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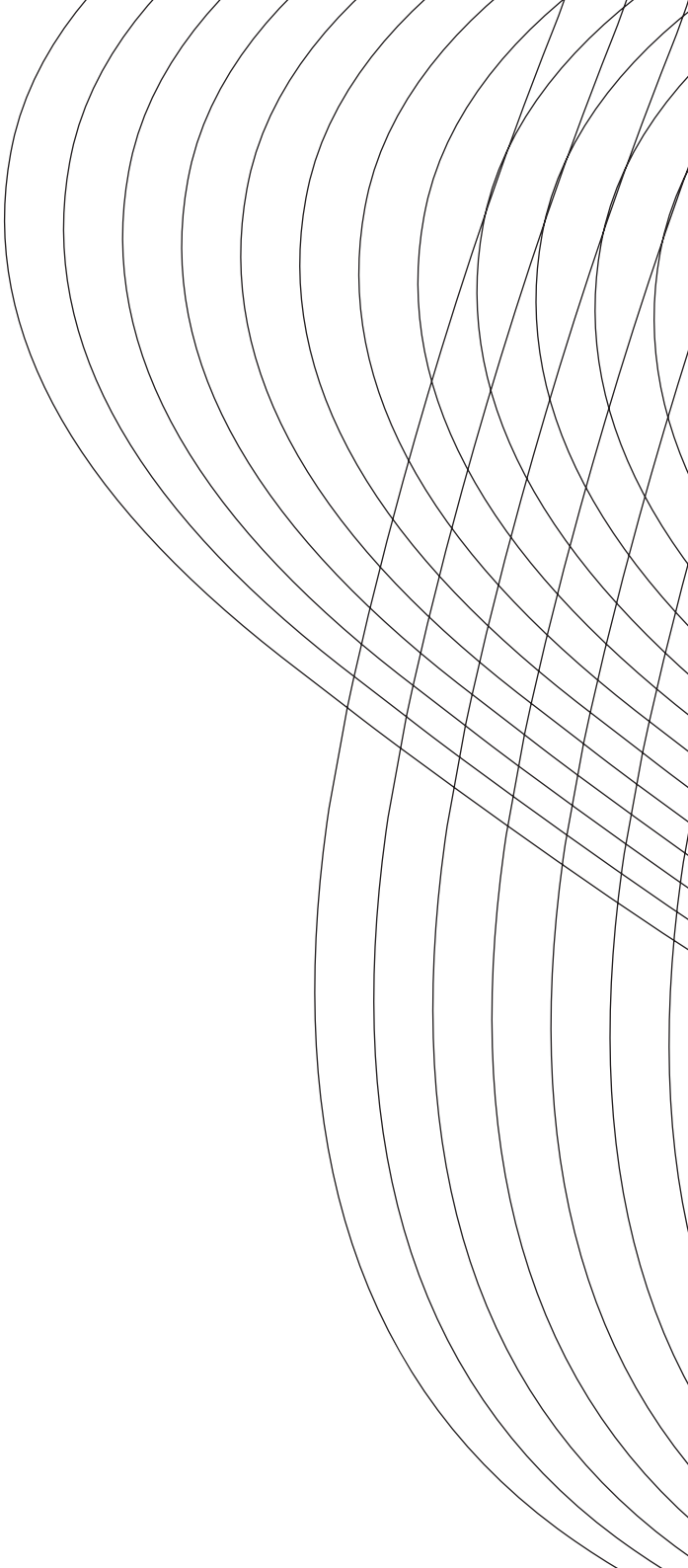
Netspar Panel Papers

Roel Beetsma and Heikki Oksanen

Pension systems, aging and the Stability and Growth Pact



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PREFACE

Netspar stimulates debate and fundamental research in the field of pensions, aging and retirement. The aging of the population is front-page news, as many baby boomers are now moving into retirement. More generally, people live longer and in better health while at the same time families choose to have fewer children. Although the aging of the population often gets negative attention, with bleak pictures painted of the doubling of the ratio of the number of people aged 65 and older to the number of the working population during the next decades, it must, at the same time, be a boon to society that so many people are living longer and healthier lives. Can the falling number of working young afford to pay the pensions for a growing number of pensioners? Do people have to work a longer working week and postpone retirement? Or should the pensions be cut or the premiums paid by the working population be raised to afford social security for a growing group of pensioners? Should people be encouraged to take more responsibility for their own pension? What is the changing role of employers associations and trade unions in the organization of pensions? Can and are people prepared to undertake investment for their own pension, or are they happy to leave this to the pension funds? Who takes responsibility for the pension funds? How can a transparent and level playing field for pension funds and insurance companies be ensured? How should an acceptable trade-off be struck between social goals such as solidarity between young and old, or rich and poor, and individual freedom? But most important of all: how can the benefits of living longer and healthier be harnessed for a happier and more prosperous society?

The Netspar Panel Papers aim to meet the demand for understanding the ever-expanding academic literature on the consequences of aging populations. They also aim to help give a better scientific underpinning of policy advice. They attempt to provide a survey of the latest and most relevant research, try to explain this in a non-technical manner and outline the implications for policy questions faced by Netspar's partners.

Let there be no mistake. In many ways, formulating such a position paper is a tougher task than writing an academic paper or an op-ed piece. The authors have benefited from the comments of the Editorial Board on various drafts and also from the discussions during the presentation of their paper at a Netspar Panel Meeting.

I hope the result helps reaching Netspar's aim to stimulate social innovation in addressing the challenges and opportunities raised by aging in an efficient and equitable manner and in an international setting.

Henk Don
Chairman of the Netspar Editorial Board

EXECUTIVE SUMMARY

This paper explores how the Stability and Growth Pact (SGP) may cope with the future costs of population aging in the European Union. Clearly, population aging has forced countries to reform their pension systems, and will continue to do so, both by reducing the generosity of pension arrangements and by switching to funding rather than relying on pure pay-as-you-go pension provision. This study explores how such reforms affect the room for adhering to the SGP, and how the SGP may induce or hamper the incentives for reform. Our analysis draws on the recent literature on aging and pensions and on the SGP. We also calibrate a simple model for addressing intergenerational equity and discuss its implications for the SGP.

The longer original version of this paper was partly prepared while Roel Beetsma stayed at the European Commission under the DG ECFIN Visiting Fellows Programme in January-February 2007 (contract number 299/2006/SI2.452.980), and subsequently published as Beetsma and Oksanen (2007). Roel Beetsma would like to thank the Commission for the stimulating research environment. We are grateful for helpful comments from Jan-Marc Berk, Marco Buti, Antoine Deruennes, Willem Heeringa, Clemens Kool, Joao Nogueira Martins, Lucio Pench, Rick van der Ploeg, Andras Simonovits, Salvador Valdés-Prieto, Ed Westerhout as well as from participants at a seminar at the European Commission, a Netspar panel meeting and the 2008 Banca d'Italia Workshop on Fiscal Indicators (Perugia). The usual disclaimer applies.

Pension Systems, Aging and the Stability and Growth Pact

1. Introduction

This paper addresses the link between two major European policy issues at the heart of the macroeconomic debate: (1) coping with rising public expenditures caused by population aging, and (2) the adherence to the EU's fiscal rules, notably to the provisions on public finances in the Stability and Growth Pact (SGP) (as revised in 2005). The analysis is concerned with the long-term sustainability of public finances, which can, however, be achieved through many different combinations of spending and revenue policies over time. We therefore narrow the focus and consider those policies that treat subsequent generations equally, taking into account not only their fertility and longevity, but also the tax payments they make and the benefits they receive from the public pension system and other expenditure programmes.

The paper is structured as follows. Section 2 discusses projections of the demography and aging-related public spending for the EU-25. It also discusses the content and implementation of the SGP, both before and after its recent reform, including the use of the expenditure projections for assessing long-term fiscal sustainability under the SGP. As the implicit pension liabilities and intergenerational equity are not explicitly addressed in the SGP, Section 3 sets up a model to provide numerical illustrations of public debt, deficits and implicit liabilities under different pension and fiscal arrangements. It pays explicit attention to a transition towards (partial) funding that might be required for intergenerational equity. The technical part is kept to a minimum, and the model is presented in detail in the *Appendix*, which is available upon request or from Beetsma's website. Section 4 discusses the implications of the analysis for pension reforms and the SGP, while Section 5 concludes the paper.

2. The SGP and aging-related public expenditures

2.1. The original SGP

While monetary policy in the euro area is delegated to the ECB, fiscal policy remains in the hands of the national authorities, which should (according to the Treaty agreed upon in Maastricht in 1991) comply with the principle of sound public finances. To ensure this compliance, the Treaty prohibits central bank financing to governments, their privileged access to other financial institutions and the bailout of debts of any public entity with the help of the European Community or its Member States. A bailout of a Member State in severe budgetary trouble by raising inflation to erode the real burden of its debt was also excluded by setting price stability as the primary objective of the ECB. This arsenal of measures geared toward preventing divergences from sound public finances was complemented by stipulation of an Excessive Deficit Procedure (EDP) with reference values for deficits (3% of GDP) and debt (60% of GDP) that can ultimately lead to the payment of fines by a Member State that does not correct its Excessive Deficit before the deadline imposed by the EU Council. Nevertheless, some countries (notably Germany) believed that all this would still not be sufficient guarantee for the ECB to be able to operate independently and achieve price stability. This fear led to creation of the SGP in 1997.[1]

One part of the SGP, the regulation "on speeding up and clarifying the implementation of the excessive deficit procedure", makes the Treaty-based EDP operational by specifying the time schedule and various criteria applied in the procedure (the "corrective arm"). The other part, the regulation "on the strengthening of surveillance of budgetary positions and the surveillance and coordination of economic policies", aims at preventing excessive deficits by requiring countries to strive for a budget

[1] For more details, see Eichengreen and Wyplosz (1998); Fischer et al. (2006) classify the various proposals to amend the Pact; prominent examples are Wyplosz (2005), von Hagen (2002), Fatas et al. (2003), Fitoussi (2002), Blanchard and Giavazzi (2004). The proposals that focus on long-term sustainability are especially relevant for the present paper: Pisani-Ferry (2002), Calmfors and Corsetti (2004) and Buiter and Grafe (2004).

that is close to balance or in surplus in the medium run (the "preventive arm"). The safety margin below the 3% of GDP deficit aims at allowing the automatic stabilizers to do their work, unless the economy falls into a very severe recession. As part of this regulation, euro area members must submit a "Stability Programme" every year, in which they set out their budgetary path for the coming years and the measures that underpin the projected path. EU countries that have not (yet) adopted the euro submit similar "Convergence Programmes". The programmes are assessed by the Commission, which provides recommendations on their content, after which the ECOFIN Council gives its opinion.

2.2. The revised SGP

The revision of the SGP was agreed upon at the ECOFIN Council and endorsed by the European Council in March 2005, after the SGP had been put on hold at the end of 2003 as a result of the failure to follow its formal procedure in the case of the Excessive Deficits of Germany and France.[2] The revision comprises several improvements and clarifications to the text on short- and medium term budget management in order to discourage pro-cyclical fiscal behaviour. Specifically, budgetary adjustment should be judged in terms of its implications for the cyclically ad-

[2] Apart from the fact that in many Member State deficits exceeded 3%, there was a particular issue that triggered the crisis in implementing the SGP in 2003. It was the question as to what should happen when the Member State in Excessive Deficit implemented the recommendations it received, but exogenous factors turned out to be more unfavourable than expected and the deficit therefore does not decline. This was especially relevant for Germany in 2003. The Commission took the view that it was legally obliged to recommend moving to the next stage of the procedure (i.e. one step closer to potential sanctions), while Germany, supported by France, wanted to return to the previous recommendations and revise them (Korkman, 2005, p. 117). This dispute caused a deadlock in the Council, as the required qualified majority was not found under the correct legal procedure to any decision. In the subsequent ruling the Court of Justice of the European Communities (2004) considered (among other things) that the recommendations could indeed be modified later by the Council, but that this would require a fresh recommendation from the Commission (paragraph 92). After this clarification to the original SGP, the possibility of repeating the steps was made explicit in the revised SGP.

justed balance, net of one-off items and temporary measures.[3] The revision also allows the deadlines for correcting Excessive Deficits to be revised and extended if unexpected adverse economic events occur. Public debt and sustainability receive greater emphasis. This is also the case for structural reforms, including pension reforms "to safeguard the sustainability of public finances in the long run, to promote growth and to avoid imposing excessive burdens on future generations" (European Council, 2005).

In operational terms, the medium-term objective (MTO) for budget balance at the end of the Stability and Converge Programme period was made country-specific, subject to possible revision in the case of major structural reforms and in any in every four years. For countries that already have adopted the euro or participate in ERM-II, the MTO ranges from a minimum of -1% of GDP for low-debt and high-potential-growth countries to budget balance or surplus for high-debt or low-potential-growth countries. As long as a country has not reached its MTO, it should achieve an annual reduction in its cyclically adjusted deficit, net of one-off and temporary measures, of at least 0.5% of GDP. The short-run costs of structural reforms, in general, are explicitly recognized for the definition of the adjustment path to the MTO.

These MTOs were first agreed upon in 2006, but it was explicitly noted that they were set for a transition period until the "criteria and modalities for taking into account implicit liabilities [related to increasing expenditures in the light of aging populations] are appropriately established and agreed by the Council" (ECOFIN Council, 2005). Even though more time was needed, useful groundwork had already taken

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[3] There was evidence that some governments resorted to one-off measures such as the sale of public assets or substituting explicit debt for off-balance liabilities. Some of these were related to pension liabilities: for example, the French and German governments received a cash inflow in return for taking over the pension liabilities of state-owned enterprises (see Coeuré and Pisani-Ferry, 2005). Evidence suggests that such shortsighted budgetary gimmickry was widely applied; see Milesi-Ferretti and Morriyama (2004), von Hagen and Wolff (2004) and Koen and Van den Noord (2005). The reformed SGP now at least partly addresses this issue, as the main fiscal indicator is the cyclically adjusted balance net of one-off and temporary measures.

place and led in 2001 to commonly agreed long-term projections for public expenditures. These will now be discussed, with a description of the way in which they have thus far been used for policy analysis. We also discuss how the systemic pension reforms appear in the revised SGP.

