still relatively lower but they also are subjected to some forms of market risk. The three remaining categories are grouped together and referred to as "risky", as they are either subjected to a relatively higher credit risk (corporate bonds and stocks) or exposed to exchange rate risk (foreign assets).

Table 9.A.2 Risk-categories of financial assets: comparison.

	Guiso and Jappelli (2001)	Common	This Study
Clearly safe		Currency	
		Transaction accounts	
		Certificate of deposits	
Fairly safe		Short-term government bonds	Long-term government bonds
		Life-insurances	Investment funds and non-life insurances
			Integrative pensions
Risky	Long-term government bonds	Stocks	
	Investment funds and non-life insurances	Corporate bonds	
	Integrative pensions	Foreign assets	

Two are the main differences between the alternative classifications. First, long-term government bonds are here moved from the risky to the fairly safe category. As argued by Guiso and Jappelli (2001), "*the large and increasing government debt leads investors to attach a non-zero probability of default even on short-term government bonds. But this has changed after the dramatic fiscal stabilization started in 1996*". Based on this reduced risk-profile, the shift from risky to fairly safe assets appears reasonable. Second, while Guiso and Jappelli (2001) isolate life-insurances into the fairly safe category and gathered all the remaining managed investments in the risky one, here all forms of managed investments are classified as fairly safe. Aggregate data split life-insurances from other kinds of insurances, including pension funds, only starting from 2003: a separate treatment for two forms of complementary social security is thus unfeasible. Furthermore, the choice of Guiso and Jappelli (2001) stemmed from the observation that "*until 1995 [...] most funds were in stocks*". However, they admit that "*the availability of a large number of money market and balanced funds in the late '90s tends to blur our definition*". Hence, also considering the high diversification that typically characterises managed investments, they are here classified as fairly safe.

10 Ageing, National Savings and the International Investment Position: The Experience of the Netherlands.

Wim W. Boonstra

10.0 Abstract

This paper discusses whether or not it is useful for policymakers to aim at the creation of a large international asset position when preparing for the ageing of the population. It looks into the relation between the balance of payments of countries and their international investment position. It appears that a large national savings surplus is no guarantee at all for a strong net asset position. This point is illustrated by The Netherlands: a country with huge national savings surpluses that failed to build up a strong net international asset position.

10.1 Introduction

The Netherlands is one of the few countries in the world, and the only country in the Eurozone, with a well-developed capital-based system of old age provisions. The Dutch pension system was established shortly after the Second World War. As participation in the system is compulsory for all employees in both the private and the public sector, this system has resulted in a high level of collective savings. The country as a whole has had a savings surplus for decades. The current account of the balance of payments, which is by definition identical to the national savings balance, has been in surplus for most of the years after the war. Since 1982, the country has accumulated current account surpluses to an amount of more than EUR 300 billion. In spite of this, at the end of 2004 the country's net external asset position amounted to just EUR 36 billion.

This article deals with the question why the Dutch, in spite of their huge savings surpluses, have failed to build up a large net international asset position. It starts with a brief description of the institutional environment, the economic performance and the balance of payments. Section 10.3 describes the development of the international investment position (IIP). In section 10.4, I will explain why the Dutch international investment position has deteriorated rapidly in the second half of the 1990s. Section 10.5 summarises and discusses the consequences for economic policy.

10.2 A high savings economy

10.2.1 The Dutch pension system

The Dutch system of old age provisions is based on a so-called three pillar system. The first pillar is a public pension system, the AOW[1]. This is a general system for every Dutch citizen of 65 years or older and it is organised as a pay-as-you-go (PAYG) system. The allowance is quite low, i.e. a gross monthly amount of EUR 942 for single persons and EUR 646 per person for couples. The premium of the AOW is paid by workers. The second pillar, which is the most important part of the system, is a supplementary pension. This is an obligatory system, in which in principle every employee has to participate. The pension premium is paid by employees, and their pension benefits increase with every working year. Traditionally, the potential pension allowance amounted to 70% of the last wage after 40 years of work. However, increasingly pension contracts are being based on the average wage during the working life, the so-called middle wage system ('middelloon stelsel'). The third pension pillar consists of private savings. The fiscal regime stimulates private pension savings to complement the collective pension savings.

It is beyond the scope of this paper to describe the Dutch pension system in more detail. This is extensively discussed in the literature [Kuné (2005), Canton et al. (2004)]. Here it suffices to say that there is a well-developed pension-industry in the Netherlands, which over the years has resulted in the formation of huge pension funds. At the end of 2005, total national pension savings amounted to EUR 675 billion (2004: EUR 550 billion), which was 125 % (112%) of Gross Domestic Product (GDP). The largest Dutch pension fund, the ABP (for public sector employees), is the second largest in the world, with total assets of EUR 191 billion (end 2005) [ABP (2006)].

The high degree of collective savings has resulted in a structural national savings surplus. Bikker (1994) has estimated that up to 40% of the Dutch surplus on the current account can be attributed to the pension savings. In a debate in Dutch policy circles in the early 1990s, several leading academics concluded that this national savings surplus is necessary with the aim of preparing for the future ageing of the population [Bovenberg (1991), Duisenberg (1992), Kolnaar (2005)]. A recent study on the impact of ageing on the Dutch public Finances by the Dutch National Bureau for Economic Policy Analysis concludes that, in a scenario of otherwise unchanged policies, the government budget will need a structural surplus of 3% of GDP in 2011 in order to deal with the financial consequences of ageing. Such a policy would

[1] AOW means 'Algemene Ouderdomswet' (general retirement pensions act).

lead to even higher surpluses on the current account, which is considered a positive development [van Ewijk et al.(2006)].

10.2.2 The function of an external surplus

A capital based system of old-age provisions is only marginally better than a PAYG system in a scenario in which all savings have to be reinvested in the domestic economy. This can be seen if one does not look only at the financial consequences of ageing, but also at the real effects. The basic difference between both systems lies in the fact that in a PAYG system the pensioners are dependent on the working population. The premiums paid by the labour force form the income of the retired. In a scenario of an ageing population, a decreasing group of workers will have to pay for a growing number of pensioners. For the working population, this will lead to a growing financial burden and sooner or later they will no longer be prepared to pay the bill.

From a financial point of view, a capital based system solves most of the problems of a PAYG-system. Working people save for their own old-age provision, leading to savings surpluses and a build-up of pension wealth in the years in which the working group is at its largest. Once the non-working population takes the upper hand, pension funds will start to distribute their wealth to the pensioners, who pay for their own non-productive years. From this point of view it is clearly a superior system.

In a closed economy high pension savings may lead to lower interest rates and higher investment, and thus to a higher production capacity in the future (plus more capital per worker in the future, leading to higher wages and leaving everybody better off). However, once the population starts to age, ultimately the expenditures of the retired would be matched by a relatively shrinking economic base. Ageing leads to a relative decline of the productive potential of a country, which will be even more pronounced in a scenario in which the active part of the population starts to shrink in absolute terms. The combination of increasing expenditure by pensioners and a shrinking real economic base will result in higher inflation. The distribution question between workers and pensioners returns in a different shape than in a PAYG system, although basically it is the same problem [Koopmans (1993)].

Therefore, cross border investments need to play a role in this system. Once a country starts to build up international assets with the aim of saving for the ageing of the population the situation can improve considerably. First, net foreign assets may be expected to result in a positive flow of capital income, adding to domestic production. When the increase in the number of retirees results in an increase in spending, the trade balance may be expected to gradually deteriorate, turning from positive into negative during this process. A positive income flow from net foreign assets can delay the moment when the current account will turn into the red as well. Once the current account turns into deficit, this can be financed by eating into the foreign assets. This reasoning forms the basic justification for the large Dutch national savings surplus [Bovenberg (1991)]. And it is for this reason as well that today the Netherlands Bureau for Economic Policy Analysis (Centraal Planbureau (CPB)) is still very positive towards the creation of high surpluses on the current account. It argues, just as Bovenberg did in 1991, that structural national savings surpluses will create a financial buffer for future deficits on the trade balance.

The implicit assumption is, of course, that other countries such as developing or emerging economies are prepared to run savings deficits and build up foreign debt. The productive employment of the savings surpluses of industrial countries in emerging economies helps to expand their economic potential. Once they start to repay their debt they will need savings surpluses themselves, which creates the space for the ageing industrial countries to run current deficits.

10.2.3 The Dutch balance of payments

a) Current account

The Netherlands have a very open economy, which is illustrated by high export and import ratios. The country is the sixth exporter in the world which is, given the relatively small size of the economy, a remarkable position [WTO (2005)]. The Dutch current account of the balance of payments is characterised by large structural surpluses. Its surplus is both in absolute and relative terms traditionally amongst the largest of the world. In the years we will investigate more closely, 1987–2004, the cumulative surplus on the current account amounted to EUR 245 billion.

b) Financial account

The openness of the Dutch economy can also be read from the financial account of the balance of payments. On the one hand, this is characterised by large outflows of capital, in the form of direct investments, portfolio investments and other flows. On the other hand, the Dutch economy is also an important receiver of foreign capital. More than 7000 foreign companies have established subsidiaries in the Netherlands. Moreover, foreign investors have invested huge amounts of assets in Dutch treasury and corporate bonds and in the shares of large Dutch companies.

Figure 10.1 Financial account: gross outflow of capital

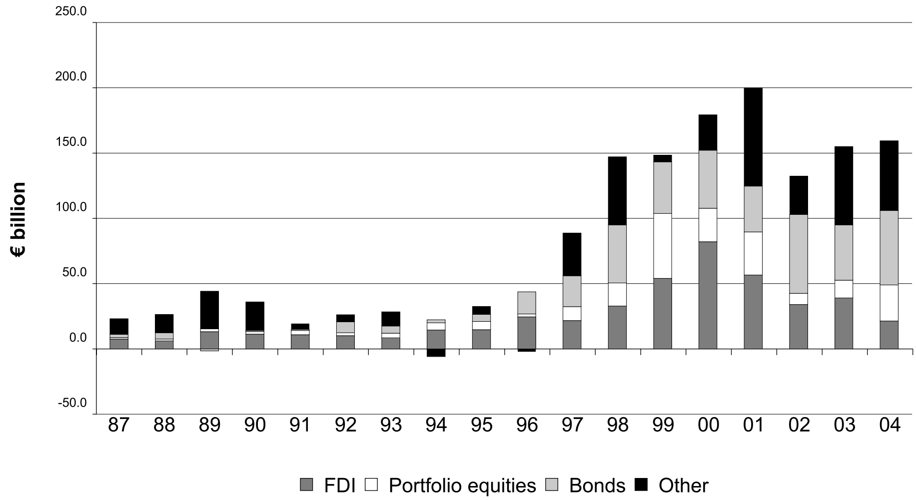
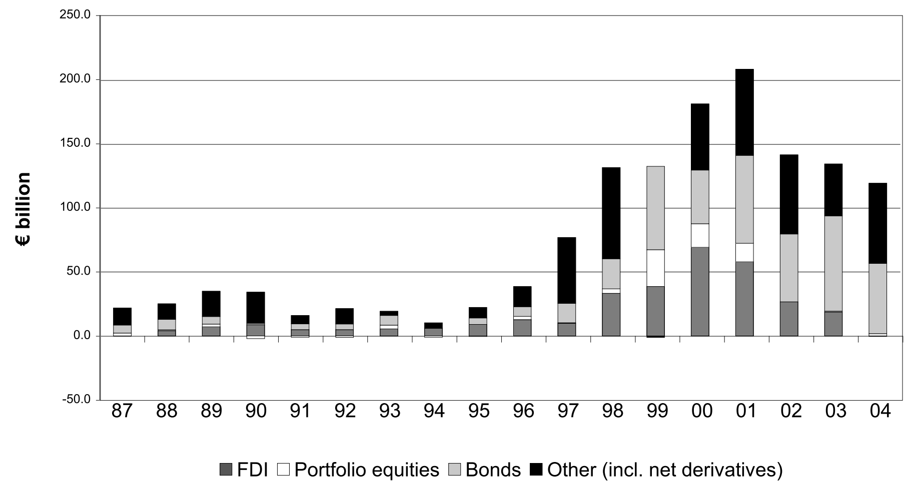


Figure 10.2 Financial account: gross inflow of capital



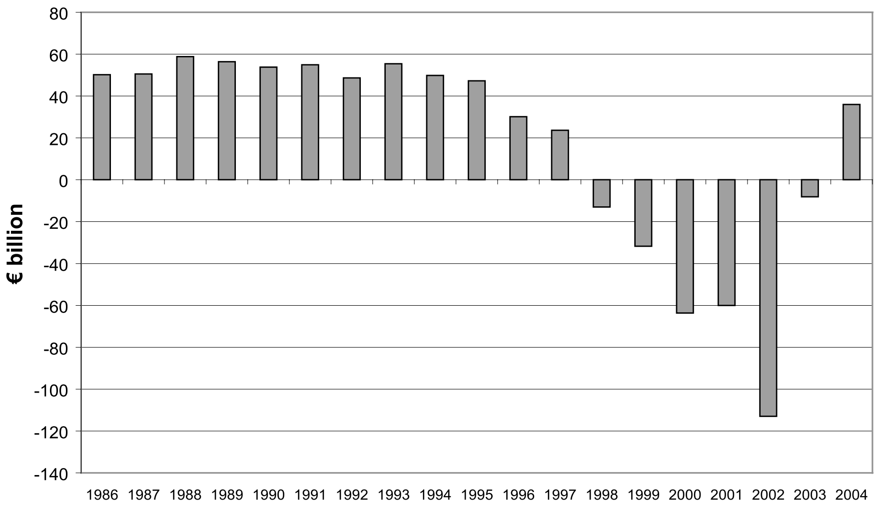
Note: FDI = foreign direct investment.
Data Source figures 1 and 2: website DNB, November 2006.

In spite of its small size, the Netherlands are the home of some prominent multinational companies, such as Philips Electronics, Royal Dutch/Shell, Unilever and Ahold and large financial institutions like ABN AMRO, Aegon, ING and Rabobank. When one looks at net cross-border flows, then one can conclude that the Dutch are important net global investors.

c) Dutch International investment position

As a result of the huge net outflows of investment capital one would expect the Netherlands to be an important creditor nation. Initially, the surpluses indeed translated into net foreign assets, although their size appeared to be disappointingly low. At its peak, in 1988, net foreign assets amounted to EUR 59 billion (27.3% GDP), although from that year the figure started gradually to decline, despite large current account surpluses. In 1998 the country became a net debtor. In 2002 the international investment position reached a low of minus EUR 113 billion (24.4% GDP), after which a strong recovery took place. At year-end 2004, the net foreign asset position was EUR 36 billion (7% GDP) positive. This is more or less equal with that year's current account surplus.

Figure 10.3 Net International Investment Position of the Netherlands (1986–2004)



Source: website DNB, November 2006

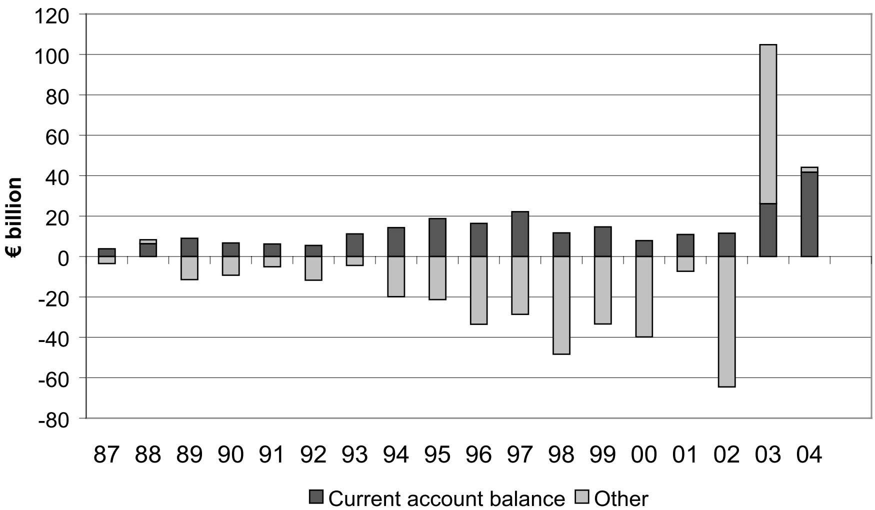
The question to be answered is: what are the reasons why the Dutch failed to build up a strong net external asset position, in spite of their high level of (institutionalised) savings. Before going to answering this question, I will first explain what the driving factors behind the international investment position of a country are.

10.3 The international investment position and the balance of payments

Most textbooks explain the international investment position (IIP) of a country from its balance on the current account [Pugel and Lindert (2000); Sawyer and Sprinkle (2006)]. A country with a savings surplus builds up international assets (or runs down debts), while deficit countries run down reserve assets or build up foreign debt. For many developing countries and emerging economies this equation may still hold. Most countries that have run into debt problems in the past, such as Mexico and other Latin American countries, first experienced a long period of current deficits.

For industrial countries, however, the current account balance is no longer the only or even the most important explanatory factor for the development of the IIP [Lane and Milesi-Ferretti (2005), Boonstra (2003)]. This is illustrated by figure 10.4, showing the annual change in the net IIP of the Netherlands, decomposed in the balance on the current account and 'other factors'. It appears from this figure that in most years these other factors are the dominant determinant of changes in the net Dutch IIP. Section 10.4 will give a detailed analysis of these other factors.

Figure 10.4 Change in International position (1987–2004)



Data source: website DNB, November 2006.

The reason behind the decreasing importance of the current account balance for the development of the net IIP is the emergence of large cross border holding of assets between countries. In the process of globalisation, companies have invested in other countries, both by establishing new plants and by buying foreign companies. Investors have diversified their portfolios over currencies and countries. This process of international investment is increasingly independent of national savings balances. If the outflow of capital exceeds the national savings surplus (if any), the difference can easily be financed on the global financial markets. Today, these investment flows are much larger than trade flows and are certainly much larger than current account balances. For example, even today the US, already by far the largest debtor in the world, is borrowing heavily abroad, not only in order to finance its current account deficit but also to finance a net outflow of direct and equity portfolio investment [Gourinchas and Rey (2005), Boonstra (2006a, b)].

This process has led to a situation in which the industrial countries are connected with huge gross cross-border investment positions, which is illustrated by figures 10.5 and 10.6. Therefore, the return on these cross-border positions becomes increasingly a determining factor of its own. It is important to realise that a large part of these returns is not registered on the balance of payments. Flows of dividends, interest payments and repatriated profits, of course, are registered on the income balance (a component of the current account) of the balance of payments, and efforts are being made to register reinvested profits as well on this balance. But adjustments of the book value of foreign direct investment and gains and losses on cross-border holding of securities do not result into cross-border cash flows and are therefore outside the scope of the balance of payments. As a result of the huge cross-border holdings, these capital gains or losses increasingly explain the movement of the international investment position, overshadowing the importance of the balance of payment flows.

Figure 10.5 Gross Foreign Assets (% GDP)

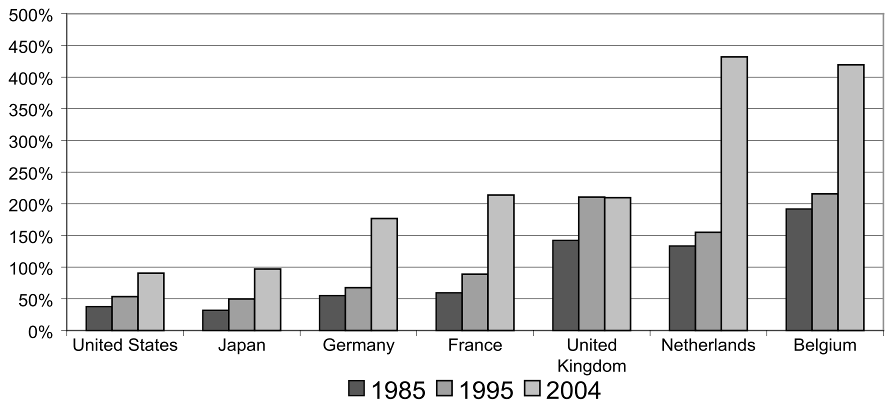


Figure 10.6 Gross Foreign Liabilities (% GDP)

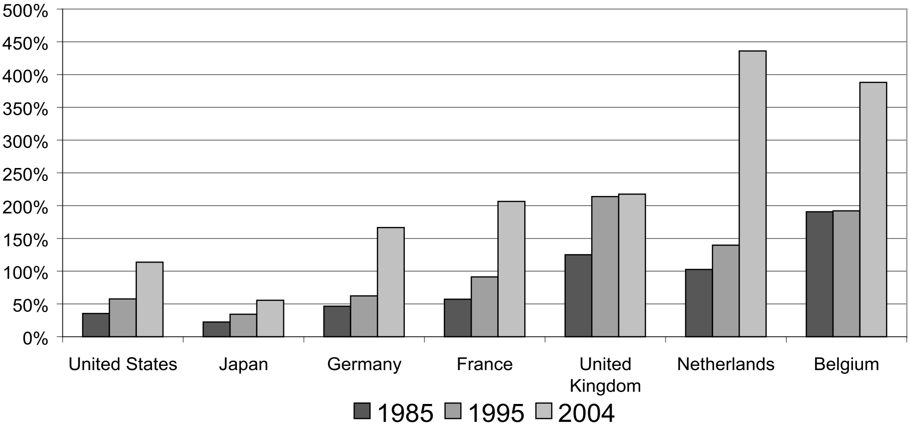
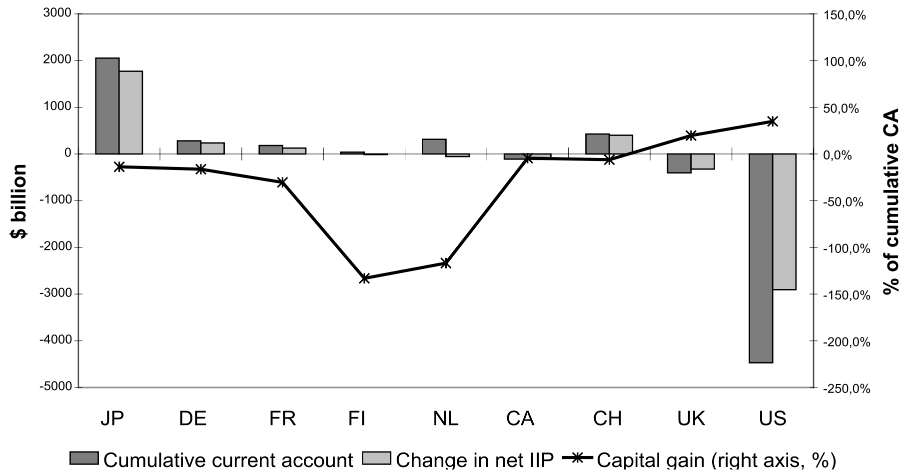


Figure 10.7 Change in net IIP and Cumulative Current Account



Source of figures 5 to 7: IMF, International Financial Statistics, April 2006 and yearbook 2005.
Note: Data over period 1981–2004, except France (1990–2004) and Switzerland (1984–2004).

Figure 10.7 illustrates this effect for a number of industrialised countries. It appears that especially for small open economies, such as the Netherlands and Finland, the cumulative current account balance is overshadowed by the change in the international investment position.

An important determining factor is the behaviour of the exchange rate. Again, the US is a good example. In the years 2002–2004 this country had a cumulative deficit on its current account of USD 1,671 billion. In spite of this dazzling figure, its net international investment position deteriorated by only USD 202 billion. This can be explained by a gain on its external assets of USD 1,469 billion, of which USD 919 billion can be explained by the so-called "currency effect" [BEA (2006)]. This is caused by the fact that a large part, estimated at 70%, of US foreign assets are denominated in foreign currency, while US liabilities are for the greater part denominated in dollars.

This development has, as expected, turned into its reverse in 2005. In that year, a relatively strong dollar has caused net currency losses on US foreign assets of more than USD 390 billion.

