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Ageing and International Capital Flows

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Preface

In November 2001 the CPB hosted a workshop 'Ageing and international capital flows', financed by the ENEPRI-network of European research institutes. This workshop (see www.cpb.nl) provided many insights, but also raised questions. Will the return on savings fall when many countries try to stimulate pension savings simultaneously? Or can developing but fast-growing countries absorb those pension savings from developed, ageing countries on a large scale? This document provides a comprehensive overview of the relation between ageing on the one hand and international capital flows on the other hand, drawing upon the current state of knowledge.

The authors would like to thank Lans Bovenberg for useful comments, Henri de Groot for many suggestions as well as empirical work on savings rates, Nico van Leeuwen for collecting data and making graphs, and Thijs Knaap for providing results of simulations with the GAMMA model.

F.J.H. Don
Director of CPB

Executive summary

In developed countries ageing populations are expected to significantly raise public expenditures on old-age pensions and health care and, thus, to raise the tax burden on the working generations. Indeed, governments are exploring different ways to alleviate this burden. One of them is to move towards better funded pension systems, in which workers save for their own old-age pensions. Of course, workers' savings need to be invested, not only at home but also abroad. A popular idea is that especially fast-growing countries in Asia may offer investment opportunities that promise a good rate of return. Capital may start to flow from developed to developing countries.

This account of ageing and capital flows assumes, however, a lot. Is not ageing common to all countries? Can developing countries absorb capital from developed countries? This paper looks at four distinct elements in the popular account of ageing, providing a comprehensive overview of the subject.

1) *What are the differences in demographic process of ageing across countries?*
Ageing of populations, mainly driven by lower fertility and higher life expectancy, is a world-wide phenomenon. There are, however, important differences in the pace and degree of ageing. In the United States fertility is higher than in Europe and Japan, which is one of the reasons why its old-age dependency ratio raises less. More important are the differences between developed and developing countries.

2) *Does ageing lead to a capital outflow, i.e. a (larger) difference between savings and investments?*
The declining fertility underlying the ageing process will lead to smaller growth of the potential labour force and lower employment. This will undoubtedly have a negative impact on private investments. To what extent and in which direction a higher life expectation and lower fertility affect consumption-savings decisions of households is unclear. Macroeconomic estimations give, however, a clear picture: they suggest a clearly negative effect of ageing on private savings rates. Taken together, ageing has a priori an ambiguous effect on net capital supply by the private sector.

Government actions do not resolve the ambiguity. On the one hand governments may try to stimulate participation of working-age generations on the labour market. On the other hand they can lower the level of old-age pensions in the future and/or raise contributions and taxes now. The first action tends to boost investment demand whereas the second action tends to raise the propensity to save.

Projections (for savings and investments) based on empirical work and model simulations are thus very welcome. They show that Japan, Western Europe and the United

States will see their current account improve at least up to 2010. After 2010, savings rates will fall faster than investment rates in most rich countries, although the timing and degree is uncertain. However, the projections rest on many, uncertain assumptions. Crucial but unknown is the mobility of capital mobility (between developed and developing countries).

3) *How mobile is capital?*

Capital mobility among developed countries and, a fortiori, between developed and developing countries is far from perfect: domestic investment rates closely follow domestic savings rates, the share of foreign assets in investment portfolios is small and interest rate differentials remain. Explanations for limited net trade in capital are found in restrictions on trade, barriers to trade in goods and asymmetric information between domestic and foreign investors. Limited capital mobility cast doubt on the idea that net trade in net capital between the rich North and the poor South will occur at a large scale. Besides, savings rates in fast-growing countries are often high, so that the need for outside capital funds is limited in these countries.

4) *What are the effects of a lower rate of return on (pension) savings*?

In the absence of sufficient outlets for excess savings on international capital markets, policies that stimulate savings simultaneously in developed countries will lead to lower interest rates, thereby making a shift towards more funded pension systems less attractive. Simulations for the Netherlands show, however, that a lower interest rate also implies more investment and higher wages, mitigating the negative effects of a lower rate of return on savings.

Conclusion

Existing evidence on international capital mobility casts doubt on the opportunities for investing on international capital markets. First, capital mobility is rather limited, especially with developing countries. This considerably reduces the scope for investing the surplus of the ageing countries in 'younger' areas. Second, the rapidly growing new and old Asian tigers appear to finance their growth by high rates of savings themselves.

As a consequence, savings and investment will be linked for the major economic blocks (US and Europe) in the OECD area. Discrepancies between savings and investment will not be absorbed by external financial markets, but will be solved by adjustment of the interest rate.

To avoid a steep rise in the tax burden on working generations requires timely policy action. Two broad options are open. The first is to invest more in human capital, for example by increasing the participation rate, especially of elderly workers. The second is to invest in financial and physical capital, for example by stimulating pension savings. Combining the two options is possible as well as sensible. However, a falling interest rate when savings are stimulated according to the second policy option makes the first policy option all the more important.

1   Introduction

Populations are ageing, especially in Europe and Japan. Against one pensioner are approximately 6 workers in 2000, whereas in 2050 there are only 3. This may pose a major social-economic problem. The main reason is that most countries have a Pay-As-You-Go (PAYG) pension system, *i.e.* the working generations pay the old-age pensions of retired generations. When the ratio of workers to pensioners falls, the contributions of the working generations have to rise, sometimes dramatically. Not only expenditure on old-age pensions will rise but also expenditure on health care. The higher tax burden on working generations will exacerbate pre-existing tax distortions and reduce economic efficiency. In fact, a vicious circle of higher taxes, falling labour supply and even higher taxes may arise, making the PAYG-systems unsustainable.

Governments explore different ways to alleviate the burden on future working generations. One way is to move towards a funded pension system, in which contributions of workers are invested to finance their own old-age income. An alternative way is to increase taxes now and create surpluses on the government budget for some time, leading to falling government debt. Both ways are essentially similar: they put the burden on the current working generation, rather than the future working generations, and boost national savings.

When developed countries simultaneously try to raise savings, where should they invest? Excess savings could drive down interest rates, thereby weakening the effectiveness of such a policy. Which countries will be able to absorb the excess savings of the ageing developed countries? There are, however, important differences in the pace and degree of ageing with the group of developed countries. In the United States fertility is higher than in Europe and Japan, which is one of the reasons that its old-age dependency ratio raises less. Besides, developing countries have younger populations than developed countries. Especially fast-growing countries in Asia may offer investment opportunities that promise a good rate of return. Developed countries can thus invest their excess savings in developing countries, which helps the developed countries to mitigate the economic consequences of ageing and developing countries to grow faster. Ageing may thus have strong effects on international capital flows. Capital may reallocate within the group of developed countries, and may start to flow towards developing countries.

This account of capital flows and ageing assumes, however, a lot. It overlooks that ageing is common to virtually all countries. Moreover, it assumes perfect capital mobility, while empirical evidence suggests otherwise. This paper takes, therefore, a closer look at the different elements in the story about ageing and capital flows. What are the effects of ageing on capital flows? How mobile is capital? And to what extent could international capital flows help to mitigate the economic effects of ageing?

We review the existing evidence on the role of international capital markets in an ageing world in a non-technical way and with an eye towards policymakers. The set-up of this paper is the

following. In Chapter 2 we sketch the important demographic changes ahead of us. We pay attention to differences across countries in these demographic transitions, as well as to the factors behind the process of demographic changes. Chapter 3 discusses how the different factors underlying the ageing process influence the balance between national savings and investment. It takes a closer look at the different elements of the current account: savings, investment and the government budget. Besides, it addresses possible policy responses to ageing and their effect on international capital flows. Chapter 4 then considers the empirical evidence about capital mobility and the possibility that capital will flow from North to South (and back). Chapter 5 then studies the effects of a lower (or higher) interest rate on the effectiveness of savings enhancing policies using the example of the funded pension system of the Netherlands. Chapter 6 draws conclusions.

2   Ageing across the world: similarities and differences

Ageing of populations, mainly driven by lower fertility and higher life expectancy, is a world-wide phenomenon. There are, however, important differences in the pace and degree of ageing, between Europe and the United States for example but mainly between developing and developed countries.

Ageing is a phenomenon that is common to many countries and regions. The United Nations' 'World population prospects: The 2000 revision' provides detailed information on demographic changes for the 1950-2000 period and projections for the 2001-2050 period. Figure 2.1 shows the so-called old-age dependency ratios for various countries and world regions, *i.e.* the population of 65 and older as a percentage of the total population, based on the UN's medium variant.[1] Immediately clear is that without exception this ratio is projected to increase. This holds for Japan with the highest old-age dependency ratio in 2000 as well as for Africa with the lowest. In fact, fast increases are not confined to the group of rich countries, but also occur in China and Latin America, that are projected to have a more similar ratio as the United States in 2050.

In spite of the common trend, the pace and the degree of the population ageing process differ substantially across countries and world regions. In Africa, Europe and Japan the old-age dependency ratios are expected to double over the next fifty years. The degree of ageing, however, is rather different. In Africa the old-age dependency ratio in 2050 is with 7% very low in international perspective. It is in sharp contrast with Japan and Europe: by 2050 about 36% of the Japanese population is 65 or older, while in Europe 29% of the people is 65+. In the United States, however, the old-age dependency ratio flattens out and in 2050 approximately a fifth of the population is 65 or older. In international perspective, this can be considered as an intermediate ageing effect.[2]

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[1] The medium projection variant assumes medium-fertility, normal-mortality and normal-migration. More details can be found in UN (2001).

[2] Since (official and actual) retirement ages differ across countries, the definition of old-age dependency – the number of people of age 65 and older as a fraction of the total population – is somewhat imprecise. Data on the number of people who actually retired, are not readily available. Therefore, we follow the convention of using 65 as marking the transition from working to retirement.

Figure 2.1   Projections for the old-age dependency ratio, 2000-2050
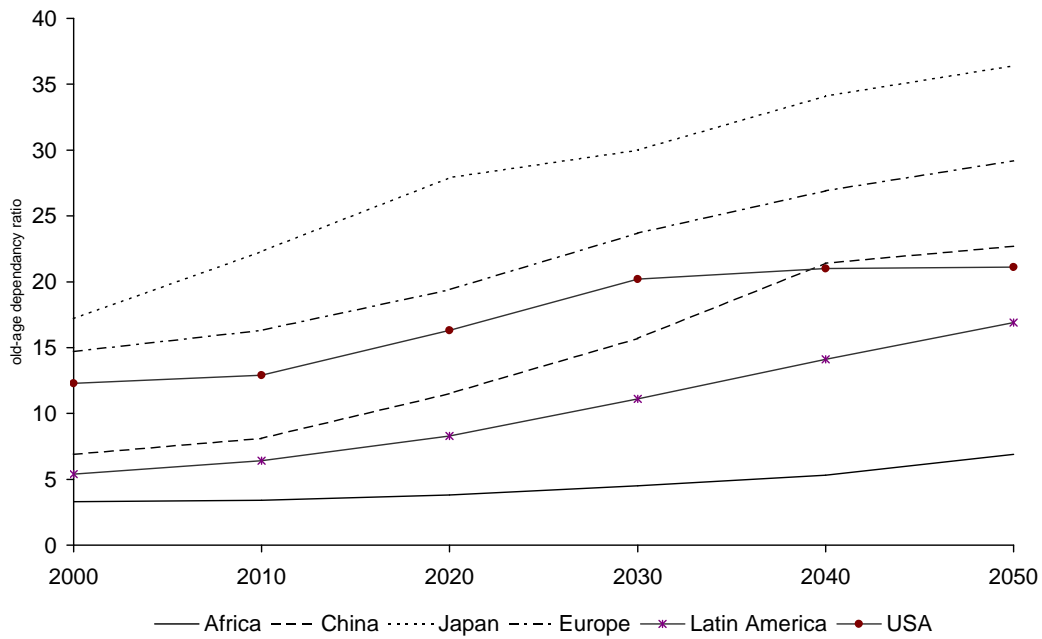
Source: United Nations (2001)

The differences across countries and world regions are even clearer in Figure 2.2, showing the future developments in the working-age (*i.e.* 20-64) population as a percentage of the total population. In Africa, the share of the working-age population shows a steady increase over the next fifty years. In Europe, Japan and the United States the relative size of the working-age population starts to shrink around 2010-2020, and will in 2050 be 6 to 9 percentage points lower than at present. Also, in Latin America the share of working-age population is expected to decrease, but the turning point is later and the effect of ageing is less pronounced.