Demography and aging-related expenditure projections

Pensions are largely un-funded in most EU countries.[4] In the EU, thus far only the Netherlands, Denmark and the United Kingdom have featured a substantial funded pension pillar. If strictly applied, a pure PAYG pension system implies that contributions into the system exactly match the pension payments. The presence of such a system thus affects neither the government's deficit nor its debt. However, the consequence of increasing expenditure under a pure PAYG system is that over the coming decades PAYG pension contributions (or other taxes) have to increase substantially. Summing all aging-related expenditures, we see that the projected increase by 2050 is 5%-points of GDP (or more) in half of the EU Member States (Economic Policy Committee and European Commission, 2006a-b). If this were to be financed from current tax revenues, then the statutory tax rates would have to increase by at least 8-10%-points (depending on the tax base). This raises some questions about the negative consequences of such tax hikes, including lower labour supply, tax evasion using various legal means and outright non-compliance with the tax rules.

These negative consequences of escalating aging-related expenditures and the potentially serious impact on the government's deficit and debt were commonly recognised towards the end of 1990s. To prepare the

[4] European Commission (2006a), pp. 52-56, provides an overview of European pension systems; European Commission (2006b), pp. 28-31, contains a scheme of the pension reforms in the EU. See also Whiteford and Whitehouse (2006). In Finland, the statutory pension system is 20-25% funded, and consists of investments mainly in assets other than Finnish government bonds. It is classified within the general government accounts; consequently (e.g. in 2006), while gross public debt was 39%, net debt was negative, at -24% of GDP (Ministry of Finance of Finland, 2007).

ground for the necessary reforms, serious work on projecting these expenditures was started at the EU level in 1999, leading to the first comprehensive report in 2001, followed by the second one in 2006 (Economic Policy Committee and European Commission, 2001 and 2006a-b). The latter provides projections for population-aging-related public expenditures in the EU Member States (EU-25 at the time) from 2004 to 2050 (henceforth referred to as "EPC projections"). They are based on demographic projections, a commonly agreed-upon set of macroeconomic assumptions regarding the labour force, productivity growth and real interest rates, and currently prevailing policies or policy rules.

In 2004, EU-25 pension expenditures were on average 10.6% of GDP, ranging from 4.7% of GDP in Ireland to 14.2% in Italy. The average increase in the EU-25 by 2050 is a relatively modest 2.2%-points of GDP. This is much less than the increase in the old-age dependency ratio, which (other things equal) would imply an 8.1%-point increase in expenditure. The countervailing factors are a projected increase in the employment rate of prime-age workers and in the retirement age, and, notably, a decrease in the average pension relative to the average wage. The projected average expenditure increase of 2.2%-points of GDP also conceals large differences among the Member States, from a 5.9%-point decrease in Poland to a 12.9%-point increase in Cyprus.

Healthcare costs and long-term-care expenditures are expected to rise, on average, at roughly the same relative speed as the pensions. The dispersion across countries is smaller than for pensions, presumably mostly because a common methodology was applied to assessing the cost of healthcare and long-term care. It is important to realise that these expenditures are difficult to project and that the potential divergence across countries is likely to be great.

Based on aging-related expenditure projections, and also taking into account current deficit and debt ratios, European Commission (2006, pp. 86-87) classifies the EU Member States into three groups with respect to risks to the sustainability of public finances: (1) "high-risk": the Czech Republic, Greece, Cyprus, Hungary, Portugal and Slovenia, where the projected increase in pension expenditure ranges from 5.6 to

12.9%-points of GDP; (2) "medium-risk": Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, Malta, Slovakia and the UK, where the projected increase ranges from zero to 7.4%-points of GDP; and (3) "low risk": Denmark, Estonia, Latvia, Lithuania, the Netherlands, Austria, Poland, Finland and Sweden, where the projected change ranges from a decrease by 5.9% to an increase of 3.5%-points of GDP, *due to legislated and implemented reforms*.

The EPC projections should be regarded with considerable caution. For example, the significant decreases in projected expenditures, notably in Poland, Estonia and Malta, and the very small increase for Italy, may indeed be achieved under current policy rules. There is serious doubt, however, about the *political sustainability* of those rules (and possibly also their interpretation). This doubt concerns the indexation of pensions: the rule that is formally in place (e.g. price indexation only), and therefore assumed for the projection, may not be politically sustainable. This may be of particular relevance for Poland, where the current rule for indexing pensions to prices is one of the factors that drive the projected replacement rates significantly down. As this rule can even be regarded as conflicting with the basic principles of the Polish Notional Defined Contribution system, one may reasonably expect the drafting of proposals for changing the indexation rule or for deliberately increasing pension payouts.

EPC projections do show, however, that aging-related public expenditures pose a severe challenge to almost all EU Member States. The illustrations below refer to EU-average numbers; for further applications, we recommend looking into the EPC projection for each Member State separately and considering all relevant details with care.

The sustainability-gap indicator

For a few years now, the EU has assessed long-term stability by using commonly agreed-upon projections for aging-related expenditures, obtained through the construction of a quantitative indicator along the lines of Buiter (1985). The indicator is based on the *constant tax rate* that would fulfil the intertemporal budget constraint (ITBC) of the govern-

ment, given the projected expenditures and the need to service the current debt. This tax rate is compared to the current tax rate, and the difference between the two is called the "sustainability gap". Given the expenditure projection, the gap indicates the permanent budgetary adjustment that ensures that the ITBC is fulfilled over an infinite horizon.[5] European Commission (2006) presents its implications as the required primary balance over a specified period in the medium term – adding, however, that setting budget-adjustment targets along these lines would require a large adjustment in most countries. Therefore, it argues, along the lines expressed by the European Council (2005), that adjusting future expenditure downwards by implementing structural reforms should be part of a policy package aimed at reaching sustainability.

Since the next round of the commonly agreed projections is foreseen for 2009, the Member States have been asked to address long-term sustainability annually in their Stability and Convergence Programmes. According to the ECOFIN Council (2005), "…the programmes should outline the countries' strategies to ensure the sustainability of public finances, especially in light of the economic and budgetary impact of aging populations." Further, it says: "The programmes should include all the necessary additional information, both of qualitative and quantitative nature, so as to enable the Commission and the Council to assess the sustainability of Member States of public finances based on current policies…. Programmes should clearly distinguish between measures that have been enacted and measures that are envisaged." The Member States were also asked to report the projection for public debt until 2050 under unchanged policies, including those determining the taxes, which in most cases show how the increasing costs of aging lead to debt explo-

[5] See also Buiter and Grafe (2004). The *gap* derived from an infinite-horizon calculation is now more prominent in the reports, while a *gap* derived from a calculation until 2050 has also been used. The Board of Trustees of the US Social Security system (Board of Trustees, 2007) uses the same method. Since 1988, they have reported the indicator for an immediate adjustment to balance the budget over a 75-year period. However, as this does not properly reflect the (likely) imbalance at the end of the period, they have (since 2003) reported the indicator also for the infinite horizon.

sion, thus indicating that current policies cannot be sustained. This way, both the projections based on current policies and the *sustainability-gap* indicators demonstrate the need for new measures and policy reforms.

The revised SGP and pension-system reforms

In anticipation of the rising costs of aging, and to share more evenly among the generations the costs of providing old-age pensions, countries have started to introduce both systemic and parametric reforms in their pension systems. Italy, Latvia, Poland and Sweden have transformed their old Defined Benefit (DB) PAYG systems into Notional Defined Contribution (NDC) systems in which pension contributions earn an administratively determined return, basically equal (or closely related) to the rate of growth of the wage bill. At retirement, the notional capital is converted into an annuity. To a great extent, this rule takes care of adjusting pensions according to the number of employees and the change in longevity. Latvia, Poland and Sweden also set up mandatory funded tiers with personal accounts. Some countries (for example, Estonia, Ireland, Germany and Lithuania) introduced personal retirement accounts, which were often supported by tax incentives; others (such as Hungary, Slovakia and Slovenia) made them mandatory to new labour market entrants or specific groups. The role of funded private supplementary occupational pensions, moreover, is increasing. Countries are also undertaking parametric reforms to ease the pressure on future public resources. Among those measures, most countries are gradually raising the retirement age, increasing the contribution period for a full pension, linking pensions to improvements in life expectancy, limiting early retirement and introducing bonuses for working longer. In some countries, indexation of pension benefits has been shifted from wages to prices (France and Austria). In other countries, pre-funding within or linked to public DB systems remains significant (Finland) or has recently been introduced (Belgium and Ireland). Overall, apart from measures to increase the effective retirement age, pension funding is acquiring a more important role in pension systems, although PAYG remains dominant so far.

Regardless of whether the pension reform is systemic or parametric, to the extent that it permanently reduces projected expenditure it alleviates the concerns of long-term sustainability. However, a reform that replaces part of the public pension system by a private-sector-managed, fully funded tier will trigger a reduction in pension contributions paid to the first pillar at a time when the pensions of the current retirees still need to be financed. A stock of assets will be built up in the newly established funded pillar, but this will not be part of the government accounts as, according to the decision by Eurostat (2004), funded defined-contribution schemes should be recorded as part of the private sector.[6] To cope with the transition, the government may issue debt, making some of the implicit pension debt explicit. The problem here, however, is that the public deficit and debt increase, while the fall in implicit liabilities due to the reduction of future pension payments from the PAYG pillar is not recognised in the national accounts relevant for assessment of compliance with the SGP. Our examples show that while government deficit and debt are affected significantly (even though the system is

[6] This decision by Eurostat concerned the defined-contribution, funded pension systems that may be managed by the government. It considered that the fund's assets are ultimately owned by the participants, who bear the risk associated with the return on the assets. These systems should therefore be classified in the private sector. With regard to the defined-benefit schemes, an important criterion is the degree of funding. The Dutch occupational defined-benefit system is classified in the private sector (as it is fully funded), while the Finnish partially mandatory defined-benefit system falls within the general government (as the degree of funding is only about a quarter).

financially sustainable before and after the partial privatisation), total contributions and total pensions are not at all affected.[7]

The revision of the SGP addressed the potential conflict between the transition to a (partially) funded pension system outside the government accounts and the SGP rules. With regard to the preventive arm, it prescribed that the "Member States implementing such reforms should be allowed to deviate from the adjustment path towards the MTO, or from the MTO itself. The deviation from the MTO should reflect the net cost of the reform to the publicly managed pillar, provided the deviation remains temporary and an appropriate safety margin to the reference value is preserved" (European Council, 2005).

In the corrective arm, the leeway is specified prescribing that (regressive) "consideration to the net cost of the reform will be given for the initial five years after a Member State has introduced a mandatory fully-funded system", so that during the five years "100, 80, 60, 40 and 20 percent of the net cost of the reform to the publicly managed pillar" will be taken into account (European Council, 2005; for a detailed presentation, see European Commission, 2007).

Note that while the allowed deviations from (the path to) the MTO and the reference deficit level as a share of the cost are falling over time and restricted to five years only, transition under pension reforms typically lasts for decades.

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[7] While quite a number of papers deal with the political-economy effects of population aging on pension arrangements (for example, Conesa and Krueger, 1999, and Gonzalez-Eiras and Niepelt, 2005), few make a formal connection with the Stability and Growth Pact. A notable example is Tabellini (2003), who considers "a pension reform that gradually but permanently reduces pension outlays in the future, but immediately cuts social security contributions so as to relax political constraints". He notes that a "transition from a pay-as-you-go towards a fully funded private pension system could have this effect", and further notes that such a reform could violate the SGP, no matter how desirable it may be from an economic point of view. Also Beetsma and Debrun (2004, 2007) argue that a strict implementation of a deficit rule may hamper structural reforms if such reforms entail large upfront costs, possibly including compensation that needs to be provided to get the political support from those who lose out on the reforms. Oksanen (2004) presents an illustration of the effect of partial privatisation on the public deficit and debt.

2.3. Intergenerational equity

While the revised SGP puts more emphasis on fiscal sustainability, it is important to realize that there are many potential sustainable fiscal paths with different distributive and efficiency implications across generations. Given the projection for the expenditure increase, an infinite number of tax-rate paths exist that fulfil the ITBC of the government, while there are no convincing reasons why the scenario with a *constant tax rate* should be chosen as the (dominant) benchmark (as is done when calculating the *sustainability gap*). There are several arguments for looking at a broader range of scenarios: (1) the constant tax rate (or permanent balance rule by Buiter, 1985) was partially motivated by tax smoothing (i.e. minimising over time the distortions caused by taxes); while this can be a relevant argument under limited circumstances, it is not valid, for example, if there is a link between the contribution payments and the future benefits for individuals; (2) those using the *sustainability-gap* indicator often emphasise that an increase in the tax rate can always be replaced by a reduction in non-aging-related expenditures; this is correct, and further weakens the argument based on tax smoothing; (3) subsequent generations generally differ from each other with regard to their demographic characteristics (fertility and longevity), retirement age and pension benefits; thus, to achieve intergenerational equity, one might envisage that they also pay different pension contributions and other taxes (Sinn, 2000 and 2004); and (4) the expenditure projection based on current policies should not dominate the modalities for setting the MTOs, as for many EU Member States emphasis should obviously be put on designing reforms that reduce these expenditures (e.g. European Council, 2005); in the process of designing a comprehensive policy package one could make alternative calculations for the MTOs conditional upon several reform options.

It is clear, as it is also acknowledged by the European Commission (2006, p. 21-22), that the SGP incorporates intergenerational equity neither explicitly nor systematically. One reason for this is that distributional issues are a matter of political preferences expressed and implemented at the national level – taking actions affecting the fundamental

principles of national social security is even explicitly excluded from the competence of the European Union (EU Treaty article 137; this is maintained in the Reform Treaty agreed in 2007). Another reason is the lack of data: since the EPC projections do not provide data by age cohort, they do not allow for a link between the costs and benefits of subsequent generations.