However, the exchange rate is only one of a range of factors that in today's world determine the return on cross-border assets. Sometimes a country becomes a victim of its own success. A strong performance of the local stock exchange can translate into an increasing foreign liability position. This is illustrated by the Finnish experience. In spite of a rather strong balance of payments performance, the net IIP of Finland deteriorated substantially due to the success of Nokia, because of the profits gained by foreigners on their holdings of Nokia shares[2].

In case of the US, such effects also play a major role. In 2005 US investors made a net profit on their international investment position of more than USD 1,000 billion. This happened in spite of the country's net liability position. Behind this superior performance is the large difference in composition between US foreign assets (mainly direct investment and portfolio equity investments) and its liabilities (overwhelmingly consisting of low yielding bonds). As a result, in 2005 the net IIP of the US deteriorated by only USD 110 billion, in spite of a current account deficit of USD 792 billion and the earlier mentioned currency losses of foreign holdings of more than USD 390 billion.

To summarise, the net result on the international investment position of a country is the sum of its current account balance, plus the balance of the capital gains (or losses) on its assets abroad minus the capital gains (or losses) made by foreign investors its domestic market. Determining factors of these capital changes are the size of cross-border assets and liabilities in relation to GDP, their composition (distribution across categories, such as direct investments, portfolio equities and bonds, and bank loans) and the relative success in investing abroad compared to the success of foreign investors in the home market.

In the next section of this article I will analyse the driving factors behind the Dutch international investment position. We will do this by breaking

[2] The Finnish example also illustrates the complex relationship between national wealth and the international investment position. The rise in value of Nokia shares will also have increased the wealth of this company's Finnish shareholders. Their increased wealth will almost certain have contributed to economic growth via positive wealth effects, leading to increased production and a higher Finnish GDP. Although the country has become richer thanks to Nokia, its external position in equity investment deteriorated from minus USD 21.9 at year-end 1996 to minus USD 206 billion at the end of 1999. However, thanks to the global collapse in IT-shares, the Finnish external position in equities improved to minus USD 66 billion at the end of 2002.

down the international investment position into its major components, i.e. direct investments and portfolio equity and debt investments. Next, I will analyse the underlying developments of each individual component.

It is important to realise, however, that this approach has its limitations, because events can have compensating effects across investment categories. This can be illustrated by an example from the Dutch experience. Ahold, a major Dutch company, has suffered serious losses on its direct investments in the US. This is part of the explanation of the poor Dutch performance in the category direct investment in the year 2002. However, these losses have contributed to a fall in the share price of Ahold on the Amsterdam stock exchange. Given the fact that a substantial part of the shares of Ahold was in foreign hands, a considerable part of the capital loss on Ahold shares was shared by foreign investors. From the Dutch perspective this was a positive factor for the relative return on cross-border equity holdings, which contributed to a substantial improvement of the net IIP in 2003.

10.4 The Dutch international investment position

Figures 10.1 and 10.2 in section 10.3 illustrate the in- and outflows of capital to and from the Netherlands. Initially, these flows were dominated by cross border direct investments. Later, from the mid 1980s onwards, portfolio investment flows took the upper hand.

10.4.1 Direct investment

Foreign direct investments aim at the acquisition of a controlling stake in a foreign company. They differ from portfolio investments in this respect, because portfolio investors usually do not aim at controlling the firm in which they invest. Direct investments involve so-called greenfield investments (the establishment of new production plants) and mergers and acquisitions. Moreover, they also include intra-company financial transactions (such as loans) between the parent company and the foreign subsidiaries.

The Dutch have a long history of investing abroad. The first registered Dutch foreign direct investment goes back to 1626, when the Dutch West Indian Company bought the island of Manhattan (for an amount of 60 guilders) from a group of local inhabitants. Van Nieuwkerk (2005) estimates the Dutch net foreign asset position at the end of the 18th century at more than 2.5 billion guilders, which at the time would have been equivalent to some 1,000% of GDP. In the 19th century, Dutch investors were on a very large scale involved in high risk investments in the building of US railways. However, in today's definition not all of these foreign assets were direct investments[3]. Before the

[3] In today's definitions these investments would be categorized as portfolio investment.

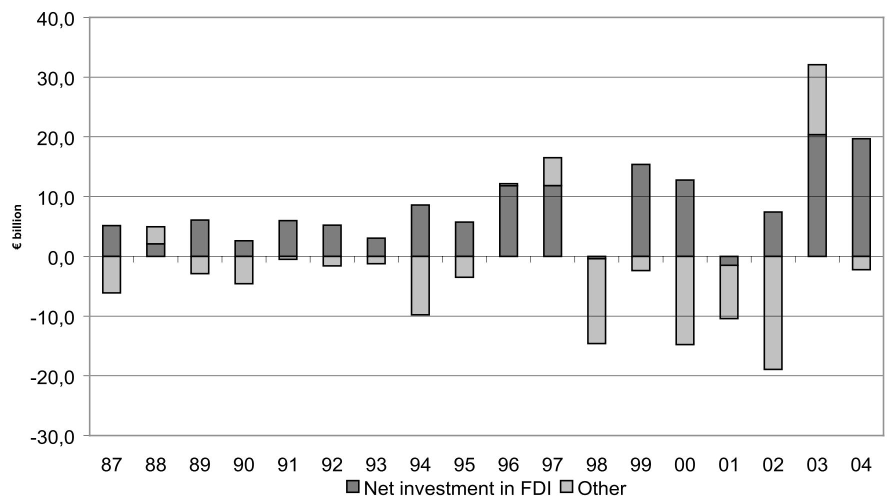
Second World War the Dutch were still among the largest investors in the US [Van Nieuwkerk and Sparling (1985), Van Nieuwkerk (2005)]. Today, with total assets in direct investment (2004) of EUR 439 billion, the Netherlands ranks number 6 in the global ranking of investing countries. Related to GDP, the country is second only after Belgium and Hong Kong.

The Netherlands is also host to many foreign companies. Several thousand of them have invested in the country, as they see the Netherlands – with its large harbours (Rotterdam, Amsterdam) and Schiphol airport – as an important gateway to Europe. This makes the country also one of the most important recipients of foreign direct investment [Hogenbirk (2002)].

10.4.2 Foreign direct investment by Dutch companies

Figure 10.8 illustrates the net outflow of Dutch foreign direct investments and the net change in its international direct investment position for the period 1987–2004. The difference between the two is the net result (capital gain or loss) on its direct investments abroad. Figure 10.8 illustrates that the Dutch have suffered large capital losses, especially at the end of the 1990s and the beginning of the new millennium.

Figure 10.8 Change in net FDI position



Data source: website DNB, November 2006.

These profits and losses have become larger and more volatile towards the end of the period. This illustrates the larger size of the investment stock, but also the fact that many of the large direct investment flows in the second half of the 1990s involved the takeover of quoted companies. In the past, many foreign direct investment assets were valued at historical costs, but today they are valued at market value[4].

In tables 10.1 and 10.2, the foreign direct investment flows from the Netherlands are analyzed more in detail. Table 10.1 summarises the changes in stock between 1986 and 2004, decomposed into balance of payment flows and other factors. The last column gives the average annual capital gains and losses during this period.

Table 10.1 Dutch foreign direct investment (1987–2004)

	Position End 86	Balance of payment flows	Other (net capital gains)	Position end 2004	Average annual capital gain (%)
Dutch Foreign Direct Investment	57.2	462.9	−81.2	438.9	−2.56
Foreign Direct Investment in the Netherlands	33.2	321.0	−9.2	345.0	−0.07
Dutch net FDI position	24.0	141.9	−72.0	93.9	

Data source: website DNB, November 2006.

Table 10.2 shows the size of the outflow to the most important destination countries and the change in book value of the foreign assets in these countries. These other factors consist of the impact of currency fluctuations, the depreciation of goodwill, and capital gains or losses on foreign assets[5].

Table 10.2 illustrates that the losses suffered by Dutch investors were largely concentrated in the US. The largest part of this finds its origins in currency losses (not in table). The weakness of the dollar during the years 2002–2004 alone has cost Dutch companies over EUR 40 billion in currency losses on assets in the US. In addition, over the whole period more than EUR 18 billion was lost due to amortization of goodwill and other losses on assets in the US. This outcome is supported by empirical evidence on the micro level[6].

[4] Another 'loss' in the category of direct investment abroad can be explained by the payment of goodwill. Goodwill payments are registered in the financial account of the balance of payments as a foreign direct investment, but are usually immediately written off by the parent company. Therefore, they are not reflected in the value of the foreign asset acquired and registered in the analysis of this article registered as a loss.

[5] The capital gains and losses on a foreign assets or liability are calculated as the difference between the actual value at the end of year T (as reported by DNB) and theoretical value (actual value of the direct investment position at the end of year T_{-1} plus the balance of payments flows investments in year T).

[6] For example, in 2001 and 2002 Ahold had to take losses on its US participations, especially US Foodservice, of USD 1.65 billion. Numico lost USD 1.8 billion on Rexall Sundown, Unicity and GNC. VNU lost almost USD 0.9 billion over the period 2000–2002 in amortization of goodwill. This list is far from complete.

Table 10.2 Dutch foreign direct investment: regional performance (1987–2004)

	Investment Flows	Change in Value	Difference
United States	109.1	45.6	−63.5
Belgium	43.3	35.1	−8.2
Luxembourg	21.9	24.0	2.1
United Kingdom	39.3	58.8	19.5
Germany	36.6	27.7	−8.9
France	27.1	25.0	−2.0
Italy	12.8	11.6	−1.2
Spain	12.7	17.3	4.5
Switzerland	22.3	26.7	4.4
Other	137.7	109.7	−28.0
Total	462.9	381.7	−81.2

Source: own calculations based on data from DNB as reported in November, 2006.

Germany is an interesting case as well. Dutch telecom operator KPN lost USD 6.6 billion and USD 14 billion in 2001 and 2002 respectively on its German participation in e-Plus. This illustrates also that the practice of valuing direct investments against market value has resulted in increased volatility in the value of participations. However, this also means that (parts of) it may be recovered in later years, which, in the case of Germany indeed happened. On the positive side, substantial capital gains were realized in the United Kingdom and, to a lesser extent, in Spain, Switzerland and Belgium.

All in all, the conclusion is that of the flow of EUR 463 billion of foreign direct investments by Dutch companies, EUR 81 billion was lost due to currency losses, the amortisation of goodwill and other capital losses[7].

10.4.3 Foreign Direct Investment in the Netherlands

As stated earlier, the Dutch economy is also a major recipient of direct investment from abroad. In the period 1987–2004 the inflow of foreign direct investment amounted to EUR 321 billion. The change in the value of the stock of foreign direct investment amounted to EUR 312 billion, which results in a valuation change made by foreign investors of minus EUR 9 billion (table 10.1). The annual average capital loss in this period amounted to a negligible

[7] Note also the remarkably large "other losses" in the category "other". There is no feasible explanation at hand. Further research here is necessary.

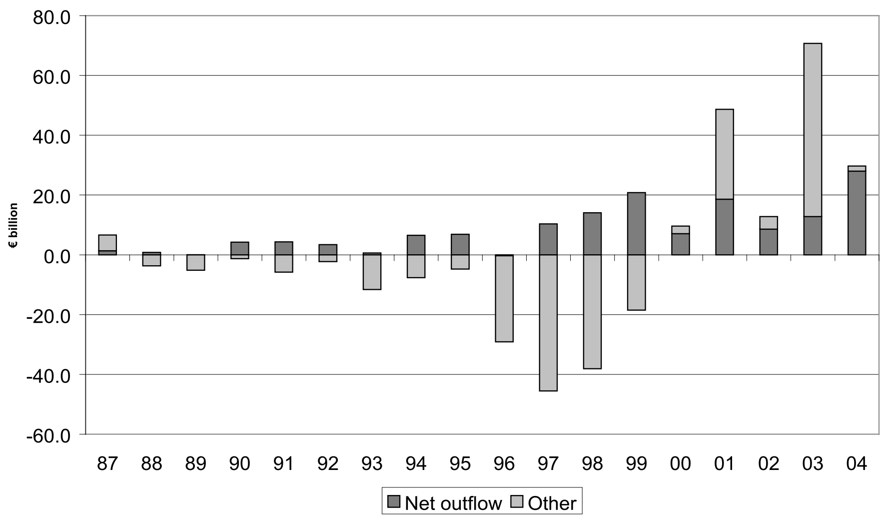
0.07%. This illustrates that foreign investors in the Netherlands fared better with their direct investments than their Dutch counterparts.

To summarise, our findings show that net direct investment abroad by Dutch companies between 1987 and 2004 amounted to an impressive total of EUR 142 billion. The improvement of the Dutch international direct investment position was much smaller (EUR 70 billion), however, due to large net capital losses by Dutch investors abroad of EUR 72 billion.

10.4.4 Equity portfolio investment

Dutch equity investors were relatively late in investing abroad. Initially, the Dutch pension funds invested overwhelmingly in Dutch State Loans. Only after the privatization of the public sector pension fund ABP in the middle of the 1980s they started to expand their equity portfolios. Once they were permitted to invest abroad, this has resulted in a substantial outflow of equity capital to foreign markets. Figure 10.9 illustrates the net foreign investment in equities by Dutch investors. It also shows that in most years the 'other' factors have dominated the development in the net international equity position.

Figure 10.9 Change in net equity position



Data source: DNB, November 2006.

Our detailed analysis of the development of the Dutch external position in equities starts with the year 1986, the first year in which we can distinguish between balance of payment flows of cross border investment in equities and in bonds (table 10.3). At the end of 1986, Dutch investors owned foreign equities for a total amount of EUR 18 billion. In the years 1987–2004 they made net investments of EUR 216 billion in foreign equities. In addition, they made net capital gains on their portfolio of foreign equities totalling EUR 91 billion.

Foreign investors, on the other hand, owned EUR 37 billion in Dutch equities at the end of 1986. They invested in total EUR 68 billion in Dutch equities, but made in addition capital gains of an impressive EUR 163 billion. At the end of 2004, they owned EUR 268 billion in Dutch equities.

In short this means that although net cross border purchases of Dutch equity investors exceed foreign purchases of Dutch equities by EUR 148 billion, the Dutch net international position in cross border equity holdings improved relatively little with EUR 77 billion. This was due to the fact that foreign capital gains on Dutch shares exceeded Dutch capital gains on foreign shares by EUR 72 billion.

Table 10.3 Dutch cross border equity investment 1986–2004 (EUR billion)

	Position end 1986	Balance of payment flows	Other (net capital gains)	Position end 2004	Average annual capital gain (%)
Dutch investments in foreign equities	18.0	216.2	91.1	325.3	8.24
Foreign investments in Dutch equities	37.0	68.1	162.6	267.7	12.30
Dutch net cross border position in equities	–19.0	148.1	(*) –71.5	57.6	

(*) A negative sign means that foreign capital gains on Dutch equities are larger than Dutch capital gains on foreign equities.

Data source: DNB, November 2006.

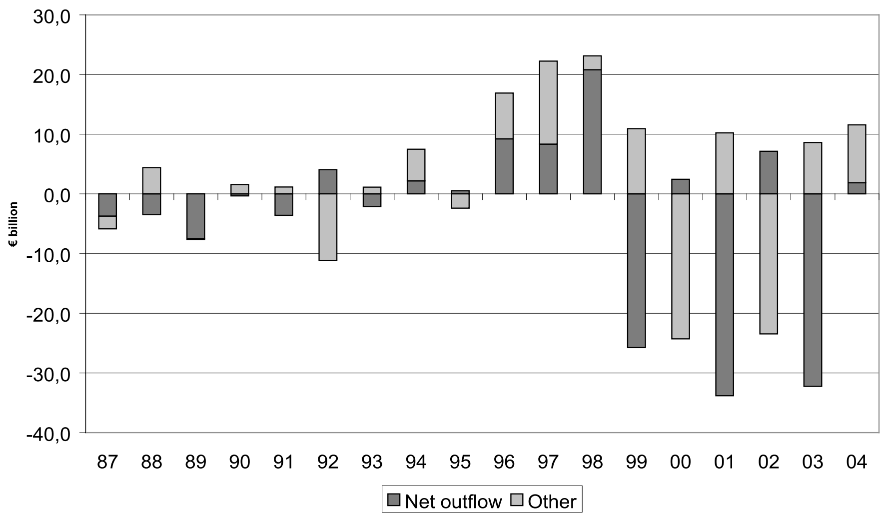
The capital gains made by Dutch investors on equities abroad amounted to an annual average of 8.24%. However, one must realise that the Dutch currency over the largest part of this period, the Dutch guilder, was one of the strongest currencies in the world. Measured in nominal trade weighted terms, the annual appreciation of the guilder against the rest of the world amounted to an annual average of 0.73%. After correction for this structural currency loss the capital gains made by Dutch equity investors abroad amounted to an annual average of 8.97%. However, even this yield is overshadowed by the result of foreign equity investors in the Dutch market. Their annual average capital gains amounted to 12.30%.

Foreign results on investments in Dutch equities have structurally exceeded the investment result of Dutch equity investors abroad. Several explanations have been mentioned for this phenomenon. One very important explanation is the fact that on average the Dutch stock markets in most years had outperformed most foreign markets. A second possible explanation, suggested by Kusters (1997; 1998) is that foreign investors outclassed their Dutch counterparts. It is indeed a fact that foreign investors structurally outperformed the average performance of the AEX (the Dutch stock index, reflecting the average market performance) [Boonstra (2005)]. However, there is a good explanation for this. It is likely that foreign investors have concentrated their investments in Dutch equities in the large Dutch multinational companies, such as Ahold, Royal Dutch/Shell, KPN and Philips Electronics, the internationally best-known Dutch stocks. During a large part of the period 1997–2004 these stocks were among the star performers of the Dutch stock exchange. Indeed, after collapse in the price of KPN and Ahold in early 2002 foreign investors failed to outperform their Dutch counterparts. The poor performance of the Dutch stock exchange in the years 2002 and 2003 resulted, quite paradoxically, in a strong improvement of the Dutch external wealth position. In those years the losses of foreign investors in their holding of Dutch shares exceeded the losses of Dutch equity investors abroad.

10.4.5 Bond portfolio investments

Figure 10.10 illustrates the net change in the international investment position in bonds, subdivided in net balance of payments flows and 'other' changes. It appears that in most years the balance of payment flows dominated the other factors.

Figure 10.10 Change in net position in bonds



Data source: website DNB, November 2006

Dutch holdings of foreign bonds amounted at year-end 2004 to EUR 452.3 billion, up from EUR 18.7 billion at the end of 1986. This increase of nearly EUR 434 billion can be decomposed in balance of payments flows of EUR 393 billion and a cumulative capital gain of EUR 41 billion. Annual average capital gains on bonds were 2.35%.

In this case, foreign bond investors in the Netherlands were beaten by Dutch bond investors abroad. Foreign capital gains on Dutch bonds were on average 1.10%. The Dutch net international investment position in bonds deteriorated over the period 1986–2004 by EUR 43 billion. This is fully explained, however, by the fact that the inflow of foreign investment in Dutch bonds exceeded the outflow of Dutch investments in foreign bonds by EUR 56 billion. This was partly compensated by the fact that Dutch capital gains on bond holdings abroad exceeded foreign capital gains on Dutch bonds by EUR 13 billion (table 10.4).

Table 10.4 Dutch cross border bond investment 1986–2004 (EUR bn)

	Position end 1986	Balance of payment flows	Other changes	Position end 2004	Capital gain (%)
Dutch investments in foreign bonds	18.7	393.1	40.5	452.3	2.35
Foreign investments in Dutch bonds	19.3	449.1	27.0	495.3	1.10
Dutch net cross border position in bonds	−0.6	(**) −56.0	(*) 13.5	−43.0	

Data source: website DNB, November 2006.

If we correct the capital gains made by Dutch investors on their bond portfolio for the currency loss, estimated at an average of 0.73% per year, their capital gain net of currency losses amounted to an annual average of 3.08%, well above the capital gain made by foreign investors on Dutch bonds. This can be explained by the convergence in interest rates within Europe in the run up to EMU. As yields on foreign bonds converged to Dutch levels (already amongst the lowest in Europe), Dutch investors could make substantial capital gains on their portfolio of foreign bonds.

Dutch bond investors did a relatively good job abroad, although part of it was spilt by currency losses. Nevertheless, on balance they made a net gain of almost EUR 31 billion.

10.4.5 The total return on cross border assets

In the previous sections we limited the discussion on the yield made on cross border portfolio investments to the capital gains. This can be justified as we tried to explain the change in the Dutch international investment position that cannot be traced back to balance of payments flows. Payments of profits, dividends and interest are usually registered on the income account, which is included in the balance on the current account.

However, the disadvantage of this approach is that it fails to give complete information on the relative investment performance of Dutch and foreign cross-border investors. Therefore, for the sake of completeness, we discuss in this paragraph briefly the total returns made by Dutch investors on their international securities portfolio and the other way around.

Table 10.5 Total yield on foreign securities
(EUR billion unless stated otherwise)

	Dutch foreign direct investment	Dutch investments in foreign equities	Dutch investments in foreign bonds	Foreign direct investment in the Netherlands	Foreign investments in Dutch equities	Foreign investments in Dutch bonds
Change end 1986–2004	381.7	307.3	433.6	311.8	230.7	476.0
Balance of payment flows	462.9	216.2	393.1	321.0	68.1	449.1
Capital gains (+) or losses (–)	–81.2	91.1	40.5	–9.2	162.6	27.0
Dividend/interest payment	222.0	28.6	111.4	145.6	60.9	120.3
Total yield	140.8	119.7	151.9	136.4	223.5	147.2
Capital gain return (%)	–2.56	8.24	2.35	–0.07	12.30	1.10
Dividend/interest payment (%)	6.99	1.68	6.66	7.66	2.80	6.12
Total return incl. currency effect (%)	4.43	9.92	9.02	7.59	15.1	7.23
Currency gains/loss (%)	–0.73	–0.73	–0.73	N/A	N/A	N/A
Total return without currency effect (%)	5.16	10.40	9.75			

Data source: DNB

The results are summarised in table 10.4. The first conclusion is that the total return on Dutch foreign direct investments is structurally lower than the return made by foreign investors on their Dutch direct investment. This is due to the large capital losses made by Dutch companies abroad, especially in the US. Moreover, it appears that foreign equity investors, compared with their Dutch counterparts, not only had superior capital gains, but they received higher dividend yields as well. However, in the category bonds, results of Dutch investors were boosted by relatively high interest income. This reflects the low inflation and low interest rate environment of the Netherlands. Coupons of foreign bonds were usually substantially higher than coupons on Dutch bonds. In addition, international convergence of interest added to capital gains made by Dutch bond investors abroad.

10.5 Summary and conclusions

The Netherlands have a high level of institutionalised savings, due to its capital based pension system. This has contributed to a structural national savings surplus, which was invested abroad. Despite its massive cumulative surplus of EUR 245 billion over the period 1987–2004, the country has failed to emerge as a major credit nation. To the contrary, the Dutch net international investment position over this period deteriorated on balance by EUR 14 billion.

Table 10.6 Summary: Change in Dutch net IIP and its components, 1987–2004 (EUR billion)

Cumulative current account balance	245
Cumulative balance on the capital account	–16
Cumulative errors and omissions	–56
Corrective cumulative balance on the current account (*)	**174**
Change in international investment position	–14
Net capital gain (+) or losses (–)	**–188**
of which:	
net losses in direct investment abroad	–72
net losses in portfolio equity investment	–72
net gains in portfolio bond investment	14
net losses in official reserves	–13
net other gains (+) or losses (–)	–45

(*) calculated as the sum of the current account, the capital account and cumulative errors and omissions.

This article has explored the most important mechanisms behind this disappointing development. It appears that for industrial countries, due to the very large cross border positions in direct and portfolio investments, the capital gains and losses on cross border assets and liabilities have much more impact on the net international investment position than the balance on the current account. In this respect, the Dutch experience mirrors that of the United States of America. Although the large current account deficits have led to a gradual deterioration of the US net international investment position, the rate of deterioration is much slower than one would expect.