Figure 2.2   Projected development in the working-age populations (% of total)
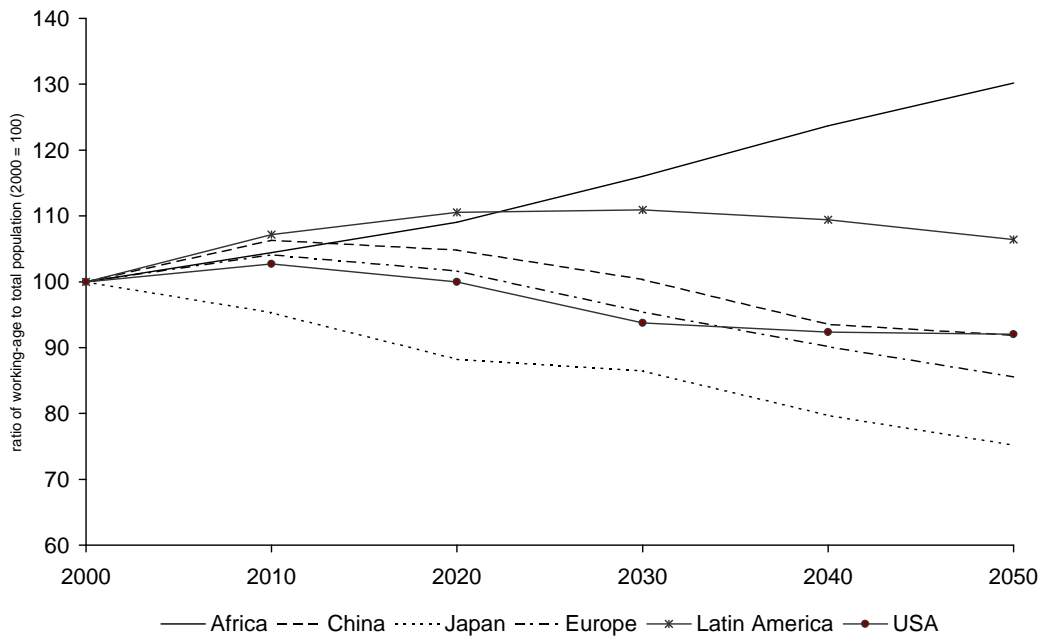
Source: United Nations (2001)

To sum up, while the projected demographic changes over the next fifty years differ in their timing and magnitude throughout the world, the differences are most pronounced between the developed countries on the one hand and the developing and emerging regions (Africa, Asia, and Latin America) on the other.[3] However, also in the group of rich countries differences emerge. Japan and Europe are affected more by the process of ageing than the United States.

2.1   Factors behind population ageing

Various forces drive the process of ageing:

- declining fertility,
- increasing life-expectancy and
- a baby boom after the Second World War.

It is important to distinguish the forces behind ageing as they may affect savings and investments in different ways. First, *fertility* typically shows a sharp decline when poor

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[3] It should be noted that demographic projections are uncertain and should be treated with caution, especially for developing and emerging countries. In particular, it is difficult to obtain good approximations for future changes in fertility, life expectancy and migration. These three components are likely to be influenced by the process of economic growth, improvements in health care and the development of new drugs, policies (such as China's one-child policy and immigration policies in rich countries), and so forth.

countries improve their living standards. The Asian experience is illuminating in this respect. Higgins and Williamson (1996) present data on youth-dependency rates in Asia (the population between the age of 0 and 14 as a percentage of the total population). Spectacular drops in youth dependency have been observed in the old and new tigers in East and South-East Asia: in Hong Kong it fell from a peak of 40.7% in 1960-64 to 20.1% in 1990-92, and in Singapore from 43.5% to 23.3%. Similarly, China saw a decline from a peak of 40.0% in 1965-69 to 26.4% in 1990-92. Fertility is strongly related to female educational attainment. Higher educational achievements of women go hand in hand with lower fertility rates, decreasing youth-dependency ratios and worsening of the ageing problem.[4]

Second, a contributing factor to ageing is an increase in *longevity*. Life expectancy typically increases rapidly in developing countries that succeed to improve living standards, working conditions, environmental quality, health care, and so forth. But also in developed countries an increase in life expectancy is observed. For instance, life expectancy at birth in the US has risen from 69.7 years in 1960 to 76.5 in 1997 (*cf.* Lichtenberg, 2002). According to Lichtenberg (2002), this development is supported by medical innovations in the form of new drug approvals and expenditures on medical care. Although future changes in longevity are difficult to predict, further increases in life expectancy seem likely. Consequently, the scope for a lengthening of working-life by postponing retirement increases.

While longevity is increasing in the Western world and in a number of developing countries, some poor countries see themselves confronted with falling life expectancy at birth, mainly because of the devastating effects of the HIV/AIDS epidemic. Poor access to drugs will only worsen this development.

A third factor behind population ageing is a temporary hike in the birth rate, the so-called *baby boom*. As the baby boomers retire, the fraction of elderly in the population will increase. This increase in the old-age dependency ratio is temporary, and the demographic transition comes to a halt when the last of the baby boom generation has passed away.

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[4] Higher levels of educational achievement not only lead to lower birth rates but also imply that people are entering the workforce later in their lives. Both effects of better education reduce the relative size of the population that participates on the labour market. On the other hand, human capital or the 'quality' of the labour force is increased.

3 Population ageing and current accounts

How ageing affects international capital flows can be studied starting from the famous macroeconomic identity for the current account (CA), equal to net savings of the private and the public sector:

(1) $CA = S - I + T - G$

where S denotes private savings, I private investments, and T-G is the difference between public revenues (taxes) and public spending. The current account is positive when the sum of net private savings and public savings exceeds domestic investment, so that the country is a net exporter of capital to other countries. Population ageing can affect the current account through the three channels S, I and T - G. Each of these channels will be discussed separately in the following three sections 3.1, 3.2 and 3.3. Section 3.3 will also discuss the policy responses from national governments to ageing, since these will affect savings and investments. Section 3.4 concludes with empirical work and model simulations about the impact of ageing on international capital flows.

3.1 Private investments

The declining fertility underlying the ageing process will lead to smaller growth of the potential labour force and lower employment. This will undoubtedly have a negative impact on demand for capital. To what extent is, however, uncertain. It also depends on the - policy - reaction to the increasing longevity which may mitigate the decrease in labour force. The implication for productivity per worker is uncertain as well as ambiguous.

As far as ageing is driven by the decline in fertility it will imply a decline in (the growth rate of) employment. Given the stock of capital, this decline amounts to an increase in the capital-labour ratio. Capital deepening will reduce the marginal productivity of capital and, in turn, the incentive to accumulate capital. In other words, investment demand will fall.

That ageing will reduce investment is commonly recognized in the economic literature. To what extent is, however, less clear. It depends on at least two factors, about which there is less consensus. First, the elasticity of substitution between capital and labour is important for the effect of lower employment on the return on investment. A smaller elasticity implies a larger effect (in absolute terms) on the investment return and thus on investment demand. Second, the existence of adjustment costs may dampen the fall in investment.

Ageing has not only effect on the number of workers but may also have a direct effect on productivity of these workers (apart from capital deepening). On the one hand, ageing may positively affect average productivity since older workers are more experienced and productive

(the *experience* effect). On the other hand, ageing could retard productivity growth when switching to a new technology becomes increasingly costly or – more generally – when change is increasingly held suspect with age (the *resistance* effect). These direct effects have received little attention in economics literature. Nahuis *et al.* (2000) take a first step towards analysing the relationship between demographic composition and productivity (growth). The available empirical evidence suggests that the share of people aged 65 and over hampers productivity growth, while the fraction of people in the 50-64 cohort contributes favourably to productivity growth. Clearly, more theoretical and empirical research is needed to establish robust relationships between ageing and productivity.

3.2 Private savings

The basic idea of the life-cycle hypothesis is that people save when working and dissave when retired. The results from micro-economic research do not fundamentally challenge this idea but raise doubts about the extent to which retired generations dissave. Moreover, to what extent and in which direction a higher life expectation and lower fertility affect consumption-savings decisions of households is unclear. Macroeconomic estimations give, however, a clear picture: they suggest a clearly negative effect of ageing on national savings rates.

3.2.1 The life-circle hypothesis

The life-cycle hypothesis as put forward by Modigliani and Brumberg (1954) is nowadays a common starting point for studies into households' savings behaviour.[5] According to it, people tend to smooth their consumption pattern by dissaving when young, saving during working life, and again dissaving when old.[6]

Empirically, the life-cycle hypothesis has had 'more successes than failures' (Browning and Crossley, pp. 20, 2001). Nevertheless, the exact shape of the age-savings profile is subject to an ongoing debate. For example, Poterba (2001) presents data on age-specific asset holdings, see Figure 3.1.[7] The figure clearly shows that asset holdings rapidly increase in the period of life between 40 and 64. But the figure also shows that the age-wealth profile declines rather gradually when households are in their retirement years.

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[5] For more elaborate discussions of the life-cycle model, the reader is referred to Modigliani (1986), Browning and Crossley (2001), and Kapteyn and Panis (2002). See also Chapter 15 in Mankiw (1992) for a textbook discussion.

[6] More precisely, agents want to smooth the marginal utility of consumption over their lifetime (see Browning and Crossley (2001) for a clear discussion and examples).

[7] The data are derived from cross-sectional estimates using the 1995 Survey of Consumer Finances (US households). Cohort and time effects may hamper the interpretation. However, Poterba (2001) shows that the quantitative importance of these cohort and time effects is limited.