These or any other possible reasons should not, however, be regarded as decisive obstacles to examining pensions and their financing from the angle of intergenerational burden sharing. The problem is that the young (those below the eligible voting age) and unborn generations are not naturally represented in the political processes. Whereas they have no vote in decisions affecting the future explicit and implicit debt burden, they are still affected by these decisions. Indeed, given the fact that those who have to shoulder part of burden cannot determine its distribution, one can easily imagine a political-economy equilibrium in which the decision about a pension reform (for example, a reduction in benefits or a lengthening of working life) is postponed longer than would be socially optimal, thereby propelling a country toward a major crisis. Failure to cope with intergenerational distribution (related to the major public expenditure schemes) may therefore lead to gross violation of the principle of sound public finances established in the EU Treaty. The original SGP, and even more so its revision, thus calls for a reduction of public debt in order to alleviate future expenditure pressures. Analysis and policy at the EU level, however, still lack a framework that encompasses all relevant issues (i.e. the demographic and economic factors) and the policy parameters for aging-related expenditures and their financing (including systemic pension reforms). These issues will be addressed below with the help of a simple model and numerical illustrations. An important question here is whether compliance with the SGP is consistent with a balanced treatment of successive generations, which we shall call *actuarial neutrality*.

3. The intergenerational distribution of costs under alternative fiscal rules

This section addresses explicitly the consequences, under population aging, of different fiscal and pension arrangements for public deficits, public debt, implicit liabilities and the balance of contributions and benefits per generation. The former two variables are of particular importance for assessing to what extent the arrangements comply with the SGP. The balance of contributions and benefits per cohort is the key for assessing the size of potential economic distortions and the intergenerational distribution of the aging burden. We illustrate the consequences of a fall in fertility and a rise in life expectancy.

3.1 Description of the pension model

The model that underlies the illustration is (with a slightly different notation) adapted from Oksanen (2005 and 2006) and presented in the *Appendix*. Here, we sketch its main features. For convenience, we use a partial equilibrium "overlapping-generations" model. There are three generations: children, workers and retirees. Workers (or employers on their behalf) contribute to the pension system, while the retirees receive a public pension (and do not pay pension contributions or, for simplicity, other taxes). The pensions can be partly (or fully) financed out of current workers' contributions or they can be partly (or fully) financed out of the assets accumulated from contributions in the past. The two extreme cases are a pure PAYG system and a fully funded system. The discounted pension benefits to be received by the current workers are termed the "implicit pension debt" (IPD, corresponding to 'accrued-to-reference-date liability' in a more general setting) of the public sector. The consolidated public sector (government plus the pension system) owns (net) financial assets A_t in period t (public debt amounts to nega-

tive assets). Further, all taxes are levied on the wage bill.[8] The consolidated public sector budget constraint is

$$(1) \qquad c_t w_t L_t + (\rho_t - 1) A_{t-1} = \pi_{t-1} w_t R_t + A_t - A_{t-1},$$

where c_t is the tax rate, w_t is the (gross) wage rate,[9] L_t is the "effective" labour supply of workers in period t, ρ_t is the financial market interest-rate factor (the interest rate is ρ_t-1), π_{t-1} is the pension accrual rate and R_t is the "effective" number of elderly. Here, $L_t = l_t \tilde{L}_t$, where $\tilde{L}_t$ is the number of new entrants to the labour force in period t, and l_t is the number of years spent in work in period t, divided by the number of years the generation works in period 0. We thus compare the labour input of a worker in each year with that in a single reference year. Further, since periods refer to generations here, and as the number of years during which a pension benefit is received generally differs from the number of years that individuals pay contributions to the pension system, we define σ_t as the number of years spent in retirement in period t, divided by the number of years spent working in period t-1, i.e. $R_t = \sigma_t L_{t-1}$. Finally,

$\rho_t = (1 + g_t)(1 + \mu_t)$, where $1 + g_t = \frac{w_t}{w_{t-1}} \frac{L_t}{L_{t-1}}$ is the wage-bill growth factor, and $\mu_t > 0$ is an exogenous mark-up of the financial market interest-rate factor on the wage-bill growth factor.

[8] For convenience, we label all primary revenues of the public sector as "taxes", even though in our theoretical model they consist mostly of pension contributions. The reason is that primary revenues also include the taxes collected (from wages) to service the initial explicit debt of the government.

[9] From now on, "wage" stands for "gross wage" – that is, the wage before pension contributions are paid.

Hence, μ_t is not influenced by the demographic shocks considered below.[10] The accrual rate as a share of the wage net of contributions, π^n_{t-1}, is set by policy. Using π^n_{t-1}, one then derives the appropriate accrual rate π_{t-1} as a share of the gross wage w_t (for the details of the calculation, see the *Appendix*). Dividing by the total wage bill in period t, we can also rewrite (1) as follows:

(2) $\quad c_t = \pi_{t-1}\,(l_{t-1}/l_t)(\sigma_t/f_{t-1}) + a_t - (1+\mu_t)\,a_{t-1}$,

where f_{t-1} is the fertility rate (hence, $\tilde{L}_t = f_{t-1}\tilde{L}_{t-1}$), and $a_t = A_t/(w_t L_t)$ are (net) assets as a share of the wage bill.

Pure PAYG and constant-debt ratio

The first rule (PAYG), which keeps the financial position of the public sector unchanged (i.e. assets as a share of the total wage bill are kept constant at a level $\overline{a}$), implies the following tax rate:

(3) $\quad c_t^{pcd} = \pi_{t-1}\,(l_{t-1}/l_t)(\sigma_t/f_{t-1}) - \mu_t\,\overline{a}$,

where superscript "pcd" is used to indicate "PAYG with constant debt". Since assets are held constant at their initial level, $\overline{a} = a_0$, where a_0 represents the initial assets as a share of GDP. The total tax rate thus consists of a component that covers the pension outlays (the first term) (and, hence, keeps the asset position of the pension system at zero) and a component that captures the cost of debt servicing (where public debt as a share of GDP (or the wage bill) is kept constant (the second term)). In the case of positive public debt (a <0), each generation must therefore

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[10] Note that for setting up the accounting framework, the expression for the interest rate is merely an identity; for the main results below, however, we need to assume that μ_t is exogenous. Note also that the framework predicts that, for a given productivity growth rate, a slowdown in the number of workers leads to a reduction in the real interest rate, while an increase in the productivity growth rate, for given demographic developments, pushes up the real interest rate. In the following, we consider only the former effect. We introduce a positive wedge between the financial market interest-rate factor and the wage-bill growth factor in order to guarantee dynamic efficiency, as is often assumed in analysis based on overlapping-generations models. While for most of our analysis we assume that this wedge is exogenous, we also briefly consider the case in which the financial market interest-rate factor itself is exogenous.

pay the interest mark-up (on the growth of the wage bill) on the public debt. As for the budget balance, under the assumption of positive wage growth, it is in surplus (deficit) if government net assets are positive (negative).

Actuarial neutrality across generations

Next, we introduce the policy rule such that in each period, given any demographic shock or change in any policy parameter, the tax rate is set at a constant level that is financially sustainable as long as there is no new shock. If and when a new shock arrives, the same principle is applied. The implied tax rate is found as follows:

$$(4)\quad c_t^a = \mu_{t+1}^t \left[\left(\frac{1+\mu_t^t}{1+\mu_{t+1}^t} \right) \left(\frac{\pi_{t-1}\left(l_{t-1}^{t-1}/l_t^t\right)\sigma_t^t}{\left(1+\mu_t^t\right)f_{t-1}} - a_{t-1} \right) \right] + \frac{\pi_t \sigma_{t+1}^t}{\left(1+\mu_{t+1}^t\right)f_t},$$

where a superscript *t* indicates that the variable is based on the shock in period *t*. For example, μ_t^t denotes the interest mark-up in period *t,* based on all information available in period *t*, while μ_{t+1}^t denotes the expected interest mark-up in period *t*+1, based on all information available in period *t*. We define θ as the implicit pension debt (*IPD*) as a share of the total wage bill. For period *t*-1, given the parameter values for period t, it is

$$\theta_{t-1}^t = \frac{IPD_{t-1}^t}{w_{t-1}L_{t-1}^{t-1}} = \frac{\pi_{t-1} w_t R_t^t / \rho_t^t}{w_{t-1}L_{t-1}^{t-1}} = \frac{\pi_{t-1}\left(l_{t-1}^{t-1}/l_t^t\right)\sigma_t^t}{\left(1+\mu_t^t\right)f_{t-1}},$$

and for period *t*, given no further shocks, it is respectively

$$\theta_t^t = \frac{IPD_t^t}{w_t L_t^t} = \frac{\pi_t w_{t+1} R_{t+1}^t / \rho_{t+1}^t}{w_t L_t^t} = \frac{\pi_t \sigma_{t+1}^t}{\left(1+\mu_{t+1}^t\right)f_t}.$$

Hence, θ_{t-1}^t is corrected for the possible change in the retirement age in period t (for a detailed explanation, see the *Appendix*). Using these expressions, we can reduce (4) to

$$(4') \qquad c_t^a = \mu_{t+1}^t \left[\left(\frac{1+\mu_t^t}{1+\mu_{t+1}^t} \right) \left(\theta_{t-1}^t - a_{t-1} \right) \right] + \theta_t^t .$$

The rule here is termed *"actuarial neutrality"*: Each generation of workers first contributes to share the burden stemming from the past decisions on pensions and other expenditures and revenues by paying the interest mark-up on the sum of the implicit pension liabilities and the explicit public debt, and then pays the full present value of its own future pensions.

Under this rule, furthermore, the sum of explicit public debt (-*a*) and implicit liabilities as a share of the wage bill (labelled the "total debt ratio") evolves as follows:

$$(5)\ \theta_t^t - a_t = \frac{1+\mu_t^t}{1+\mu_{t+1}^t} \left(\theta_{t-1}^t - a_{t-1} \right) = \frac{1+\mu_t^t}{1+\mu_{t+1}^t} \left[\left(l_{t-1}^{t-1} / l_t^t \right) \theta_{t-1}^{t-1} - a_{t-1} \right].$$

This equation thus implies that the total debt ratio remains constant as long as $\mu_t^t = \mu_{t+1}^t$ and $l_{t-1}^{t-1} = l_t^t$. In more general cases, the total debt in the previous period has to be re-valued by the factor $\left(1+\mu_t^t\right) / \left(1+\mu_{t+1}^t\right)$ and corrected for the retirement age change. If implicit liabilities increase (for example, due to longer time in retirement), i.e. $\theta_t^t - \theta_{t-1}^t > 0$, then pension contributions should increase, thereby leading to an offsetting reduction in the public debt. This contributes a positive component to the public sector budget surplus.

The expression for c_t^a, given the above, is a general expression for the tax rate under actuarial neutrality. It is valid for any subsequent changes, permanent or temporary, in the demography, retirement age, generosity of pensions and interest-rate margin μ_t^t. Under this rule, the balance of pension contributions and benefits of each generation are fully separated from the characteristics and pension policy choices of other generations starting from the moment at which the actuarial neutrality rule was first implemented. This result is quite robust, as it allows, for example, any changes in μ_t^t as long as they do not depend on the other factors in the

formula. To assess the plausibility of this assumption, note that under elementary growth theory the interest rate should depend on demographic factors and the pension system rules. In the model here this is the case: for given μ_t^t and μ_{t+1}^t, the interest rate goes down with the fall in fertility. Combined with the actuarial neutrality rule that affects government saving in the economy, this may be a plausible approximation of the functioning of the economy.

Note, furthermore, that our result on the dynamics of the total debt ratio (including the considerations related to μ_t^t) is applicable under any initial degree of funding, which then evolves as a function of factors in the formula for c_t^a. In particular, if the system were initially fully funded, it would remain so under the actuarial neutrality rule.

3.2 The calibration

Our numerical example is largely based on the following stylized calibration taken from Oksanen (2005). The unit period corresponds to 30 years, which is roughly the average childbearing age of women in Europe. It is also roughly the average age difference between a retired person (70) and a worker (40). Throughout, we assume that the annual growth rate of the nominal wage per worker is 3.28%, which stems from a unit real-wage growth rate of 1.75% and an inflation rate of 1.5% per annum. The interest-rate mark-up over the growth of the total wage bill equals 1.5%-points per annum.

The economy starts in period 0 in a steady state in which people work for 40 years and spend 18 years in retirement (hence, $\sigma_t = 0.45$). These numbers are thus used to scale pension contributions and pensions to correspond to realistic numbers, although the formal model works with the 30-year period. Fertility, moreover, initially preserves a constant population. Further, the unit pension is initially set at 55% of the wage after pension contributions (i.e., $\pi_{t-1}^n = 0.55$), so as to make the initial numbers comparable with those for 2004 in the EPC projections. Initial public debt is 60% of annual GDP.

Period 1 includes both a 20% fall in fertility (roughly corresponding to a fall from 2.1 children per woman, which is needed to preserve the

population, to 1.7, which is close to the current average in Europe) and an increase in longevity by three years (this corresponds to one year for each ten-year period). Period 2 shows a further increase in longevity by three years. This allows us to match quite closely the assumptions on the increase in longevity in the EPC projections for the EU average (an increase in life expectancy (at birth) for males (6.3 years) and for females (5.1 years) from 2004 to 2050).

3.3 The numerical results

We show the time paths of the most relevant variables under pure PAYG and various policies under actuarial neutrality. We consider two possible policy measures to deal with the rising aging burden: an increase in the retirement age and a reduction of the replacement rate; the tax rate is then residually determined by these measures and the type of policy rule implemented. For the case of actuarial neutrality we also consider a (partial) privatisation of the public-pension pillar, where the latter is partly replaced by a mandatory, funded private pillar. Most numbers are expressed in percentages of GDP, assuming that the total wage bill (including pension contributions) is 60% of GDP.