Table 10.6 summarizes the Dutch experience. It shows that huge net losses on foreign direct investments and to a lesser extent on its cross border holdings of equities and bonds form a large part of the explanation. In case of the direct investments, there were massive losses by Dutch companies in the US. As concerns the cross border holdings of securities, foreign equity investors usually realized higher capital gains on their portfolio holdings of Dutch securities than the other way around. To put in another way: the Netherlands were punished for a relatively good performance of the Dutch stock exchange by a deterioration of its international investment position. In addition, the Dutch have paid a high price for the strength of their currency, which resulted in huge currency losses on foreign assets.

In total, an amount of assets comparable with the total size of the Dutch public debt has gone up in smoke in a couple of decades. This is an unintended and irrational way of spending national wealth, which however has gone largely unnoticed. Even today, many Dutch policy makers still think that the country has a large net international asset position as a result of the huge cumulative current account surpluses of the past [Van Ewijk et al. (2006)]. The lack of a visible substantial net foreign asset position is attributed to statistical problems.

10.5.1 Lessons to be learned

The Dutch experience shows that, in today's integrated world markets, a strong balance of payments is no guarantee at all for a strong international investment position. Especially for small, open economies with large cross border assets and liabilities the size of the national savings surplus can easily be dwarfed by the net capital gains or losses on the international investment position.

As a result, one can put large question marks at the wisdom of a policy that aims to generate huge national savings surpluses by the creation of a high degree of institutionalised pension savings and/or budget surpluses. On a more general level: under worldwide funded pension systems, net pension income from abroad is zero and the only net real benefit (in the sense of higher aggregate consumption) would have to come from lower interest rates and higher investment. For individual countries, such a savings policy is only rational in a world in which other countries have saving deficits, due to a high level of productive investments. Only when countries are confronted with the ageing of their populations in an asynchronous way the creation of structural savings surpluses can help in the preparation for the ageing phenomenon. Under that scenario, countries with a relatively fast ageing population can invest their surpluses in more dynamic, younger emerging countries. Only then one will be able to create a useful financial buffer in anticipation of future trade deficits.

However, today almost all emerging economies have savings surpluses themselves, which makes it for industrialised countries with a savings surplus difficult, if not impossible, to find a productive employment for it. If all countries start to create savings surpluses at the same time, they will simply add to the 'global savings glut' which ultimately disappears into the world's large black hole: the US deficit on the balance of payments [Bernanke (2005)]. In the case of the Netherlands a large part of the cumulative national saving surpluses already has disappeared in this black hole, from which most of it probably will never reappear. And once the dollar starts to depreciate further, future losses may be even larger.

Today, the policy debate in the Netherlands still focuses to a large extent on the question how to prepare the public finances for the challenges posed by the ageing of the population. This, indeed, is a major challenge, given the high ambition level of the Dutch social security and pension systems. There is no doubt that in the future budget surpluses will be the norm, and deficits the exception.

At the same time, however, the benefits of the creation of a large national savings surplus are taken for granted by policy makers. In my opinion, it is very important that policy makers, when preparing for ageing, not only concentrate on public finances but also face the question how to create a business climate in which the private sector can employ the public savings surpluses in a productive way. The Dutch experience shows, that it is far from certain that the creation of extremely large national savings surpluses is of any help in meeting the challenges of ageing.

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11 The Impact of Projected Demographic Developments on Funded Pension Provision in Austria

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11.0 Abstract

The following study analyzes the impact of demographic developments in Austria (and in the OECD) on funded pension provision in Austria. It does so by integrating demographic developments into a standard growth model, linking the results to the accumulation and annuitisation of funded pensions. Furthermore, the simulations introduce the possibility of the international diversification of investments and consumption as well as the integration of real capital markets. The simple structure of the model allows us to conduct a number of sensitivity analyses. Furthermore, it helps to identify the the underlying interactions at work in obtaining the overall results. The key results of this study are the following: (1) Households' net supply of savings and the demand for capital by the corporate sector (net investment) both need to be integrated into the empirical and theoretical analysis of the impact of demographic developments on financial markets. Focusing solely on the relative supply and demand for financial assets within the household sector (as is done in the asset meltdown literature) does not provide the adequate conceptual framework. (2) Funded pension provision is exposed to two demographic risks: decrasing birth rates and increasing longevity. On the one hand, lower expected growth rates of the input labour are expected to exert downward pressure on long-term real interest rates and future funded pension income. Increasing longevity further reduces future funded pension income. (3) On the other hand, decreasing future net savings relative to net investment partly exert upward pressure on the long-term real interest rates. The net impact is evaluated based on a simulation exercise. (4) In public discourse, the superiority of funded pension provision is argued on the basis of demographic change, which is supposed to make public pension provision unsustainable. The model and the simulations in this paper highlight the impact of demographic change on funded pensions and its dynamics as well as quantify the order of magnitude of this impact. The negative impact of demographic change on funded pension provision is non-negligible.

11.1 Introduction

The need to cut down benefits in public pay-as-you-go systems is defended by the inevitable impact of demographic change. At the same time, private funded pension provision is tax subsidized in many OECD countries (i.e. Austria), as if it were not subject to the negative impact of demographic change. This paper questions the implicit assumption that private pension provision would not be negatively affected by demographic change. Its impact on funded pensions is frequently discussed in economic literature on the basis of the “asset meltdown” hypothesis. According to this theory, an increase in the share of pensioners as a percentage of the total population (or relative to the working age population) triggers a decline in asset prices, as pensioners dissave in old age and, owing to this demographic development, there might be fewer economically active persons that actively save than dissvares who act as sellers in the capital markets. Following a methodical critique of this hypothesis, an alternative conceptual framework is presented. Within this framework, the main mechanisms are identified that are of cardinal importance for the interaction between demographic developments and funded pension provision. Since some of the effects identified work in opposite directions, their relative significance within the conceptual framework is examined by means of quantitative simulations. The purspose of the simulations is to provide an insight into the relative strength of the opposing effects at work and should be interpreted as forecasts.

The paper is structured along the following lines: Section 11.2 provides a brief overview over the expected demographic developments in Austria until 2050. Section 11.3 presents a summary of the main instruments of private pension provision in Austria. Section 11.4 discusses the literature on the impact of demographic change on the macroeconomy and on financial markets (i.e. long-term real interest rates). In section 11.5, demographic change is integrated in a neoclassical growth model with Harrod-neutral technological progress to analyse its impact on the long-term returns of funded pension provision (i.e. the long-term real rate of interest). Section 11.6 links the long-term real interest rate to funded pension provision. In section 11.7 the model dynamics are simulated based on data, on which the Austrian Committee for Long-Term Pension Sustainability relied as well. Section 11.8 summarises and concludes the paper.

11.2 Demographic Developments in Austria

According to Statistics Austria (2003), the Austrian population is projected to grow modestly from 8.13 million to 8.21 million until 2050 thanks to positive migration growth, in particular (Table 11.1).

Table 11.1 Population Structure in Austria from 2000 to 2050

	2000	2020	2050	2000	2020	2050
Age		in thousands			in %	
0 to 14	1,351	1,180	1,087	16.64	14.17	13.25
15 to 65	5,510	5,455	4,782	67.85	65.5	58.27
over 65	1,260	1,693	2,337	15.51	20.33	28.48

Source: Statistics Austria (2003).

Despite positive migration growth, a significant change in the population's age structure is expected. The share of people of employable age (15 to 65) will fall from 67.85 percent in 2000 to 65.5 percent in 2020 and amount to only 58.27 percent in 2050. In addition, the share of children and adolescents (aged 0 to 14) will decline from 16.64 percent (in 2000) to 14.17 percent (in 2020) and fall to 13.25 percent in 2050. According to Statistics Austria, the birth rate is expected to be constant between 2002 and 2050 with 1.4 births per woman aged 15 to 45. Until the year 2050, life expectancy at birth will increase from 75.8 years (for men) and 83 years (for women) in 2002 to 80.2 and 88 years, respectively. The life expectancy of 60-year-olds will rise from 20.1 (for men) and 24.2 (for women) to 25.5 and 29.4 years, respectively.

Two demographic factors are of particular interest for the following analysis: (1) the long-term average rise in the number of economically active people and (2) the ratio of not economically active to economically active persons. The average rise in the number of economically active persons over the respective preceeding 20-year period will fall steadily from 0.3 percent (in 2002) to –0.16 percent (in 2030) to then rise back slightly to –0.05 percent by 2050. The ratio of not economically active to economically active persons will increase from about 83 percent (in 2000) to some 97 percent in 2050.

11.3 Funded Pension Provision in Austria

What is the extent of funded pension provision in Austria? Table 11.2 shows that, in the period from 1999 to 2005, passbooks on which a total of some EUR 114 billion were the most important savings vehicle (23.57 million savings accounts of domestic nonbanks, of which around 5.67 million were building loan contracts). However, no distinction can be made between long-term pension provision in the form of the passbook and short-term saving motives. Traditional life insurance with some 9.5 million individual and group policies (in 2003) and a premium reserve fund of around EUR 46 billion (in 2005) is widely used. Since 1999, savings products geared more to capital markets have gained in relative importance. In particular, demand for retail funds (about EUR 112 billion, including some 83,000 contracts of the tax-subsidized 'Prämienbegünstigte Zukunftsvorsorge'[1] offered by investment companies, KAGs), unit and index-linked life insurance policies (including another 686,000 contracts of the 'Prämienbegünstigte Zukunftsvorsorge' offered by insurance companies) and pension funds (about EUR 11 billion and some 440,000 beneficiaries, including prospective beneficiaries) has grown following the debate on the stability of the public pension system. At EUR 696 million, the volume of severance funds is still low despite some 3.3 million qualifying periods, as these funds were introduced only in 2003.

Table 11.2 Key Long-Term Saving Vehicles in Austria from 1999 to 2005 (EUR million)

	1999	2000	2001	2002	2003	2004	2005
Occupational pension funds (total assets)	7,300	7,833	8,037	7,876	9,122	10,126	11,549
Severance funds (assets of collective investment funds)	–	–	–	–	146	363	696
Life insurance premium reserve funds*	28,323	31,192	33,802	35,656	37,645	41,390	45,898*
Passbooks excluding building loan contracts	105,869	102,942	110,841	110,481	114,472	112,806	113,863
Building society savings	15,998	16,278	16,644	16,504	16,923	17,680	17,945
Retail funds**	–	68,142	74,076	73,483	81,187	90,654	112, 716
Of which pension investment funds	–	217	179	238	373	711	

Sources: FMA, OeNB, OeKB, Austrian occupational pension fund association, adapted by FMA 2004; * Estimated reinsurance values for 2005. Domestic insurance companies excluding small mutual insurance companies. ** Retail funds minus investment by mutual funds in domestic investment certificates.

The volume of funded pension options (in particular, pension funds, severance funds and 'Prämienbegünstigte Zukunftsvorsorge') is therefore relatively high overall given that they were introduced rather late compared to other countries (i.e. Netherlands, Switzerland, UK, US). Nevertheless, the combined investments of funded pension provision already amount to

[1] This third-pillar product was introduced in 2003.

some 25 percent of GDP, which ranks Austria 15th among OECD countries with respect to the relative size of funded pension provision.[2] For a while, the accumulated contributions and the number of contracts will remain well below those of savings and building loan contracts. In the next few decades, however, funded pension provision will make considerable advances and gain in relative importance, as these are long-term capital accumulation products with increasing coverage and partly compulsory membership for employees (severance funds).

To analyze the impact of demographic developments on funded pensions, there are basically two starting points: (1) Consumption by not economically active persons arises from property rights and social security claims on national income that is generated by economically active persons, thereby inducing nonconsumption by the latter – provided the consumption is not funded by capital income. (2) The decline in the number of economically active persons impacts on economic growth, capital productivity and the demand for capital. The first correlation is generally discussed primarily within the framework of the "asset meltdown" hypothesis and largely in isolation from the second. In this study, a conceptual framework is developed to facilitate the integrated analysis of both these effects.

11.4 The Impact of Demographic Change on the Macroeconomy and on Financial Markets: The Literature

The following section analyses the literature on the impact of demographic change on the macro-economy and financial markets. A number of recent studies analyse the impact of demographic change on the macro-economy.[3] The main issues investigated are: how will ageing affect GDP growth per capita and labour productivity.

The OECD (2005) analyses the impact of demographic change on economic growth in France, Germany, Japan and the USA. It projects that demographic change will have a modestly negative impact on GDP growth per capita. In order to take into account policy responses to demographic change, the study

[2] OECD (2006). Latest data refers to 2004.

[3] Inter alia Börsch-Suppan, Köke, Winter (2004), EPC/EC (2006), Kozu, Sato, Inada (2003), McCarty, Neuberger (2003), OECD (2005), Young (2002). The approaches are very similar in all the studies. They utilise a general equilibrium approach based on an overlapping generations-model (OLG). The supply side of the economy is modelled as standard aggregate production function based on two inputs (capital and labour) and increases in aggregate labour productivity (capital deepening and total factor productivity) as well as in the quality of labour. Under the assumption of perfect competition on output and input markets the real wage and the real rate of interest are the marginal productivities of labour and capital, respectively. The household sector is partitioned into overlapping generations. Each generation is modelled as maximising lifetime utility based on a standard utility function and an intertemporal budget constraint under certainty. The rationality assumptions underlying this approach are extreme as is the convention to abstract from uncertainty. The simulations based on these OLG-models utilise demographic projections until 2050.

analyses the impact of pension reforms that encourage personal long-term savings as well as policies that aim at increasing participation rates, individual labour productivity and the quality of labour. In all four countries GDP growth per capita is projected to average about +1.4 to +1.6 percent per annum until 2050,[4] which implies that living standards double over the next 45 to 50 years. A comparison of these results with a baseline scenario (with an average GDP growth rate of about 1 percent) highlights the significant positive impact of policy responses to increase participation rates, individual labour productivity and the quality of labour.[5] For the EU-25 EPC/EC (2006) projects GDP growth per capita to average +1.7 percent until 2050. It declines from 2.4 percent (2004 – 2010) to 1.9 percent (2011 – 2030) and, finally, to 1.2 (2031 – 2050).

According to EPC/EC (2006) and OECD (2005) the contribution of a declining labour input (employees × average hours worked per year) to GDP growth per capita will be very modest.[6] In addition, the data published in Timmer, Ypma, van Ark (2003) shows that the growth contribution of labour input in the EU-15 was negative in the period 1980 – 1995 (– 0.2 percentage points per annum on average). Daveri (2001) estimates the growth contribution of labour to be – 0.46 percentage points p.a. on average in the period 1991 – 99. Doppelhofer (2006) presents data for the OECD covering the period 1960 to 2000. The average GDP per capita growth rate was 2.69 percent p.a., of which 2.46 percentage points were attributed to total factor productivity growth, 0.61 to education (human capital growth), 0.19 to capital deepening, and – 0.57 percentage points to labour input. Table 11.3 compares historical values of GDP per capita growth rates in the Euro-area with the data in EPC/EC (2006). Over the period 1980 to 2005 the average growth rate was 1.75 percent p. a. slightly above the projected value of 1.5 percent p.a. The historical impact of labour productivity growth was 1.9 percent p.a. and slightly higher than projected value of 1.6 percent p.a. The historical contribution of labour input was – 0.2 percent p.a., twice the projected value of -0.1 percent p.a. The projected growth rates of GDP per capita are higher for the period 2004 to 2030 than the historical values, because the contribution of labour input is projected to be even higher in the next 25 years than in the past. The modest impact of demographic variables over the very long horizon until 2050 is largely due to the fact that population growth affects GDP growth per capita only via the growth rate of labour input, i.e. the participation rate

[4] This is roughly in line with average GDP growth per capita in Western Europe (AT, BE, DK, FI, FR, DE, IT, NL, NO, SE, CH, UK, GR, IE, PT, ES) in 1973 – 1998 with 1.78 percent per annum (Maddison 2001, Table A1-d).

[5] See also Maddaloni et al. (2006).

[6] In the EU-25 the contribution of the declining share of working age population is – 0.3 percentage points and is mostly compensated for by an increase in the employment rate (+0.2 percentage points). In FR and in the USA the direct impact of labour input growth rate on GDP growth per capita amounts to +0.1 and +0.6 percentage points per annum until 2050. The corresponding values for DE and JP are – 0.1 and – 0.7 percentage points, respectively.

among the working age population, the unemployment rate, and hours worked need to be taken into account in addition to demographic variables.[7]

Table 11.3 Projected GDP per capita growth rates in the Euro-area set in relation to historical values for the period 1980 to 2005*

	GDP per capita	Labour productivity	Labour input
Historical values			
1981–90	2.0	2.5	–0.5
1991–95	1.1	2.3	–1.2
1996–00	2.5	1.7	0.9
2001–05	1.2	0.7	0.5
Historical average	1.75	1.9	–0.15
Projections**			
2004–30	1.8	1.6	0.2
2004–50	1.5	1.6	–0.1

Source: * Gomez-Salvador et al. (2006, Table 2, page 22); * *EPC/EC (2006, Table 2–10, 2–12 and 2–13).

What accounts for the projected decline in GDP growth per capita if not demographic change directly? Latzer and Schmitz (2002) review studies on growth accounting which show that GDP growth in the EU in 1980–2001 was driven by the dynamics of the capital stock and labour productivity (capital deepening and total factor productivity) rather than by the evolution of labour input. The low contribution of labour input was largely due to a low utilisation of labour in the EU. Comparing the data in EPC/EC and OECD with the results in Timmer, Ypma and van Ark (2003, p. 49, 50) demonstrates that the lower growth rates in the projections until 2050 are largely due two sources: (i.) the lower projected growth of labour productivity (Table 11.4) and (ii.) the lower contribution of the growth of capital services (capital deepening) than in the past. The latter is a consequence of the assumption that capital per efficiency unit remains constant from 2030 to 2050 in the EPC/EC (2005) study and after 2080 in the OECD (2005) study. Timmer et al. estimate that the growth rate of the capital stock was 3.54 percent p.a. in 1980–2001 in the EU and exceeded the growth rate of efficiency units of roughly 2.2 (Timmer et al. (Tables 6, 10, 11)). The EPC/EC assumes that the growth rate

[7] In 1950–1998 the employment rate in 12 Western European countries (Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland and the UK) remained stable at around 43.5 percent of the population, while the hours worked per capita dropped by 27.3 percent (Maddison 2001, Table 3–7). The development of working hours outweighed the impact of population growth on total hours worked per year (–8.5 percent over the entire period), so that the 12 Western European countries already experienced a decreasing labour input from 1950 to 1998.

of labour productivity is 1.7 percent p.a. and the growth rate of labour supply is –0.07 percent p.a. (2003–2050). Therefore, the implied growth rate of the capital stock is 1.63 percent p.a. for the period 2003 to 2050, which is well below the historic value of 3.54 percent p.a. The OECD assumptions imply that the growth rate of the capital stock of around 0.9 to 1.3 percent p.a. for FR, DE, JP and the USA for the period 2001–2050. This is below the implied historic values for the period 1980 to 2000 according to Jorgensen (2001, Tables 3.3 and 3.8) which are 2.8 percent (FR), 3.3 percent (DE), 3.9 percent (JP) and 2.9 percent (USA). Historically the growth rate of the capital stock substantially exceeded the historic growth rates of the efficiency units which ranged from 1.3 (JP), 1.4 (FR), to 1.5 (USA) 1.6 (GE) percent p.a.

Table 11.4: Sources of average aggregate labour productivity growth per annum in the European Union (EU-15) from 1980–2001 and from 2004 to 2050 (in % p.a.)

		1980–1990*	**1990–1995***	**1995–2001***	**Average 1980–2001**	**2004–2050****
Average labour productivity		2.28	2.43	1.37	2.06	1.7
of which	Contribution of capital deepening	1.16	1.30	0.90	1.12	0.60
	Contribution of total factor productivity	1.12	1.14	0.46	0.94	1.10

Sources: *Timmer, Ypma, van Ark (2003) [excl. LU] and **EPC/EC (2005). The data in this table can deviate from the data in Table 4, which refers to the Euro area only.

Börsch-Suppan, Düzgün and Weiss (2005) discuss a large number of studies from different fields on the impact of ageing on labour productivity. They conclude that neither the gerontological nor the organisational or economic analyses reveal a systematic relationship between ageing and individual labour productivity. Furthermore, studies that investigate the effects of potential ageing-induced changes in individual labour productivity on aggregate labour productivity cannot identify a relationship.

To sum up, the quantitative studies of the impact of demographic change on the macro-economy conclude that demographic change has a negative impact on GDP per capita growth in 2004–2050. But the results are mainly due to the assumption of low productivity growth, while the contribution of the development of labour input is only very modestly negative and in some countries even positive. A shrinking labour input is nothing new for Western

Europe; it has been shrinking since WWII. The projections are driven by low assumptions concerning capital accumulation and total factor productivity growth. But since the growth contribution of labour was significantly negative since 1980, the projected results are still around the GDP per capita growth rates of recent history. But the projections allow for another conclusion: they emphasise the positive impact of policies that aim at increasing participation rates, individual labour productivity and the quality of labour.

We distinguish two main approaches to investigate the impact of ageing on financial markets: one rests on simulations based on highly stylised general equilibrium OLG models and the other on the econometric analysis of historical data[8].

Based on the simulation approach, OECD (2005) finds that the impact of demographic change on the *long-term real rate of interest* relies largely on policy responses in the area of public pay-as-you-go pension systems. If the burden of adjustment in public pension system rests entirely on rising contribution rates, the simulated real rate of interest would fall in all countries from around 4.5 percent in 2000 by 0.3 – 0.7 percentage points until 2025. In FR and the USA it would again increase afterwards. In DE and JP it would basically flatten out at 3.7 – 4.0 percent. If the burden of adjustment in public pension systems rests on significant reductions of the replacement ratio for new beneficiaries, perfectly rational households adjust their savings rates immediately[9]. This amplifies the substitution of labour by capital (capital deepening) and reduces real interest rates by 0.9 – 1.2 percentage points to 3.3 – 3.6 percent until 2025. Real rates tend to stabilise at these lower levels in FR and the USA, but continue to decline markedly in DE and JP. The results suggest that if shifts to funded pensions increase long-term savings, it has a non-negligible, negative impact on real interest rates.

The simulations allow for neither international diversification of financial assets nor for the international integration of input and output markets. Börsch-Suppan, Köke and Winter (2004) suggest that international diversification further reduces the impact of ageing on financial markets, but that this comes at the price of increased uncertainty due to political and exchange rate risk[10]. International diversification in the accumulation phase would be accompanied by a balance of trade surplus and by a balance of trade deficit in the de-accumulation phase to avoid adverse effects of ageing on the terms of trade.

McCarthy and Neuberger (2003) conclude that the results of the simulation studies on the impact of *financial markets* are very sensitive to the way policy

[8] Bosworth, Bryant, Burtless (2004), Davis, Li (2003), England (2002), Geanakoplos, Magill, Quinzii (2002), Maddaloni et al. (2006), Miles (2002), Poterba (2004), Young (2002).

[9] The OECD assumes that the replacement ratio were optimal for households in the previous regime, which is not obvious, as participation in the public system was not voluntary.

[10] However, one has to bear in mind that many of the companies listed on national stock exchanges represent portfolios of internationally diversified activities themselves. Thus, the focus on the portfolio shares of national markets underestimates the degree of diversification.

responses are accounted for in the models. In most studies demographic change reduces real returns by 0.2 – 0.45 percentage points by 2020, which is low compared to the volatility of real returns in the past. The modest impact on financial markets is due to the effects of two opposing forces: On the one hand, the net marginal product of capital is expected to decline due to an increase in capital intensity and, on the other hand, the long-term real interest rate is projected to increase owing to the impact of structural change in the population on savings. Most simulation studies find that the first effect outweighs the second. However, given that real returns have an impact on funded pensions and the ensuing annuities over a period of up to 60 years, even a modest, negative impact of ageing on long-term real interest rates leads to non-negligible losses for beneficiaries in funded pensions compared to a scenario without demographic change.