Figure 3.1   Asset holdings (× 1000 US $) and age

■ common stockholdings ▨ net financial assets ▫ net worth
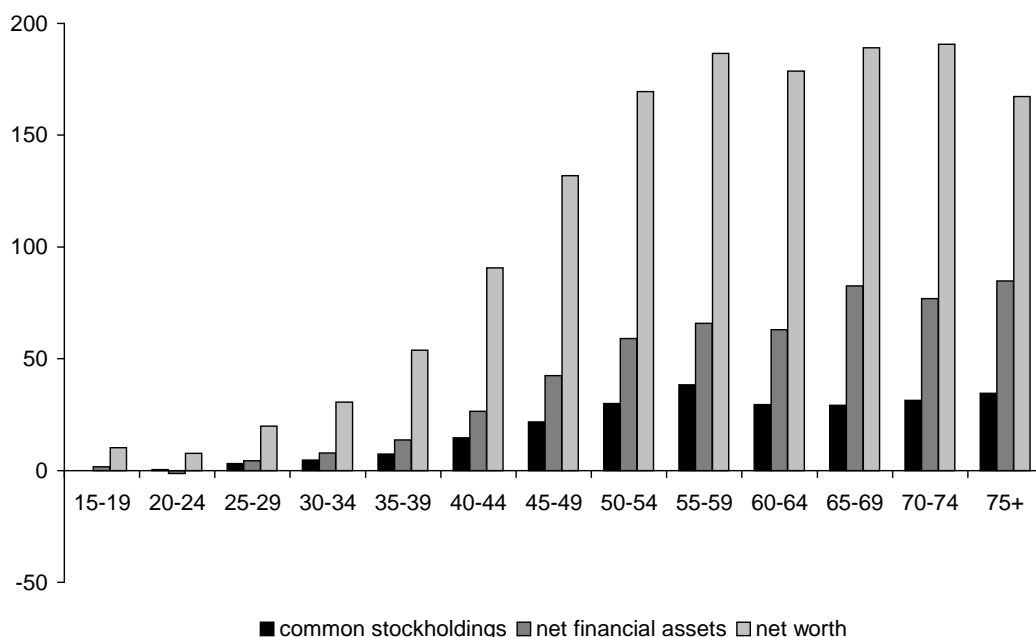
Source: Poterba (2001)

That retired generations do not dissave much and leave bequests, has several explanations. First, generations are connected and parents are altruistic towards their children. In that case, dissaving by the elderly is limited as part of their wealth is transferred to the next generation through bequests.[8] Second, people have uncertain life spans and they cannot write perfect life insurance contracts, so that bequests are sometimes unintended (*cf.* Davies, 1981). Third, bequests may arise from a strategic motive. In particular, testators may use bequests to influence the decisions of potential beneficiaries, *cf.* Bernheim *et al.* (1985). For example, bequests can be used as compensation for services rendered by beneficiaries, such as care and attention.[9]

Notwithstanding the discussion about the exact relation between age and savings, the broad pattern of dissaving when young, saving when working and again dissaving when old is fairly robust. It also appears from estimations across countries and over time, that relate countries'

[8] Canton and Meijdam (1997) study the impact of population ageing on macroeconomic outcomes in often-used models, varying with respect to the degree of altruism. With altruism parents take the utility of their children into account in the design of their savings plan. Without altruism, parents – and their 'unloved children' – make separate savings plans.

[9] The model by Bernheim *et al.* (1985) and the notion of strategic bequests can have important macroeconomic implications. Although parents are altruistic towards their children, Ricardian equivalence (see text box) no longer holds. Also, the model suggests interesting interactions between demography and savings. As a credible threat of disinheritance requires that there are at least two beneficiaries, the increasing number of single-child families could reduce the incentive to save to buy attention. Likewise, Japan's high savings rate can be explained (at least to some extent) by the fact that the vast majority of elderly Japanese live with their children. Finally, the strategic bequest mechanism is inoperative in some European countries, such as Sweden, as testators are required to divide the bulk of their estates evenly between their children.

savings rates to the age structure of their population. A robust finding is that a higher share of the population between the age of 40 and 65 leads to a higher savings rate, whereas a higher share of the population older than 65 leads to a lower macroeconomic propensity to save. Figure 3.2 shows the estimated effect of age on savings rates. Estimation results are presented in Appendix A. Clearly, the estimated age-savings profile agrees with the life-cycle hypothesis. For example, the group between 40 and 45 saves above average, whereas the group between 65 and 70 saves below average.

Figure 3.2   Estimated relation between gross domestic savings (% GDP) and age structure of population
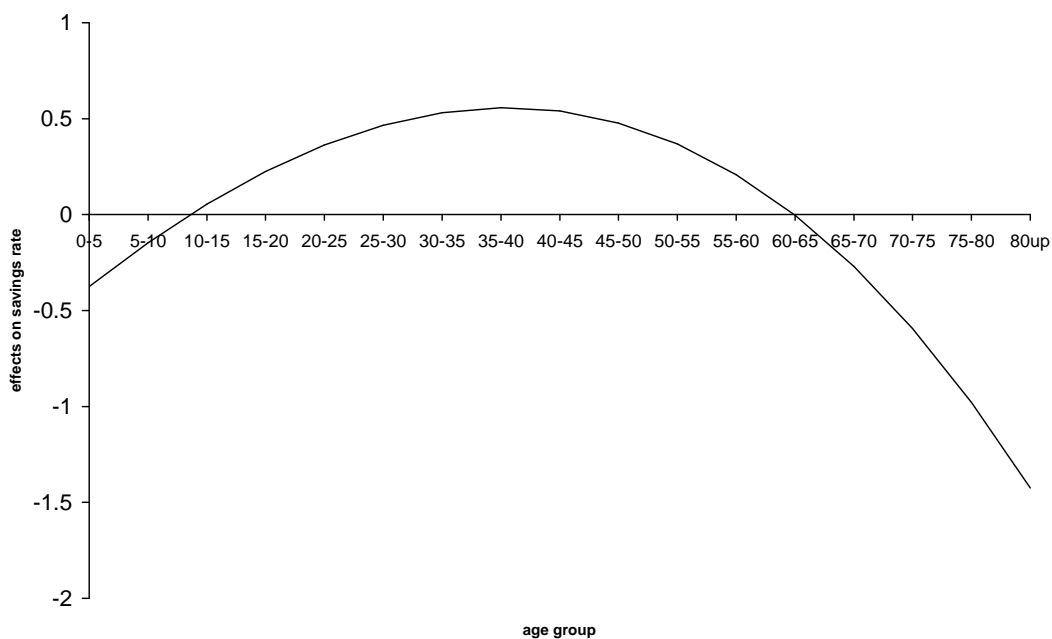
Source: de Groot and Tang (2003), see also Appendix

3.2.2   The effect of ageing on savings

With the life-cycle hypothesis in mind, we can explore the effects of ageing on macroeconomic (private) savings rates. A distinction between a *composition effect* and *behavioural effects* (*cf.* Bloom *et al.*, 2002) is helpful.

The composition effect follows from the assumptions that the average savings ratios for different age groups are constant but that the shares of the different groups in the entire population change. Under this assumption, population ageing reduces the average savings rate. As the fraction of elderly in the population grows, the groups with low or negative savings become relatively larger, leading to a lower overall savings rate.

Behavioural effects – derived from the life-cycle framework – presume that the savings ratios of different groups and individuals change. These effects are more complicated, and depend on the underlying causes of the ageing process, *i.e.* the increase in longevity and the fall in fertility.

Bloom *et al.* (2002) study the effects of an increase in *longevity* on optimal savings plans. For a given retirement age, an increase in longevity will tend to spur savings during working life, to compensate for the longer period of dissaving when retired. When retirement is endogenous and people spend a larger fraction of their lives in good health as longevity increases, the effect on savings is ambiguous as people may find it optimal to extend their working life and postpone retirement. Indeed, the phenomenon of a 'second career' is becoming more and more common, especially among knowledge workers (*cf*. The Economist, 2001). According to Bloom *et al*., the dominant effect is that increases in longevity lead to higher savings rates at every age. They apply this idea to explain the boom in savings in East Asia during 1950-90 as a result of rising life expectancy and falling youth dependency, and the decline in savings rates in response to falling life expectancies in Africa.

The relation between longevity and savings is, however, more complex than Bloom *et al.* may suggest. It highly depends on the institutional setting. For example, their study seems more relevant for a country with a funded pension system than a country with a PAYG-system (*cf*. Kapteyn and Panis, 2002).

With declining *fertility* different mechanisms may be working in different directions. On the one hand, with smaller families less private saving is needed to keep the amount of resources available per child (*e.g.* to pay for tuition) unchanged. On the other hand, Brooks (2000) considers, however, the equally plausible possibility that the weight per child in the parental utility function is declining in the number of children. In that case, a decrease in the number of children leads to an increase in consumption per child. Which consideration dominates the saving-consumption decision is hard to tell a priori. Interestingly, Higgins and Williamson (1996) provide empirical evidence for a close relationship between the impressive decline in the Asian youth dependency ratio and the substantial increase in savings rates since the 1960s. This suggests that there is a trade-off between investment in human capital (*i.e.* children) and accumulation of physical capital. In any case, our understanding of the relation between private savings, fertility and education is limited and needs to be improved.

Probably, the direct effects of lower fertility and higher life expectancy are less important than the indirect effects through forced changes in the institutional setting and government policies. Ageing puts government budgets under pressure and forces governments to engineer important changes in pension systems, social security, budgetary policy and so on. The next subsection (3.3) continues with a discussion of government budgets and policies.

Before we turn to the public sector and public policies, let us at least conclude that estimations across countries and over time come up with the robust finding that ageing has or

will have a strong, negative impact on savings at the aggregate level. This could simply be the effect of changes in the composition of the population. Figure 3.3 shows both historical and projected savings rates for China, India, Italy and the United States, where the projections are based on the same estimation results that also underlie Figure 3.2. Whereas in China and India the changing age structure of their populations lead to a peak in the savings rates between 2010 and 2020, in Italy and the United States savings rates are projected to fall from 2000 onwards. For all countries, the decline in the savings rate is most pronounced between 2030 and 2040. Of course, these projections do not take into account changes in policies and institutions that may boost savings rates, especially in developed countries.

Figure 3.3   Historical national savings rates, 1960-2000, and projected rates, 2010-2050
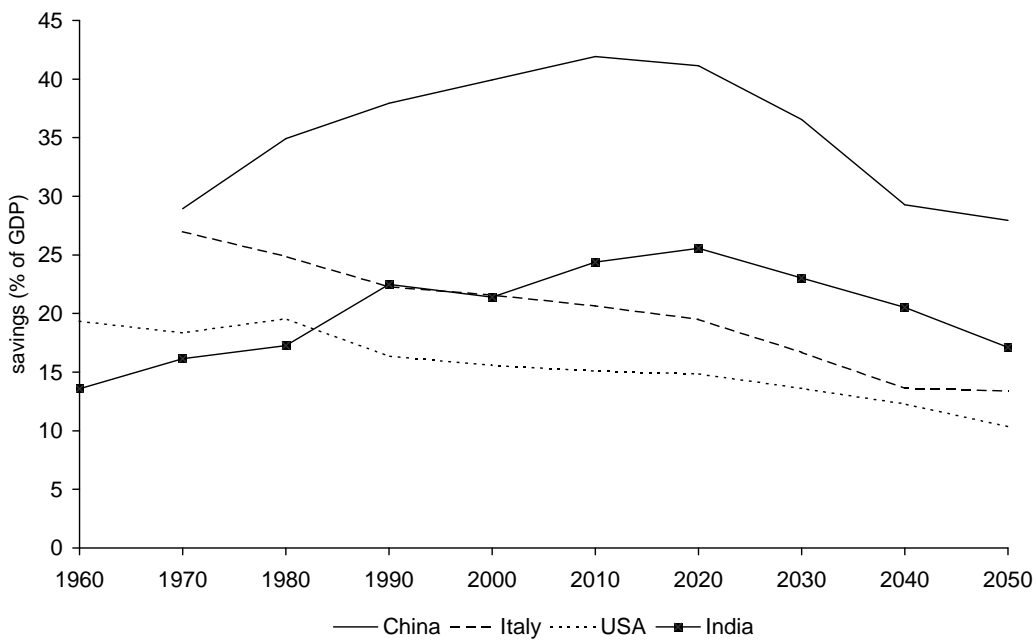
Source: de Groot and Tang, see also Appendix

3.3 Government budget and policies

The government budget is the third channel though which ageing influences the balance between national savings and investment, and thereby the current account. Ageing puts the public sector under pressure. Expenditures on old-age pensions, as part of PAYG system, and health care are expected to rise. This threatens to raise the tax burden on working generations significantly. When governments want to prevent this, they have two broad options. On the one hand governments may try to stimulate participation of working-age generations on the labour market. On the other hand they can lower the level of old-age pensions in the future and/or raise contributions and taxes now. The first option tends to boost investment demand whereas the second option tends to raise the propensity to save.