Table 1 displays the time paths of the tax rate and pension expenditures, the public debt, the implicit pension debt (IPD), the total debt and the budget surplus (all as shares of GDP) under the PAYG rule. A negative value for the budget surplus/GDP ratio thus indicates a public deficit. Throughout, the debt and the budget surplus are expressed as ratios of annual GDP (see the *Appendix*). In the baseline case no policy changes are undertaken, while in the next case the retirement age increases "moderately", such that the working life in period 1 rises to 41 years and in period 2 to 42 years (i.e. it rises by one-third of the increase in life expectancy); under the "large" retirement increase, the respective numbers are 41.5 and 43 years (i.e. the retirement age increases by half of the increase in life expectancy). Further, we also consider a reduction in the pension accrual rate π^{n}_{t-1} as a share of the wage net of pension contributions from 55% to 48%. Table 2 reports the corresponding cases under actuarial neutrality. Table 3 also illustrates a partial privatisation

of the public pension system under actuarial neutrality. A new steady state is always achieved in period 3; the period-4 numbers are reported merely as confirmation. Budget balances and public-debt levels that violate the Stability and Growth Pact are indicated with boldface characters.

Panel 1 of Table 1 shows the results for the baseline PAYG scenario. The reduction in fertility and the two-step rise in longevity produce an increase in pension expenditure from an initial level of 11.9% of GDP to a new steady-state level of 17.5% of GDP. Taxes (the bulk of which consists of pension contributions) as a share of the total wage cost ("wage" for short) rise from the initial 21.7% to 31.1% in the new steady state. Given that the generosity of the pension benefits is untouched, the implicit pension debt rises as a share of GDP. This rise is produced both by the additional years in retirement and the fall in fertility. Permanently lower fertility means that the relative IPD increases because the growth of the wage bill is permanently reduced, implying that a given amount of future pension outlays is discounted at the lower rate. Naturally, an increase in the retirement age alleviates the rise in pension expenditures and the tax rate. In period 1 the tax rate falls because the contribution period has increased while the rise in longevity has not yet materialized (because it concerns those working in period 1, and thus the longevity rise materializes in period 2). Panels 2-3 of Table 1 show the results for moderate- and large increases in years at work, respectively. Panels 4–6 correspond to panels 1–3, respectively, assuming that the target net replacement rate set in period 1 and onwards is 48% instead of 55%. Obviously, as next period's pension outlays fall, the implicit pension debt is lower under the lower net replacement rate. The budget surplus is practically unaffected in all of these cases. Projected pension expenditure in panel 5 roughly corresponds to the EPC projection for the EU-15.

Table 2 illustrates *actuarial neutrality* as an alternative policy rule. The baseline assumes no change in the generosity of the benefits or in the retirement age. Both pension expenditures as a share of GDP and the tax rate rise in line with the fall in fertility and the rise in life expectancy. Now the system moves to partial funding, as the contributions are increased already in period 1. The rise in the implicit debt ratio is followed

by an equivalent reduction in the public debt ratio (or increase in the public asset ratio), and the deficit turns into a surplus from period 1 onwards in all panels 1-3. The surplus is largest in period 1, when the population is affected by two shocks simultaneously (the rise in workers' life expectancy and the fall in the fertility rate). An increase in the retirement age (panels 2-3) mitigates the increase in pensions and, hence, the implicit pension debt. This implies that fewer public assets are accumulated than under the baseline and, hence, that the public sector runs a smaller surplus. Also, a reduction in the accrual rate (panel 4) produces a smaller implicit debt/GDP ratio, thereby requiring smaller surpluses than under the baseline. This effect is further strengthened when the reduction in the accrual rate is combined with the increase in the retirement age (panels 5-6). The expenditure increase of 2.7%-points of GDP in panel 5 in Table 2 roughly corresponds to the EPC projection for the EU.

All actuarially neutral scenarios clearly show that as long as the demographic change is permanent, the financial position of the government should also change permanently. Depleting the public assets once the aging process has ended is therefore excluded, unless pension accrual is drastically reduced.

Table 3 considers the latter option induced by a partial privatisation (possibly in combination with other measures) in which implicit pension debt is swapped for (explicit) public debt. The partial privatisation is implemented with a one-third reduction in the accrual rate expressed as a share of the gross wage rate. Obviously, compared to the baseline under actuarial neutrality, the partial privatisation leads to a reduction in public pension expenditure as a share of GDP and in taxes paid to the government (the contributions to the newly established second pillar come on top of this). Comparing the new steady state with period 0, the debt/GDP ratio falls only slightly (panel 1). The public-debt ratio in period 1 exceeds the 60% limit of the SGP, while the deficit ratio in that period remains just marginally below the 3% limit. A rise in the retirement age (panels 2-3) lowers the implicit debt ratio, leading to higher public debt and deficit ratios than a partial privatisation alone. The deficit ratio now

violates the SGP in period 1, and so does the debt ratio from period 1 onwards. Adding to this a reduction in the accrual rate leads to a further swap of debt, and hence to a worsening of the budgetary figures (panels 4-6).

Table 1: Public finances and pensions under PAYG

Period	0	1	2	3	4	change
1. PAYG – baseline: net accrual rate 55%; fixed retirement age						
pension exp/GDP, %	11.9	11.9	15.9	17.5	17.5	5.6
tax rate	21.7	21.7	28.4	31.1	31.1	9.4
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	305.4	336.3	336.3	336.3	107.8
total debt/GDP, %	288.5	365.4	396.3	396.3	396.3	107.8
budget surplus/GDP, %	−1.9	−1.9	−1.5	−1.5	−1.5	0.4
2. PAYG – net accrual rate 55%; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.7	14.8	15.9	15.9	4.0
tax rate	21.7	21.3	26.5	28.4	28.4	6.7
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	284.0	304.9	304.9	304.9	76.4
total debt/GDP, %	288.5	344.0	364.9	364.9	364.9	76.4
budget surplus/GDP, %	−1.9	−2.0	−1.5	−1.5	−1.5	0.4
3. PAYG – net accrual rate 55%; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.6	14.3	15.1	15.1	3.2
tax rate	21.7	21.1	25.6	27.0	27.0	5.3
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	273.7	289.5	289.5	289.5	61.0
total debt/GDP, %	288.5	333.7	349.5	349.5	349.5	61.0
budget surplus/GDP, %	−1.9	−2.0	−1.5	−1.5	−1.5	0.4
4. PAYG – target net replacement rate 48%; fixed retirement age						
pension exp/GDP, %	11.9	11.9	14.4	15.9	15.9	4.0
tax rate	21.7	21.7	25.8	28.3	28.3	6.6
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	275.9	304.8	304.8	304.8	76.3
total debt/GDP, %	288.5	335.9	364.8	364.8	364.8	76.3
budget surplus/GDP, %	−1.9	−1.9	−1.5	−1.5	−1.5	0.4
5. PAYG – target net replacement rate 48%; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.7	13.3	14.3	14.3	2.4
tax rate	21.7	21.3	24.1	25.8	25.8	4.1
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	255.9	275.4	275.4	275.4	46.9
total debt/GDP, %	288.5	315.9	335.4	335.4	335.4	46.9
budget surplus/GDP, %	−1.9	−2.0	−1.5	−1.5	−1.5	0.4
6. PAYG – target net replacement rate 48%; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.6	12.8	13.6	13.6	1.7
tax rate	21.7	21.1	23.3	24.5	24.5	2.8
public debt/GDP, %	60.0	60.0	60.0	60.0	60.0	0.0
IPD/GDP, %	228.5	246.3	261.0	261.0	261.0	32.5
total debt/GDP, %	288.5	306.3	321.0	321.0	321.0	32.5
budget surplus/GDP, %	−1.9	−2.0	−1.5	−1.5	−1.5	0.4

Notes: (1) The tax rate consists mainly of pension contributions and is expressed as a percentage of the total wage cost. (2) The final column "change" gives the %-point change from period 0 to the new steady state, except for the budget surplus/GDP ratio, where it gives the %-point change from period 0 to the lowest or highest level.

Table 2: Public finances and pensions under actuarial neutrality

Period	0	1	2	3	4	change
1. Actuarial neutrality – baseline: net accrual rate 55%; fixed retirement age						
pension exp/GDP, %	11.9	11.9	16.3	18.2	18.2	6.3
tax rate	21.7	26.4	28.4	28.4	28.4	6.7
public debt/GDP, %	60.0	−25.1	−60.5	−60.5	−60.5	−120.5
IPD/GDP, %	228.5	313.5	349.0	349.0	349.0	120.5
total debt/GDP, %	288.5	288.5	288.5	288.5	288.5	0.0
budget surplus/GDP, %	−1.9	2.5	2.3	1.5	1.5	4.4
2. Actuarial neutrality – net accrual rate 55%; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.6	15.0	16.4	16.4	4.5
tax rate	21.7	25.3	26.1	26.1	26.1	4.4
public debt/GDP, %	60.0	−12.9	−38.4	−38.4	−38.4	−98.4
IPD/GDP, %	228.5	295.8	314.3	314.3	314.3	85.8
total debt/GDP, %	288.5	282.9	275.9	275.9	275.9	−12.6
budget surplus/GDP, %	−1.9	1.8	1.5	0.9	0.9	3.7
3. Actuarial neutrality – net accrual rate 55%; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.5	14.4	15.5	15.5	3.6
tax rate	21.7	24.7	25.0	25.0	25.0	3.3
public debt/GDP, %	60.0	−6.8	−27.2	−27.2	−27.2	−87.2
IPD/GDP, %	228.5	287.1	297.4	297.4	297.4	68.9
total debt/GDP, %	288.5	280.2	270.2	270.2	270.2	−18.3
budget surplus/GDP, %	−1.9	1.5	1.1	0.7	0.7	3.4
4. Actuarial neutrality – accrual rate reduced to 48%; fixed retirement age						
pension exp/GDP, %	11.9	11.9	14.6	16.3	16.3	4.4
tax rate	21.7	24.6	26.4	26.4	26.4	4.7
public debt/GDP, %	60.0	8.1	−24.4	−24.4	−24.4	−84.4
IPD/GDP, %	228.5	280.3	312.9	312.9	312.9	84.4
total debt/GDP, %	288.5	288.5	288.5	288.5	288.5	0.0
budget surplus/GDP, %	−1.9	0.8	1.3	0.6	0.6	3.2
5. Actuarial neutrality – accrual rate reduced to 48%; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.6	13.4	14.6	14.6	2.7
tax rate	21.7	23.5	24.3	24.3	24.3	2.6
public debt/GDP, %	60.0	18.8	−4.3	−4.3	−4.3	−64.3
IPD/GDP, %	228.5	264.1	280.9	280.9	280.9	52.4
total debt/GDP, %	288.5	282.9	276.6	276.6	276.6	−11.9
budget surplus/GDP, %	−1.9	0.2	0.6	0.1	0.1	2.5
6. Actuarial neutrality – accrual rate reduced to 48%; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.5	12.9	13.8	13.8	1.9
tax rate	21.7	23.0	23.2	23.2	23.2	1.5
public debt/GDP, %	60.0	24.1	5.9	5.9	5.9	−54.1
IPD/GDP, %	228.5	256.1	265.4	265.4	265.4	36.9
total debt/GDP, %	288.5	280.2	271.3	271.3	271.3	−17.2
budget surplus/GDP, %	−1.9	−0.1	0.2	−0.1	−0.1	2.1

Notes: see Table 1.

Table 3: Public finances and pensions under actuarial neutrality: one-third privatisation

Period	0	1	2	3	4	change
1. Actuarial neutrality – 55% accrual rate; fixed retirement age						
pension exp/GDP, %	11.9	11.9	10.9	12.1	12.1	0.2
tax rate	21.7	20.6	21.9	21.9	21.9	0.2
public debt/GDP, %	60.0	**79.4**	55.8	55.8	55.8	-4.2
IPD/GDP, %	228.5	209.0	232.7	232.7	232.7	4.2
total debt/GDP, %	288.5	288.5	288.5	288.5	288.5	0.0
Budget surplus/GDP, %	-1.9	-2.9	-0.8	-1.4	-1.4	-1.0
2. Actuarial neutrality – 55% accrual rate; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.6	10.0	10.9	10.9	-1.0
tax rate	21.7	19.8	20.3	20.3	20.3	-1.4
public debt/GDP, %	60.0	**85.7**	**68.7**	**68.7**	**68.7**	8.7
IPD/GDP, %	228.5	197.2	209.5	209.5	209.5	-19.0
total debt/GDP, %	288.5	282.9	278.2	278.2	278.2	-10.3
Budget surplus/GDP, %	-1.9	**-3.3**	-1.4	-1.7	-1.7	-1.4
3. Actuarial neutrality – 55% accrual rate; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.5	9.6	10.3	10.3	-1.6
tax rate	21.7	19.4	19.6	19.6	19.6	-2.1
public debt/GDP, %	60.0	**88.8**	**75.3**	**75.3**	**75.3**	15.3
IPD/GDP, %	228.5	191.4	198.2	198.2	198.2	-30.3
total debt/GDP, %	288.5	280.2	273.5	273.5	273.5	-12.0
Budget surplus/GDP, %	-1.9	**-3.5**	-1.6	-1.8	-1.8	-1.6
4. Actuarial neutrality – accrual rate reduced to 48%; fixed retirement age						
pension exp/GDP, %	11.9	11.9	9.7	10.9	10.9	-1.0
tax rate	21.7	19.4	20.6	20.6	20.6	-1.1
public debt/GDP, %	60.0	**101.6**	**79.9**	**79.9**	**79.9**	19.9
IPD/GDP, %	228.5	186.9	208.6	208.6	208.6	-19.9
total debt/GDP, %	288.5	288.5	288.5	288.5	288.5	0.0
Budget surplus/GDP, %	-1.9	**-4.0**	-1.5	-2.0	-2.0	-2.1
5. Actuarial neutrality – accrual rate reduced to 48%; increase in working life (40-41-42)						
pension exp/GDP, %	11.9	11.6	9.0	9.8	9.8	-2.1
tax rate	21.7	18.6	19.1	19.1	19.1	-2.6
public debt/GDP, %	60.0	**106.8**	**91.4**	**91.4**	**91.4**	31.4
IPD/GDP, %	228.5	176.1	187.3	187.3	187.3	-41.2
total debt/GDP, %	288.5	282.9	278.7	278.7	278.7	-9.8
Budget surplus/GDP, %	-1.9	**-4.4**	-2.0	-2.2	-2.2	-2.5
6. Actuarial neutrality – accrual rate reduced to 48%; increase in working life (40-41.5-43)						
pension exp/GDP, %	11.9	11.5	8.6	9.2	9.2	-2.7
tax rate	21.7	18.3	18.4	18.4	18.4	-3.3
public debt/GDP, %	60.0	**109.5**	**97.3**	**97.3**	**97.3**	37.3
IPD/GDP, %	228.5	170.7	176.9	176.9	176.9	-51.6
total debt/GDP, %	288.5	280.2	274.3	274.3	274.3	-14.2
Budget surplus/GDP, %	-1.9	**-4.5**	-2.2	-2.4	-2.4	-2.6

Notes: see Table 1.