Econometric studies of the relationship between demographic variables and the *prices/returns of financial assets*, respectively, yield ambiguous results. In some studies the impact is implausibly high; in others the coefficients of demographic variables are not significant at all[11].

To sum up, the simulation studies project downward pressure on the long-term real rate of interest and real returns on financial markets. The econometric studies cannot identify a systematic relationship between ageing and prices/returns on financial markets.

This study is not based on the conceptual framework of overlapping generations, as the results are very sensitive to the structural and parameter assumptions[12]. Furthermore, they endogise a lot of macro-variables and make it hard to conduct sensitivity analyses with respect to these macro-variables (e.g. participation rates). Instead, the real impact of demographic developments and the dissaving momentum of different generations are integrated into a growth theory framework. Furthermore, this conceptual framework integrates contrary effects arising from both the change in demographic structure (growing overall consumption by not economically active persons) and the decline in population (especially in the working age population and the demand for real capital) on the long-term real interest rate.

[11] The econometric studies encounter a number of methodological problems: (1) the specification of the variables representing demographic change (e.g. absolute or relative cohort sizes, average age) is not trivial and strongly influences the results. (2) The number of observations and thus the statistical validity of the results in the econometric analysis tend to be overstated. In time series studies that cover the period after WW II usually some 50 to 60 years of yearly data are included. As demographic change is gradual, yearly data on demographic change in this period does not represent 50 to 60 independent data points on ageing. (3) The studies attempt to correct for other determinants of savings or prices/returns on financial markets, such as GDP growth and real interest rates. The simulation studies discussed above identify a systematic relationship between demographic change and these variables. Therefore, the inclusion of demographic variables and macro-variables violates the assumption of independence of explanatory variables in regression analysis. (4) As demonstrated above, policy responses have a significant impact on the relationship between demographic change and growth. The econometric studies fail to account for this result.

[12] McCarthy and Neuberger (2003).

11.5 Demographic Developments and Real Interest Rates: The Model

The impact of demographic developments on the long-term average real interest rate can be conceptually represented by a neoclassical growth model[13]. Since primarily the effects arising from a change in the rise of the number of economically active persons are to be analysed for real variables, a supply-oriented conceptual framework is best suited to the problem. The model is guided by a large number of simplifying assumptions: In the long term, prices are assumed as having sufficient flexibility to ensure an equilibrium in goods, finance and labor markets in each period. In addition, the analysis disregards many other possible influencing factors for real interest rates. Since this concerns a model that operates with real parameters, potential monetary factors do not play a role. In other words, above all, monetary policy, inflationary expectations and financial market volatility are excluded on heuristic grounds. Moreover, a closed economy is assumed (although that assumption is relaxed in the simulations). The analysis confines itself to the correlation between demographic developments and output potential, as well as to marginal capital productivity. It is also assumed that technological progress is exogenous and not factor-related, i.e. that it is solely a function of time and increases the productivity of the overall amount of the relevant factor and not only in the latest period of newly created units. The purpose of the model is to establish a conceptual framework to uncover the mechanics that are at work. The simplicity is an advantage in this respect and it also allows looking at various influencing factors such as productivity growth, participation rates and international long-term average real interest rates. The results should not be interpreted as forecasts or projections.

11.5.1 What is the Interaction between Demographic Variables and the Real Interest Rate in the Neoclassical Growth Model?

The equilibrium growth path for exogenous, factor-related Harrod-neutral technological progress is derived from an output function of a general form as follows:

$$Y(t) = F\left[A^K(t)K(t), A^L(t)L(t)\right] \tag{1}$$

This function is consistently differentiable in all instances and satisfies some additional conditions: output per unit of labor and marginal capital stock per unit of labor are defined as *y* and *k* so that $y = f(k)$. In addition,

[13] The corresponding model can be found in any textbook on macroeconomics and grwoth theory. The representations selected here follows Mankiw (1997) and Frenkel and Hammer (1999).

marginal capital productivity per unit of labor is positive $f'(k) > 0$ but is negative $f''(k) < 0$ as the capital stock per unit of labor increases and for $\lim_{k \to 0} f'(k) = \infty, \lim_{k \to \infty} f'(k) = 0$.

Output *Y(t)* in period t is a function of 1) the level of technological knowledge $A^K(t)$ determining capital productivity, 2) capital stock *K(t)*, 3) the level of technological knowledge $A^L(t)$ determining labor productivity, and 4) labor supply *L(t)* in the period. Only Harrod-neutral technological progress satisfies the conditions of equilibrium growth: technological progress leaves both the capital coefficient $k / f(k)$ and the functional income distribution between labor and capital unchanged. Harrod-neutral technological progress is defined as labor-boosting technological progress that leaves the capital productivity unchanged but increases the productivity of the overall amount of the factor labor. From this it follows that $\partial A^K(t) / \partial t = 0$. If $A^K(t)$ is normalized to 1, a starting point for the analysis is derived as follows:

$$Y(t) = F\left[K(t), A^L(t)L(t)\right] \tag{2}$$

$$\frac{Y(t)}{A^L(t)L(t)} = f\left[\frac{K(t)}{A^L(t)L(t)}\right] \tag{3}$$

Due to the linear homogeneity of the output function, $\hat{y} = Y(t) / A^L(t)L(t)$ – labor productivity per efficiency unit – can be given as a function *f[•]* of capital intensity per efficiency unit $\hat{k} = K(t) / A^L(t)L(t)$ and simplified to the labor productivity function per efficiency unit $\hat{y}(t) = f[\hat{k}(t)]$. Capital productivity per efficiency unit is defined as

$\hat{y}(t) / \hat{k}(t) = [Y(t) / A^L(t)L(t)]/[K(t) / A^L(t)L(t)]$.

Let us analyze the long-term equilibrium growth rate, defined as constant capital stock over time per efficiency unit. If the capital intensity per efficiency unit is differentiated by time, is remodeled and set to equal zero, this yields the correlation between total national saving and national investment in a state of equilibrium growth (equations 4 to 6). A constant saving rate $0<s<1$, constant rise in the number of economically active persons with the rate $g_L = \partial L(t) / \partial t$, a constant aggregate depreciation rate of δ, and Harrod-neutral technological progress of $g_A = \partial A^L(t) / \partial t$ are assumed:

$$\hat{k}(t) = \frac{K(t)}{A^L(t)L(t)} \tag{4}$$

$$\frac{\partial \hat{k}}{\partial t} = sf\left(\hat{k}\right) - \left(g_L + g_A + \delta\right)\hat{k} = 0 \tag{5}$$

$$s\,\hat{y} = \left(g_L + g_A + \delta\right)\hat{k} \tag{6}$$

Sufficient levels of total national saving are required to keep the capital stock per efficiency unit constant. In other words, depreciation needs to be financed from this as does additionally required capital stock for additional efficiency units, which consist of both additional labor owing to the rise in the number of economically active persons and technological progress (equation 6). Along the equilibrium growth path, national output per efficiency unit and capital stock per efficiency unit are constant over time. Output per unit of labor and per capita income *Y/L* increase with the labor productivity that is equal to the rate of technological progress g_A, $g_{Y/L} = g_A$. National income Y increases with both labor productivity and the rise in the number of economically active persons $\left(g_Y = g_A + g_L\right)$.

11.5.2 How can structural population change be integrated into the model?

The standard model assumes that the population consists solely of economically active persons. This conceptual framework is not suitable for analyzing the economic effects of structural population growth. Consumption by not economically active persons also needs to be financed from national income, irrespective of the form of underlying claim thereon. This could be social security legislation and the Pension Fund Act, as well as a financial claim. The national dependency ratio *dep*, the ratio of not economically active to economically active persons, is multiplied by real consumption *rep* per not economically active person relative to national income per economically active person. From this can be calculated the share of consumption by not economically active persons as a percentage of national income per efficiency unit. The constancy of the variable *rep* is assumed on heuristic grounds, so that the real consumption per not economically active person increases in proportion to national income per economically active person[14]. National income per efficiency unit can therefore be broken down into the individual components of consumption per efficiency unit $\hat{c}$, consumption by not

[14] The variable rep is determined primarily in accordance with social security legislation and social policy. Constancy assumes that cuts in the public pension system will basically be compensated by private provision. Only a small portion (consumption by beneficiaries from funded pension provision) depends on the real interest rate. Roughly 50 percent of not economically active persons will be pensioners in 2020. If around half of these receive from the second or third pillar a supplementary pension covering a quarter of their average consumption, this will be equivalent to only 6.25 percent of the consumption by not economically active persons.

economically active persons $dep \times rep \times f\left(\hat{k}\right)$ and saving per efficiency unit $\left[f\left(\hat{k}\right) - dep \times rep \times f\left(\hat{k}\right)\right] \times s$. It is assumed on heuristic grounds that not economically active persons do not save. It follows from equation (6) that total saving has to be equal to the demand for real capital. Consequently, for consumption per efficiency unit accounting for structural population growth, equation 7 can be derived as:

$$f\left(\hat{k}\right) - dep \times rep \times f\left(\hat{k}\right) - \left[f\left(\hat{k}\right) - dep \times rep \times f\left(\hat{k}\right)\right] \times s = \tag{7}$$

$$= \hat{c} = \left(1 - dep \times rep\right) f\left(\hat{k}\right) - \left(g_L + g_A + \delta\right)\hat{k}$$

11.5.3 Is there a Saving Rate for which long-term consumption per efficiency unit is maximized?

For any saving rate, there is a constant capital stock per efficiency unit and constant income per efficiency unit which satisfy equation (6). Consumption by not economically active persons is determined in accordance with social security law and financial claims based on property rights. On this basis, the share of income of economically active persons may be calculated as a percentage of national income, a portion of which the latter save. Economically active persons are not indifferent to the level of the saving rate. They make their saving decision such that their long-term level of consumption is maximized. If the saving rate is too high, the capital stock is too large and their consumption is lower despite higher output, as more output needs to be invested in maintaining the equilibrium capital stock. If the saving rate is too low, gross marginal capital productivity will exceed the level required to maintain the equilibrium capital stock and, by increasing the saving rate, additional capital can be saved until maximum consumption is attained.

In equations (8) and (9), therefore, the optimum consumption per efficiency unit $\hat{c}^*$ is derived in accordance with the optimum capital stock per efficiency unit $\hat{k}^*$, with a potentially positive time preference rate of households being disregarded:

$$\frac{\partial \hat{c}^*}{\partial \hat{k}^*} = \left(1 - dep \times rep\right) \frac{\partial f\left(\hat{k}^*\right)}{\partial \hat{k}^*} - \left(g_L + g_A + \delta\right) = 0 \tag{8}$$

$$\frac{\partial f\left(\hat{k}^{*}\right)}{\partial \hat{k}^{*}} = \frac{g_L + g_A + \delta}{(1 - dep \times rep)} \tag{9}$$

Equation (9) shows that gross marginal capital productivity must be equal to the sum of the growth in the number of economically active persons g_L, technological progress g_A and depreciation δ, divided by the portion of the share available for both consumption and saving by economically active persons as a percentage of national income so that the latter do not have to spend more than is necessary to maintain the capital stock and can consume more.

11.5.4 What Impact Do Demographic Developments Have On Gross Marginal Capital Productivity?

The decline in growth in the number of economically active persons is included in the model by $g_{L1} < g_L$. Structural growth is integrated into the conceptual framework by the rise in consumption by not economically active persons owing to the dependency ratio *dep* increasing to dep_1 (including increased aggregate consumption and, thus, 'dissaving' by pensioners).

As equations (10) and (11) show, the impact of demographic developments on the long-term average real interest rate are not clear:

$$\partial \frac{\left(\frac{\partial f\left(\hat{k}^{*}\right)}{\partial \hat{k}^{*}}\right)}{\partial g_L} = (1 - dep \times rep)^{-1} > 0 \tag{10}$$

$$\partial \frac{\left(\frac{\partial f\left(\hat{k}^{*}\right)}{\partial \hat{k}^{*}}\right)}{\partial dep} = (g_L + g_A + \delta)(dep)(1 - dep \times rep)^{-2} > 0 \tag{11}$$

The derivations of gross marginal capital productivity in accordance with both the rise in the number of economically active persons (equation 10) and the dependency ratio (equation 11) have the same positive sign. Since the former decreases and the latter increases, contrary effects on the long-term average interest rate are generated. The heuristic assumption according to which not economically active persons do not save does not affect the result in principle[15]. It should be borne in mind that the dependency ratio for the economy as a whole increases less steeply than is frequently presented in debate. The decrease in the youth dependency ratio and the increase in the participation rate of 15- to 65-year-olds partly offset the increase in the old-age dependency ratio.[16] The increase in the participation rate has two effects on the share of not economically active persons as a percentage of the economically active, as it both increases the number of economically active persons and reduces the number of not economically active persons to the same extent. As a result, particularly the permanent level effect of the increase in the participation rate counters not economically active persons' growing consumption induced by demographic change. By contrast, the transitory increase in the participation rate (but not the level thereof) has an impact on economic growth. The former affects growth only insofar as it influences the rise in the number of economically active persons, i.e. only until a new constant participation rate has been reached.

In short, in the neoclassical growth model, the following can be said for the effects of a decline in the rise of the number of economically active persons: the optimal capital intensity per efficiency unit increases, and the factor labor is partially substituted by the factor capital. The net marginal product of capital – i.e. the long-term average real interest rate – can, on the one hand, decline due to a broadening of the capital base but, on the other hand, can increase owing to structural change in the population. The growing consumption by not economically active persons (a form of dissaving) increases long-term average real interest rates, as this reduces the total net saving available for investment purposes. Which of the two effects prevails is further analyzed below by means of a simulation based on Austrian data. Total output per efficiency unit and capital stock per efficiency unit are constant over time. Output per economically active person and per capita income *Y/L* rise in tandem with labor productivity $g_{Y/L} = g_A$. National income *Y* increases in parallel with both labor productivity and the rise in the number of economically active persons $\left(g_Y = g_A + g_{L1}\right)$. However, it now grows at a slower rate than when the number of economically active persons

[15] For equation (9) the inclusion of a positive saving rate of not economically active persons s_{dep} gives rise to only a minimal adjustment, which does not affect the results in equations (10) and (11):

$$\frac{\partial f\left(\hat{k}^*\right)}{\partial \hat{k}^*} = \frac{g_L + g_A + \delta}{\left[1 - dep \times rep\left(1 - s_{dep}\right)\right]}. \tag{9a}$$

[16] Tichy (2005) underlines that the demographic development of the dependency ratio until 2050 is not unusual in historical terms, but that the low values of the 1990s were atypically low.

grows more rapidly. If $g_A < |g_{L1}|$ (for $g_{L1} < 0$), national income could even decline.

Although the model is not very sophisticated, it does indicate the most important influencing factors of demographic developments on the long-term average real interest rates. The key points of criticism about the neoclassical model relate to two assumptions, in particular: the rate of technological progress is exogenous, and the economy it applies to is a closed economy.

Neoclassical growth theory places considerable importance on the exogenous rate of technological progress, as this determines per capita income growth. The more recent growth theory[17] endogenizes the rate of technological progress. This is why quantitative analysis uses scenarios that assume future productivity growth fluctuating between 1.25 percent and 2.25 percent a year. In the model, it is assumed that the rate of technological progress is independent of demographic developments based on the evidence discussed in section 12.4.

The model's most restrictive assumption is definitely that of a closed economy. As a result, the long-term average real interest rate may fall irrespective of demographic developments in the rest of the world. Since in many other OECD countries (e.g. Germany, Italy, Japan, Spain, the U.S.A., as well as the CEE countries) demographic developments are similar to Austria's, long-term average real interest rates are also expected to decline in these countries. In this way, the advantages of international diversification and integration are moderated. Idiosyncratic risks (country risks, currency risks and political risks) frequently associated with investments in the countries with the fastest population growth often render these countries rather unattractive for long-term pension provision in Austria.[18] However, even if pension provision were fully diversified internationally, this would not be enough to avert the impact of demographic developments on the real interest rate in Austria. If annuities that have benefited from internationally diversified assets are pay-out and consumed in Austria, the previously negative capital balance would turn positive, which would lead to a real appreciation of the home currency and again to lower returns to pension capital, unless the balance of trade truns negative at the same time, such the real exchange rate remains unaffected. As Börsch-Suppan et al. (2003) therefore explain, both investment and consumption should be internationally diversified, i.e. especially in the form of capital exports during the accumulation phase and goods imports during the decumulation phase. If, however, the hypothesis of fully integrated global financial and real capital markets is assumed, a globally uniform net marginal capital productivity would be generated. It would be independent of demographic developments in Austria. If Austria's

[17] Inter alia Romer (1986, 1990).
[18] Bosworth et al. (2004).

net marginal capital productivity cannot fall below the standard international level, the required capital deepening will not therefore take place to readjust the structure of consumption in the face of a shrinking labour input. The result is a suboptimal capital stock and a suboptimal level of Austrian national income. The relatively low degree of financial and real capital market integration is known in economics as a Feldstein-Horioka puzzle. In addition, the extent of investment portfolios' international diversification is surprisingly low[19].

11.6 Real Interest Rates and Funded Pension Provision

The funding principle facilitates intertemporal income transfer between years of gainful activity and those of retirement by the acquisition of assets (especially financial assets). Assets are acquired from current savings over the period of gainful activity. At the end of this period, annuities are acquired using the accumulated wealth. What is the relationship between future annuities and net marginal capital productivity?

With real constant annual individual net savings *S* and an expected long-term average real interest rate *r* (after tax and additional asset management fees), after t_A years pension capital *PC* can be derived from equation (12):

$$PC = \frac{(1+r)^{t_A} - 1}{r} S \qquad \forall r, t_A : r \neq 0, t_A \in N_+ \tag{12}$$

With given real constant annual individual net savings *S*, the pension capital *PC* attained after t_A years decreases if the expected long-term average interest rate *r* (after tax and additional asset management fees) is reduced:

$$\frac{\partial PC}{\partial r} = -\frac{(1+r)^{t_A} - 1 - rt_A(1+r)^{t_A - 1}}{r^2} S > 0 \quad \forall r, t_A : r > 0; t_A > 1, t_A \in N_+ \tag{13}$$

$$\Leftrightarrow \qquad \frac{(1+r)^{t_A} - 1}{t_A} < r(1+r)^{t_A - 1} \tag{14}$$

Inequation (14) is valid, as the annual average net return is smaller than the last period's interest income discounted over a single period. This results from the compound interest effect, whereby the capital stock is far higher at the start of the last period compared with the first period. If the expected long-term average real interest rate *r* (after tax and additional asset management fees) is reduced, the required real constant net savings *S* has to increase in order to attain the given target pension capital *PC* after t_A years.

[19] Obstfeld and Rogoff (2001).

For an expected long-term average real interest rate r (after tax and additional asset management fees), pension capital PC, which is required to receive a constant real annual annuity R over T_R years, can be obtained from equation (15):

$$PC = \frac{(1+r)^{t_R} - 1}{(1+r)^{t_R} r} R \qquad \forall r, t_R : r > 0; t_R \in N_+ \tag{15}$$

If, before entering retirement, one has saved a capital stock of PC at the end of the saving period and the expected real interest rate r (after tax and additional asset management fees) falls owing to demographic developments, this will affect the constant real annuity R:

$$R = \frac{(1+r)^{t_R} r}{(1+r)^{t_R} - 1} PC \qquad \forall r, t_R : r > 0; t_R \in N_+ \tag{16}$$

$$\frac{\partial R}{\partial r} = \frac{(1+r)^{t_R}\left[-1 - r t_R (1+r)^{-1} + (1+r)^{t_R}\right]}{\left[(1+r)^{t_R} - 1\right]^2} PC > 0 \ \forall r, t_R : r > 0; t_R \in N_+ \tag{17}$$

$$\Leftrightarrow \qquad \frac{(1+r)^{t_R} - 1}{t_R} > \frac{r}{(1+r)} \tag{18}$$

Inequation (18) is valid, as the annual average net return is greater than the discounted real interest rate of a single period due to the compound interest effect. If the long-term average real interest rate r falls owing to demographic developments, the annual annuity R will also fall for a given pension capital PC. A decline in the long-term average real interest rate has a twofold effect on funded pension provision, decreasing both the pension capital saved and the resulting annuity.

11.7 Demographic Developments and Real Interest Rates: The Simulation

The model shows that the impact of demographic change on funded pensions is complex and two opposing forces are at work. The following simulations provide a rough approximation of the order of magnitude of the net-impact. The variables and assumptions employed in the simulations are listed below (Table 11.5). In accordance with the expectations of the Austrian Committee for Long-Term Pension Sustainability (2002), I assume a rate of technical progress g_A of 1.75 percent p.a. The rate of depreciation δ enters the simulation with a value of 4 percent p.a., as it does in most Austrian macro-models. The growth rate of the number of economically active persons g_L is calculated as the 20 year average around the years 2000 and 2020, respectively, in order to reflect the equilibrium approach taken in the model. The calculations are based on demographic projections of Statistik Austria (2003) and on the assumptions of a 75 percent (Stockholm-Barcelona target) and a 70 percent participation rate, respectively. The variable g_L enters the simulations with a value of 0.3 percent p.a. for 2000 and 0.07 percent for a participation rate of 75 percent p.a. [and with -0.016 p.a. percent at a participation rate of 70 percent] for 2020. Throughout the simulations I assume that hours worked per economically active person remain constant. The total dependency ratio *dep* (all not economically active persons in percent of economically active persons) decreases from 82.3 to 74.7 percent[20]. This is due to the raising participation rate and decreasing unemployement among not economically active persons in the age group 15 to 65. These affect the ratio in two ways: they decrease the numerator and increase the denominator of the ratio *dep*. The replacement rate *rep* for all not economically active persons (not only pensioners!) is now about 25 percent of GDP per capita in Austria[21]. We assume it remains constant, in principle. That implies that once the future evolution of funded pension provision and the growing number of pensioners in second and third pillar pension systems, the aggregate replacement rate will be somewhat reduced due to demographic change to roughly 24.22 percent.

The world long-term real interest rate remains constant in the simulations at the simulated level of the single long-term real interest rate in the model based on the data for 2000. This reflects the – very restrictive – assumption that demographic change would be confined to Austria. Demographic projections do not support this assumption, so that we will conduct sensitivity analyses based on lower world interest rates. The administrative fee of 1 percent of contributions and the asset management fee of 1.5 percent of funds under management are approximations based on evidence from Austrian funded pension products[22]. The simulation is based on the assumption that longevity at retirements is 22 years in 2000 and 24 years in 2020[23].

The simulations assume that individuals start to contribute to funded pension provision at the age of 30. The approximations of the international

[20] The treatment of below 15 year olds is ambiguous. On the one hand, one can argue that children are a cost factor and that their consumption is foregone consumption of their parents. On the other hand, one can argue that children are part of the family and that their consumption also provides utility for their parents. Furthermore, the replacement rate for children would have to be considerably below that of not economically active persons aged 15+. If have conducted the simulations with and without the inclusion of children in the not economically active persons. The main results presented are those without them. However, interesting results for the simulation that include them are referred to in footnotes where they are of interest. Basically, the inclusion raises the level of interest rates but also increases the negative impact of demographic change on the long-term average real rate of interest and on the real annuity R somewhat.

[21] Source: Hauptverband der Sozialversicherungsträger and own calculations.

[22] Source: OeNB Financial Stability Report 7 (2006, 31) and Schmitz (2006).

[23] Source: Statistik Austria (2003) average for males and females.

integration of real capital markets (60 percent) and of the international diversification of pension investments and of the consumption of pensioners (50 percent) are based on Börsch-Suppan, Ludwig, and Winter (2003). The numbers imply that the long-term real rate of interest cannot fall more than 40 percent of the difference between the world interest rate and the stimulated domestic interest rate below the world interest rate and that 50 percent of the contributions yield a rate of return equal to that in the rest of the world[24]. Since the diversification of the consumption of future pensions is assumed to be equally high, there are no negative effects on the term of trade when international assets are divested. The interest rate employed in the simulations for 2020 for the accumulation phase equals the weighted average of the simulated long-term real interest rate in 2000 and that in 2020, in order to take into account the long-term horizon of funded pension provision. Since the largest changes in the long-term real rate of interest are projected until 2020 and evolve rather flatly afterwards, the future interst rate is weighted twice as heavily as the current rate (ratio of 1:2) to reflect that long-term interest rate will remain low for most of the 35 years of the accumulation phase. For the annuity phase the long-term real interest rate simulated for 2020 forms the basis of the calculations. It is important to bear in mind that international integration and diversification and averaging across time severely reduce the impact of demographic change on funded pensions.