3.3.1 Pressure on the government budget

Ageing is first and foremost a problem of distribution, namely between young and old generations. It has arisen with the introduction of Pay-As-You-Go systems (PAYG). In such a system the working generations pay taxes to finance the old-age benefits of the retired generations. The PAYG systems were introduced in many countries to give old generations a decent income. It was part of a broader programme to provide assistance to those who saw their income decline and to provide insurance against labour market risks such as disability and unemployment. Public pension systems can also be seen as a form of insurance, namely against longevity. In particular, the period during which elderly people are retired (and are presumably unable to work) is uncertain. Pensions ensure the income stream of people who run the risk of becoming old.

A PAYG-system is a social contract between young and old generations: the young generations support the old generations in the expectation that once they retire themselves, they will also receive income support. If the age structure of the population were stable, neither party would have an incentive to break the social contract. The root of the problem is, however, that the age structure of the population does change during the coming decades. The baby boom, fewer children, and longevity will raise the dependency ratios and put the social contract between generations under pressure: the tax burden on young working generations will rise, sometimes dramatically. To illustrate, Figure 3.4 shows the expected increase in the expenditures on old-age pensions in a number of countries. It reveals that the increase is significant for the majority of countries and falls in the range of 3 to 5% of GDP. There are substantial differences between countries, however. In the Netherlands, Denmark and Finland, expenditures increase substantially. In Japan and Poland, they are actually projected to decline as share of GDP, in part because old-age pensions are not indexed to wages.[10]

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[10] The differences originate partly in different assumptions behind the projections. For instance, Spain assumes that its unemployment rate falls from 14% in 2000 to 4% in 2035. Italy assumes an increase in the participation rate of women from 55% in 2000 to 77% in 2050. Whether such assumptions are plausible is somewhat doubtful. It typically calls for reforms to reduce unemployment or increase participation. It is not clear whether countries are willing (or able) to do that.

Figure 3.4   Public expenditure on old-age pensions in 2000 and 2035 for various OECD countries

old-age pensions (% of GDP)

■ 2035 ▨ 2000
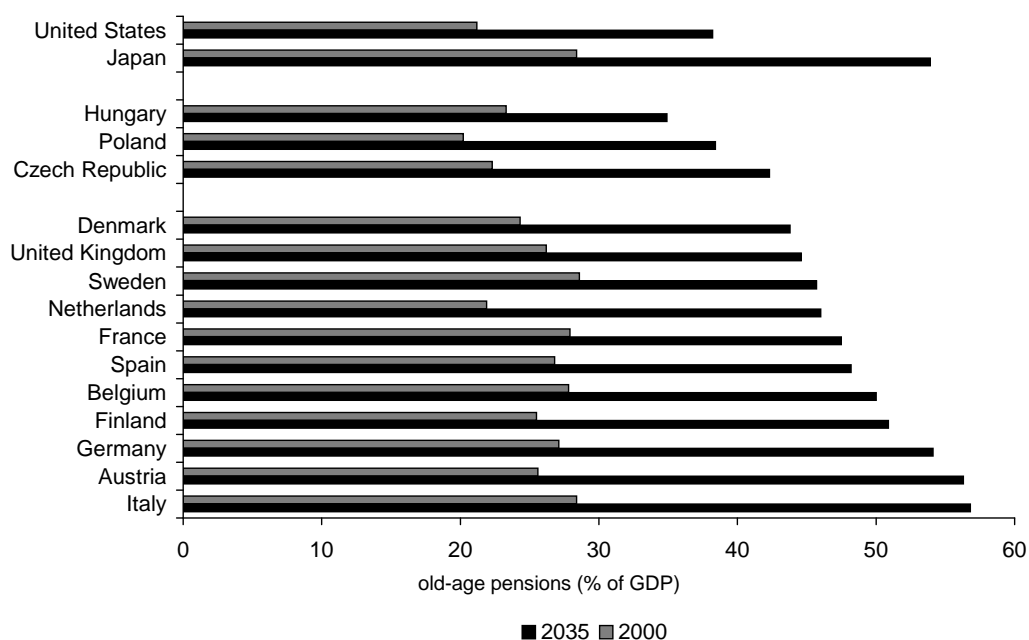
Source: OECD (2001)

This problem of an increasing tax burden on young generations is reinforced by another effect of ageing, namely increasing public expenditures on health care. Historical data, presented in Figure 3.5, show that health care expenditures have increased significantly during the past decades. The pattern is, however, again diverse. Between 1960 and 1995, health care expenditures in the US increased from 5% to 14% of GDP, in the Netherlands from 4% to 8% and in the United Kingdom from 4% to 6%. Demographic changes in this period just explain a part of the historical increase in health care expenditures. Baumol's law is at work as well. This law says that a sector with relatively slow productivity growth must raise its relative price and will see its share in income and production rise (when price elasticity's are low and/or income elasticity's are high).

The upward trend in health care expenditure is not likely to reverse, if only because the populations are ageing. The OECD (2001) has collected projections for a number of countries. Between 2000 and 2035 the increase in expenditures as a result of ageing only is predicted to lie between roughly 1% of GDP for the Czech Republic, Denmark and Finland, to more than 4% of GDP in Australia, New Zealand and the Netherlands.

Figure 3.5   Health care expenditure in 5 OECD countries (% GDP), 1960-1997
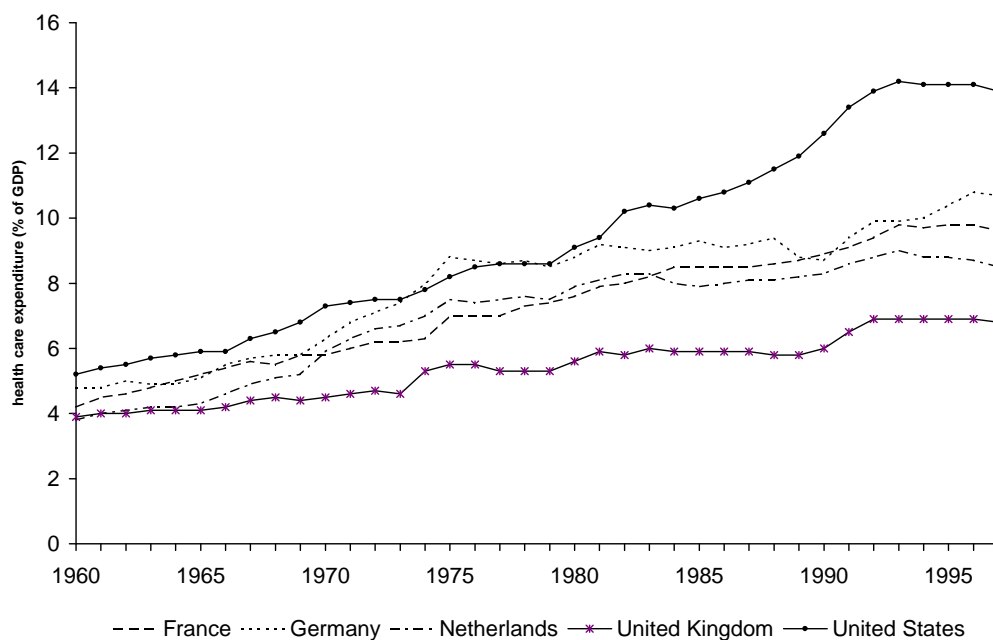
Source: OECD (2001)

The fast increasing public expenditures on old-age benefits and health care put pressure on the government budget. More generally, they put pressure on society. First, it puts a strain on the intergenerational contract between young and old generations because of the increasing tax burden on the young. Second, the higher tax burden on the young exacerbates distortions in the economy. Indeed, taxes induce behavioural responses because private agents will try to avoid them, *e.g.* by working fewer hours, invest less and consume untaxed products. These responses erode the tax base, thereby reducing tax revenue, as well as reduce economic welfare.

3.3.2   Policy reforms: higher savings and more investment

With growing pressure on the public budget and on society, governments must react, sooner or later. Most countries are considering measures to arrive at a 'fair' distribution of the burden of ageing that is acceptable for young and old, and to avoid a too high tax burden. We discuss two broad options to prevent an increase in the tax burden on younger generations.

1.   Investment in human capital: higher participation

The problems arising from ageing are partly the result of increasing longevity in an institutional setting with a given retirement age. When people grow older and the retirement age does not change a falling share of workers needs to carry the financial burden of a rising share of retired people. The most straightforward response to this would be an increase in the retirement age. (see also Bovenberg, 2001). Sweden, Norway and the US have already made steps in this

direction. Thus, the financial burden of longevity is shared between younger and older generations. Since the number of healthy years has increased and is usually expected to increase further, sharing the risk is not impossible or unreasonable. It may be imposed gradually, *e.g.* by linking the official retirement age to life expectancy.

An alternative investment in human capital is increasing the participation rate of those younger than the age of 65. In Europe, there seem to be ample opportunities for this. First, some European countries such as Belgium, Poland, Italy and Spain feature high unemployment rates. Secondly, the participation of older workers is low in most countries. For instance, in Austria, Belgium and Hungary less than one-third of the male population between the age of 55 and 64 is working. Finally, the female participation rate is below the male participation rate in all European countries. On average, this difference amounts to 15 percentage points. Female participation is high in Scandinavian countries, but particularly low compared to males in Italy, the Netherlands and Spain.

An alternative way to broaden the tax base is to let more immigrants enter. This assumes that immigrants will make a net contribution to public finances. A number of studies suggest, however, that the fiscal impact of immigration is not necessarily positive (*e.g.* Roodenburg *et al*. 2003). When the net contribution is positive but small, very high numbers of immigration are necessary for immigration to make a difference. This would make it unlikely that such a policy finds broad political support.

2.   Investing in financial capital: switching systems

The problem of ageing is partly temporary: it is associated with a large income redistribution from the future young generations to the baby-boom generations. To relax this problem, the baby-boomers could share the temporary burden with future generations and partly pay for their own old-age pensions.[11] The government can encourage financial savings by the baby-boom generation in several ways.

[11] Referring to intergenerational fairness, Hans Werner Sinn (2000) points out that the baby-boom generations have failed to invest in 'human capital'. They have chosen to spend less time and effort in raising children. Families have become smaller, and people have opted for lives without children. In Europe, fertility rates have fallen in the second half of the 20th century, and are often below 2.1, the value that is needed for mere reproduction. This has put the PAYG-system under pressure. Sinn finds it fair that these generations invest in real capital to save for their own old-age pension. This argument also implies that current tax rates for households without children should rise more than tax rates for households with children.

- First, it can reduce the net income support to retired generations. The direct effect is reduction of the tax burden on the future, working generations.[12] To the extent that households anticipate a decline in the real value of old-age pensions, they will save more to make up for this decline.

- Second, the government can create a budget surplus so as to reduce public debt, by raising current taxes (or cut current public spending).[13] As long as Ricardian equivalence between debt and taxes does not hold, this will reduce private consumption and raise private savings. The text box gives a brief explanation of Ricardian equivalence and highlights the conditions under which the equivalence breaks down.