A complete privatisation under actuarial neutrality would make all implicit debt explicit. In period 1, the budget deficit rises above 13% of GDP, after which it falls to a steady-state level of about 7%. The deficit in the new steady state is so high because the economy is growing and the debt ratio is kept constant. Moreover, it remains constant at a higher level than before, because it now includes the previous implicit debt, implying much higher interest payments (for details, see Beetsma and Oksanen, 2007, Table 4). Although total pensions and their contributions are completely unaffected, the rules of the SGP are grossly violated.

3.4 Other aging-related expenditure

The above approach to pensions can be extended to other *aging-related* expenditures. This subsection discusses the principles behind the expenditures and refers to the euro area or EU-15 average numbers taken from the EPC projections.

While the projections for *unemployment benefits* and *education expenses* might be interesting for a number of purposes, one should consider carefully whether these expenditures indeed belong to an analysis of debt and deficit focused on the distribution of the aging burden between successive generations. Unemployment benefits as a percentage of GDP might be projected to fall in the long run, but should that enter already the determination of the current tax rate? It might well be more appropriate that the (projected) decline be reflected in the tax rate only when it actually takes place.

One may also question whether a decline in education expenditure should enter the determination of the debt- and deficit paths. If it does, the result could be that *current* workers are allowed to pay lower taxes, thanks to a *future* decline in education expenditure. The alternative is to view education expenditures as something to be paid primarily by the workers as parents, at the moment when they occur (helped also by the retirees as grandparents with their tax contributions), keeping them out of an analysis of debt and deficit. Omitting these two expenditure items would come in rather handy, of course, since their projections are highly uncertain.

Next we turn to *healthcare costs and long-term-care expenditures*. In 2004, they were respectively 6.4% and 0.9% of GDP in the EU-15, while their projected increase by 2050 amounts to 1.6% and 0.7% of GDP, respectively. Although we have employed these numbers in our calculations, they are highly uncertain, and the conclusions derived from them are admittedly only tentative, requiring a substantial amount of further work (e.g. Chapters 4-5 in Economic Policy Committee and the European Commission, 2006a).

The key questions are as follows: who benefits from these expenditures, and who provides the financing? A stylised fact is that roughly half of healthcare costs benefits the working-age population (including their children), while the other half benefits the elderly, particularly those approaching their final years of life. As the bulk of public expenditure on long-term care is related to the elderly, we simply assume that they consume all of it.

An estimate must then be made of how an increase in longevity affects the volume of healthcare facilities and long-term-care services to be used by the elderly. One extreme assumption is that it increases proportionally with the number of people over, say, 60 years of age. The opposite extreme is that an increase in longevity raises these expenditures hardly at all, as the bulk of these are concentrated in the last few years before death.

Finally, note here that public-health costs and long-term-care expenditures are normally covered by tax revenues that are paid also by the elderly. The way in which these expenditures are financed thus differs significantly from that of pension outlays, which are typically covered by pension contributions paid by workers, but not by pensioners.

Fortunately, the framework described above is derived from a more general model that is applicable also to these other aging-related expenditure items. One assumption that we need to make concerns the ratio between the level of taxable income of the elderly and that of the workers. We set this at 60%, keeping in mind the level of pensions as compared to wages in Europe (see *Appendix* for the details).

We make the following assumptions: the system is initially (until period 0) in the steady state, initial public debt is zero, and healthcare costs and long-term-care spending for the elderly are financed out of current taxes. Table 4 reports the outcomes for three scenarios.

Again, we spell out the effects of aging on expenditures, on taxes on wages and on income of the elderly, on debt and on the deficit. Because taxes would mechanically follow expenditures, we do not present the results for full financing from current taxes (the analogue to the pure PAYG pension system). Instead, the results discussed below are all based on the same new rule as for pensions: after any change, the tax rate is set at a level that is financially sustainable as long as there is no new shock, and *mutatis mutandis,* revised when such a shock arrives. We also compute for each period the implicit debt, which is defined as the capital value of these expenditures benefiting the elderly in the following period.

Note that the policy rule no longer results in perfect actuarial neutrality, as it did for pensions. The reason is that the same tax rate is applied to the incomes of both workers and pensioners. For example, if the working-age generation were to start consuming a higher amount of healthcare services than the previous generation did, then policymakers should immediately increase the tax rate. The current elderly will then also pay higher taxes, although they would get nothing in return. Under our assumptions, it is impossible to avoid this consequence. It may be noted, however, that the additional taxes paid by the elderly not only benefit the younger generation in the same period, but also benefit all future generations, since they mostly go toward the redemption of public debt .

The first scenario (panel 1 of Table 4) assumes that the time spent as a net user of these services increases by 1½ years in periods 1 and 2, while longevity is assumed to increase by three years, leading to a relatively small increase in the elderly/net contributors ratio. The result is a stepwise frontloading of tax collection leading to an eventual increase in net government assets by 23.3% of GDP. Government assets rise because the tax rate immediately jumps to a higher level as soon as the projected

expenditure increases, while this increase will materialise much later. In our simple model, in fact, expenditure first decreases, due to the fall in the number of children. In the second scenario, the time as net user increases by two years in periods 1 and 2. We label it as a moderate increase in the ratio of the elderly to net contributors. In this case, public assets increase to 27% in the new steady state. The third scenario additionally assumes for periods 1 and 2 a pro rata 4% increase in expenditures for both the younger generation and the elderly for each 30-year period. The implied expenditure increase of 2.3%-points of GDP roughly corresponds to the EPC projection for the EU average. Our rule for frontloading taxes leads in this case to an eventual reduction of public debt by 35% of GDP and a budget surplus of 1.4% of GDP in period 1 and 0.9% in the new steady state. Total debt decreases in these scenarios partly because the elderly always also contribute to the payment of expenditures benefiting the younger generations.

Obviously, the full consequences of aging for the public budget under the policy rule introduced in this paper can be calculated by summing the budgetary effects associated with the pension outlays and those associated with healthcare costs and long-term-care expenditures reported in Table 4. This enables us to compute the (explicit) public debt, the total debt and the budget surplus as a share of GDP under a large number of combinations. Table 5 provides just one example, combining pensions under actuarial neutrality, a moderate retirement-age increase and a net accrual rate reduction to 48% (panel 5 in Table 2) and the last scenario for healthcare costs and long-term-care expenditure. The total debt ratio declines relatively little, showing that an unchanged ratio represents a rough approximation of our policy rule. The conventionally measured government deficit moves from the initial 1.9% of GDP deficit to a surplus of 1.6% for 60 years, and net explicit debt declines by 100% of GDP over two generations. These are large numbers that deserve careful assessment. Before turning to these implications in Section 4, we first look into the sensitivity of our results to the interest-rate assumption.

Table 4: General model applied to healthcare- and long-term-care expenditure

Period	0	1	2	3	4	change
1. Small increase elderly/net contributors ratio						
expenditure/GDP, %	7.3	6.9	8.1	8.5	8.5	1.2
tax rate	10.0	10.4	10.5	10.5	10.5	0.5
public debt/GDP, %	0.0	-18.2	-23.3	-23.3	-23.3	-23.3
net ID/GDP, %	52.8	68.4	71.1	71.1	71.1	18.3
total debt/GDP, %	52.8	50.2	47.9	47.9	47.9	-4.9
budget surplus/GDP, %	0.0	0.9	0.7	0.6	0.6	0.9
2. Moderate increase elderly/net contributors ratio						
expenditure/GDP, %	7.3	7.0	8.4	8.9	8.9	1.6
tax rate	10.0	10.6	10.7	10.7	10.7	0.7
public debt/GDP, %	0.0	-20.1	-26.9	-26.9	-26.9	-26.9
net ID/GDP, %	52.8	70.2	75.4	75.4	75.4	22.6
total debt/GDP, %	52.8	50.1	48.5	48.5	48.5	-4.3
budget surplus/GDP, %	0.0	1.0	0.8	0.7	0.7	1.0
3. Moderate increase elderly/net contributors ratio and 4% increase in expenditure per 30 years						
expenditure/GDP, %	7.3	7.3	9.1	9.6	9.6	2.3
tax rate	10.0	11.3	11.5	11.5	11.5	1.5
public debt/GDP, %	0.0	-27.4	-34.8	-34.8	-34.8	-34.8
net ID/GDP, %	52.8	76.4	82.0	82.0	82.0	29.2
total debt/GDP, %	52.8	49.0	47.2	47.2	47.2	-5.6
budget surplus/GDP, %	0.0	1.4	1.0	0.9	0.9	1.4

Notes: see Table 1.

Table 5: Overall financial implications of aging

Period	0	1	2	3	4	change
expenditure/GDP, %	19.2	18.9	22.5	24.3	24.3	5.1
tax rate	31.7	34.8	35.7	35.7	35.7	4.0
public debt/GDP, %	60.0	-8.6	-39.2	-39.2	-39.2	-99.2
net ID/GDP, %	281.3	340.5	362.9	362.9	362.9	81.6
total debt/GDP, %	341.3	331.9	323.8	323.8	323.8	-17.5
budget surplus/GDP, %	-1.9	1.6	1.6	1.0	1.0	3.5

Notes: see Table 1.

3.5 Sensitivity to the interest rate

The results above depend on the assumed, exogenously determined interest-rate margin, μ_t, of 1.5% per annum. For example, the required budget surplus in period 1 in Table 5 is 1.6%. This number would become 0.3% if we assumed $\mu_t = 3\%$, and roughly 4% for $\mu_t = 0$; the latter is at the border of the dynamic efficiency of the economy. The budget surplus is thus rather sensitive to the assumed interest-rate margin, which should therefore be carefully considered in all applications. Note, however, that this sensitivity equally concerns the permanent balance rule and *sustainability-gap* indicators.

As we argued earlier (in Section 3.1), it is plausible to assume that the interest rate falls along with the decline in the number of workers, due to the fall in fertility. It is plausible even for a small open economy, since population aging takes place all over the world. Without going into too much detail here, however, we briefly explore the implications of the alternative assumption: that the interest rate itself, rather than its margin over the growth rate of the wage bill, is exogenous at a constant level $\bar{\rho}$. When we solve our model under this alternative assumption, the expressions for the tax rate and total debt dynamics become, respectively (see *Appendix*, Section 4),

(4'')

$$c_t^a = \left[\frac{\bar{\rho}}{g_{t+1}^w f_t} - 1\right]\left[\left(\frac{g_{t+1}^w l_{t-1} f_t}{g_t^w l_t^t f_{t-1}}\right)\left(\theta_{t-1}^t - a_{t-1}\right)\right] + \theta_t^t,$$

and

(5') $$\theta_t^t - a_t = \frac{g_t^w \left(l_t^t / l_{t-1}\right) f_{t-1}}{g_{t+1}^w \left(l_{t+1}^t / l_t^t\right) f_t}\left(\theta_{t-1}^t - a_{t-1}\right),$$

where $g_t^w = w_t / w_{t-1}$ is the growth factor of the unit wage, and where the implicit debt as a share of the wage bill is now given by

$$\theta_{t-1}^t = g_t^w \pi_{t-1} \sigma_t / \bar{\rho} \text{ and } \theta_t^t = g_{t+1}^w \pi_t \sigma_{t+1} / \bar{\rho}.$$

The factor in front of $\left(\theta_{t-1}^{t} - a_{t-1}\right)$ on the right-hand side of (5') is the ratio of the growth factors of the total wage bill in periods t and t+1. Note, in particular, that fertility in period t does not affect the *IPD* in period t, as the given pension expenditure in period t+1 is now discounted at an exogenously determined interest rate. Our policy rule does feed it into the determination of the tax rate, however, and thereby into the debt dynamics.

Assuming the same value for the constant interest rate as in the initial steady state in the simulations reported above, the numerical results for the tax rate, public debt and the deficit are remarkably similar. The *IPD* (and consequently the total debt) are lower compared with our earlier results, because the interest-rate margin over the growth rate of the wage bill now increases to a permanently higher level.

4. Implications of actuarial neutrality for pension reforms and the SGP

The framework above is quite general, providing merely an accounting framework based on the budget identity of the public pension system. It neglects, however, behavioural responses to policy changes. Specifically, it ignores intra-temporal behavioural trade-offs between consumption and work effort. These behavioural effects are ambiguous, as the rising future tax burden reduces the after-tax real wage, with a likely negative substitution effect, *ceteris paribus*, on the future labour supply, while the effect via income is positive. Replacing current pension policies with a shift towards actuarial neutrality will cause a weakening of both effects, because the future rise in taxes will be contained. Further, a shift towards actuarial neutrality smoothes tax rates over time, thereby producing lower labour supply losses in present-value terms and less intertemporal (undesirable) shifting of work effort. Finally, the transition towards actuarial neutrality tightens the link between work effort and future benefits, which thereby further stimulates labour market participation. Note that our framework can be used for simulations under alternative assumptions about the exogenously determined retirement age, which is one of the expressions for the choice between leisure and work.