[24] This assumption is only reasonable as long as the share of funded pensions is modest, otherwise the large surplus in the capital balance and a large surplus in the trade balance could have destabilising effects.

Table 11.5 The variables and assumptions employed in the simulation

	Baseline (Based on demographic conditions in the year 2000) (1)	**Scenario (based on demographic conditions in the year 2020) (2)**
Rate of technical progress in % – g_A	2	1.75
Depreciation rate in % – δ	4	4
Yearly growth rate of economically active persons* in % – g_L	0.3	0.07 [−0.016]
Population aged 15 to 65 years	5,510,265	5,455,161
Participation rate in %	67.4	75
Economically active persons	3,713,919	4,091,371
Not economically active persons aged 15 to 65 years	1,796,346	1,363,790
Population aged 65+ years	1,259,798	1,692,914
Dependency ratio in % of economically active persons – *dep*	82.3	74.7
Replacement rate in % of the gross-income of economically active persons (incl. taxes and net-savings) – *rep*	25	24.22
World long-term real interest rate in %	3.93	3.93
Administrative fee in % of yearly contributions	1%	1%
Asset management fees in % of assets under management	1.5%	1.5%
Integration of real capital markets in %	N/A	60
International diversification of pension investment and consumption of pensioners in %	N/A	50

*Average over the previous 20 years based on the assumptions of 75 percent [and on the assumption of a future participation rate of 70 percent, respectively].

Sources: WIFO, OeNB, Statistik Austria, Kommission zur langfristigen Pensionssicherung, own calculations.

The results of the simulation are sensitive to the incorporation of the international integration of real capital markets and the international diversification of pension investments and of the consumption of pensioners

(Table 11.6). Compared to the baseline scenario (column 1) demographic change reduces pension capital accumulated at retirement by EUR 1,328 (−2.1 percent). This results in a reduction of the real annuity per month from EUR 316.30 to about EUR 288.50 (−8.8 percent)[25]. The simulated long-term real rate of interest in 2000 is 3.93 percent, which is roughly in line with the long-term average of the Austrian secondary interest rate of 4.12 percent over the period 1986 to 2004. The long-term real rate of interest relevant for funded pensions (that is, the weighted average of the 2000 value and the simulated value for 2020 with international integration) falls by 0.11 bp. The real effective rate during the decumulation phase falls by 0.16 bp. The evolution of the long-term real rate of interest (without averaging but taking into account integration and diversification) is in line with findings in the literature[26]. It falls from 3.93 percent in 2000 to a low of 3.55 percent in 2019 and increases slightly to 3.62 in 2032, where is flattens out. The impact of demographic change on funded pensions is non-negligible.

Table 11.6 Summary of Results with Diversification and Integration

	Basic scenario 2000 (1)	**Demographic change 2020 (2)**	**Difference (in EUR) (2) – (1)**	**Difference (in %) (2) – (1)**
Pension capital *PC* (in EUR)	64,414	63,086	1,328	2.1
Real annuity *R*/ month (in EUR)	316.3	288.5	27.8	8.8
Effective real long-term interest rate (accumulation phase)	3.93	3.82	0.11	
Effective real long-term interest rate (decumulation phase)	3.93	3.77	0.16	

N.B. world real interest rate 3.93, participation rate 75 percent and productivity growth 1.75 percent, longevity 24 years at age 65.

If longevity at retirement turns out to be lower than the expected 24 years, the reduction of the monthly annuity decreases to 4.0 percent (from 8.8 percent). If on the other hand longevity increases to 26 years, the real annuity shrinks further from EUR 288.50 to EUR 276.20, which amounts to a total decline due to demographic change of 12.7 percent (Table 11.7). Unsurprisingly,

[25] Including children in the simulations lead to a reduction of pension capital by 3.1 percent and of pensions by 9.8 percent.

[26] See section 11.4 and Börsch-Suppan, Ludiwg and Walter (2003), Winter (2003) and Miles (2002).

an increase in longevity has a strong impact on funded pensions with each additional year reducing pensions by about 2 to 2.5 percentage points. An increase in longevity influences future pensions via two channels: first, if longevity increases (decreases), the share of elderly not economically active persons grows (shrinks). This has a negative (positive) effect on aggregate savings and raises (lowers) the long-term real interest rate. That would push funded pensions up. Second, increased (decreased) longevity directly reduces the annuity paid out of a given level of pension capital. This would push funded pensions down. The second effect clearly dominates.

Table 11.7 The impact of increasing longevity

Life expectancy at 65 (average m/f)	22	24	26
Pension Capital PC (in EUR)	62,926	63,086	63,252
Real annuity R/month (in EUR)	303.5	288.5	276.2
Reduction of Pension Capital PC rel. to basic scenario	2.3	2.1	1.8
Reduction of Real annuity R rel. to basic scenario	4.0	8.8	12.7
Effective long-term real rate of interest (accumulation phase)	3.81	3.82	3.84
Effective long-term real rate of interest (decumulation phase)	3.75	3.77	3.79

N.B. world real interest rate 3.93, participation rate 75 percent and productivity growth 1.75 percent, longevity 24 years at age 65.

In order to gauge the impact of international integration of real capital markets and of the diversification of pension investment and of the consumption of pensioners, we rerun the simulations without them (Table 11.8). That resulted in an overall decrease of pensions of almost 22 percent as a consequence of demographic change. Relative to the simulated scenario the cut in pensions amounts to an additional 12.9 percentage points. This effect is partly due to diversification (4.5 percentage points) and partly due to integration (8.4 percentage points). One must bear in mind that the demographic scenarios for the EU and many OECD countries do not different much from the Austrian scenario, so that the benefits of integration and diversification are likely to be overly optimistic. Overall, integration and diversification have substantial repercussions on the impact of demographic change on funded pensions without, however, eliminating them even without taking into account demographic change in the EU and OECD countries. Furthermore, international diversification leads to a capital account surplus and an accompanying surplus in the balance of trade during the accumulation phase. Later on, during the decumulation phase it would lead to a large capital account deficit and an accompanying balance of trade deficit. If funded pensions account for a large share of GDP, such large shifts in the external position of a country can have substantial destabilising effects.

Table 11.8 The role of international diversification of pension investment and consumption of pensioners and integration of real capital markets

	2020 without diversification and integration (1)	2020 with diversification but without integration (2)	2020 with diversification and integration (3)	Impact of diversification and integration (3) – (1)
Pension Capital PC (in EUR)	58,095	61,155	63,086	4,991
Real annuity R/month (in EUR)	247.8	261.9	288.5	40.7
Reduction of Pension Capital PC rel. to basic scenario	9.8	5.1	2.1	–7.7
Reduction of Real annuity R rel. to basic scenario	21.7	17.2	8.8	–12.9
Effective long-term real rate of interest (accumulation phase)	3.38	3.66	3.82	0.44
Effective long-term real rate of interest (decumulation phase)	3.11	3.52	3.77	0.66

N.B. world real interest rate 3.93, participation rate 75 percent and productivity growth 1.75 percent, longevity 24 years at age 65.

The simulations are based on the assumption of future productivity growth of 1.75 percent per annum. On the one hand, a fall in the growth rate of labour productivity to 1.5 percent per annum reduces simulated pensions by a further 1.3 percentage points to 10.1 percent (Table 11.9). If on the other hand future labour productivity growth picked up to 2 percent per annum, the impact of demographic change on funded pensions would be partly cushioned. Pensions would fall by 7.5 percent rather than by 8.8 percent. An increase of productivity growth to 2.25 percent per annum would further reduce the impact of aging by another 1.3 percent, so that pensions would be reduced by 6.2 percent rather than 8.8 percent. Productivity growth has a strong impact on the impact of demographic change on funded pensions, but higher trend growth would not suffice to keep pensions constant in the face of it.

Table 11.9 Sensitivity analysis with respect to future productivity growth

Future productivity growth	1.50	1.75	2	2.25
Pension Capital PC (in EUR)	62,604	63,086	63,573	64,064
Real Annuity R/month (in EUR)	284.5	288.5	292.6	296.7
Reduction of Pension Capital PC rel to basic scenario	2.8	2.1	1.3	0.5
Reduction of Real annuity R rel to basic scenario	10.1	8.8	7.5	6.2
Effective long-term real rate of interest (accumulation phase)	3.78	3.82	3.86	3.90
Effective long-term real rate of interest (decumulation)	3.71	3.77	3.83	3.89

N.B. world real interest rate 3.93, participation rate 75 percent.

A lower than expected participation rate of 70 percent would further reduce the growth rate of the economically active population from 0.07 percent per annum to −0.16 percent per annum. This drives the long-term real of interest even further down, as it further increases capital intensity and decreases the marginal productivity of capital. However, this is counterbalanced by the effect of an increase in the consumption of not economically active persons and the ensuing decrease in savings, which put upward pressure on long-term real interest rates. The second effect prevails, but the fall in the interest rate is only 4 bp lower in accumulation phase than in the main scenario and 3 bp lower in the decumulation phase (Table 11.10). This attenuates the cut in pensions by some 0.7 percentage points (from 8.8 to 8.1 percent).

Table 11.10 Sensitivity analysis with respect to future participation rates

Future Participation Rates	0.70	0.75	Difference (1) – (3)
implying g_L	−0.016	0.07	−0.086
Pension Capital PC (in EUR)	63,346	63,086	260
Real annuality R/month (in EUR)	290.7	288.5	2.2
Reduction of Pension Capital PC rel. to basic scenario	1.7	2.1	−0.4
Reduction of Real annuity R rel. to basic scenario	8.1	8.8	−0.7
Effective long-term real rate of interest (accumulation phase)	3.86	3.82	0.04
Effective long-term real rate of interest (decumulation phase)	3.80	3.77	0.03

N.B. world real interest rate 3.93, participation rate 75 percent.

The simulations assume that the future world real interest rate would remain constant at 3.93 percent. However, as demographic change affects all OECD countries this assumption is untainable. The sensitivity analysis suggests that a fall in the world long-term real of interest in 2020 from 3.93 to 3.60 percent reduces pensions by a further 6.3 percentage points, so that they would be cut by some 15.1 percent relative to a world without demographic change (Table 11.11)[27]. A fall of another 20 bp would lead to an overall reduction of pensions by 18.6 percent. International integration and diversification make funded pensions in Austria very sensitive to the world long-term real rate of interest and to demographic change in the countries into which Austrian pension funds diversify (i.e. OECD countries and Central and Eastern European Countries CEECs).

Table 11.11 Sensitivity analysis with respect to future world real interest rates

Future world real interest rate	3.40	3.60	3.93
Pension capital PC (in EUR)	58,837	60,393	63,086
Real annuity R/month (in EUR)	257.4	268.7	288.5
Reduction in Pension Capital PC rel. to basic scenario	8.7	6.2	2.1
Reduction in Pension Capital R rel. to basic scenario	18.6	15.1	8.8
Effective long-term real rate of interest	3.34	3.50	3.82

N.B. participation rate 75 percent and productivity growth 1.75 percent.

The following picture emerges when we put the various pieces together: demographic change in Austria and in the OECD countries would lead to a reduction of future pension capital by 6.2 percent and future funded pensions in Austria by 15.1 percent relative to a world without demographic change.

11.8 Summary

The review of the literature demonstrated that the long-term projections of the impact of demographic change on per capita growth are biased by the assumption of future low productivity growth and of a lower growth rate of capital. The direct impact of demographic change is very limited. In addition, a look at the data reveals that potential labour input has already been falling since the 1950s due to the decrease in hours worked per economically active person.

[27] Including children in the simulations reduces pension capital by 9 percent and pensions by 18 percent.

A simulation for 2020 based on equations (9), (12) and (16), using demographic data provided by Statistics Austria (2003) and the Austrian Committee for Long-Term Pension Sustainability (2002), shows the following key results[28]:

The two contrary effects of demographic developments largely offset each other. In the model, however, demographic developments trigger a decrease in long-term average real interest rates in Austria. This decrease is a long-term phenomenon. The simulation results in the model are therefore not fundamentally dependent on the choice of year (2020). In the scenario to which the highest probability of event is allocated, future productivity growth will fall to 1.75 percent a year and the participation rate will rise to 75 percent. Despite international diversification in the investment of funded pension provision, consumption by pensioners and partial integration of financial and real capital markets, demographic developments will have a negative impact on funded pension provision, even if one assumes that they would confined to Austria: the long-term average real interest rate during the accumulation phase would fall by about 11 bp and during the decumulation phase by 16 bp, the pension capital at the end of the saving period will be some 2.1 percent lower and the annual pension will be down by approximately 8.8 percent relative to a world without demographic change.

Since in many other OECD countries (e.g. Germany, Italy, Japan, Spain, the U.S.A. and the CEE countries), demographic developments are similar to Austria's, a decline of the long-term real interest rate is also anticipated in these countries, thus moderating the merits of international diversification and integration.[29] This is supported by the studies cited in section 3 and a study by Miles (2002), in which the European real interest rate of 3.95 percent (2000) falls to 3.66 percent in 2020 and to around 3.50 percent in 2050. Based on a world long-term real interest rate of 3.60 percent demographic change reduces pension capital by 6.2 percent and pensions by 15.1 percent. The impact of international demographic change on funded pensions in Austria is non-negligible.

The results are sensitive to a number of parameters: (i.) International diversification and integration reduce the demographic risk of funded pension provision. However, if the degree of international diversification and integration is significant, the dependency of funded pension provision on international real interest rate trends (and international demographic developments) is very high. (ii.) An increase in longevity has a strong impact

[28] The quantitative results of the impact of demographic developments on long–term average real interest rates and funded pension provision which are derived from the model are used to represent two things: first, the magnitude of the contrary effects arising from capital deepening and growing consumption by not economically active persons on long-term average real interest rates and, second, the demographic risk of funded pension provision. These results are not forecasts of future trends in Austrian real interest rates.

[29] Poterba (2004).

on funded pensions with each additional year reducing pensions by about 2 to 2.5 percentage points. Further sensitivity analyses show that the impact of demographic developments on funded pension provision is (iii.) reduced by a rise in productivity growth and (iv.) strengthened by an increase in the participation rate.

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12 General Government Debt Sustainability in Slovenia

Hana Genorio

12.0 Abstract

This paper presents the impact of demographic changes on pension and health care expenditures, which influence government debt sustainability over the short-, medium- and long-terms. It has been attested that an increasing proportion of the elderly population in Slovenia will boost pension expenditures as well as health care expenditures by the year 2050. It would result in debt unsustainability over the projected period in the no-policy-change scenario. Changes in the pension and health insurance system together with higher economic growth and a higher employment participation rate could mitigate unfavourable demographic trends.

12.1 Introduction

There is growing concern regarding public debt in most European Union (EU) member states, and long-term debt sustainability is becoming a primary economic policy issue. Currently, Slovenian government debt is still low by international standards, and far below the Maastricht Treaty reference value. However, unfavourable demographic trends in particular might seriously endanger debt sustainability in the future.

Available population projections unambiguously reveal an increasing proportion of the elderly population. The Slovenian population is about to become the seventh oldest in the world by the year 2050, second only to Italy in the EU. The elderly population will boost pension expenditures as well as health care expenditures since they require more health care services. Furthermore, long-term sustainability is also threatened by low fertility rates, leading to an ever-smaller working-age population to support the increasing number of pensioners.

The main purpose of this paper is to examine debt sustainability in the short-, medium- and long-terms, and to identify potential sources of debt unsustainability in Slovenia's case. The paper focuses particularly on how the ageing population affects debt sustainability. Given the endogenous interest payments and debt dynamics, long-term constraints imposed on the fiscal primary balance are derived.

The applied method consists of calculating debt sustainability coefficients (gaps) in various plausible macroeconomic and policy scenarios of future economic environment. It is contained in two steps. First, a bottom-up approach involving a detailed analysis of past and future expenditures, revenues and factors affecting the fiscal balance, such as demographic changes, to derive plausible paths for the future primary balance and government debt levels. These ingredients are used in the second step to calculate short-, medium- and long-term debt sustainability coefficients, introduced by Blanchard et al. (1990) and used by the European Commission. All the coefficients are calculated under three different pension indexation rules and eight alternative macroeconomic scenarios.

The results demonstrate that general government gross debt would experience a worrisome increase taking into account only pensions and health care expenditures, which are going to deteriorate due to the ageing of the population. This leads to the conclusion that the present fiscal policy is unsustainable in the long run.

Further on, the results acquired by the sensitivity calculations with alternative scenarios first attest that demographic changes have a strong impact on future pension and health care expenditures. Second, it is observed that fiscal policy is very important for long-term debt sustainability. Third, it is shown that the response of government debt in Slovenia is stronger with respect to growth rate and participation rate changes than to interest rate changes in the long run. This means that strong economic growth would lead to rapid improvement in public finances. Fourth, it is demonstrated how estimates of long-term debt sustainability are acutely sensitive to the projections of health care expenditures.

Short-term debt sustainability coefficients indicate that the present fiscal policy could lead to deterioration in sustainability indicators. However, the need for fiscal adjustments, a tax increase or expenditures decrease, is not substantial in the short run. Medium-term coefficients show that fiscal adjustments would be needed in almost all examined cases and the needed adjustments are stronger than in the short-term. Finally, long-term debt coefficients indicate that either primary surpluses or significantly higher economic growth and proper fiscal policy are necessary in Slovenia if fiscal policy is to maintain a sustainable government debt level.

The paper is organized as follows: Section 12.2 reviews the concept of government debt and debt sustainability, and applies it to the Slovenian case. Section 12.3 introduces the debt sustainability coefficients. Section 12.4 presents macroeconomic assumptions and demographic forecasts for Slovenia, and also analyzes the evolution of future pension expenditures assuming three different pension growth scenarios. Finally, it comprises the projections of future health care expenditures, differentiating between elderly health care expenditures. The results are presented and commented on in Section 12.5. Section 12.6 summarizes the main findings and provides guidance for further research.

12.2 Government Debt in Slovenia: Where do we stand?

This section first looks at some definitions of government debt and debt sustainability, and second, presents an analysis of the current debt dynamics in Slovenia. Regarding the Maastricht criterion on debt, Slovenia does not pose any problems of non-compliance. However, this does not assure long-term debt sustainability.

12.2.1 Concepts and definitions

Public finances are sustainable if and when the government meets its obligations when they arise in the future, contributing to a stable macroeconomic environment that will promote economic growth in the long run. However, debt sustainability is not simply a matter of avoiding debt accumulation. It also requires keeping the tax burden at a reasonable level, and not restraining essential public expenditures such as investment and R&D[1]. Blanchard, who defines a sustainable fiscal policy as one in which the ratio of debt to GNP eventually converges back to its initial level, provides an alternative definition[2]. In order to assure debt sustainability in the long run, HM Treasury, for example, sets two fiscal rules: the golden rule and the sustainable investment rule[3].

The European Commission in turn acts to discourage unsustainable fiscal positions in the Euro Area via its Stability and Growth Pact, which sets forth that government deficits should not exceed 3% of GDP, and public debt as a proportion of GDP should be held below 60%[4]. While a lot of attention has been given to the government deficit figures until now, the European Commission[5] has largely agreed that there should be more focus on debt sustainability. This implies that more attention should be paid to the medium- to long-term budgetary impact of current policies. However, the European Commission states that even in assuming a Member State achieves a medium-term budgetary target, there still exists a risk of an unsustainable public policy. Therefore, long-term fiscal projections are very important for governments in forming their current policies[6]. Some experts criticize that the analytical and operational definition of sustainability as appointed in the Maastricht Treaty is not straightforward[7]. Moreover, the economic rationale of the fiscal reference values is under question[8].

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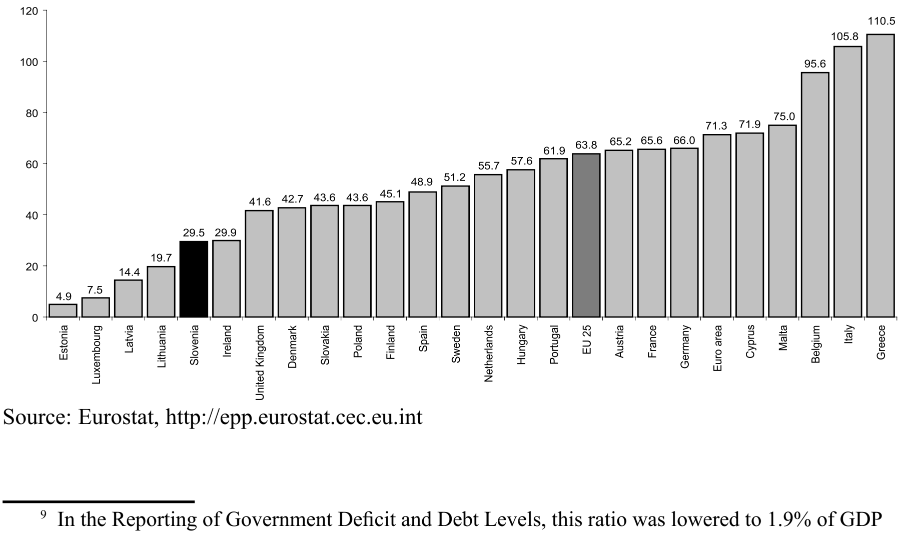
[1] Costello and Regling (2003)
[2] For more definitions on debt sustainability, see the working paper by Balassone and Franco (2000)
[3] HM Treasury (2002, 2003)
[4] See the Maastricht Treaty, Art. 109j and 104.
[5] See European Commission (2003b), p.35
[6] See Flores, Giudice and Turrini (2005)
[7] See Franco, Marino and Zoteri (2004) Buti and Sapir (1998) and Buti, Eijffinger and Franco (2002)
[8] See Buiter et al. (1993) and Eichengreen and Von Hagen (1996).

12.2.2 Current trends

At present, Slovenia does not exceed any of the two reference values, and major changes are not expected over the short-term (one year) period. In 2004, the deficit ratio reached 1.9% of GDP. The government's objective, laid down in the Convergence Programme 2004-update, is for the general government deficit to reach 2.1% of GDP in 2005[9]. Under that scenario, the government deficit should fall to 1.8% in 2006 and to 1.1% in 2007. This is expected to be achieved not by changing the overall fiscal burden, but through a gradual decline in the expenditure-to-GDP ratio in 2005 and 2006. Moreover, the new government is committed to achieving a close-to-balance position in the medium-term and to improve the quality of fiscal policy by redirecting expenditures towards those programs that have a positive impact on economic growth.

Regarding public debt, Slovenia today presents a much more optimistic picture than its deficit ratio would suggest, with a level far below the reference value of 60% of GDP. Since 2000, when the government debt ratio stood at 27.4%, it has increased by 2.1% over the subsequent years to the present time. In principle, this reflects a sound and relatively sustainable medium-term fiscal position of the past budget balances. Other determinants, however, such as privatization transactions, restructuring of the banking system and valuation adjustments should also be considered. Comparisons with the other EU-25 countries are provided in figure 12.1, which shows that Slovenia has the fifth lowest government debt in the EU-25 and remains far below the average level.