- Third and finally, the government can - partially - switch from a PAYG system towards a funded system. In the latter system individuals invest in funds now from which they draw to finance their old-age income later.

Apart from the distributional motive for sharing the burden of ageing, it is sometimes also defended on efficiency grounds. As far as these policies help to avoid increases in future tax rates, they contribute to overall welfare by limiting the distortionary impact of taxation. Taxes change behaviour of economic agents and impose costs on society. These costs vary more than proportionally with the rate of taxation. Therefore, it is efficient to smooth the rate of taxation over time; with a constant rate, the costs of taxation are minimized. Smoothing the burden across generations often concurs with smoothing tax rates over time.[14]

Other popular arguments for shifting towards a more funded system are more problematic. One argument is that the returns on contributions in a funded system are generally higher than the returns in a PAYG system. The rate of return in a funded system is equal to the real interest rate (on government bonds) and perhaps the excess return on investment to the extent that pension funds invest in equity. In a PAYG-system the 'rate of return' depends on the real growth rate of labour income, since this forms the basis. In the long run the growth of labour income equals the sum of employment and productivity growth. Historically, the real interest rate exceeds the growth rate of labour income, which suggests that switching from a PAYG scheme to a funded system will yield a higher rate of return. Another argument is that contributions in a funded system are less distortionary than in a PAYG system as households pay for their own pensions. Both arguments concern the steady state only. Unfortunately it is not costless to arrive in this

[12] Engineering a relative decline in (real) old-age benefits does not always involve a drastic action or decision. Just relaxing the indexation of future old-age pensions to wages, can yield significant savings in present value terms.

[13] For example, the budgetary consequences of ageing in the Netherlands are studied in Van Ewijk *et al.* (2000). Public finance will show a budget surplus over a long period of time if policies remain unchanged. The public debt is therefore reduced substantially. The surplus will turn into a deficit by 2016. In particular, the ageing leads to a sharp increase of expenditures on public pensions and health care. A mechanism of increasing debts, interest payments and deficits will turn current policies unsustainable in the long run. As a way to arrive at a sustainable path of public finances, Van Ewijk *et al.* (2000) show that a relatively mild increase of direct taxes is required.

[14] The idea of tax smoothing is bread and butter for economists, ever since Barro introduced it in 1974. For example, Van Ewijk *et al.* (2001) assume that a constant burden is optimal and tries to calculate how much the Dutch government must raise current taxes to achieve that.

steady state. As pointed out by Sinn (2000) is not possible to improve the welfare of some and to maintain the welfare of others (the Pareto criterion). Some of the current generations will lose, since they have to pay twice, for the PAYG system and now also for the funded system. This makes a regime switch difficult to accomplish.

Political economy of ageing

Indeed, the political economy of ageing is important for the course of actions that governments are likely to take. An extensive review of this takes us too far. To underline the relevance of political economy, we discuss two examples from the economic literature.

First, the elderly might use the voting mechanism to steer policy to less growth-promoting activities. Some direct support for the latter interpretation is provided by Poterba (1996), who deals with the relationship between educational spending and demographic composition. He finds evidence of generational competition in the allocation of public funds. Educational spending per child in 48 US states in the post-war period is negatively related to the fraction of elderly. The empirical results indicate that the projected rise in the fraction of the population aged 65+ from 12.5% in 1990 to 18.7% in 2030 translates into a 10% reduction in educational spending per child. And, as Poterba (1996) puts it, ".... the implications of such changes for income inequality and economic growth depend on controversial parameters linking school spending to school outcomes and wages, but the potential effects could be substantial." (pp. 24-25).

Second, Bütler (2001) studies the political feasibility of pension reforms. In particular, while a uniform reduction in pension levels would be resisted by retirees, a financially equivalent increase in retirement age should find support among retirees – at least among those beyond the targeted statutory retirement age. Using data on a Swiss referendum on an increase in female retirement age from 62 to 64 held in 1998, Bütler finds empirical support for this prediction.

Conclusion

The increasing public expenditure on old-age pensions and health care will in most countries put the government budget and, more generally, society under pressure. Governments must sooner or later respond to this pressure. They have two broad options that are possible to combine in different ways. First, they can try to raise the participation on labour markets. If effective, this option leads to more employment as well as more investment. Second, they can try to raise private and public savings. The effect of net demand for capital is unclear.

Ricardian equivalence

Until now we have treated the private and public sector as independent entities. However, when Ricardian equivalence holds, the public sector deficit or surplus will have repercussions on optimal savings plans by households. For instance, a public sector deficit financed by issuing government bonds implies an increase of future taxes to service the debt (ceteris paribus). Forward-looking households anticipate this future tax increase, and adjust their consumption plans downward to smooth their life-cycle consumption possibilities. Likewise, in case of a public sector surplus, households expect a future tax reduction and anticipate this development by adjusting their consumption plans upward by saving less.

The Ricardian equivalence debate is summarised in Romer (1996). He mentions the following reasons why Ricardian equivalence may not hold exactly:

1. Population growth;

2. Liquidity constraints;

3. Non-lump-sum taxes;

4. Rule-of-thumb consumption behaviour.

First, when new individuals are entering the economy, part of the future tax burden connected with the issue of bonds is borne by individuals who are not alive when the bond is issued. Therefore, the bond represents net wealth to those who are living at the time of the bond issue. A difficulty with this argument is that individuals with finite lifetimes may behave as if they are a single household (cf. Barro, 1974). When generations are connected by bequests, Ricardian equivalence may be restored, and individuals keep their consumption paths unchanged in response to a bond issue. Second, a bond issue may matter when households face liquidity constraints. In particular, when the household faces a higher interest rate for borrowing than the government does, the household may respond to a bond issue by increasing consumption if the government is borrowing on the household's behalf. Third, when taxes are not lump-sum but a function of income, a bond issue reduces the household's uncertainty about lifetime income. The future tax liability is large (low) if future income is large (low). This may induce households to increase current consumption. Fourth, and finally, individuals may not optimise over long horizons, but instead may follow 'rules-of-thumb' in choosing their consumption-saving plans. As a result, people may increase their current consumption in response to a bond-financed tax cut. By-and-large, Romer concludes that "... despite its logical appeal, there does not appear to be a strong case for using Ricardian equivalence to gauge the likely effects of governments' financing decisions in practice" (1996, pp. 72).

3.4 Current accounts and capital flows

Projections based on empirical work and model simulations show that Japan, Western Europe and the United States will see their current account improve at least up to 2010. After 2010, savings rates will fall faster than investment rates in most rich countries, although the timing and degree is uncertain. Crucial but unknown variable is the capital mobility (between developed and developing countries).

Ageing has a negative impact on savings and investment. The changing composition of populations will (eventually) reduce private savings and thus the supply of capital. Ageing also leads to less employment (growth) and less investment, reducing demand for capital. Besides, in response to the upward pressure on the public deficit and the growing strain on society governments will respond: they will try to reverse the direction that these three variables threaten to take. The effect on net demand for capital is difficult to determine a priori. From this perspective, countries with similar patterns of ageing may differ in their net demand for capital. Of course, possibilities for trade in capital arise from differential effects of ageing but also from desynchronized patterns of ageing. In chapter 2 we have seen that countries differ in the pace and degree of ageing.

With the uncertainty about the implications of ageing for current accounts and capital flows empirical studies and model simulations are more than welcome. They may help us to see regularities and gain insight in the future development of current accounts and capital flows.

3.4.1 Econometric work

A number of econometric studies on the relationship between ageing and international capital flows have emerged. The older studies often use somewhat rough indicators for population ageing, such as the old-age dependency ratios. More recent studies are almost exclusively based on a better method, proposed in Fair and Dominguez (1991). Fair and Dominguez construct a technique where account is taken of the entire age structure of the population. Without trying to be exhaustive, we shall review some of these more recent studies in this sub-section.

The work of Higgins (1998) provides a good starting point. He relates savings and investment rates to the population age structures for a panel of 100 countries, covering the period from 1950 to 1989.[15] The estimation results suggest that the 'centre of gravity' for investment demand is earlier in the age distribution than that for savings supply. In other words, the share of young workers in the population exerts a positive effect on the investment rate (and not on the savings rates), whereas the share of mature workers has a positive impact on the savings rate (and not on the investment rate). As a result, a country that sees its working-age population

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[15] The separate demographic influences on saving and investment can only be identified when countries can borrow and lend on the international capital market without constraint and at a given world interest rate. With imperfect capital mobility, the econometric estimates reflect a mix of the separate effects on savings supply and investment demand.

increase will first see its current account deteriorate and then improve. After the workers are retired, the current account will move towards a deficit.

Lürhmann (2001) and Lane and Milesi-Ferretti (2001) find similar results. Lührmann studies the relationship between demographic changes and international capital flows, using data for a broader set of countries (181) for later years (1970-1997). Lane and Milesi-Ferretti (2001) take a somewhat different approach. They study the evolution of net foreign asset positions for a group of 66 countries over the 1970-1998 period. The estimated relation between demographic structure and net foreign assets is quite strong. The pattern of demographic effects is consistent with the results of Higgins and Lührmann. Lane and Milesi-Ferretti find a decline in the net foreign asset position if the population shares of younger age cohorts increase and a rise in net foreign assets if the share of workers near their retirement increases, with a maximum effect for the 50-54 age group. Finally, evidence is found for the running down of net foreign assets if the 65+ age cohort increases.

Higgins uses the estimation results to project the changes in the current account as a result of demographic developments alone into the future. Table 3.1 shows that in developed countries investment rates are projected to decline faster than savings rates, improving their current account. This effect is in 2025 not as strong as in 2010, when the baby-boom generation is expected to retire.

Table 3.1	Projected changes in the current account as a result of demographic developments (%-points of GDP)	
	2010	2025
Germany	1.1	1.3
Japan	1.5	2.3
United States	4.5	1.9
OECD (unweighted average)	3.2	1.7
Source: Higgins (1999).		

The projection in Table 3.1 raises, however, questions. As Higgins himself notes, "Out-of-sample projections cannot capture the general equilibrium effects of a novel pattern in demographic change". The novel pattern is that the world population will get older, and not younger as in the estimation period. For this reason, model simulations that incorporate general-equilibrium effects and take into account the global, common trend of ageing, are useful and will therefore be discussed in the next sub-section.

Furthermore, capital is not perfectly mobile, linking investment and savings. This makes it difficult to identify the separate effects of ageing on savings on the one hand and on investment on the other hand. More importantly, according to the projections the OECD runs in 2010 and 2025 a current account surplus. This requires that the non-OECD countries will have a

corresponding deficit. But how mobile is capital and will the developing countries be able to absorb the inflow of investment funds? Given the fact that at the moment the net current account for the OECD as a whole is approximately zero, these questions are highly relevant. Capital mobility (between developed and developing countries) is discussed in the next chapter.

3.4.2   Model simulations

Brooks (2000) and INGENUE (2001) simulate general-equilibrium models for the world economy to gauge the effects of ageing on international capital flows. Both models employ the idea of the life-cycle: different generations make optimal savings-consumption decisions, while they do not want to leave bequests. Labour supply is exogenous and follows directly from demographic projections. The investment-production decision of firms is modelled in less detail than the savings-consumption decisions of households. Characteristic is that given labour supply there are decreasing returns to capital: in every world region an increase in the capital-labour ratio leads to a fall in the rate of return to capital. In response to any difference in the rate of return investment funds will react: capital is perfectly mobile.