Our framework can be interpreted as that of a closed economy because the financial market interest rate adjusts to changes in the demographic situation. Above, we only briefly considered the case in which the financial market interest rate was given, as it is for a small open economy. The increase in the interest-rate margin as a result of population aging mitigates its consequences for the implicit pension debt as a share of GDP. With most industrialized countries experiencing population aging and integrated capital markets, however, the assumption of a falling financial market interest rate may also be more realistic for a small open economy. In any case, the results for the government's finances are quite similar under both assumptions about the interest rate. International coordination of pension reform in the direction of actuarial neutrality would lead to more saving because of the pre-funding of fu-

ture pension expenditures. This would reduce the international interest rate and increase investment, which, in turn, would raise global welfare – as long as over-saving does not occur (i.e. the economies remain dynamically efficient). Whether these consequences and the related policy choices are important enough to merit international policy coordination remains an issue for further study.

In spite of the above-mentioned limitations, our framework can be used for discussing the implications of changes in demographic factors and policy rules. Combinations of these changes represent alternative public pension reforms with differing implications for public finances at large. Although the underlying assumptions are simple, the results for actuarial neutrality are quite robust. Admittedly, they are derived from a partial equilibrium analysis, which ignores the behavioural responses of private-sector agents. It is clear, however, that the demographic and pension system variables would dominate the results even if the model would comprise some endogenous private-sector reactions. A number of interesting results for policy design can thus be derived.

4.1 Implications for designing pension reforms

Our framework highlights the implicit pension debt and makes the distinction between pension rights accrued to reference date and those to be accrued in future. The examples above took the former as given: accrued rights were assumed to be well defined and respected. This does not always correspond to reality. Yet, the framework here represents an effort to clarify the implications of the rules up to now and to arrive, at least, at a range of estimates for the accrued rights. If this is not done, there is some danger that the elderly, having already accrued most of their pension rights, might fear that they will lose under any not-so-well-defined reform plan. As the number of elderly is increasing, this may block reforms that are related even remotely to *future* accumulation of rights.

The framework here can be compared to the generational accounts developed by Kotlikoff and others (e.g. Kotlikoff, 2002) that aim at revealing intergenerational imbalances by projecting public expenditure by

generation under prevailing policies and calculating the required net tax payments for the current population and for all future generations. Our framework makes this approach operational, notably for public pensions, and develops the actuarial neutrality formula for spelling out the many different combinations of demographic and economic factors and policy-rule options that treat successive generations neutrally.[11]

Our analysis also helps to solve a puzzle in the literature on the political economy of pensions: since Samuelson (1958), it is clear that a pure PAYG public pension system as an implicit intergenerational contract is superior to a fully funded pension system if the rate of increase in the wage bill exceeds the interest rate. If the interest rate were higher, however, then every self-interested worker would prefer to leave the system, invest his pension savings in market assets and receive a higher return on his pension contributions. As the latter is true in a dynamically efficient economy, it becomes difficult to explain the permanence of a public un-funded pension system under the simple assumption of self-interested individuals taking a majority vote on a mandatory PAYG pension system (assuming that the workers still outnumber the pensioners). Razin et al. (2002) avoid this by assuming that the cash grant is paid to both workers and retirees. This artificial assumption is crucial for their results (for a critical discussion, see *European Journal of Political Economy*, 2007). Galasso (2006), following Browning (1975), assumes that, when voting on pensions, people would lose all of their accumulated rights if they would not accept continuation of the current system, while if they would accept it, they would benefit from both the previously accumulated rights and those to be acquired in the future. If the question put to vote would be formulated this way, then the return on

[11] The rule of actuarial neutrality can also be compared with Musgrave's (1986) 'fixed relative position' rule for determining a fair pension formula, referred to in recent discussions, e.g. by Esping-Andersen et al. (2002). Pensions are thus indexed to the wage rate after pension contributions, while a pure PAYG system is strictly preserved. Although the same indexation rule is applied in the illustrations above, the decisive difference is that the degree of funding is made endogenous here. The Musgrave rule deviates from actuarial neutrality, and under population aging leads to an increasing burden for future generations.

future contribution payments would obviously exceed the market return for workers above a certain cut-off age. A choice between such extreme alternatives arises seldom in real political processes, however, not only because most people would consider it brutally unfair, but also because it would tend to make reforms increasingly difficult.

The actuarial neutrality rule offers an alternative framework for the political process of pension reform, as it builds upon the distinction between accrued rights and those to be accrued in future: if an agreement is reached on accrued rights, then current pensioners and older workers should be able to suspend their own concerns and accept even radical reforms of the rules in the interest of future rights and their financing. The trade-off between contributions and benefits from this point onwards would be made clear for each generation, and the selected alternative would then gradually replace the original arrangement.

The results above are simple because they are based on a model in which successive generations follow one another after each 30-year period (i.e. all members of a given generation are born at the same instant). The reality is quite different, and we can only interpret the results representing neutrality for an average-aged worker and an average-aged retiree. As the same tax rate is set for all workers in a given year, and as the demographic change is gradual, there is no way to reach perfect actuarial neutrality for every yearly age cohort. Our results can be generalised for annual data, however, and the unavoidable deviations from perfect neutrality could be estimated.

Another easy extension would involve addressing the consequences of forecasting errors. Recall first that under actuarial neutrality the decisions taken by each generation are fully separate from those taken by subsequent generations. The required time span thus encompasses a generation (i.e. on average, 30 years), and uncertainty concerning the more distant future is irrelevant. This already is helpful, as people are often (rightly) worried about the accuracy of very long-term projections. Projections over the next 30 years, however, may also turn out to have been wrong. For example, suppose that the actual longevity increase for the next period happens to have been underestimated in period 1 – some-

thing that has frequently happened in reality. Under PAYG, the tax rate of the workers in period 2 rises to cover the larger amount of pension outlays. Explicit debt remains constant and the consequences of the mistake are thus borne in the period in which the error materializes. Under actuarial neutrality, a limit is set to the increase in the tax rate in period 2 that is caused by the mistake, implying that the impact of the error will also be seen in an increase in the total public debt. The consequences of the mistake are thus spread out over all working generations as of period 2. This feature is a clear advantage of an actuarially neutral system: the system implicitly allows for intergenerational risksharing by spreading the costs of unexpected shocks over all current and future workers.

Furthermore, for a given contribution rate and the various other factors, the results for actuarial neutrality developed above can be used to find the accrual rate and thereby the replacement rate in the next period. Although this extension is not presented here in detail, take note of the main, relatively straightforward implications. The resulting rule can be compared to Notional Defined Contribution (NDC) systems in which the rate of growth of the wage bill, among other factors, basically determines the pensions. This blueprint of the NDC system deviates from actuarial neutrality to the extent that the retirement age of the subsequent generation affects the growth rate of the wage bill, which subsequently affects the replacement rate for the currently retired. Hence, complete neutrality is not achieved. Rather than viewing this as a major deficiency somehow disqualifying the NDC system, we should recognise that the system goes a long way towards actuarial neutrality when compared with maintaining defined benefits (DB) under a pure PAYG system under an aging population (for a more detailed analysis of the transition from DB to NDC and the need for an additional adjustment mechanism to complement the basic NDC blueprint, see Oksanen, 2004, pp. 584-586).

4.*2 Implications for the Stability and Growth Pact*

As noted in Section 2, the *sustainability-gap* indicator is prominently used in the policy documents implementing the SGP (recall that it measures the difference between the constant tax rate required for covering the projected public expenditure and servicing public debt and the prevailing (or planned) cyclically adjusted tax rate). It gives the immediate once-and-for-all adjustment that fulfils the intertemporal budget constraint of the government for the given expenditure projection (although an infinite number of other tax-rate paths exist that do the same).

In the context of the revision of the SGP in 2005 it was well understood that the *sustainability-gap* indicator should not be interpreted as directly implying an MTO (and thus as a recommendation to increase taxes (or the primary balance) to close the gap). It was rightly stressed that it would be equally important to take measures to reduce future expenditures so as to narrow the gap from that end (European Commission, 2006 and 2007). In addition, even for cases in which the given expenditure projection would have reflected an acceptable policy line, closing the gap would have implied an MTO that would require quite an ambitious policy revision. There was no readiness for pursuing such recommendations, partly because the methodology used could not appropriately take into account the implicit liabilities (notably, the future pensions). Thus, for a transition period of a few years, the medium-term objectives for budgetary adjustment were set in the range from -1% of GDP to balance or surplus, with a more ambitious target for high-debt- and low-potential-growth countries, and vice versa (ECOFIN Council, 2005). Making the MTO dependent on debt presumably reflects the aim to reduce the disparities in indebtedness, since all countries borrow from a common pool of savings, while high-debt countries have shown less discipline in the past. Explicit debt is also more objectively measurable than implicit debt is. While the emphasis on explicit debt obviously does not stem primarily from considerations about intergenerational equity, potential growth could, in principle, be linked to intergenerational aspects. This is the case if higher growth follows from higher investment, which is then bequeathed to the next generation. However, if higher

growth is seen to ease the expenditure increase due to the indexation of pensions to prices rather than wages, then this higher growth is, effectively, already incorporated in the expenditure projection and should not be counted twice.

The newly established MTOs to be implemented in the next few years guarantee quite safely the sustainability of the (explicit) public debt. They imply a reduction in public debt, and rolling over such borrowing would undoubtedly encounter few, if any, difficulties in the markets. However, there is still a worrisome question: can governments implement those MTOs in the future when aging-related expenditures increase, calling for increasing tax rates (or a reduction in some other expenditure items)? This seemed to concern the ECOFIN Council (2006), when it noted that reaching the MTOs in the 2005 programmes based on the revised SGP guidelines would be an important step, but not a sufficient one. In particular, the Council called "for further structural reforms and/or budgetary consolidation, in line with the three-pronged strategy to ensure sustainability decided by the Stockholm European Council in 2001, i.e. (i) reducing debt at a fast pace; (ii) raising employment rates and productivity; and, (iii) reviewing and, where appropriate, reforming pension, health care and long-term care systems." We now explore how the *actuarial neutrality* rule, focusing on intergenerational equity, provides further rationale and precision for the ambitious policy line expressed by the ECOFIN Council.

Does actuarial neutrality lead to overly ambitious MTOs?

The public-finance targets implied by the actuarial neutrality rule seem very ambitious in view of how public deficits and debt have behaved over the past 30 years in most EU countries. The summary example (Table 5) led to a reduction of 100% in the government debt ratio and a 1.6% surplus over a 60-year period. Two questions are of interest here: First, is the rationale for this policy strong enough, and second, what exactly should be adjusted in policy, and when?

As to the first question, the answer could come from the principle that the rules for such important public-policy areas as pensions and health-

care should, at least broadly, follow the principle of social *insurance,* implying that a clear link should exist between the costs and benefits for each generation. Unless future benefits are significantly reduced, this principle will lead to partial pre-funding in these systems. If the acquired funds belong to the general government sector, then the targets for public debt and deficit should be set such that the surplus in the public-pension system is fully integrated with the debt- and deficit targets imposed on the entire government sector, as the pension-system surplus will otherwise be squandered by a deficit in other public-policy areas.[12] This means that even if actuarial neutrality were implemented in the public-pension system, its intended effect on intergenerational equity requires that the target for the general government deficit is not, for example, fixed at zero or some other number. The way in which MTOs should be set under the SGP is therefore of utmost importance, and the issue has not yet been fully settled.

Next, the method for setting the MTOs should take into account precisely what should be adjusted and at what speed. One should first ascertain whether the expenditure projections should be taken as realistic and acceptable, at least tentatively, before seriously considering the financing side.

For countries where the projected expenditure increase considerably exceeds the EU average (whatever quantitative indicator is used to express the imbalance), the focus should first be put on reforming the pen-

[12] The accumulation of funds in the public-pension system should thus show up as a positive item for the budget balance and a reduction in net debt. If the public-pension system is organised as a separate entity, then the question arises as to where it should invest. Some authors argue that if pension funds (private or public) invest in government bonds, they are in effect pure PAYG (e.g. Barr, 2004, p.114). This obviously requires that the government always issues new debt (i.e. increases the deficit) for accommodating such investment. Whether or not this happens depends on rules and policies. From the perspective of intergenerational equity, investment by a public (private) pension fund in government debt is neutral if the government net debt is reduced (kept constant) in response to this investment. Bosworth and Burtless (2004) find that this requirement has been met at the state level in the US, while in OECD countries (from 1970-2000) 60-100% of public pension saving at the national level was offset by larger deficits in other budgetary accounts.

sion- and healthcare systems to contain spending growth, and then move on to setting proper targets for the debt and deficit only on the basis of reformed rules. In some other countries the projected expenditure can be unrealistically low because the projections are based on a strict application of the rules currently in force, even though they might not be politically sustainable. This may, for example, result from the rule that pensions are indexed to prices only and therefore fall behind real wage growth (an example is Poland, where the GDP share of pension expenditure is projected to fall by 5.9%-points). It may be difficult to speculate on politically induced changes in benefit rules in assessments made at the level of the EU institutions, but it is also obvious that one should avoid setting the fiscal targets based on unrealistic projections.

Our stylised example (summarised in Table 5) represents EU average expenditure projection that might already prove difficult to meet for some countries. After all, the implied MTO of 1.6% of GDP over two generations is very ambitious. Furthermore, there is a serious risk that the expenditure projections regarding healthcare and long-term care will be exceeded (in the past couple of decades, these expenditures have increased much faster than is now projected for the coming decades; see Economic Policy Committee and European Commission, 2006a, pp. 121 and 127). In this light, the current MTOs for the EU on average do not seem ambitious enough for actuarial neutrality. The required significant adjustment then suggests the need for allowing time for it, both for political economy reasons (finding the necessary majority for the reforms) and also for purely economic grounds based on the cost of adjustment.

Note, here, that the *sustainability-gap* indicator in most cases tends to exaggerate the immediate need for budgetary adjustment because the technical assumption behind it is a constant tax rate, and it therefore does not systematically take into account the incidence of expenditure and taxes on successive generations that differ in terms of their demographic characteristics (for an early comparison of *sustainability-gap* indicators and the actuarial neutrality rule, see Oksanen, 2003).