Figure 12.1 Government debt in % of GDP for EU-25 in 2004



Source: Eurostat, http://epp.eurostat.cec.eu.int

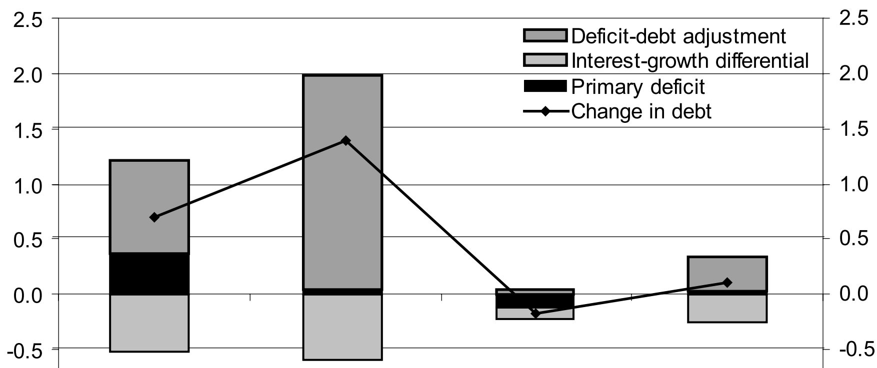
[9] In the Reporting of Government Deficit and Debt Levels, this ratio was lowered to 1.9% of GDP

In order to better understand the debt dynamics, the breakdown of the Slovenian general government debt ratio is presented in Figure 2 below. The change in debt has been broken down into three factors: primary deficit, interest-growth differential and deficit-debt adjustment. Factors that contributed to the higher debt level are shown with a positive sign and vice versa.

First, the primary balance shows general government net lending, excluding interest payments. A significantly decreasing pattern of the primary balance since 2001 can be seen above. This indicates that deficits increased the debt ratio in 2001, 2002 and 2004, while in 2003 a primary surplus contributed to debt reduction.

Second, the interest-growth differential shows a combined effect on the level of interest rates and economic growth on each year's debt level. It explains how much economic growth has contributed to lower debt more than interest payments increase it, or vice versa. Interest payments show government expenditures for interest on the accumulated past general government debt. It can be seen that the interest-growth differential has lowered government debt levels over the past four years. This means that economic growth has been higher compared to the implicit[10] interest rate. The highest interest-growth differential was registered in 2002, when it decreased the government debt by around 0.6 percentage points of GDP. Forecasts for GDP growth rates are not as optimistic compared to rates from the past two years. From here, one may conclude that economic growth in the future may not contribute as much to lowering the government debt levels as it has in the past few years.

Figure 12.2 Government debt dynamics in Slovenia, 2001–2004
(changes in % of GDP)



Source: Ministry of Finance and author's calculations.

[10] The implicit interest rate is generally defined as current year interest payments divided by the debt from the previous year

Third, deficit-debt adjustment is defined as the difference between the government balance and the annual change in government debt. It captures the rest of the factors, such as debt takeovers, valuation adjustments, enterprise restructuring and privatizations, which cause government debt to change. In the past five years a majority of the deficit-debt adjustment in Slovenia was composed of the valuation adjustments, i.e. the exchange rate adjustment, and debt takeovers, which are contributors to an increase in government debt. The major takeover happened in 2001 when the government took over debt from the Slovenian railways and iron industry, which amounted to SIT 89.9 billion or 1.9% of GDP[11]. In 2002 there was a particular accrual adjustment made in the Notification tables in order to reconcile the eleven months of VAT and excise duties[12].

In the calculations of the future gross debt, the deficit-debt adjustment is equal to zero, which is an important assumption. There are some contingent liabilities and government property which might influence the government debt and its sustainability in the long run. However, there is no accurate data available on contingent liabilities for Slovenia. At the end of 2004 there were 9.1% of GDP guarantees, but this is only part of the contingent liabilities. Moreover, it would be more relevant to calculate net debt, where the government's property is also taken into account. However, as this data is not available, the ESA95 definition of debt is used.

It is expected that Slovenia will continue to fulfil the two fiscal Maastricht criteria until the year 2007, when euro adoption occurs. Nevertheless, fulfilling the Maastricht criteria and joining the Euro Area does not mean that long-term debt sustainability has been achieved. For this purpose, the present working paper looks more precisely at the evolution of Slovenian long-term fiscal expenditures, which are likely to substantially increase due to the impact of demographic changes such as ageing of the population.

12.3 Debt Sustainability Coefficients or Sustainability Gaps

Assessing long-term debt sustainability is done using the bottom-up approach. This means that a profound analysis of past and future expenditures, revenues and other factors affecting fiscal balance, such as demographic changes, are included in the derivation of the primary balance and debt levels.

[11] The data is taken from the Report on Debt Management in Slovenia for 2001.

[12] The Central Government budget only included revenues from VAT and excise duties from February to December, and re-applied the principle of pure cash flow. (Reporting on Government Deficits and Debt Levels, Notification of April 2003).

12.3.1 *Definition of debt sustainability gaps*

Sustainability gaps are indicators used to assess long-term sustainability of public finance or debt sustainability[13]. They show the gap between the current budgetary policy and the policy needed to ensure sustainability. They can be expressed as tax gaps or primary balance gaps. Tax gaps show the difference between taxes needed to achieve long-term debt sustainability and current taxes. However, the results may be interpreted in favour of lowering expenditures instead of increasing tax rates. Likewise, the primary balance gap[14], or the required primary balance gap as it is referred to by the European Commission, explains what the primary balance should be, so as to achieve the fiscal goal of debt sustainability.

Long-term sustainability coefficients through fiscal projections also indicate the evolution of a debt-to-GDP ratio over time. It may either be the evolution of debt so that at the end of the observed period it reaches a certain level, or debt evolution by putting some restrictions on other fiscal indicators.

Blanchard et al. (1990) choose three indicators to determine debt sustainability over a varying time horizon. These are short-term, medium-term and long-term gaps. The short-term indicator corresponds to one year, the medium-term to five years and the long-term to a 40-year projected period. This paper performs calculations of all three indicators, using long-term gaps as upgraded by the European Commission.

The European Commission, in its recent EPC publications[15] and their Assessments of the Convergence Programmes, calculates three long-term indicators. First, they calculate the S1 indicator, which measures the required primary balance that ensures a debt-to-GDP ratio of 60% in 2050. Second, the S2 indicator fulfils the inter-temporal budget constraint. Third, the Required Primary Balance (RPB) gap, which shows the minimum required average cyclically adjusted primary balance as a share of GDP over the first five years of the projected period, which guarantees respecting the inter-temporal budget constraint of the government[16].

12.3.2 *Calculating sustainability coefficients (gaps)*

This paper differentiates between three types of sustainability gaps[17]: short-term, medium-term and long-term. Under the long-term sustainability gap, two additional gaps are differentiated.

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[13] cf. European Commission (2004), Blanchard (1990) and HM Treasury (2002, 2003, 2004)
[14] See also Deutsche Bundesbank (2003), p.26–29
[15] cf. European Commission (2004)
[16] cf. European Commission (2005)
[17] cf. Blanchard et al. (1990)

a) Short-term sustainability gap[18]

Short-term sustainability gap relates to the period of one year and is easy to assess.

$$t^* - t = g + h - t + (r - \theta)^* b_0 = d + (r - \theta)^* b_0 \qquad (1)$$

where t^* denotes the required tax ratio, t the current tax ratio, g real spending, h transfers, t taxes, d the primary balance, r the real interest rate, θ the real GDP growth rate and b_0 the current debt level.

An advantage of the short-term tax gap, as opposed to the rest of the sustainability gaps, is that it does not require any forecasts and only relies on present factual data. Moreover, a breakdown of the primary deficit is not necessary.

b) Medium-term sustainability gap[19]

$$t^* - t = ((\text{average over the next 5 years of } g + h) + (r - \theta)^* b_0) - t \qquad (2)$$

Here, a breakdown of the primary balance into g (real spending), h (transfers) and t (taxes) is necessary. It relates to a five-year period.

c) Long-term gaps

Long-term debt sustainability determined by the fiscal gaps is based on the assumption that the debt rule is met either at the end of the projected period or in perpetuity. From there, what needs to be changed today in order to reach a required debt level in the future can be concluded. It is possible to determine exactly how much today's taxes need to be increased (reduced) or expenditures lowered (increased) in order to cover future spending and rising (declining) debt levels.

The first long-term gap coefficient presented in this working paper is a tax gap related to the S1 coefficient calculated by the European Commission. The difference is in the target debt values. The S1 indicator is used to calculate the gap between current policies and those which would ensure a so-called "prudent" debt ratio in the long run. However, it should be noted that the 60% ratio is a reference value and not a target, and each country may choose its most appropriate level. For that reason this paper presents the S1 indicator at three different levels: 0%, 30% and 60% of GDP debt levels.

[18] cf. Blanchard et al. (1990), p.15, 16.
[19] cf. Blanchard et al. (1990), p.17.

The second indicator, the S2 or IBC (inter-temporal budget constraint) gap, calculates the difference between the currently projected tax ratio and the ratio required to cover future public expenditures in perpetuity, plus current debt. This means that the current debt must be equal to the discounted present value of all future primary balances, and it indicates the need for a possible immediate and permanent change in either revenues or expenditures.

Budgetary projections only cover the period up to 2050 so that further assumptions beyond this date are needed in order to provide the IBC sustainability gap. Calculations in this paper assume that the primary balance remains constant as a percentage of GDP at a 2050 level, implying no further demographic impact on the budget. The tax burden and non-age-related expenditures remain constant as a share of GDP after 2050 as well.

Sustainability gaps of zero would mean that the current fiscal policy is sustainable. On the contrary, a positive value indicates that a sustainable tax rate is higher than the current tax rate and therefore an adjustment in the fiscal policy is needed, either on the revenue or expenditure side.

12.4 Assumptions for Debt Sustainability

This section discusses the influence of demographic changes on the two major budgetary expenditures, i.e. pension and health care expenditures. It presents assumptions on the future macroeconomic environment and demographic projections. It also analyses the impact of an ageing population on future pensions, as well as assessing the evolution of future health care expenditures.

12.4.1 Assumptions on the future macroeconomic environment

It is assumed for modelling purposes that future tax revenues grow in accordance with nominal GDP. In addition, non-age-related expenditures and other age-related expenditures remain constant as a share of GDP over the projected period[20] as well, although it is unlikely that these items will remain unchanged for several decades[21].

Future GDP growth depends on labour productivity and employment growth. There exists the danger of a negative impact from the ageing population on growth potential via labour supply, unless this effect is offset by higher participation and productivity rates[22]. If the non-working population

[20] Similar assumptions were made by Costello and Regling (2003) and by HM Treasury (2002, 2003, 2004)

[21] Hauner (2005) in his research of fiscal expenditures under alternative assumptions determines that either keeping real non-age-related expenditures constant or keeping them constant per capita can be viewed as significantly negative.

[22] See Kraigher (2003)

(65+) rises faster than the working population (20–59) due to the ageing of the population, production will be left to a smaller labour force and real GDP growth will fall in the long run through negative employment rates. Moreover, productivity tends to decline with an ageing labour force, which lowers the growth rate for output[23]. Real GDP growth is thus predicted to decrease from 3.9% in 2005 to 0.6% by the year 2050 for the Baseline scenario, which is shown in Table 12.1.

Table 12.1 Main macroeconomic assumptions

Baseline Scenario	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Productivity	3.0	3.0	3.0	2.8	2.6	2.4	2.2	2.0	2.0	2.0
Employment	0.2	–0.2	–0.9	–0.8	–0.8	–0.8	–1.0	–1.3	–1.3	–1.4
Real GDP Growth*	3.9	2.8	2.0	2.0	1.7	1.5	1.2	0.7	0.7	0.6
Inflation	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Real interest rate	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Sources: *Jongen (2004) and author's calculations

Real GDP growth and real interest rate projections are difficult to predict over such a long period of time (to 2050). For that reason, alternative scenarios will give a picture of how real GDP growth and real interest rates affect debt sustainability.

Inflation, measured as CPI, is kept constant at 2.5% over the projected period. Moreover, the real interest rate is held constant at 3%. The fact that with increasing debt levels economies usually face increasing risk premiums is ignored. Annual employment growth rates, presented in Table 12.1, are derived from the calculations explained in Annex 12.1.

12.4.2 Demographic projections for Slovenia

Demographic changes, resulting in increased pension and health care expenditures, are the most probable factor and are expected to have a negative impact on debt sustainability in the long run. For that reason, this sub-section analyzes the demographic situation in Slovenia.

According to population projections based on the United Nation's World Population Prospects[24] medium-term scenario, the overall population in Slovenia is expected to fall by 17.2% from 2000 to 2050, due to low fertility

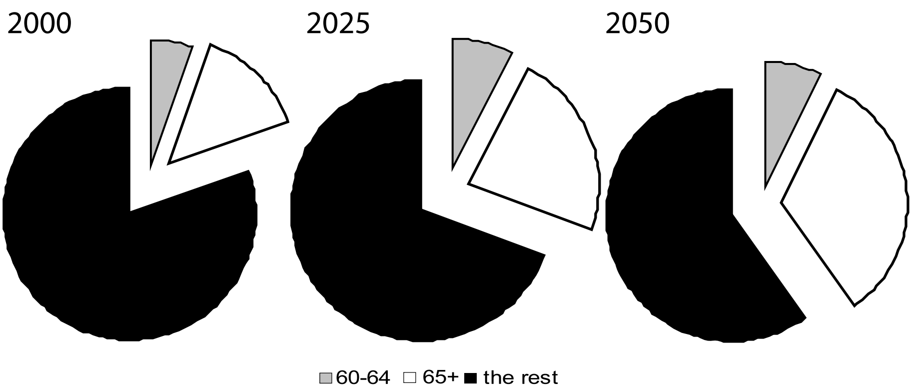
[23] Kinnunen and Kuoppamaki (1998).
[24] See also Strojan-Kastelec (2005), Annex II.

rates and a low immigration rate. Slovenia should be even more concerned than similar countries as its population is about to become the seventh oldest in the world and the second oldest in the European Union by the year 2050.

However, Eurostat's new Population Projections (2005) show a decline in the total population of only 4.4% by the year 2050. This substantial difference in population projections tells us that demographic developments are difficult to predict in the long run. Nevertheless, the population age structure from Eurostat's projections, compared to the United Nation's Prospects, differs only marginally. This paper only considers the United Nation's Population Projections since the difference between the two projections does not affect the conclusions on debt sustainability.

Slovenia currently has the sixth lowest fertility rate in the world (1.22). By the year 2050, it is projected to move into fifth place. As a result, the Slovenian population between the ages of 15 and 59 will decrease from 65.6% of the overall population in 2005 to 47.2% in 2050. It is therefore evident that the share of older people in the total population will rise. Figure 4, on the left-hand scale, indicate that the sizes of the working-age population and children are projected to fall substantially, while on the other hand the over-60 population group is sharply rising[25]. Consequently, the median age in Slovenia is about to increase from 40.2 years in 2005 to 51.9 in 2050, compared to 27.7 years in 1950.

Figure 12.3: Population structure by age group from 2000 to 2050



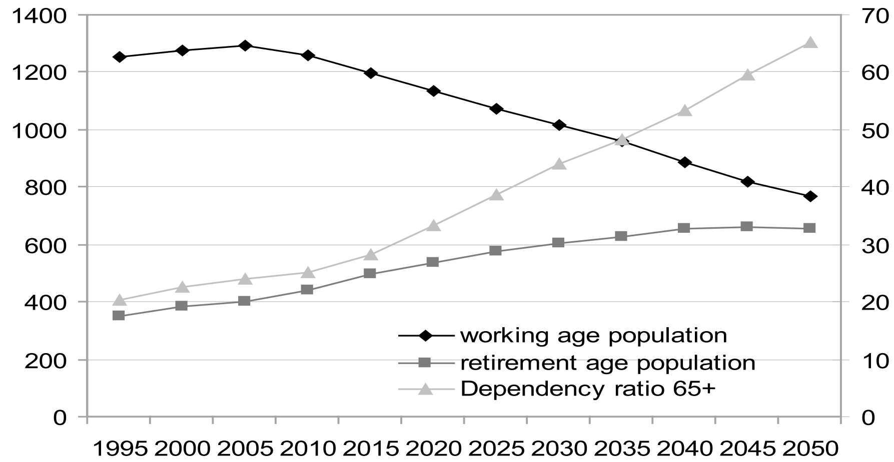
Source: United Nations World Population Prospects, the 2004 Revision.

The effect of demographic changes and the worrisome evolution of an ageing population in Slovenia can be better seen by the performance of the elderly dependency ratio in Figure 12.4, on the right-hand scale, where

[25] This working paper, under one of the alternative scenarios, assumes that after 2010 the working age population will increase gradually by employing people from the 60–64 age group. By the year 2030, 50% of the population from that group will join the working age group.

the elderly dependency ratio is defined as the ratio between the number of people aged 60+ and the number of people aged 20 to 59. It is obvious that the share of the older population will increase significantly by the year 2050. The dependency ratio will in both cases more than double by the end of the observed period.

Figure 12.4 Slovenian population of working and retirement ages, 1995 to 2050 (in thousands)



* Working age is 20–59. Retirement age is 60+.
Source: United Nations World Population Prospects, the 2004 Revision

To sum up, demographic changes in the Slovenian population will have a double negative effect on long-term fiscal and macroeconomic development. First, ageing of the population will create higher expenditures for pensions and health insurance. Second, it will contribute to slower GDP growth, unless there are higher participation or productivity rates.

12.4.3 Pension expenditures

It is necessary to make an assessment of probable future pension expenditure developments, which will, due to demographic changes and ageing of the population, deteriorate future debt sustainability. Although it is not possible to exactly predict the evolution of the future population, it is nevertheless certain that the number of pensioners will rise relative to the working age population. Pension revenues are predicted to grow in line with employment and nominal wage growth.

There are two indicators which help to explain the impact of the ageing population on pensions and finally on debt sustainability. The first is the support ratio and the second is the replacement ratio[26].

First, the support ratio measures the share of the employed population over all pensioners. The ageing of the population will cut this support ratio to nearly half over the period from 2005 to 2050. The current pension system, put in place in 2000, determines a gradual increase in the retirement age. The support ratio significantly decreases due to the strong ageing of the population over the projected period. It falls from 1.5 in 2005 to 0.8 in 2050. The support ratio, which includes only elderly pensioners instead of all pensioners, drops from 2.6 to 1.0 from 2005 to 2050.

Second, the replacement ratio measures the difference in pension and wage growth. In order to better understand the importance of pension policy decisions and their effect on long-term fiscal sustainability, this paper presents three scenarios related to pension growth.

Under the first, Baseline, scenario (Scenario **W&I**) the replacement ratio captures pension growth, which is determined by inflation and wage growth. This means that pensions are predicted to grow slower than wages, since only 50% of the wage growth is taken into consideration for the pension increase. It very roughly resembles the pension indexation formula[27] (Scenario **R/01**) introduced in 2001[28], and was in use by mid-2005. By this pension legislation, pensions are about to grow at a slower pace than wages. Therefore, the replacement ratio for the **R/01** Scenario would be falling gradually to the end of the projected period.

However, the pension indexation formula has been changed in mid-2005, so that pensions are indexed to total wage growth. This assumption is therefore included in the second scenario. Scenario **W** predicts that replacement ratios will remain constant over the projected period. Scenario **I**, which is the most optimistic (but not realistic), predicts that pensions would only grow in line with the projected inflation rate. The replacement ratio in this scenario would significantly decline over the period to 2050.

Figure 12.5 shows replacement rates by the three explained scenarios. The lowest replacement rate arises from Scenario **I**, while the highest by Scenario **W**.

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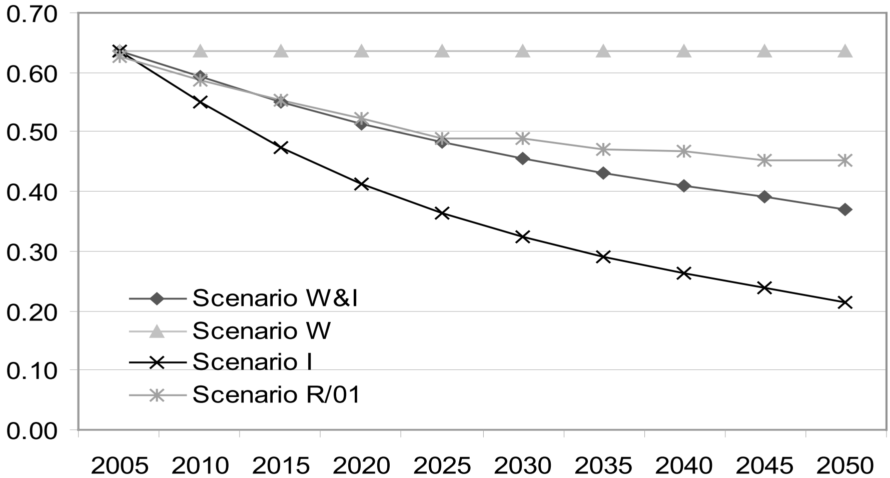
[26] Before calculating these two indicators, we have to make projections of the number of people employed and the number of people retired over the next 45 years. They are explained in Annex 12.1

[27] Under the pension legislation, implemented in 2000, there was: (1) a gradual increase of the retirement age, (2) a complex system for pension indexation which had, on average, reduced the rate of pension indexation slightly below the rate of wage growth in 2001, (3) a gradual reduction of replacement rates to lower levels, (4) the introduction of retirement penalties that were about to affect certain groups of people who qualified for retirement at an early age.

[28] See also Strojan-Kastelec (2005), p. 9 – 15.

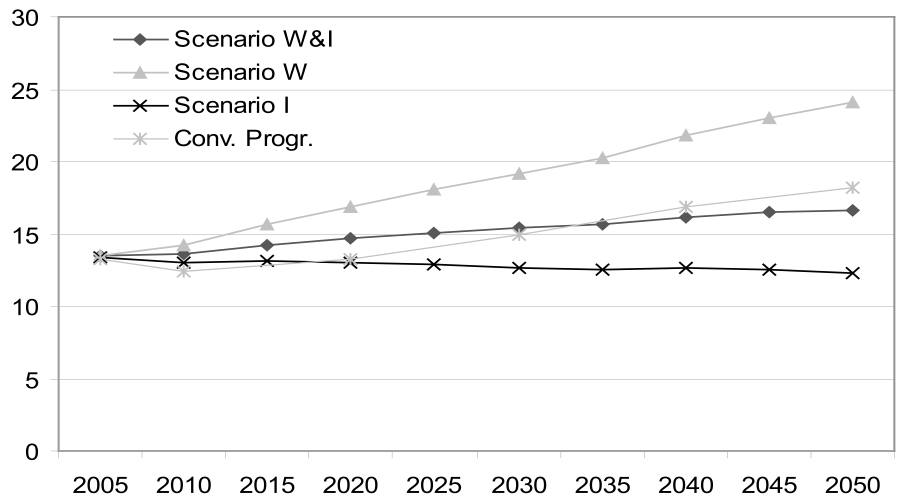
Figure 12.5 Replacement rates by the three scenarios



Source: ZPIZ Pension Fund and author's calculations

The highest growth in pension expenditures is expected under Scenario W, while Scenario I projects a decrease in pension expenditures over the projected period up to 2050. The Baseline Scenario **W&I** resembles the calculations from the Convergence Programme 2004-Update made by the Slovenian Ministry of Finance. Under this scenario, pension expenditures would increase from 13.4% of GDP in 2005 to 16.6% of GDP by the year 2050.

Figure 12.6 Pension expenditures by the three scenarios in % GDP (UN's projections)



Source: United Nations Population Projections, ZPIZ Pension Fund and author's calculations

12.4.4 Health care expenditures

Quantifications of the impact of demographic changes on health expenditures are highly uncertain. While there is a broad consensus in the literature that population ageing will increase health care expenditures and thus put further pressures on fiscal sustainability, all estimates are acutely sensitive to the assumptions on which they are based. Consequently, considerable care is needed when interpreting health care expenditure projections and sensitivity checks should be thoroughly examined.

Uncertainty about health care expenditure projections stems from several factors. First, many projections use mechanical assumptions that hold for the past, but might change in the future. For example, a commonly used assumption is a constant ratio between the health care expenditures[29] of the elderly population (usually 65+) and of the rest (0–64). However, certain evidence presented in Jacobzone (2002) shows that age-expenditure profiles change over time. Second, the fact that people will be living longer is likely to be coupled with a better health status of the elderly population[30]. This might in turn mitigate the effects of demographic changes on health care expenditures[31]. On the other hand, others claim that morbidity postponements are one of the factors that will substantially increase health expenditures in the future[32]. Third, health care expenditures are also strongly driven by non-demographic determinants, such as new technologies in medicine and research, and development in the health sector. This provokes rising costs in pharmaceuticals as well as higher inflation in health services. Omitting the technological effects on health care expenditures could result in underestimated projections of future expenditures.