The development of the current account for Japan and Western Europe is broadly the same in Brooks as it is in INGENUE. They improve their net foreign asset position further until they reach a turning point. After that Japan and Western Europe will see their current account deteriorate and will see it become negative eventually. Brooks predicts that Japan's current account becomes negative around 2010. In INGENUE the turning point is later, around 2020. For Japan the current account recovers not earlier than after 2050 in Brooks, while INGENUE predicts movements around equilibrium after 2020. For Europe, both models predict a prolonged period of a current account deficit.

Brooks projects the United States to follow a similar pattern as Japan and Western Europe. First, its current account improves, until a peak in 2010, and then it deteriorates. A similar pattern is predicted in the scenario study by McMorrow and Roeger (2003). The simulation results of INGENUE, on the other hand, shows that the current account of the region that includes the United States as well as Canada, Australia and New Zealand, see its current account improve throughout the simulation period: it swings from a deficit in 2000 to a surplus in 2040.

Of course, when the rich countries – Japan, Western Europe and the United States – see their current account improve, the rest of the world must by definition import capital. This assumes that trade in capital between developed and developing countries is possible and does not meet important restrictions. This assumption is not obvious. Interesting are therefore simulation results of Börsch-Supan, Ludwig and Winter (2001). They consider the possibility that capital mobility is restricted to the OECD-area. Under this restriction differences in the pattern of ageing among the rich countries become important. They show for example that Germany will export capital to the United States after 2025. In the latter country the old-age

dependency ratio does not rise as fast as in the rest of the OECD-area, so that opportunities to invest are more abundant in the United States than elsewhere.

Computable general-equilibrium models are a helpful source of information in the discussion on the effects of population ageing on international capital flows and interest rate movements. One reason is that these models do not suffer from the problem of inconsistency to which out-of-sample projections on the basis of empirical work are prone. The model simulations and Higgins' projections share, however, the result that the rich OECD countries will see their current account improve until at least 2010. After that year important differences occur, not only between models simulations and straightforward projections but also between the various computable general-equilibrium models themselves.

   A critical factor in both empirical work and model simulations is the mobility of capital. If capital is not perfectly mobile, estimated effects of ageing on investment rates partly reflect the indirect effects on saving rates. This complicates projections for investment and saving rates, especially when capital mobility changes. Similarly, the model simulations assume perfect capital mobility within the group of rich countries as well as between rich and poor countries. With perfect mobility large swings in the current account are feasible, but with only imperfect capital mobility savings and investment are tied together, at least to some extent. Therefore, we consider the evidence for capital mobility in the next chapter.

4 International capital mobility

Capital mobility among developed countries and, a fortiori between developed and developing countries is far from perfect: domestic investment rates closely follow domestic savings rates, the share of foreign assets in investment portfolios is small and interest rate differentials remain. Explanations for limited net trade in capital are found in restrictions on trade, barriers to trade in goods and asymmetric information between domestic and foreign investors. Limited capital mobility and other reasons cast doubt on the idea that net trade in net capital between North and South will occur at a large scale.

A perhaps common perception is that capital flows across the globe in search for profitable investment opportunities and responds to even the smallest difference in rates of return. Undoubtedly, capital flows have grown relative to income and production in the world. Figure 4.1 illustrates that OECD countries hold significant foreign positions, indeed. Against the persistent deficit position of the US, other countries (Japan and the Netherlands) have built up a lasting creditor position. For the OECD as a whole the net positions largely cancel (Lane and Milesi-Feretti, 2001), implying that capital flows are in particular relevant to the richer countries.

But this does not ensure that capital mobility is indeed perfect. In fact, international trade in capital is often subject to important restrictions and high costs. Besides, trade in capital and in goods are strongly related. Since trade in goods is subject to important transport and transaction costs, trade in capital also diminishes rapidly with distance. This chapter will argue that capital mobility is far from perfect, within the group of developed and let alone between developed and developing countries. The implication is that savings and investment are still tied together.

Figure 4.1   **Net Foreign Assets for various OECD countries**
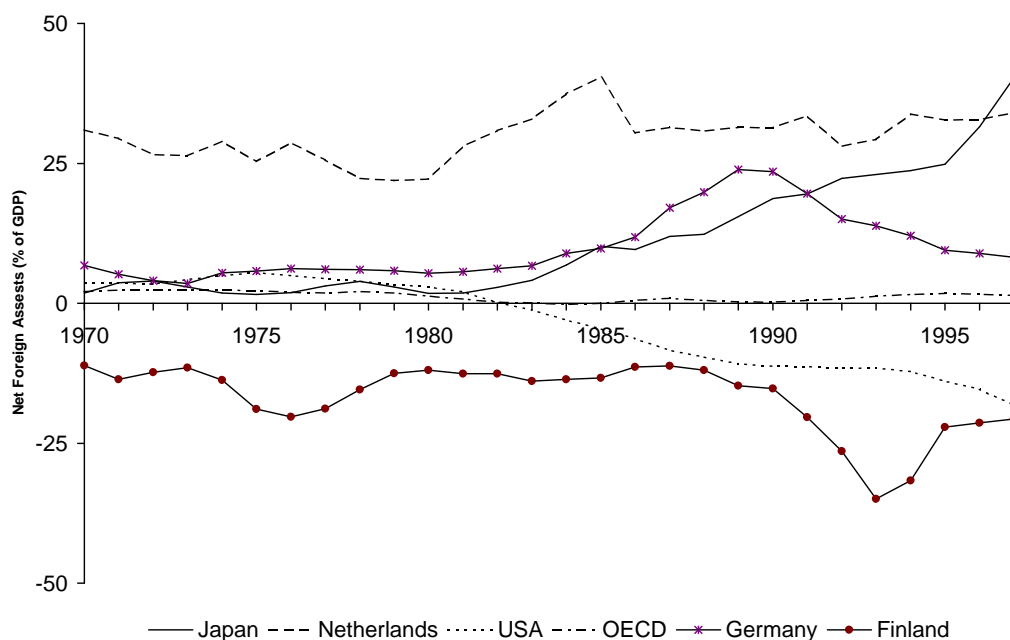
Source: Lane and Milesi-Feretti (2001).

4.1   The Feldstein-Horioka puzzle

The gap between (public and private) domestic saving and (public and private) domestic investment equals the current account surplus. In turn, this surplus corresponds to a net capital outflow. For most countries, the average gap between domestic savings and investments is small. This already points at modest international capital flows. In a seminal contribution, Feldstein and Horioka (1980) take a closer look at the correlation between savings and investments. They write (pp. 317):

"With perfect capital mobility, there should be no relation between domestic saving and domestic investment: saving in each country corresponds to the worldwide opportunities for investment while investment in that country is financed by the worldwide pool of capital. Conversely, if incremental saving tends to be invested in the country of origin, differences among countries in investment rates should correspond closely to differences in saving rates."

Feldstein and Horioka report evidence strongly contradicting the hypothesis of perfect international capital mobility. In Table 4.1 we report regression results based on their data set, and run a similar regression using the same group of countries on a more recent data set provided in Obstfeld and Rogoff (2000). The results imply that international capital mobility is

still far from perfect, although higher than in the 1960-'74 period considered in Feldstein and Horioka (1980).

Table 4.1	Relationship between savings and investment (dependent variable: I/Y)	
	Feldstein and Horioka (1980)	Obstfeld and Rogoff (2000)
	Period 1960-'74	Period 1990-'97
Constant	0.031	0.071
	(0.031)	(0.019)
S/Y	0.904	0.638
	(0.067)	(0.095)
R^2	0.9	0.73
N	19	19

Note: The regression method is OLS. Standard errors are between brackets.

4.2 The consumption correlations puzzle

International capital markets perform several functions. First, capital markets lead to an efficient allocation of funds across space and time. Funds flow to those places where investment yields the highest rate of return. In the previous subsection we have seen that the international capital market does not perform the first function optimally, since domestic investments still depends on domestic savings. Second, capital mobility allows investors to diversify portfolios and to share risks; countries can borrow or lend to absorb transitory changes in income so as to avoid abrupt changes in consumption. In this subsection we try to assess how capital markets perform this function.

International diversification of a portfolio brings the advantage that the return on this portfolio becomes less volatile: the total risk becomes lower because unexpected gains and losses cancel out. With mobility of assets, one would expect that investors in different countries hold portfolios that are more or less similar in their composition, so that (undiversifiable) risks are shared. This would imply that changes in capital incomes are similar across countries and, thus, that the correlation of consumption is higher than the correlation of production. Table 4.2 shows the average coefficient of correlation between the United States and 20 other rich countries for the growth rates of gross domestic product (GDP) and consumption per capita for three 15-year periods. The table reveals that the coefficient for GDP in the last period is substantially higher than in the first period. This might reflect a better integration and more synchronization of economies.[16] The correlation coefficient for consumption per capita has hardly increased,

[16] Note that the correlation coefficient is the highest in the second 15-year period, when countries faced important common supply and demand shocks (the oil crises in 1973 and 1979 and the tight monetary policies in the early eighties).

however, during the second half of the twentieth century. Moreover, we see that the correlation of consumption per capita is smaller than that of GDP in both in the second and the third period. This suggests that international capital markets do not perform the function of risk sharing very well.

Table 4.2	Average coefficient of correlation between the United States and 20 other OECD countries	
	Gross Domestic Production	Consumption per capita
1956-1970	0.24	0.30
	− 0.25	− 0.25
1971-1985	0.44	0.05
	− 0.25	− 0.27
1986-2000	0.41	0.31
	− 0.34	− 0.33

Note: The results are based on two-year averages of annual growth rates. Between brackets is the standard deviation around the mean.
Source: Own calculations based on Heston, Summers and Aten (2002).

This latter finding is consistent with the observation that portfolios of investors still show a strong 'home bias', *i.e.* an over representation of national assets relative to foreign assets. This home bias has decreased somewhat in recent years, at least in Western Europe as a result of the EMU. For example, pension funds as well as insurance companies hold a higher percentage of foreign equity in virtually all member states since the late 1990s. Yet, the home bias in asset portfolios is still important (see Adam *et al.*, 2001).

Cochrane (1991) and Mace (1991) look at risk-sharing in the American, domestic financial markets. Under full risk-sharing, consumption should be perfectly correlated with aggregate shocks (for which insurance is not possible) but consumption should be independent of idiosyncratic disturbances. Both studies use micro-data for the United States to test this implication of full risk-sharing. Cochrane (1991), for example, related growth in food consumption to variables that capture idiosyncratic shocks, such as days of work lost because of illness, a dummy for involuntary job loss, days of work lost to strikes, etcetera. For many variables the idea of full risk-sharing is not rejected. But full insurance does not apply for all variables, *e.g.* the loss of more than 100 days of work due to illness. Mace (1991) also finds evidence in favour of full insurance, but the results are not robust to changes in the specification of the utility function. The conclusion seems to be that domestic financial markets in the United States perform the function of risk-sharing much better than international markets. Borders still matter, even for capital.

4.3 Other indicators of capital market integration

Adam *et al*. (2001) present an overview of indicators to measure the evolution of capital market integration in the European Union. These indicators give a more detailed picture of credit and bond markets. We discuss here three types of indicators: interest rates, bank charges for cross-border payments and market penetration of foreign banks.