Applying the framework in the present paper to gradual adjustment for overlapping *yearly* age cohorts is relatively straightforward if we

note that the average retiree is 30 years older than the average worker. We can therefore use our framework where the unit period is 30 years for setting the parameters for these representative individuals. Then, if the system already imposes actuarial neutrality, any changes in demography and possibly in pension system rules should be incorporated gradually over a 30-year period. This leads to quite slow change, and should not lead to adjustment costs that need specific treatment. However, this is not, in practice, the main issue with the speed of adjustment. Since for most countries the initial conditions are far removed from actuarial neutrality, the main issue instead becomes at what pace the new policy rule should be implemented.

If putting in place the new rules causes tangible adjustment costs, then it can be argued in the spirit of actuarial neutrality that these costs should be shared between current and future generations. The new parameters of the pension arrangement should therefore enter into force gradually, which would allow total debt to reach a correspondingly higher level than with immediate adjustment.

A completely different argument may emerge if the induced increase in government saving causes over-saving in the economy. This would manifest itself as a rate of interest below the long-term growth rate of the economy, indicating that the economy is dynamically inefficient, and consumption could therefore be increased without harming the consumption of future generations. It is controversial whether this is likely to happen in modern economies, but if and when these signs would be seen, governments would then have the pleasant duty of increasing expenditures or reducing taxes. One could argue that even in this case (notably because the problem with over-saving will most likely only be temporary) it is useful to implement actuarial neutrality in public pensions and move to partial pre-funding (assuming that this follows from the benefit rules), using other public finance instruments to eliminate the saving glut. This would follow from the idea that it is useful to isolate the transitional issues from the accepted sound principles of the pension system.

Finally, even while we focussed on intergenerational equity, our analysis above disregarded public investment. This is acceptable only if we can assume that the public capital stock is reasonably maintained and expanded in line with economic growth determined by other factors. However, if major investment projects are undertaken or planned, it is clear that they should be recognised as part of the net assets to be left to future generations. The same should be valid for cases in which the government disinvests (i.e. sells off its real assets). Thus, an assessment of whether public investment is abnormally high or low should enter the setting of the MTOs.

Privatisation

The results from the illustrations of the (partial) privatisation of the public pension system clearly indicate that a conflict with the SGP rules may arise, although how serious this becomes will depend on several factors. In our stylised examples for one-third privatisation and 60% of GDP initial public debt (Table 3), breaching the rules becomes a serious risk.[13] If there were also reasons for temporarily high public investment, then the conflict would become even more intense, while lower initial debt gives more room for adjustment. Also note that our figures refer to 30-year averages. The peak in the yearly deficit would thus be even higher, and would not happen immediately (or over the first five years) after the privatisation, but well after (as the immediate loss in contributions to the first pillar would be followed by compounded interest on the debt this produces). Also note that the budget surplus target is larger under a policy of frontloading the taxes to finance the increase in the costs of

[13] Note that the reference scenario is not a pure PAYG mono-pillar system, but a mono-pillar that is first reformed to implement actuarial neutrality. The latter would lead to a reduction of the public debt, while the one-third privatisation would turn that around to an increase (compare, for example, panel 5 in Table 2 with its counterpart in Table 3).

healthcare and long-term care. This helps to offset the negative effect on the budget balance of pension system privatisation.[14]

Measurement and treatment of implicit pension debt and the SGP

Implicit pension debt defined as accrued-to-date pension liabilities features prominently in the present paper. In the 1990s there was some interest in estimating these liabilities (e.g. van den Noord and Herd, 1993), but no systematic updating has taken place since then. This will change, fortunately, as the international statistical community is about to finalise its proposals to set up, in the next SNA/ESA revision, accounts for public-pension liabilities (see Advisory Expert Group on National Accounts (AEG), 2007; also European Commission, 2007, Part II, Section 2.3). It has been agreed that the pension liabilities of private corporations will be shown on their balance sheet, as is already the case under International Financing Reporting Standards (IFRS) for (listed) companies. Due to the difficulties in defining pension liabilities under the government social insurance schemes, they will not be shown in the core accounts, but in new supplementary accounts.[15]

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[14] One noteworthy assumption that we made above is that the interest rate does not depend on swapping implicit debt (to be serviced from future taxes) for explicit debt (to be issued on the open market and then serviced from future taxes). Especially under a major privatisation this swap presumably has effects that are left outside our simple model. However, we note that under actuarial neutrality the direct impact of privatisation on aggregate saving is nil. Yet, a change in demand for and supply of various assets and liabilities might lead to certain secondary effects. This should not, however, seriously undermine our results for the orders of magnitude of the direct effects on the key fiscal variables.

[15] The pension entitlements of the government's own employees form a special case, as neutrality with respect to private-sector employers should require recording these entitlements as government debt. This could add roughly 50-60% of GDP to the public-debt figures in European welfare states. Pension entitlements of government employees may actually be closer to social insurance schemes, however, and on this basis an allowance was made that they could be shown in the supplementary accounts only. The more precise criteria regarding where to draw the line will be set up later. Difficult borderline cases hampering international comparisons will undoubtedly appear.

The estimates will then be available for improved analysis of the public finances. As shown in the present paper, actuarial neutrality across generations can be made operational as a rule of constant total debt (adequately modified for additional factors), which can provide a benchmark for policy decisions. This would provide genuine prominence to debt sustainability in fiscal analysis and notably draw into the analysis intergenerational equity considerations related to public pensions.

Our results should remove the concern expressed by Franco (1995) that the IPD should not be used without qualification as a stand-alone indicator of the future pension burden (also European Commission, 2007, p. 99, and Blanchet and Ouvrard, 2006). His concern is valid for pure PAYG systems and for a fixed interest-rate assumption. However, as shown in Section 3.5 above, once the straightjacket of pure PAYG is relaxed, this no longer discredits the sensible use of the IPD for analysis and policy design – regardless of whether or not the interest rate is fixed. Also, the often-expressed concern about the difficulty in treating the effects of the changes in the (perceived) interest rate on the IPD need not be pertinent: these effects can be identified and treated in the same way as capital gains and losses under the current accounting rules for long-term fixed-interest-rate debt.

The IPD as defined here can be compared to *open-system pension liabilities*, defined as the present value of projected pension expenditure minus revenue up to infinity. The *sustainability-gap* indicator corresponds to the constant tax rate matching this liability.[16] Thus, just like the *sustainability-gap* indicator, the projection for *open-system liabilities* is not sufficient for assessing intergenerational equity: it does not contain the data by age cohort, nor does it distinguish between rights accrued to reference date and those to be accrued in future (or, if they are used in the data, this information is suppressed by aggregation). Instead, the IPD as defined here, projected for the future, can always be combined with the same projection for revenues as the projection for *open-system li-*

[16] European Commission, 2006, Chapter I and Annex I, and 2007, Section 2.3; see also Buti and Nogueira Martins, 2006, and Blanchet and Ouvrard, 2006.

abilities, in which case it undisputedly provides superior information when compared to the latter. Most importantly, the IPD contains the elements that are indispensable for a systematic treatment of intergenerational equity.

Furthermore, there is a completely separate controversy as to how much effort should be put into estimating the (accrued-to-date) IPD, and how the latter should be related to the explicit public debt. First, under most public pension systems in Europe, implicit pension rights are not backed by explicit well-defined commitments. For example, the indexation rule is often ambiguous. Second, it is often feared that the official publication of an implicit-liabilities estimate may give those liabilities an explicit character, and thereby make it more difficult to renege on them. For this reason, Coeuré and Pisani-Ferry (2005) argue quite fiercely against including implicit liabilities in their measure of the net balance position of the government, because "governments can default on them without producing a financial crisis and, in fact, default is what pension reform frequently amounts to".

These concerns allow us to derive a useful conclusion: official publication of implicit liabilities should always be accompanied by an explicit statement that the figures are based on current policy and that no legal rights can be extracted from them. Moreover, baseline figures for implicit liabilities could be complemented by projections based on alternative assumptions about indexation (for example, to give the baseline figures a less definitive character). This would reflect the true nature of the IPD estimates and remove concerns about the abuse of the officially published figures.

In addition, we should emphasise that pension reforms do not necessarily imply that the government is defaulting on its obligations. The accrued-to-date IPD can be an object of competing interpretations and even default, but apart from this, the reforms can importantly revise the rules on the future accumulation of rights.

5. Concluding remarks

This paper explored how the Stability and Growth Pact may cope with the future costs of population aging in the European Union. In anticipation of the rising costs associated with aging, countries have started to, or plan to, reform their pension systems – both by reducing the generosity of pension arrangements and increasing the retirement age, and by switching from pure PAYG pension provision to pre-funding, including reduction of public debt and partial privatisation. This paper investigated how such reforms relate to the provisions of the SGP.

Although the SGP, especially after its revision in 2005, clearly aims to ease the financial burden to be shouldered by future generations, it does not incorporate intergenerational equity explicitly and systematically. The simple model in this paper provides such a framework, based on the rule that generations that are identical in terms of demography (longevity and fertility) and retirement age should face the same tax rate for the same level of benefits. This implies a neatly defined benchmark that we have termed *actuarial neutrality*, and we show that a wide range of alternative pension arrangements that comply with this benchmark exists. The results provide further rationale and precision for the ambitious policy line widely expressed by the European Union finance ministers (e.g. ECOFIN Council, 2006) and others. They also show that a pure PAYG rule does not, in general, comply with actuarial neutrality, but rather tends to shift an increasing burden to future generations.

For the many countries in which aging-related expenditure is projected to increase considerably under current policies, emphasis should be on considering policy changes that will help contain the increase. The medium-term objective (MTO) for budget balance should then be set on the basis of the reformed rules. However, the EPC projection for a Member State close to the EU average might be a relevant starting point for setting targets for the debt and deficit. This average increase in pensions already incorporates a significant reduction in the replacement rate and an increase in retirement age, and yet, as a result of the ongoing change in age structure of the population, expenditures increase. Our

stylised example above, which mimics those figures and also takes into account the projected increase in healthcare expenditure (Table 5), shows that actuarial neutrality then implies that the target should be a significant budget surplus for several decades. It thus does not seem sufficiently ambitious to set the MTOs under the revised SGP provisionally in the range from -1% of GDP to balance or surplus. What is at stake here is transparency and consistency: if the public pension system is reformed to comply with intergenerational equity, but the MTO for general government does not incorporate the resulting pre-funding, then this purpose of the pension reform has been undermined. To avoid this, the issue of an economically optimal and politically acceptable speed to reach the ambitious target becomes a pressing issue. The framework here may help in providing a politically acceptable response, as it makes explicit how the burden is shared across generations. In the event that such a policy line is rejected, then one possible conclusion may be that the retirement age should be increased significantly more than is now projected for the EU average.

The revised SGP now recognises the problem with the transitional cost of (partial) privatisation of pensions. However, the revised rules allow only a limited excess over the 3% of GDP deficit ceiling for a limited period of time. Our results show the inevitable downside of this: that a partial privatisation performed on a fully actuarially neutral basis of a reformed and sound mono-pillar pension system may not easily be accommodated under the current rules. If, for example, one-third of the implicit pension debt is swapped for explicit public debt, then the government budget balance should be allowed to deteriorate by 4 to 5 percentage points of GDP relative to the otherwise similar mono-pillar system. The risk of breaching the 3% deficit ceiling therefore becomes imminent. Hence, while there might be sound economic reasons for privatisation (e.g. a reduction in the distortionary effects of the pension system on the labour market), it is clear that under otherwise similar policies a country that maintains a mono-pillar system can be much more comfortable with the SGP rules than a country that contemplates and implements a partial privatisation of the system. More concretely, a sig-

nificant privatisation may lead to Excessive Deficit and prevent the Member State from adopting the euro, for which reason the reforms for establishing a fully funded second pillar may be abandoned or delayed. This is hardly in the spirit of the EU budgetary rules as they were originally drafted.

A remedy to this consequence of the current rules would entail a change to the Protocol on the Excessive Deficit Procedure (EDP) annexed to the EU Treaty. When the SGP was revised in 2005, no changes were made to the Treaty, including the Protocol on the EDP, presumably because of the concern that the EDP as a budgetary anchor would have been undermined. However, if serious plans for significant privatisation would be considered by some Member State, then a limited clause that the surplus in the second pillar be included in the government budget balance for the purposes of this Procedure might have to be considered. This would require a unanimous decision of the EU Council.

Experience with the EDP as inserted in the Maastricht Treaty in 1991, and its enforcement under the SGP, show that it is difficult to avoid the tension between the economic rationale behind complex issues and the simplicity required by the political process. Having put in place the short- to medium-term rules in the late 1990s, the SGP was gradually extended to deal with long-run budgetary sustainability. The provisions in the Treaty and the revised SGP provide an improved legal framework for policies to comply with the principle of sound public finances. It is commonly acknowledged, however, that improving the implementation of the legal rules is an ongoing process. The framework in the present paper provides some clarification regarding the issues to be tackled, and the ongoing work of pension actuaries and statisticians to gather estimates on implicit pension liabilities will greatly help in analyzing the issues and designing economically sound reforms.

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SUMMARY OF DISCUSSION

By Nathanaël Vellekoop

Pension Systems, Aging and the Stability and Growth Pact
By Roel Beetsma (UvA) and Heikki Oksanen (European Commission)

Chairman: Henk Don (EUR)
Discussants: Ed Westerhout (CPB) and Clemens Kool (Utrecht University)

Netspar Panel: April 23, 2008

Ed Westerhout opens the discussion by noting the high relevance of this paper. The paper is relevant because of the ongoing policy debates, over what debt policies should be in an aging world, and whether and how the retirement age should be raised. In multiple countries there is a transition going on towards more funding of pension schemes. The paper is broad in its structure. It tackles the question whether the Stability and Growth Pact (SGP) hinders the transition in different member states from pay-as-you-go (PAYG) financed schemes towards pension schemes that are more funded. Furthermore, the paper provides a lengthy discussion of different criteria for debt policies, based on the literature and actual policy rules. Finally, the authors construct and apply a generational accounting model. The policy implications of the paper are differentiated: optimal policy rules are difficult or even impossible to find.