Projections of future health care expenditures used in this paper are based on Slovenian Ministry of Health calculations presented in the White Book[33]. The Slovenian Ministry of Health estimated additionally incurred health care expenditures attributable explicitly to the ageing of the population from 1993 to 2002 and made projections up to 2015. On the basis of these calculations, it can be estimated that, on average, a one percentage point increase in the share of population aged over 65 years results in a SIT 9.6 billion increase of health care expenditures, measured in constant 2002 prices, and this assumption is applied in the paper. Another assumption applied is that the share of health care expenditures in GDP would remain constant at 6% if there were no

[29] In OECD countries, health care expenditures for elderly people are three to five times higher than for the rest of the population (Jacobzone,(2002)).

[30] For example, see HM Treasury (2002), p. 16.

[31] See e.g. Schulz (2005), p.11–18.

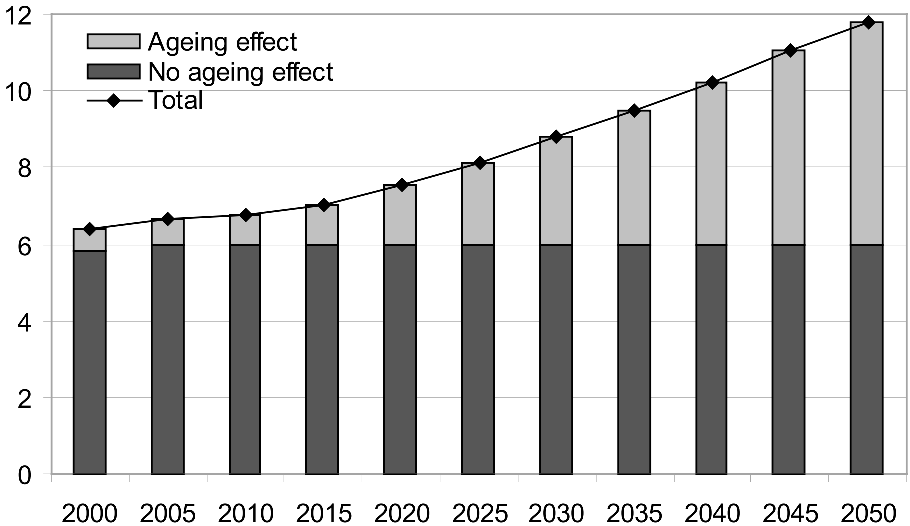
[32] See e.g. Lagergren (2000).

[33] Ministry of Health of the Republic of Slovenia, (2003)

change in the age structure of the population. This paper predicts that after 2004, revenues will be increasing in accordance with the nominal GDP.

Figure 12.7 shows a projected evolution of health care expenditures in percent of GDP from 2000 to 2050. Overall health care expenditures are about to increase significantly as a consequence of the increased health care expenditures of the elderly population.

Figure 12.7 Health care expenditures with and without ageing costs (in % of GDP)

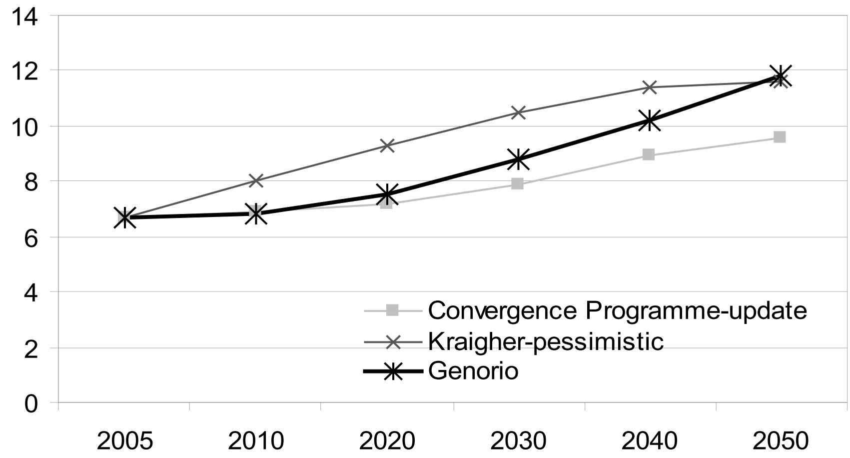


Source: White Book on Health Reform, 2003 and author's calculations

Similar results are presented by other studies (see Figure 12.8). Kraigher (2003) provides two health care expenditure scenarios, depending on two different assumptions of the future demographic developments. The more pessimistic scenario comprises demographic developments almost identical to the one used in this paper. Kraigher in his paper assumes that the age group of 0–54 spends 3.2% of GDP on health care expenditures, while a person from the 55+ age group spends 18% of GDP. Health care expenditures would exceed 9% of GDP under the optimistic demographic developments and would come close to 12% under pessimistic ones by the year 2050. On the other hand, the update of the Convergence programme projects health care expenditures to reach 9.6% of GDP in 2050[34].

[34] The original Convergence Programme, published in May 2004, put the number at 8.9% of GDP.

Figure 12.8 Comparison of health care expenditures in % of GDP



Source: Convergence Programme 2004-update, Kraigher (2003), White Book on Health Reform, 2003 and author's calculations.

Differences between various health care expenditure projections are mostly due to different underlying demographic and macroeconomic assumptions[35]. However, it should be noted that the primary purpose of this paper is not to provide exact numbers for future health care expenditures, but rather to assess the effect of different health care projections on debt sustainability[36]. This can then be used to evaluate different fiscal policies regarding their effect on debt sustainability.

12.5 Results

This section presents developments in debt levels and in debt sustainability indicators under different scenarios, taking into account demographic changes and their impact on pension and health care expenditures. First, the outcome of the Baseline scenario under three different pension adjustment scenarios is presented. Second, seven alternative scenarios are introduced. Finally, debt sustainability gaps are calculated for all scenarios. The main conclusion is that a continuation of the current fiscal policy set against unfavourable demographic changes is very likely to result in unsustainable debt levels.

[35] For example, the assumption on the evolution of the employment rate used in this paper differs considerably from the one used in the Convergence Programme. The sensitivity of the employment rate on the final government debt can be seen in the simulation of the first alternative scenario.

[36] See Section 5.2, Figure 15 for government debt evolution with health care expenditures from the Convergence Programme 2004-update.

12.5.1 Baseline scenario

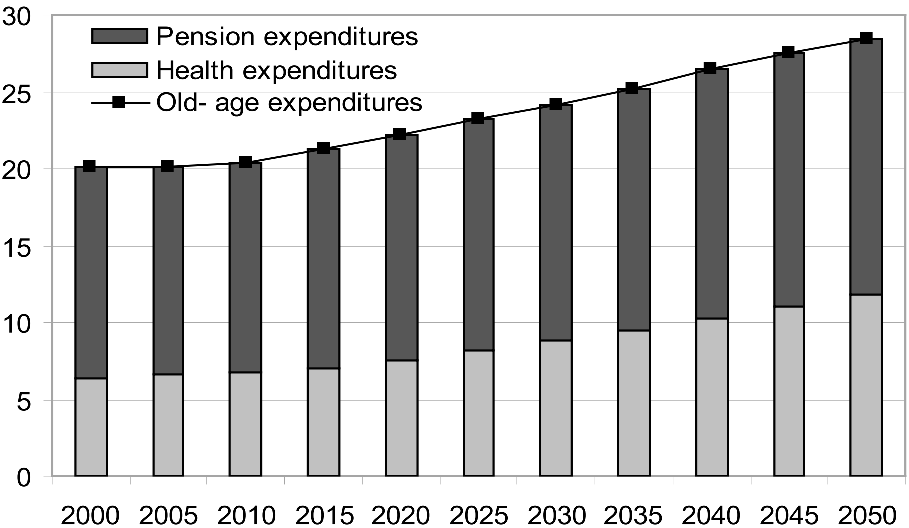
The Baseline scenario takes into account macroeconomic assumptions shown in table 12.1 and pension growth in line with wages (50%) and inflation (50%) (Scenario **W&I**). This scenario also takes into account a gradually increasing participation rate for the population aged 20 – 59, while for the population group 60 – 64 it is set to 0.

Table 12.2 Participation rates[37] under the Baseline scenario

Participation rates	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(20 – 59)	0.69	0.69	0.69	0.70	0.71	0.72	0.73	0.74	0.75	0.75

Table 12.2 shows that 69% of the population between the ages of 20 and 59 is employed in 2005. By the year 2050 this number is predicted to increase to 75%. However, the participation rate could also rise because of immigration flows of the working-age population or because of the gradual increase of the retirement age. Immigration would mitigate the impact of falling birth rates and ageing of the population, providing more labour supply[38].

Figure 12.9 The evolution of total Pension and Health care expenditures as % of GDP, Baseline with Scenario W&I



Source: ZPIZ, ZZZS, author's calculations

[37] Employment rate is the ratio of employed people in the active population, i.e. the population under 60 years of age and it amounts to 0.69%. For more see the section on Pensions, Section 12.4.3.

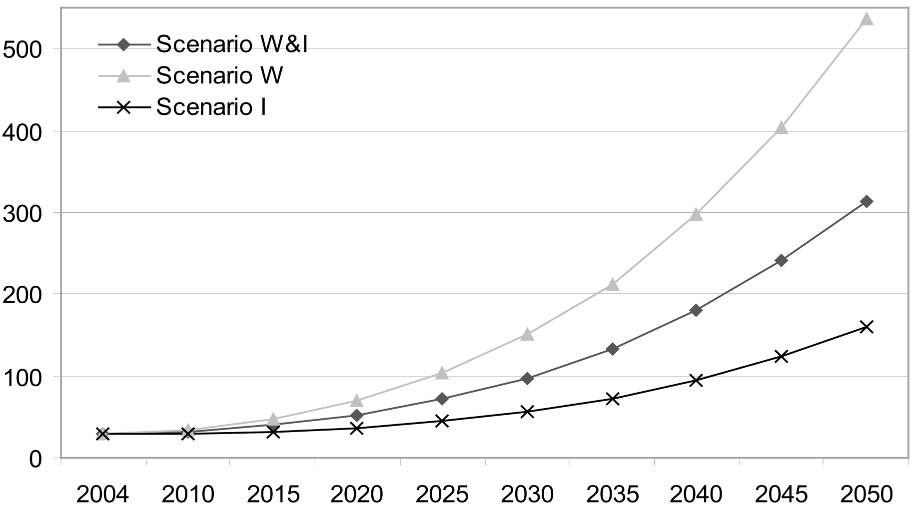
[38] See Green Paper "Confronting demographic changes: a new solidarity between the generations", Communication from the Commission, 16 March 2005

Incorporating the upper predictions into calculations of future pension and health care expenditures, one can determine the evolution of the total elderly related expenditures over the next 45 years. The evolution can be seen in Figure 12.9. Health care expenditures would almost double over the projected period of 45 years. In addition, pension expenditures are about to rise from 13.4% of GDP in 2005 to 16.6% of GDP by 2050.

How important is a policy decision on pension growth for debt sustainability in the long run? The answer is shown in Figure 12.10 below, where debt evolution for the three different scenarios of the pension growth explained in Section 12.4.3 is presented.

Scenario **W** is the one that indicates the least favourable outcome. There is a significant difference between Scenarios **W**, **W&I** and **I**, which points to the importance of fiscal policy decisions on the evolution of the gross debt, and therefore on long-term debt sustainability.

Figure 12.10 Government gross debt by Baseline and three pension scenarios



Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

To show the sensitivity of various factors on the evolution of the government debt in the long run, this working paper in the next section provides seven more scenarios in addition to the three scenarios explained above.

12.5.2 Sensitivity analysis

The sensitivity analysis was carried out by assuming seven additional scenarios. First, the participation rate for the population aged 60–64 was increased. Second, to allow for slow and fast growth scenarios, real GDP growth rates were decreased and increased by 1 percentage point. Third, interest rates were lowered and raised by 1 percentage point from the Baseline scenario. Fourth, the demographic structure remained at the 2005 level. Finally, health care expenditures, projected by the Ministry of Finance and published in the Convergence Programme 2004 update, were simulated.

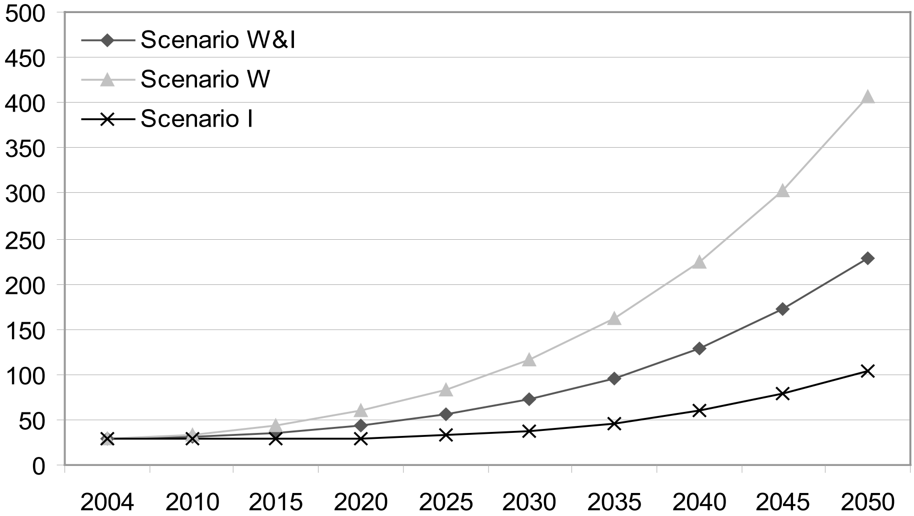
Table 12.3 Scenarios

Scenarios		
1)	Baseline	Baseline
2)	Part. rate ↑	Increased participation rate for a group 60–64
3)	1 pp ↑ Q	1 p.p. increase in productivity growth rate
4)	1 pp ↓ Q	1 p.p. decrease in productivity growth rate
5)	1 pp ↑ i	1 p.p. increase in the real interest rate
6)	1 pp ↓ i	1 p.p. decrease in the real interest rate
7)	Pop. 2005 level	Population structure remains at 2005 level
8)	C.P. health exp.	Projections of the health care expenditures taken from the Convergence Programme 20004-update

First, the participation rate for the population group aged 60–64 is increased from 0 to gradually increasing levels in order to partly accommodate the labour market on demographic changes. This means that the retirement age will gradually increase and the population aged 60–64 would gradually prolong their working period up to age 65, thus increasing the labour supply. The participation rate for this age group will range from 0.1% in 2010 to 0.5% in 2050. It would never exceed 0.5%, since it is expected that there will be more disabled and ill people from this age group compared to the group aged 20–59.

Figure 12.11 shows that increasing the participation rate in the age group 60–64 would significantly improve debt outcomes. Under Scenario **W&I**, government debt would approach 60% only by 2026, and by 2050 it would be 86 percentage points of GDP lower than in the Baseline scenario. This improvement was expected, since a higher participation rate means a stronger labour supply and consequently higher GDP growth rates, which lowers debt levels. However, debt sustainability is still not assured over the projected period. Despite the gradual incorporation of the population aged 60–64 into the working age population, risks of unsustainable debt developments do not disappear.

Figure 12.11 Government gross debt by (Part. rate ↑) and three pension scenarios



Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

The subsequent scenarios concern an increase or decrease in real GDP growth and real interest rate.

Figure 12.12 below shows evolution of the government gross debt under all three pension scenarios and an alternative scenario with deviations from the growth rate assumption by 1 percentage point.

Assuming pension growth in line with wages and a 1 percentage point lower growth rate from the Baseline leads to the least favourable result. On the other hand, assuming pension growth in line with inflation and a 1 percentage point higher growth rate from the Baseline leads to the most favourable result. In addition, there is also a big difference between the same pension scenario and a different growth rate scenario.

A significant deviation of the alternative scenarios compared to the Baseline scenario[39] tells us that growth rate plays a crucial role. In the case of future growth rate drops, debt sustainability will significantly deteriorate. On the other hand, future growth rate increases would help to keep government debt on a more sustainable path.

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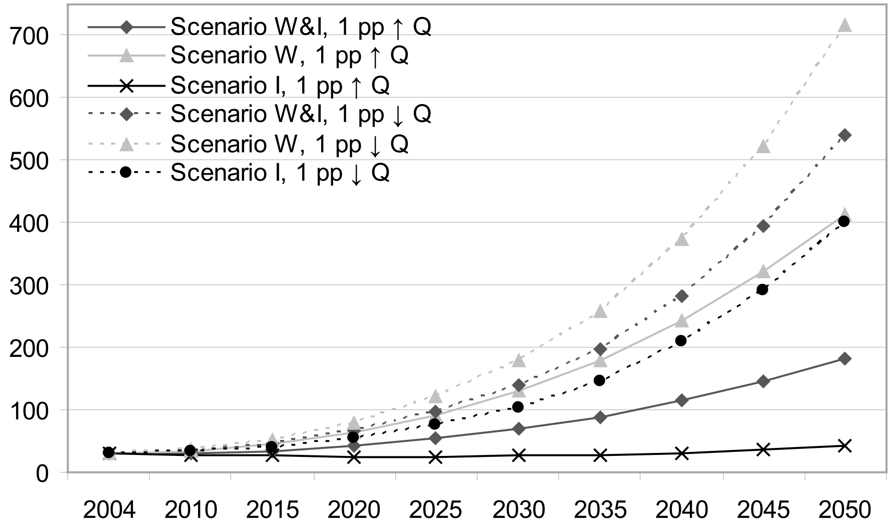
[39] See Annex II

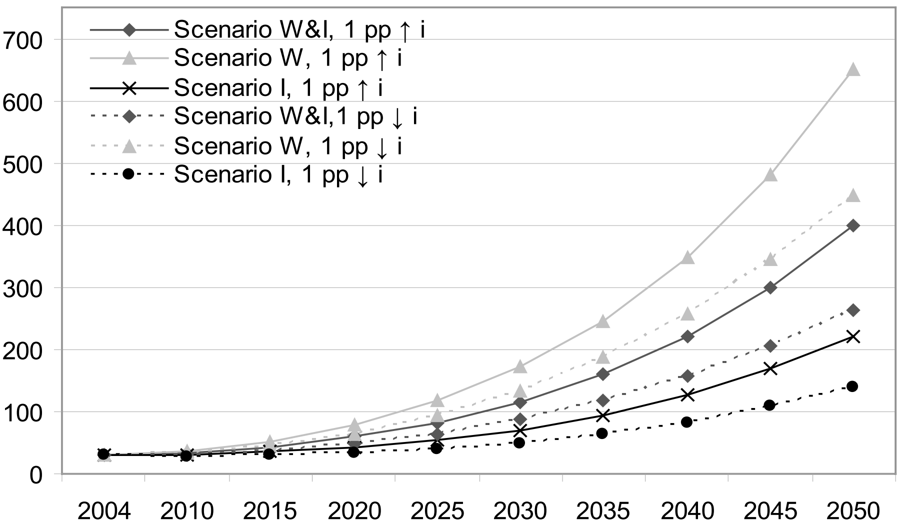
Figure 12.12 Government gross debt and growth rate sensitivity with three pension scenarios



Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

Figure 12.13 shows the evolution of the government gross debt under all three pension scenarios and an alternative scenario with deviations from the interest rate assumption by 1 percentage point.

Figure 12.13 Government gross debt and interest rate sensitivity with three pension scenarios



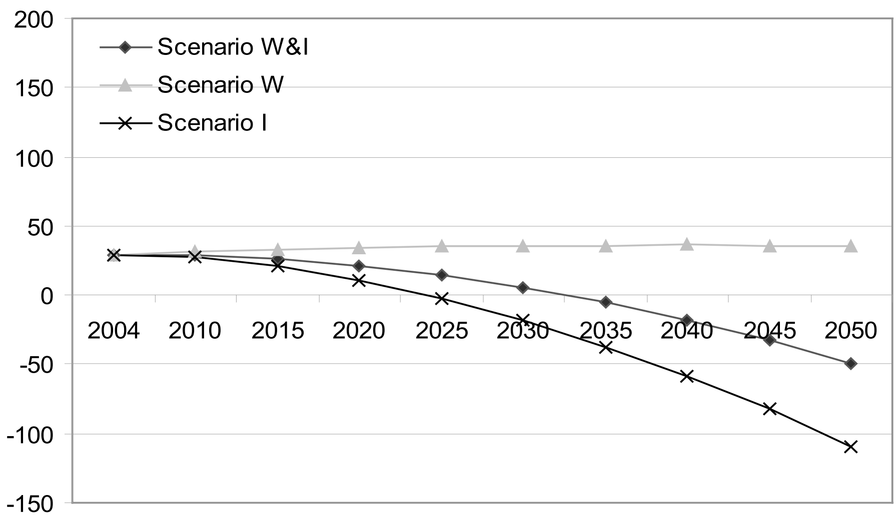
Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

A 1 percentage point higher interest rate would increase debt in 2050 by more than 100 percentage points, if pensions grow in line with wages.

A 1 percentage point lower interest rate would have a smaller impact on the final result of government debt than an increase. In the case of pension growth in line with wages, this decrease would improve the debt level in 2050 by 88 percentage points. Comparing interest rate scenarios with growth rates and the Baseline scenario, we can conclude that growth rate deviations have a stronger impact on the evolution of government debt than interest rate deviations. Nevertheless, the difference in the pension adjustment mechanism is more important.

Figure 12.14 shows the evolution of government debt for the three pension scenarios and under the assumption that the demographic structure and the size of the population remain at the 2005 level. This scenario has been introduced in order to confirm a presumed strong link between ageing of the population and long-term debt sustainability. Government debt in % of GDP remains constant or decreases if we predict the population from 2005 to remain constant over the whole observed period.

Figure 12.14 Government gross debt and Scenario (Pop. 2005 level)

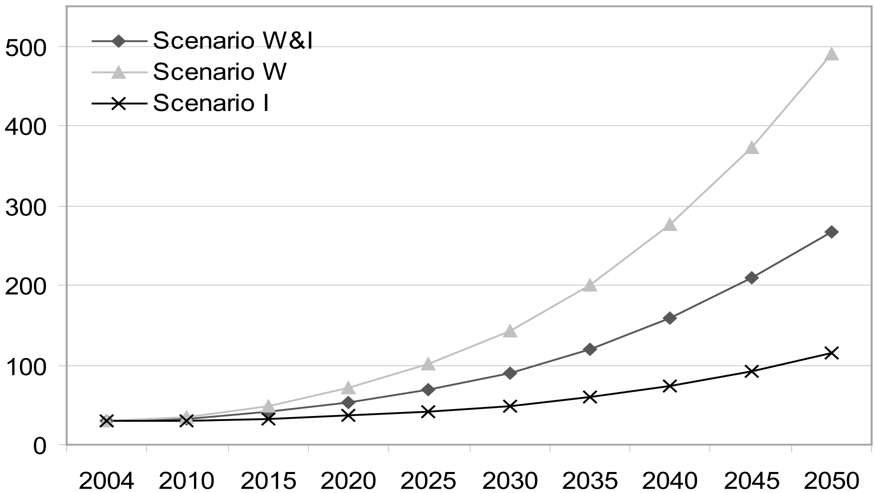


Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

A decrease of government debt below 0% of GDP after 2030 is a consequence of the increasing nominal GDP, which results from the predicted gradual increase in the participation rate and consequently higher labour supply and employment rates. An alternative scenario shown in Figure 14 indicates that demographic change will have an important impact on future debt sustainability.

Finally, health care expenditures, projected by the Ministry of Finance and published in the Convergence Programme 2004-update, were simulated. According to this scenario, health care expenditures reach 9.6% of GDP in 2050. Figure 15 below exposes the difference in government debt evolution, which results from different health care projections[40]. In comparison to the Baseline scenario, the difference of 2.2% of GDP in health expenditures results in a difference of 46.4% of GDP in government debt under all three pension scenarios at the end of the observed period.