Data on four *interest rates* (the inter-bank 3-months rate, the 10-years government bond benchmark, the mortgage rate, and the corporate loan rate) are available.[17] According to Adam *et al.* (2001), both indicators reveal that European financial integration has increased, particularly after the introduction of the euro in 1999. However, the speed and degree of convergence differs substantially across the various interest rates. The inter-bank rate and the long-term bond market are highly integrated, but the mortgage market and the corporate bond market are converging at a lower speed.

Bank charges for cross-border payments are less clear on the process of integration. While the within-country price dispersion for foreign bank transfers and the average duration for such transfers have fallen, the average cost of cross-country transfers has not converged and the transfer's direction matters. This suggests room for improvements.

A third indicator of financial integration on the credit and bond market is *market penetration of foreign banks*. Foreign banks can enter the domestic market by (i) acquiring or creating domestic branches within the country, or (ii) direct cross-border lending or borrowing without physical presence in the domestic market. Retail banking by foreign banks on the domestic market would probably call for the first activity, while the second activity might be more relevant for the business sector. According to the presence of foreign banks, there is little evidence for credit market integration in the EU: cross-border penetration of banks is limited. Also, in terms of cross-border lending and borrowing activities there is substantial room for further integration, as these is a clear indication of home bias for these activities.

4.4 Explanations for imperfect capital mobility

A number of explanations for the apparently low international capital mobility have been suggested in the literature.[18]

Restrictions on international trade in capital
Although capital markets are becoming better integrated they are still subject to restrictions. Impediments may derive from national regulations, and differences therein, that have a direct

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[17] To study the pattern of integration, Adam *et al.* use the concepts of β-convergence, borrowed from the empirical growth literature. In case of β-convergence the various interest rates converge to the same steady state value over time. With ɣ-convergence they look at the cross-sectional dispersion of interest rates, *i.e.* the degree of financial integration at any point in time.

[18] See for example Obstfeld and Rogoff (1996) for a more elaborate discussion.

impact on trade in capital. They may also arise from barriers to entry for banks that result in imperfect international competition between them.

Imperfect integration of goods markets

Obstfeld and Rogoff (2000) show that transportation costs in the international trade of goods goes far toward explaining the Feldstein-Horioka saving-investment puzzle without, as is often the case, exacerbating other puzzles. Bovenberg (1989) and Acemoglu and Ventura (2002) explore a similar mechanism but assume imperfect substitutability between home and foreign consumption goods.

The intuition of the argument goes as follows. Assume that goods of different origins are imperfect substitutes. This has the implication that to sell more units of a good, the price of that good has to fall. Consider furthermore a two-period economy. When net exports are negative in period 1, positive net exports in the second period are required (to pay back the loan in the first period). Now, the relative price of the good is lower in period 2 than in period 1. The expected deflation will push up the home real interest rate above the world interest rate. In that case, cross-border capital flows are smaller than casual inspection of international interest rate differentials would suggest. This helps to explain part of the Feldstein-Horioka puzzle.

Asymmetric information

Gordon and Bovenberg (1996) see asymmetric information between domestic and foreign investors as an obstacle to international capital mobility. Investors usually know more about the prospects of their own economy and about investment opportunities at home, than about those in other countries. Indeed, although some information in capital markets can be transmitted digitally, a lot still requires face-to-face contact. To illustrate this, Table 4.3 shows some estimates presented in CEPR (2002) on the impact of distance on economic interactions in capital markets. The estimates express equity flows and foreign direct investment at different distances, relative to the flows at a distance of 1000 km. We see that distance substantially reduces equity transactions and, to a lesser extend, FDI. Hence, distance matters.

Table 4.3	The impact of distance on cross-border capital flows		
		Equity flows	Foreign direct investment
1000 km		1	1
2000 km		0.55	0.75
4000 km		0.31	0.56
8000 km		0.17	0.42
Source: CEPR (2002).			

Portes and Rey (1999) provide an empirical assessment of the role of informational asymmetries. They use a panel data set on bilateral cross-border equity flows between 14 countries over the 1989-1996 period. Market size, openness, efficiency of transactions, and distance appear to be the most important determinants of transaction flows. Furthermore, it is shown that distance is largely a proxy for informational asymmetries. Portes and Rey include telephone call traffic and multinational bank branches to account for information transmission, and an index of the degree of insider training to account for information asymmetries between domestic and foreign investors. These variables show up with highly significant coefficients in the regression model, whereas significance of the distance variable is lost upon inclusion of these variables.

The conclusion is thus that capital mobility within the group of developed countries is far from perfect. The explanations are found in restrictions on trade in capital, natural and other barriers to trade in goods markets and asymmetric information between domestic and foreign investors. Since these explanations are even more relevant for trade between developed and developing countries, the conclusion applies a fortiori to capital mobility between them.

4.5 Will capital flow North to South?

A rather popular idea is that the old North will finance its pensions by investing in the young South. Indeed, empirical work and model simulations corroborate this idea, at least up to 2010. It assumes that in the North the savings rate does not fall as fast as the investment rate. Without the possibility to invest in the South, this would tend to depress the rate of return on investment. With this possibility, however, excess capital will flow towards the South, looking for investment opportunities with a relatively high rate of return.

The finding that capital mobility is rather limited, casts doubt on the idea that the North will invest in the South. Capital mobility within the group of developed countries is limited, let alone between developed and developing countries. Indeed, if this idea were to materialise, developing countries would need to liberalise their financial markets so as to remove these impediments. However, there are other reasons that capital may not flow from developed to developing countries at a large scale.

- More than 10 years ago Lucas asked: Why Doesn't Capital Flow from Rich to Poor Countries? He replied that the return in poor countries is not necessarily higher than in rich countries, so that capital from the North will not seek investment opportunities in the South. This goes against the neoclassical assumption that backward, developing countries have ample investment opportunities with high rates of return. It is this assumption from which the idea of convergence derives: the poor countries will grow faster than and catch-up with the rich countries. However, high growth is not a common experience for developing countries and convergence is at best conditional on many factors.

  Lucas (1990) points at human capital in explaining low marginal returns to physical capital in developing countries. Cross-country differences in the marginal product of capital are smaller when account is taken of international differences in human capital per worker. More recently, Hall and Jones (1999) allow for cross-country differences in total factor productivity, and show that persistent international differences in per capita output are the result of long-lasting differences in social infrastructure.

- In countries with good growth prospects, often in Asia, savings rates are high as well. For example, Figure 3.3 shows that the savings rate in China is roughly twice as high as in the United States. In other words, the (fast-growing part of the) South does not need the capital from the North. Developing countries may welcome foreign direct investment from the rich countries because this enables them to learn new production techniques and methods. But not because they lack the funds to finance investment.

- Finally, ageing is not confined to developed countries, but is rather a world-wide phenomenon. Figure 2.1 shows for example that also in China the old-age dependency ratio will increase after 2010 and eventually be higher than in the United States. Of course, ageing will occur later in developing countries than in developed countries. Capital flows can potentially exploit this difference in timing.

5 The impact of lower interest rates

In the absence of sufficient outlets for excess savings on international capital markets, policies to stimulate savings by current generations will lead to lower interest rates, thereby making a shift towards more funded pension systems less attractive. Simulations for the Netherlands show, however, that a lower interest rate also implies more investment and higher wages, mitigating these negative effects.

For a single economy international capital markets may provide a sufficient outlet for excess savings in the wake of ageing. For the larger blocks within the OECD world exporting its excess capital is not a feasible option, however. First, ageing is a worldwide phenomenon; there is no major country that can easily absorb the surplus of savings of the ageing countries. Second, due to capital market imperfections it is difficult to exploit the differences that exist in speed and timing of ageing across countries. The evidence on capital mobility casts doubt on the idea that the rich and relatively fast ageing countries can finance old-age pensions by investing their savings in poor but fast-growing countries. When in the early stages of ageing a gap between savings and investment rates opens up in (some of) the rich countries and the excess savings cannot be exported to the poor but fast-growing countries the interest rate will have to fall to let demand and supply meet.

A falling return on savings seems a threat to policies that aim to raise national savings. Governments try to move towards a funded pension system and/or to reduce government debt (see section 3.3). Without these policies the tax burden on the young, working generations may rise significantly, exacerbating already existing tax distortions and reducing economic efficiency. When the return on savings falls, these policies become less effective: more savings are needed now to guarantee old-age pensions, or part thereof, in real terms later. In other words, the contributions to pension funds or taxes must rise more with a falling than constant rate of return on savings. In fact, promoting national savings seems to have a negative international spillover: the larger the group of countries that want to export capital but cannot, the larger the downward effect on the interest rate will be. This suggests – the other way around – that the rich and ageing countries have much to win from capital mobility: investment opportunities in developing countries that promise a relatively high rate of return help them to deal with the problem of financing old-age pensions.

The interest rate is, however, not only relevant for pensions savings. Changes therein will also affect other economic variables. A lower interest rate will also imply a higher capital-labour ratio and thus a higher wage rate, which reinforces the basis of a PAYG-system. Besides, it will also imply that the debt burden will press less heavily on governments. Therefore we will explore the implications of different scenarios for the interest rate in more details.

Simulations for the average international interest rate based on general-equilibrium models produce mixed results. Most models predict that population ageing will lead to lower future interest rates (*cf.* INGENUE (2001), Brooks (2000), Börsch-Supan *et al.* (2001)), but some models produce increasing world interest rates (see for instance Kotlikoff *et al.* (2001)). An important factor is actually the policies implemented to face the ageing problem. Policies which tend to focus on additional – public or private – yield lower interest rates than policies that foster participation and investment in human capital. As most models predict falling rates of return to capital and to be on the conservative side, we shall consider the case in which the world is confronted with downward pressure on the world interest rate in the decades ahead of us. In general, falling interest rates are bad news for pension funds, as the financial returns fall. However, there are other effects as well. A lower interest rate also stimulates investment in physical (and human) capital and thereby raises productivity of labour. This leads to higher wages and higher GDP in the longer term. The higher wages tend to strengthen the financial base of the pension system. But, if outlays on pensions are indexed to wages, also the expenditures of pension funds are affected. Obviously, rising interest rates produce opposite effects.

To get a more comprehensive view, Table 5.1 shows the effects for the Netherlands – with large pension funds – when the interest rate decreases with 1 percentage point in 2010. This decrease could arise, for example, from more savings in other OECD countries. These effects are simulated with GAMMA, CPB's overlapping generations model for the Dutch economy (Draper and Westerhout, 2002).

A lower interest rate leads to an inflow of capital. Investment shows a peak in 2010 and after that year a permanent increase of more than 8%, reflecting replacement of worn-out capital. The higher capital stock leads to higher labour productivity. As a result the wage rate increases with 5.6%. Nevertheless, workers do not necessarily see an improvement in their disposable income. Contributions for their pensions have to rise to make up for the lower return on pension savings. Even more importantly, contributions for others' pensions will rise. The reason is that in the Netherlands the level of old-age pensions is indexed to the wage rate. In fact, the net benefit that the working generations derive from the funded pension system (the net present value of contributions and old-age pensions) will go down for the working generations and go up for the already retired generations.

The public sector does not benefit from a lower interest rate either. Pension contributions are tax-deductible, and the government will see its revenue fall when these contributions rise steeply. Besides, the effect of lower interest payments is negative on impact but not very strong. Other expenditures than interest payments tend to rise: the wages for civil servants will rise and the demand for health care increases. The result is that the financial position of the public sector worsens: debt will start to rise and interest payments on this debt eventually rise as well.