Overview of the EU Approach towards Member States' Debt Policies
The EU policy rules with respect to member states' debt policies are written down in a number of agreements: the Maastricht Treaty (1991), the Stability and Growth Pact (1997) and the revision of the Stability and Growth Pact in 2005. The Economic Policy Council (2001) and the European Commission (2006) both assess the budgetary implications of aging in various EU-countries. This shows the development and the shift in focus in Europe from the fear for inflation towards budget implications of aging. The paper gives a nice illustration of this development over time. However, little attention has been paid to the impact of debt surveillance

polices. A general question would be whether EU policies have been successful in curtailing public debts of member states. A more specific question would be whether the changes in the EU-rules had any effect on the development of public policies. Answers to these questions are important, because the authors propose to incorporate the issue of sustainability of public finances into EU debt polices.

Proposal for Debt Criterion Based on the Principle of Actuarial Neutrality
The paper discusses how to assess the degree to which current budgetary policies are unsustainable. This assessment is based on a generational accounting model and applied to EU-countries. The assessment is also based on freezing current policy rules. All future values of public expenses and public revenues are condensed into one measure, the sustainability gap. And, as common in the generational accounting literature, the paper calculates implicit and explicit debt. Some remarks about the sustainability gap. First, the sustainability gap is interpreted as an annuity value. Hence, it does not correspond to actual budgetary polices. The paper stresses the fact that there is a great variety of policy reforms that can be implemented in order to restore fiscal sustainability. But furthermore, the paper interprets the sustainability gap as a policy measure. Namely, as the immediate and permanent change in the primary surplus that should be made in order to restore fiscal sustainability, that is to close the sustainability gap. This is called the actuarial neutrality rule and treats successive generations on an equal basis. But this is similar or identical to the Musgrave criterion, but what exactly is the difference between the Musgrave criterion and the one applied in the paper.

Concerning the rule of actuarial neutrality, there are two problems with this rule. The first problem is a political argument. One can argue that it is up to national policy makers how to weigh the interests of different generations. There are situations in which a policy maker wants to treat different generations differently. An example of this could be that the policy of raising the retirement age is judged negatively, because it harms particular generations that are close to retirement. The second problem is the operationalization of fairness. This paper takes a tax rate that is constant over time. Note that tax smoothing is not the same as actuarial neutrality in the case of rising longevity. If future generations are richer, then the decreasing marginal utility of income implies that future generations should pay more in order to equalize after-contribution marginal

utilities of income. Furthermore, future generations inherit not only a public debt, but also a variety of assets, where on can think of physical and environmental capital, whether this inheritance is positive or negative. This paper also argues that unemployment benefits and educational expenditures might be excluded from the actuarial neutrality calculations as they are to the benefit of specific cohorts. This underlines that it is not entirely clear which government expenditures should be included in this actuarial neutrality calculation, and subsequently, which items should be included into the model.

Pension Reform

The major question of this paper is whether the SGP hinders the transition from PAYG-based pension schemes that are (partially) prefunded. The idea is that privatization reduces the implicit pension debt. This allows policy makers who conduct to the rule of actuarial neutrality to lower the tax rate. This tax rate reduction is immediate and permanent. But because the reduction in expenditures occurs later in time, the public debt temporarily increases. From this reasoning, the SGP could hinder a policy that in it selves may be efficiency enhancing. The SGP recognizes this problem, but as the authors stress, it gives only partial compensation for this. With respect to the efficiency gain of a funded scheme when the economy is dynamically efficient, it is good to note that this gain does not exist. A gain from a higher return is offset by higher pay. In the absence of distortions, the steady state gain from a higher rate of return is exactly compensated by the loss from the transition generations who have to pay double. Only if the pensions are reduced of the generations who are retired at the time the reform, then there will be an efficiency gain. If we assume that labor market distortions may increase the efficiency of such a move. Then the question is again: does the SGP hinder the transition from PAYG-based pension schemes towards schemes that are (partially) prefunded? A faint answer would be not to cut taxes before the increase of the primary surplus sets in. But if the effects of the policy reforms are highly uncertain, a formal analysis could yield the result of the paper. Besides this remark, he agrees that supplementing the SGP with an assessment of sustainability would be a good thing in that respect. A sustainability approach is superior to the EU's debt approach as it accounts for both explicit and implicit debts, where both are relevant. However, the problem with the sustainability approach is that implicit debts

depend on various economic variables that are highly uncertain, like the interest rate or the inflation rate. That would make it much harder to quantify implicit debts.

Generational Accounting (GA) Model

The GA model applied in the paper is quite standard. It attributes taxes and (social security contributions) and public expenses to different cohorts. The model operates under two regimes: (1) the PAYG system: that keeps the ratio public debt to GDP at its initial level. (2) the regime of actuarial neutrality, that imposes an immediate and permanent tax rate change in order to achieve fiscal sustainability. The model plays with different assumptions on the retirement age. Some remarks about the model. The time structure of the model is confusing. If people work from 20 years to 65, and people are retired from 65 to 80, then the model let these people live to the age of 110, but give the retired years a lower weight of 1/3 (this weight is calculated as (80–65) / (110–65). Furthermore, this time structure gives biased results. Pension expenditure in this example occurs for 15 years, but is spread over 45 years. Even if expenditure is scaled appropriately, the results will change because the change in time structure affects the duration of pension income flows. The present value of a stream of 15 years is not equal to the present value of a stream of 25 years, due to the interest rate. Besides these remarks about the time structure, the model seems too stylized to be useful for numerical exercises. The model has only one type of tax. This denies the role of different types of taxation, like income and labor taxation. The development of consumption and output differ greatly and so may the taxes do in an aging society. The model does not account for economic behavior. This is strange as it denies that pension reforms may increase economic efficiency by combating distortions on labor and capital markets. The model equates the labor market exit age with the retirement age. This is counterfactual since many workers quit the labor market before the retirement age. The model therefore greatly exaggerates the effects of raising the retirement age.

Health Care

Pensions and health care is an integrated issue, but it is separated in the paper. The paper recognizes though that health care and pensions are likewise in the sense that they can be interpreted as a PAYG-scheme that

makes transfers from the young to the old. Two remarks in this respect. If read correctly, death-related costs are taken to be a quarter of total health care costs. This seems way too high and gives a downward bias towards the implications of an increase in longevity. The number given in the literature lies in a range of 5% to 20%. Secondly, health insurance is financed by taxes that are paid by both workers and retirees. The paper argues that because of that, actuarial neutrality cannot be achieved in the case of health care. This is not convincing in the case where the government has the availability over cohort-specific taxes. In this case, a government can raise the tax rate on workers and transfer the revenues from the pension to the health insurance scheme. As long as cohort-specific taxes are the case, one can count actuarial fair cohorts.

Conclusion
It is a good thing that the awareness of the aging problem has increased. It also is a good thing if it would be the case that information about the degree of unsustainability of EU member states' debt policies is given a more prominent role in future EU debt surveillance polices. This would to a large extent solve the problem raised in this paper that the current SGP-rules hinder a move towards more funded schemes. Given the difficulties of defining intergenerational fairness, one rather hesitates to substitute current SGP-rules for one based on the principle of actuarial neutrality, or intergenerational equity. Given the difficulties of assessing implicit debts, rules based on the unsustainability of budgetary policies supplement rather than replace current SGP rules.

Clemens Kool continues the discussion by noting the importance and the timeliness of the topic. An evaluation of fiscal policies is important. Despite all the beautiful plans of the SGP, in the real world countries run into situations where the plan has to be adapted. He is impressed by the thorough analysis of the paper, the mix of theory-based accounting experiments with a policy debate. He sees two messages in the paper. The first one is that the concept of actuarial neutrality using an inter-generational accounting framework should be the basis for design and evaluation of pension reform. The second message is that the SGP actually hinders pension reform. He partly agrees to the latter, but wonders how important this is.

He has some minor questions with respect to the outcomes of the model. First, technologically-driven growth seems to be absent. He wonders whether this could or would play a role. Furthermore, the interest rate is taken as exogenous in the model. He wonders whether a risk premium related to pension policy matters. Financial theory says that there is a relationship between the risk premium on bonds people hold and the fiscal policy a government runs. Then there is not an asset valuation effect in the analysis. With respect to the government debt, it is not clear who holds the government debt. Is it true that the implicit assumption in the paper is that government debt is held by the retired generation? Finally, it might be interesting to have some welfare concept applied to be able to compare the different transition paths, or to be able to compare inter-generational gains and losses when no equity consideration is imposed.

When thinking about the political economy of the SGP, he has some other considerations. First of all, the theoretical underpinning under the SGP is lacking, for example, what does theory say about a debt rule of 60% of GDP? According to him the SGP was initially not aimed at coping with pension reforms and aging problems. The SGP was aimed at too liberal (current) government expenditures and excessive deficit spending. Even in that case, his view is that especially the corrective arm of the SGP was ill-designed. The EU has less power to enforce its rules and thus there is a high likelihood of a low credibility. The paper convincingly makes clear that debt should be allowed to act as a buffer. This is even stronger questions the allowed debt levels by the SGP. It does not come as a surprise that the design of the SGP does not perfectly fits the needs of today. In thinking over the SGP is a binding constraint, he first notes that the SGP is not an ultimate goal, but a means to an end. He finds it hard to image that if a country really wants to do pension reform and therefore has to run deficits and a higher debt, that this really could be a problem. But maybe institutions are too strong. He again considers that the initial SGP was not designed for these issues, and asks if this could be a problem.

Final remarks are that the paper only talks about government finances related to intergenerational issues. However, there are a lot of other factors which may interfere. An unresolved issue is what fiscal rules we do want to impose, where we have to take into account that future generations are not to be hurt. The real policy challenge is if we can think

of pragmatic mechanisms and rules that both improve on the SGP and are feasible. The paper is relatively silent in this respect. However, there is a slight modification of the SGP underway in allowing more leeway. Another option we can think of is putting the whole thing completely at arm's length from the government. This would be an insurance perspective. In addition to this, a long horizon needs credibility of the government, where one has to think of the potential time-inconsistencies of reforms. It is likely that countries with the biggest problems have the least credibility in this respect.

Reply by Beetsma and Oksanen to Westerhout

With respect to the sustainability gap: this is calculated as the tax rate that makes the intertemporal budget constraint to hold, so that society is able to finance all future liabilities. The closing gap is an unfair measure, because current generations pay for future generations. But those future generations live longer and should therefore pay higher taxes. The closing gap is too harsh on current generations.

With respect to actuarial neutrality, this is a politically difficult issue. Actuarial neutrality runs counter towards equal treatment of generations. Our view is that each generation should pay for their own pensions. However, a shift from the current situation towards more actuarial neutrality would be large and politically difficult.

With respect to the timing of the model, there is a technical difficulty in the model. The worker life is larger than the life of a retired. This is a difficult issue, unless one uses a generational accounting model on an annual basis. The remark is correct that the analysis has to account for this in the model, but maybe the results do not change much.

With respect to the empirical finding that people leave the labor market before there 65th birthday: this has the implication that a society or government should be more ambitious than our model says. The budget surpluses should be higher in this case and our current results are then conservative estimates.

Our view is that the SGP is not to be thrown away, but should only have some minor adjustments. Assets that are accumulated should be taken into account.

Reply by Beetsma and Oksanen to Kool

With respect to the absence of explicit technological driven growth, technological growth is taken as an exogenous factor which affects labor. There is no risk premium with respect to pension policy or asset valuation effect in the model. This could indeed matter and can be important. With respect to the holdings of the public debt, it is assumed that debt is issued on the international capital markets and that interest payments go to the public budget. It does not matter for the model if for example workers hold debt upfront. With respect to the remark that the rest of the government is left out in the analysis: we argue that the government at large should hold surpluses. It is important that those surpluses are not merged with deficits from other government departments. There are empirical examples where this happens between government bodies. It is important that the government as a whole runs a surplus.

General Discussion

Van der Ploeg asks for the relevancy of the results from a model with generational accounting. There is no economic behavior modeled, there are no incentive effects, he views it merely as an accounting exercise. He questions the value of the answers from the model.

Beetsma replies that this is a true remark. If it can be assumed that the behavioral effects and the behavioral feedback effects are smaller than the accounting effects, then changing to a more actuarial neutral system will give us more than the labor gain. We can count this as an efficiency gain.

A **question** is asked to what extent it is a bad policy not to have actuarial neutrality at all. **Beetsma** replies that in the paper there is no optimal debt policy or welfare concept applied. The paper looks at the compliance with the SGP.

Oksanen adds that the model in the paper is a very partial model, with only workers and a government. A lot of issues raised are topics to be included in a next paper. With respect to the concept of actuarial neutrality, they choose the world of this model because of the issue of intergenerational fairness. Actuarial neutrality serves as a benchmark to

which policy makers can choose to deviate from. The criterion of actuarial neutrality is not exactly the same as the Musgrave criterion. Another justification for this paper is that it serves as input for policy makers and the public. Policy makers and the public often do not understand how costly pensions are. We should therefore show them calculations and ask them who should pay for the pensions. EU projections do not distinguish between who is paying and who is benefiting. Pension reforms should therefore be added into financial accounts.

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PENSION SYSTEMS, AGING AND THE STABILITY AND GROWTH PACT

This paper addresses the link between two major European policy issues at the heart of the macroeconomic debate: (1) coping with rising public expenditures caused by population aging, and (2) the adherence to the EU's fiscal rules, notably to the provisions on public finances in the Stability and Growth Pact (SGP) (as revised in 2005). The analysis is concerned with the long-term sustainability of public finances. Although the SGP, especially after its revision in 2005, clearly aims to ease the financial burden to be shouldered by future generations, it does not incorporate intergenerational equity explicitly and systematically. The simple model in this paper provides such a framework, based on the rule that generations that are identical in terms of demography (longevity and fertility) and retirement age should face the same tax rate for the same level of benefits.