Figure 12.15 Government gross debt and Scenario (C.P. health exp.) with three pension scenarios



Source: Author's calculations, Ministry of Finance, ZPIZ, ZZZS

Four main conclusions can be derived from the sensitivity analysis provided above. First, the sensitivity calculations show that the response of the government debt dynamics in Slovenia is stronger with respect to the growth rate and participation rate changes than with respect to interest rate changes in the long run. This means that stronger economic growth would lead to a significant improvement in public finances. Second, it can be observed from all the presented figures and differences between the three pension scenarios, that fiscal policy is very important for long-term debt sustainability. Third, it has been attested by the sixth alternative scenario that demographic changes significantly deteriorate debt sustainability in the long run. Fourth, the last alternative scenario demonstrates that estimates of long-term debt sustainability are acutely sensitive to the projections of health care expenditures and assumptions on which they are based.

[40] See section 4.4.

12.5.3 Debt sustainability coefficients (gaps) in various scenarios

As explained in Section 12.4.2, this paper calculates three types of debt sustainability coefficients, or gaps: short-term, medium-term and long-term. S1 and S2 are long-term coefficients, and under S1 there are additional three scenarios. All together, including all alternative scenarios, this paper calculates 144 debt sustainability gaps.

Short-[41] and medium-term debt sustainability gaps are presented in table 12.4 below. The short-term sustainability gap (t^*-t) indicates by how much the tax ratio (t^*) needs to be increased (or expenditures decreased) in one year, in order to cover the primary deficit (d) and the amount of $(r-\theta)^*b_0$, which stands for the product of interest-growth differential and current debt. This means that the tax rate must keep the ratio of debt-to-GDP constant in the short-term. If the interest rate is higher than the growth rate, then this would deteriorate debt levels. A positive sustainability gap means that tax rates need to rise so as not to accumulate additional debt. For the calculation of sustainability gaps, the projected deficit for 2005 and 2006 is 1.9% of GDP.

First, the short-term sustainability gaps for 2005 and 2006, presented in Table 12.4, are mostly positive but small for pension Scenarios W&I and W. Positive numbers indicate that there is already a need for fiscal adjustments in 2005 and 2006 under the majority of scenarios. Negative numbers, which result mainly from the third pension Scenario I, imply that current fiscal policy was sustainable in the short-term if pensions would rise in line with inflation.

Second, medium-term sustainability gaps give a very similar picture to the short-term. From Table 12.4 it is seen that the majority of the numbers are positive for the first two pension scenarios (first two columns), which means that under these scenarios, fiscal policy would need to be adjusted immediately or over the next five years.

[41] See equations for short-term substainability gaps in section 12.4.2.

Table 12.4 Short- and medium-term sustainability coefficients (gaps), 2005 and 2006 (in %)

2005	Short term gap (2005)			Medium term gap		
Scenarios	W&I	W	I	W&I	W	I
Baseline	0.05	0.15	−0.06	0.17	0.52	−0.16
Part.rate ↑	0.05	0.15	−0.06	0.04	0.37	−0.27
1 pp ↑ Q	0.05	0.15	−0.06	−0.02	0.40	−0.40
1 pp ↓ Q	0.05	0.15	−0.06	0.39	0.65	0.14
1 pp ↑ i	0.05	0.15	−0.06	0.19	0.52	−0.13
1 pp ↓ i	0.05	0.15	−0.06	0.19	0.52	−0.13
Pop. 2005 level	0.05	0.15	−0.06	−0.20	0.11	−0.50
C.P. health exp.	0.06	0.17	−0.04	0.24	0.59	−0.08
2006	**Short term gap (2006)**			**Medium term gap**		
Scenarios	**W&I**	**W**	**I**	**W&I**	**W**	**I**
Baseline	0.17	0.41	−0.06	0.68	1.14	0.26
Part.rate ↑	0.10	0.33	−0.12	0.49	0.92	0.09
1 pp ↑ Q	0.07	0.35	−0.19	0.41	0.96	−0.10
1 pp ↓ Q	0.28	0.47	0.10	1.01	1.34	0.69
1 pp ↑ i	0.47	0.71	0.25	0.71	1.15	0.29
1 pp ↓ i	−0.12	0.12	−0.34	0.71	1.15	0.29
Pop. 2005 level	−0.04	0.18	−0.24	0.14	0.55	−0.24
C.P. health exp.	0.22	0.46	−0.01	0.78	1.24	0.36

In the medium-term, the highest increase in current taxes would be needed, under the assumption of the pension's increase in line with wages and one percentage point decrease in the growth rate. If pensions grow in line with inflation (third column), then fiscal adjustments would rarely be needed. On the other hand, starting from 2006, it would be needed under six scenarios.

Third, long-term sustainability gaps, S1 and S2, are presented in table 12.5 below. The first one is calculated under the assumption that a certain debt level is achieved at the end of the projected period, and the second one under the assumption that the inter-temporal budget constraint is assured.

Values of the S1 and S2 debt sustainability gaps, as well as of short- and medium-term gaps, depend on the level of the non-age and age related expenditures, on the current stock of gross debt, on the interest-growth differential, and on the current tax ratio.

Table 12.5 presents S1 gaps, calculated with three different end points for government debt. The first end point is a 0% of GDP debt level, the second is 30% of GDP and the last one is the Maastricht reference value for government debt of 60% of GDP. If the difference of $t^* - t$ is positive, it means that Slovenia is not able to ensure respecting the 60% (or 30% or 0%) value over the very long-term period, considering current fiscal policy. Therefore permanent adjustment of the primary balance is needed.

The most favourable outcome of the S1 debt sustainability gap results from the scenario where population is assumed to remain at the 2005 level. Fiscal adjustment is almost not needed except under two cases, where the needed adjustment is not very high. This result confirms our presumption that debt sustainability is strongly connected to demographic changes or ageing of the population.

Table 12.5 Long-term sustainability coefficients (gaps) for a period from 2005 to 2050 (in %)

Long-run gaps	S1_1 (0%)			S1_2 (30%)			S1_3 (60%)			S2 (intertemporal constraint)		
Scenarios	W&I	W	I	W&I	W	I	W&I	W	I	W&I	W	I
Baseline	4.4	7.4	2.2	4.0	7.0	1.8	3.5	6.6	1.8	5.4	9.5	2.7
Part.rate ↑	3.3	5.8	1.5	2.9	5.4	1.1	2.4	5.0	0.6	4.1	7.5	1.9
1 pp ↑ Q	3.2	7.3	0.7	2.7	6.7	0.2	2.1	6.2	−0.3	3.7	9.2	0.7
1 pp ↓ Q	5.8	7.7	4.3	5.5	7.4	4.0	5.2	7.1	3.7	7.5	10.0	5.6
1 pp ↑ i	4.3	7.1	2.4	4.0	6.7	2.1	3.7	6.4	1.8	5.0	8.4	2.7
1 pp ↓ i	4.7	7.9	2.4	4.1	7.4	1.9	3.6	6.8	1.4	6.2	10.8	3.2
Pop. 2005 level	−0.9	0.7	−2.1	−1.5	0.1	−2.6	−2.1	−0.5	−3.2	−1.6	0.4	−2.8
C.P. health exp.	3.7	6.8	1.6	3.3	6.4	1.2	2.9	6.0	0.8	4.3	8.5	1.7

Table 12.5 shows S2 gaps under 24 different scenarios. The two most favourable outcomes, after the constant population scenario, are the scenario with an additional percentage point in productivity and the scenario with a gradually increasing participation rate, i.e. an increasing retirement age and therefore labour supply. Comparing these S2 gaps with the Baseline scenario gaps, we can see that they are lower, which tells us that higher productivity and an increasing participation rate improves debt sustainability in the long-term.

To sum up, several debt sustainability coefficients indicate that in the future, either primary surpluses or significantly higher economic growth and proper fiscal policy will need to happen in Slovenia if fiscal policy is in favour of keeping government debt levels on a sustainable path.

12.6 Conclusions

Demographic changes involving a rising elderly population relative to the working age population deteriorates long-term debt sustainability for two reasons. First, it creates higher pension and health care expenditures. Second, it contributes to a slower GDP growth because of the fall in the labour supply, unless there are higher participation or productivity rates.

Under the Baseline scenario, pension and health care expenditure projections up to 2050 show a significant increase due to the ageing of the population. Pensions are modelled under three different policy scenarios, which give us three different patterns of the future pension evolution. First, the highest growth in pension expenditures is expected under the scenario where pensions are predicted to grow in line with wages. In 2050 they are projected to reach 24.1% of GDP. In addition, under the Baseline scenario, where pensions grow in line with wages and inflation, pension expenditures will increase from 13.4% of GDP in 2005 to nearly 16.6% of GDP in 2050. Finally, in the third scenario, where pensions are assumed to grow with the inflation rate, pension expenditures decrease by 1 percentage point over the projected period up to 2050. Health care projections indicate a strong rise in health care expenditures owing to the ageing of the population as well. This paper estimates that health care expenditures may increase by more than five percentage points by the year 2050 and will approach 12% of GDP. The corresponding debt sustainability coefficients show that there is a strong impact of the ageing population on future debt levels and that future fiscal sustainability is exposed to serious risks if the current system does not change.

Alternative scenarios lead to four main conclusions. First, the sensitivity analysis shows that the response of the government debt dynamics in Slovenia is stronger with respect to the growth rate and participation rate changes than with respect to interest rate changes in the long run. This means that stronger economic growth would lead to significant improvement in public finances.

Second, significant differences between the three pension scenarios point at the importance of the fiscal policy for long-term debt sustainability. According to the Baseline scenario, where pensions are predicted to grow in line with wages and in line with inflation, government debt would amount to 314% in 2050. Under a condition that pensions grow in line with wages, government debt reaches 535% of GDP in 2050, while if they are about to grow in line with inflation it amounts to 161% of GDP.

Third, if we assume that the population over the projected period remains at the 2005 level, Slovenia would not suffer any debt unsustainability problems. Under the scenario where pensions are about to increase with wages, debt would follow a constant pattern, while if they were indexed with wages and inflation, government debt would even decrease and go below 0 in the long run.

Fourth, estimates of long-term debt sustainability are acutely sensitive to the projections of health care expenditures and assumptions on which they are based. A comparison with the health care evolution, from the Convergence Programme 2004-update, shows a difference of 2.2 percentage points of GDP in health expenditures, which results in a difference of 46.4% of GDP in government debt under all three pension scenarios at the end of the observed period.

In all, there is a need to put more emphasis on debt and debt sustainability. To ensure debt sustainability in the long run, the demographic changes and macroeconomic conditions are to be assessed and taken into consideration when making strategic long-term decisions. Currently unsustainable policies might harm future generations via future fiscal and macroeconomic imbalances.

Some issues warrant further research. First, more sophisticated health care expenditures could be arrived at by econometric estimation. Second, the efficacy of fiscal policies up to now could be assessed by calculating debt sustainability coefficients for the past. Third, other factors that affect long-run debt sustainability, such as education and unemployment benefits, could be included in the estimation of debt sustainability coefficients.

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Annex 12.1 Calculating the number of people employed

The number of employed people is calculated as:

$$\text{Empl} = R_{(20\text{-}59)} * S_{(20\text{-}59)} + R_{(60\text{-}64)} * S_{(60\text{-}64)}, \tag{12.A1}$$

where $R_{(20\text{-}59)}$ denotes the participation rate for the population of working ages 20–59. It is calculated as a ratio of employed people in the active population, i.e. the population from 20 to 59 years of age and it currently amounts to 0.69. The participation rate for this segment of the population is predicted to gradually increase to 0.75 over the projected period. $R_{(60\text{-}64)}$ denotes the participation rate for the population group aged 60 to 64. In the Baseline scenario it is set to 0, since the present average retirement age is 58 years and 7 months. One of the alternative scenarios predicts an participation rate of 0.10 in 2010 and 0.30 in 2020. After 2030 and up to 2050 it remains at 0.5. With this it is defined that the retirement age will slowly increase, and after 2030 half of the population from the group aged 60–64 will be employed. This also indicates a reduction in unemployment rates. $S_{(20\text{-}59)}$ denotes the number of people in the age group of 20 to 59, and $S_{(60-64)}$ the number of people aged 60 to 64.

Regarding the number of pensioners, calculations for forecasts differentiate between four types of pensions: old age pensions (POA), disability pensions, widow and family pensions, and the rest.

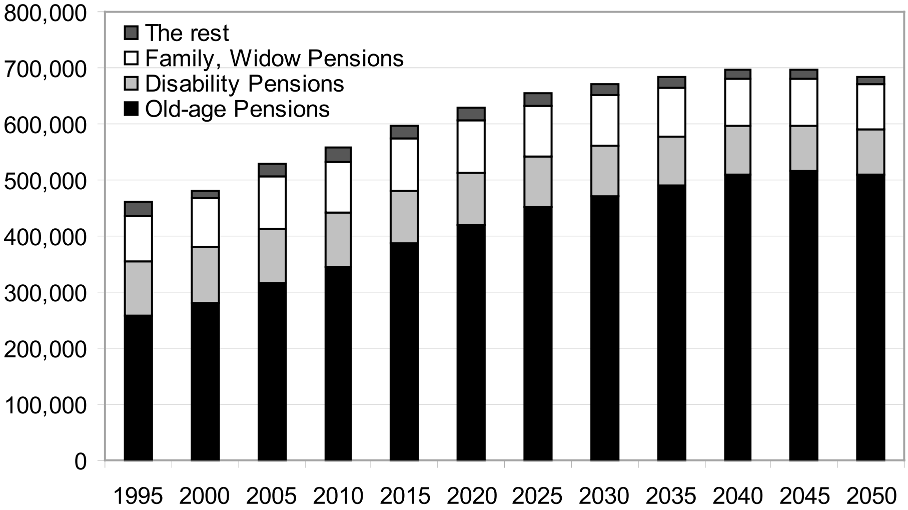
The number of old-age pensioners is calculated as:

$$\text{POA=predicted pensions*coef. for pension}=(S_{(65+)} + (1 - R_{(60-64)} * S_{(60-64)})) * \left(\frac{oldpensions}{S_{(65+)} + S_{(60\text{-}64)}}\right) \tag{12.A2}$$

where predicted pensions represents the number of persons aged 65 and over, plus the product of the population from age group 60 to 64 and $1 - R_{(60\text{-}64)}$. In addition, a coefficient for pensions is calculated as a ratio of old age pensions in the population of over 60 years of age. For the year 2000 it is 0.73, and for 2005 it is 0.79. For the years to come, it is assumed that a coefficient for pensions is constant at 0.78.

Disability pensions are predicted to grow with the growth rate of the overall population, since the rise of this pension group does not depend on the age factor. In addition, widow and family pensions are predicted to grow with the growth rate of the population aged 20+, because these pensions are mainly present among the population older than 20 years. Persons under 20 are dependent on adults, who are eligible for the named pensions.

Figure 12.A1 Breakdown of pensions and projections up to 2050



Source: ZPIZ, Pension Fund and author's calculations

From Figure 12.A1 it is clearly seen that the greatest increase from 1995 to 2050 belongs to the group of Old-age Pensions, which nearly doubles over the observed period. Disability Pensions were up by 1,000 from 1995 to 2005. However, they are about to decrease from 2005 to 2050 because of the fall in the overall population. In addition, Family and Widow Pensions follow a similar pattern. The rest of the pensions are also about to fall due to the fall in the population aged 20 – 64. The overall number of pensioners has risen by 70,000 in the last 10 years and they are projected to increase by an additional 155,000 over the next 45 years.

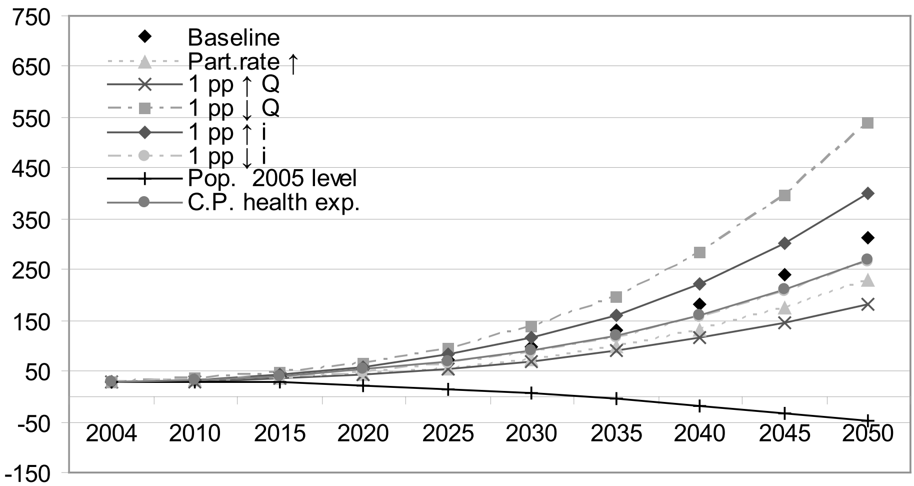
Annex 12.2 Results of the alternative scenarios under three pension scenarios

a) Scenario **W&I**

Table 12.A1 Government gross debt in % of GDP under the assumption that pensions grow in line with wages and inflation

	2004	2010	2015	2020	2025	2030	2035	2040	2045	2050
Baseline	29.5	32.2	39.7	52.5	71.5	97.5	132.2	180.5	240.6	314.0
Part.rate ↑	29.5	31.2	35.7	43.7	55.8	72.4	96.0	129.1	172.9	228.5
1 pp ↑ Q	29.5	30.3	34.7	42.6	54.3	69.6	89.2	115.4	146.3	181.6
1 pp ↓ Q	29.5	34.5	46.2	65.8	95.9	138.5	198.0	283.4	395.5	540.1
1 pp ↑ i	29.5	33.9	43.6	59.4	82.9	115.3	159.2	221.1	300.3	399.8
1 pp ↓ i	29.5	30.9	37.0	47.9	64.5	87.0	116.6	157.0	206.2	264.4
Pop. 2005 level	29.5	29.4	26.8	21.6	14.5	5.4	–5.4	–18.1	–32.5	–49.1
C.P. health exp.	29.5	32.8	40.6	52.3	68.9	90.7	119.6	159.7	208.9	267.6

Figure 12.A2 Government gross debt evolution under eight different scenarios and assumption that pensions grow in line with wages and inflation

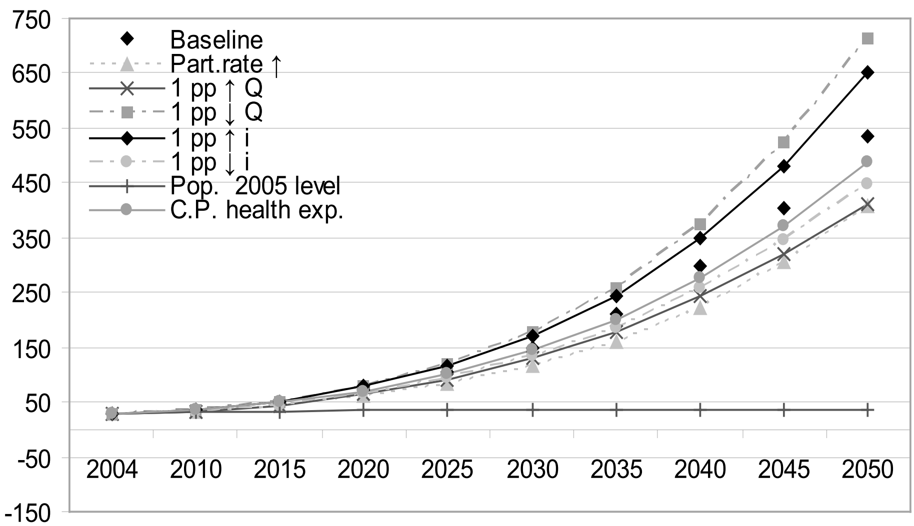


b) Scenario **W**

Table 12.A2 Government gross debt in % of GDP under the assumption that pensions grow in line with wages

	2004	2010	2015	2020	2025	2030	2035	2040	2045	2050
Baseline	29.5	34.6	47.9	70.4	104.2	150.3	212.2	297.4	404.3	535.5
Part.rate ↑	29.5	33.4	43.1	59.5	83.6	116.2	161.2	223.1	303.9	406.1
1 pp ↑ Q	29.5	33.2	44.4	63.7	92.0	129.5	178.0	242.8	320.8	412.6
1 pp ↓ Q	29.5	36.4	52.2	79.1	120.1	178.0	258.5	373.0	522.7	715.1
1 pp ↑ i	29.5	36.3	51.8	77.8	116.8	170.9	244.8	348.6	482.1	650.9
1 pp ↓ i	29.5	33.2	44.7	44.7	94.3	134.3	186.8	257.7	344.3	447.5
Pop. 2005 level	29.5	31.6	33.2	34.3	35.1	35.7	36.0	36.2	35.9	35.8
C.P. health exp.	29.5	35.2	48.7	70.3	101.5	143.5	199.5	276.7	372.9	489.0

Figure 12.A3 Government gross debt evolution under eight different scenarios and assumption that pensions grow in line with wages

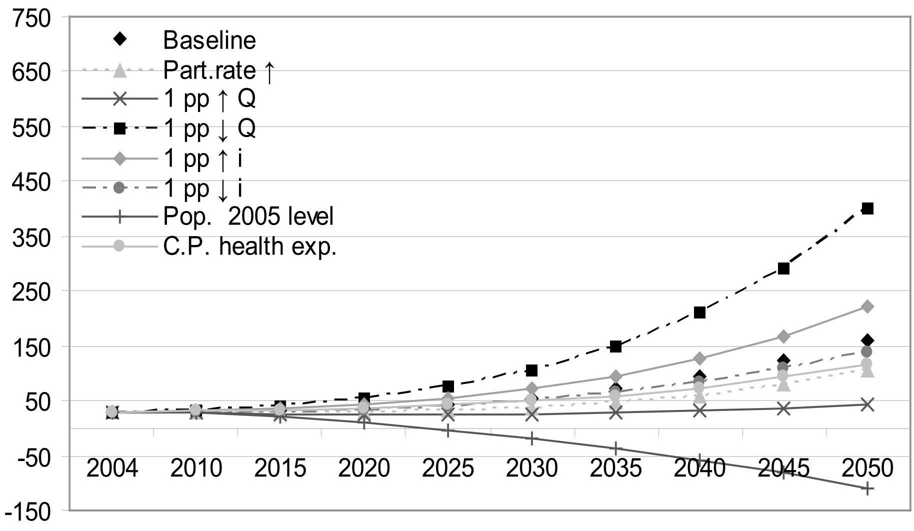


c) Scenario **I**

Table 12.A3 Government gross debt in % of GDP under the assumption that pensions grow in line with inflation

	2004	2010	2015	2020	2025	2030	2035	2040	2045	2050
Baseline	29.5	30.0	32.4	37.1	44.7	55.8	71.5	94.6	124.2	160.9
Part.rate ↑	29.5	29.0	29.1	30.1	32.8	37.6	45.9	59.4	78.7	104.3
1 pp ↑ Q	29.5	27.7	26.3	25.3	25.2	25.8	27.5	31.2	36.2	42.0
1 pp ↓ Q	29.5	32.8	40.6	53.9	74.6	104.5	147.1	209.3	292.0	399.8
1 pp ↑ i	29.5	31.6	36.2	43.6	54.9	70.9	93.3	125.9	168.3	222.2
1 pp ↓ i	29.5	28.7	30.0	33.6	40.1	49.7	63.3	83.1	108.1	138.3
Pop. 2005 level	29.5	27.4	21.0	10.7	−2.6	−18.7	−37.4	−58.7	−82.2	−109.1
C.P. health exp.	29.5	30.5	33.3	36.9	42.1	49.0	58.8	73.8	92.4	114.5

Figure 12.A4 Government gross debt evolution under eight different scenarios and assumption that pensions grow in line with inflation



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