Table 5.1   A 1% decrease in the interest rate in 2010: effects for the Netherlands

	2010	2015	2025	2050
Relative change				
Investment	108.2	8.1	8.1	8.1
Wage rate	5.6	5.6	5.6	5.6
Absolute change, % of GDP				
Pension contributions	13.7	29.3	10.2	7.7
to own pension	1.4	2.0	2.4	2.7
to others' pensions	12.3	27.3	7.8	5.0
Absolute change, % of GDP				
Public revenues	1.1	– 2.5	– 2.0	– 2.9
Public expenditure	– 0.1	0.0	0.8	2.8
interest payments	– 0.1	– 0.1	0.4	2.2
expenditure excluding interest	0.0	0.1	0.3	0.6

Source: CPB, own calculations with GAMMA.

Working generations are not necessarily hurt by a lower interest rate. Of course, a lower rate of return on savings requires higher savings now to ensure an adequate level of the old-age pension later. However, it also leads to more investments and higher wages, so that the working generations can afford higher savings. In the case of the Netherlands the working generations are nevertheless worse-off. The interest rate risk is not equally shared across generations. The already retired generations see their income rise, since old-age pensions are indexed to wages. As a result, intergenerational redistribution increases, at the expense of the working generations.

Moving towards a funded pension system makes countries more vulnerable for interest rate risks. Capital mobility may help to reduce these risks, since trade in capital exploits and eradicates interest rate differentials and changes therein. The results for the Netherlands suggest, however, that the interest rate risks are not necessarily large, because high wages may accompany low interest rates. The distribution of interest rate risks is perhaps a larger problem, depending on the institutional setting. Wage-indexed pensions increase the exposure to interest rate risks for the working generations.

Conclusion

Although ageing is a world-wide phenomenon there are significant differences in magnitude and timing of ageing across countries. The differences are most pronounced between the developed countries on the one hand and the developing and emerging regions (Africa, Asia and Latin America) on the other hand. In principle, these differences could help to relieve the consequences of ageing around the world. Ideally fast-ageing countries should temporarily invest their excess savings in countries which are less subject to ageing. Model simulations suggest that the fast ageing countries (Europe, Japan, and the US) will improve their net foreign asset position in the next 10 to 20 years, where after it reaches a turning point. Existing evidence on international capital mobility casts doubt on the opportunities for investing on international capital markets. First, capital mobility is rather limited, especially with developing countries. This considerably reduces the scope for investing the surplus of the ageing countries in 'younger' areas. Second, the rapidly growing new and old Asian tigers appear to finance their growth by high rates of savings themselves.

As a consequence, savings and investment will be linked for the major economic blocks (US and Europe) in the OECD area. Discrepancies between savings and investment will not be absorbed by external financial markets, but will be solved by adjustment of the interest rate. This should be taken into account when deciding on the policies towards ageing. Exporting the financial consequences of ageing is no policy option for major economic blocks like Europe or the United States.

Population ageing will put the solidarity between generations under pressure. In the next forty years the number of pensioners is expected to double relative to the number of workers. With the current institutions that heavily rely on PAYG for financing pensions and health care, this will put a heavy burden on future generations. Timely policy action is called for. Broadly speaking there are two directions for policy reforms:

- Investing in human capital
  Ageing is partly the result of increasing longevity. A straightforward answer to the ageing problem is therefore to raise (effective) retirement age. In Europe in particular there seems to be scope for such a policy as the participation of workers between the age of 55 and 65 is exceptionally low. Also stimulating participation of younger generations can help as it broadens the basis for intergenerational solidarity.

- Investing in financial / physical capital
  The process is partly temporary. The baby boom and the sharp drop in fertility in the 1960s and 1970s has caused a lengthy transition to a new steady state with a greyer population on average.

The economic consequences of demographic transition can be smoothed if current generations to a larger extent 'pay for their own pensions' by increasing savings now. This can be done by stimulating pension savings (a partial shift to funded pensions) or by increasing government savings by creating a surplus in the government budget and reducing public debt.

In a world with imperfect international capital mobility both policy options are inter-related. The tendency of the interest rate to fall when public and private savings are stimulated according to the second policy option, makes the first policy option of investing in human capital all the more important. Savings and investment go hand in hand, also in government policy. A sustainable policy towards ageing stands on two legs: stability AND growth. Budgetary discipline is indispensable, but it should not overshadow the need of sound policies towards human capital and labour market participation.

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Appendix: Estimated relation between savings and age composition

Background

For the estimation of the relationship between savings and the demographic composition of economies, we have used a slightly modified version of the commonly-used methodology developed in Fair and Dominguez (1991) to estimate age-dependent economic decisions such as savings, participation, etc. We estimate the following equation:

(A1) $\qquad S_{it} = \beta_{0,i} + \beta_1 g_{it} + \sum_{j=1}^{17} \alpha_j C_{j,it} + \varepsilon_{it}$

where S_{it} is the average savings rate of country i over the time period t-t+5, $\beta_{0,i}$ is a series of country-specific fixed effects, g_{it} is the growth rate of GDP per capita of country i over the time period t-t+5, and $C_{j,it}$ is the fraction of cohort j of the total population in country i at time t. In total, we have seventeen 5-year cohorts, namely 0-5, 5-10, 10-15, ..., 75-80 and 80 and above. Multi-collinearity among the cohort-size variables complicates the estimation of this equation. We therefore follow Fair and Dominguez in putting more structure on the estimated effects sizes α_j. The polynomial constraint that we impose is

(A2) $\qquad \alpha_j = \gamma_0 + \gamma_1 j + \gamma_2 j^2 + \gamma_3 j^3$

Furthermore, we impose the restriction that

(A3) $\qquad \sum_{j=1}^{17} \alpha_j = 0$

This implies that the average α over an individual's life time is equal to zero and that the α's for specific periods in life can be seen as deviations from the life-time average. We can then derive that

(A4) $\qquad \gamma_0 = -\dfrac{\gamma_1}{17} \sum_{j=1}^{17} j - \dfrac{\gamma_2}{17} \sum_{j=1}^{17} j^2 - \dfrac{\gamma_3}{17} \sum_{j=1}^{17} j^3$

The age variables thus enter into the regression equation in the following way:

(A5) $\qquad \sum_{j=1}^{17} \alpha_j C_{j,it} = \gamma_1 Z_{1,it} + \gamma_2 Z_{2,it} + \gamma_3 Z_{3,it}$

where

(A6) $\qquad Z_{1,it} = \sum_{j=1}^{17} j C_{j,it} - \dfrac{\sum_{j=1}^{17} j \cdot \sum_{j=1}^{17} C_{j,it}}{17}$

$$Z_{2,it} = \sum_{j=1}^{17} j^2 C_{j,it} - \frac{\sum_{j=1}^{17} j^2 \cdot \sum_{j=1}^{17} C_{j,it}}{17}$$

$$Z_{3,it} = \sum_{j=1}^{17} j^3 C_{j,it} - \frac{\sum_{j=1}^{17} j^3 \cdot \sum_{j=1}^{17} C_{j,it}}{17}$$

Our estimation yields estimates for the country specific fixed effects, β_1, γ_1, γ_2, and γ_3. Using equation (4), we obtain the value of γ_0. Finally, using γ_0, γ_1, γ_2, γ_3 and equation (A3), the cohort-specific effects on savings are derived. The contribution of ageing to (variation in) savings can then simply be determined by using

$$(A7) \qquad S^{ageing} = \sum_{j=1}^{17} \alpha_j C_{j,it} = \sum_{j=1}^{17} (\gamma_0 + \gamma_1 j + \gamma_2 j^2 + \gamma_3 j^3) C_{j,it}$$

Data

Our data are derived from a variety of sources. Information on the age composition of economies is taken from the United Nations. Data on GDP per worker are taken from the Penn World Table (Mark 6.1). The growth rate was constructed as an average annual growth rate. GDP per worker is expressed in constant dollars, where conversion is based on purchasing power parities. Our measure for savings is average Gross Domestic Savings for the five-year periods distinguished in the analysis and is taken from the World Bank (World Development Indicators, 2002). Their data have been aggregated to five-year cohorts, neglecting the distinction between males and females.

Regression results

The regression results underlying the figures in the main text are reported in Table A1. Equations 1 and 2 use fairly aggregated cohorts reducing the problem of multi-collinearity among the cohort measures. These results give a first impression of the variation of savings over the lifetime of individuals. They have been used to generate the predictions for savings in Figure 3.3.[19]

Equations 3 and 4 use five-year cohorts, aggravating the problem of multi-collinearity and requiring estimation according to the Fair and Dominguez method laid out in the first part of

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[19] The reason for using this specification for predicting savings for the period up to 2050 instead of the Fair and Dominguez specification is related to the fact that the out-of-sample behaviour of the Fair and Dominguez specification is less realistic than for the simple specification using cohorts. This is likely to be related to the imposed functional form in the Fair and Dominguez specification. More specifically, savings rates are projected to become negative for rapidly ageing countries in the course of the 21st century when using the Fair and Dominguez specifications.

this appendix. The evolution of savings over an individuals lifetime based on these regressions is given in Figure 2.2 in the main text.

Results are reported for both our preferred extensive sample (covering 107 countries) as well as for a restricted sample of only OECD countries to give a first feeling of the sensitivity of our results for sampling. More detailed sensitivity analyses considering both sampling as well as specification are available upon request.

Table 5.2 **Dependent variable is average domestic savings (% of GDP), pooled cross-section analysis with 5-year periods from 1960 to 2000**

	Simple approach (107 countries)	Simple approach (OECD only)	F&D approach (107 countries)	F&D approach (OECD only)
g	0.14	0.64***	0.20*	0.65***
	(1.34)	(4.31)	(1.89)	(3.97)
C_{25-45}	0.57***	– 0.09		
	(4.52)	(– 0.67)		
C_{45-65}	0.84***	0.06		
	(3.82)	(0.31)		
$C_{>65}$	– 0.79***	– 0.55***		
	(– 3.38)	(– 3.28)		
Z_1			0.39***	– 0.270***
			(2.69)	(– 2.19)
Z_2			– 0.0249	– 0.0434***
			(– 1.16)	(2.90)
Z_3			-5.8×10⁻⁵	– 0.0019***
			(– 0.07)	(– 3.26)
$R_{adj}^{\ 2}$	0.77	0.64	0.78	0.65
N	608	153	608	153

Note: All equations are estimated using country-specific fixed effects. White heteroskedasticity consistent *t*-statistics have been reported in parentheses. *, ** and *** means significance at, respectively 10, 5 and 1%.

From the third regression specification, γ_0 is straightforwardly derived as -0.81. This results in a pattern of α's as depicted in Figure 3.2 in the main text. This pattern is generally found for a wide range of different specifications. We have, for example, included the real interest rate as an explanatory variable, measures of the degree of development of financial markets, etc., but the general picture that emerges tends to prevail. It has to be noted that this pattern is fairly consistent with other econometric analyses where the relationship between ageing and savings have been estimated. Figure 3.3 is based on the first specification in Table A1. Again, this pattern is found for a wide range of alternative specifications. It is to be noted, though, that using the Fair and Dominguez specifications yields extreme savings rates for several countries after 2030. This is likely to be caused by the imposed functional form, resulting in relatively poor out-of-sample behaviour (see also footnote 19).

Abstract

Ageing will have an impact on both savings and investment, potentially leading to substantial international capital flows. This CPB Document provides a comprehensive overview, by considering various questions. What are the differences in demographic process of ageing across countries? Does ageing lead to a capital outflow? How mobile is capital? What are the effects of a lower rate of return on (pension) savings?

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