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## Fiscal sustainability indicators and policy design in the face of ageing

Geert Langenus



# NATIONAL BANK OF BELGIUM

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### FISCAL SUSTAINABILITY INDICATORS AND POLICY DESIGN IN THE FACE OF AGEING

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## **Abstract**

Mainly due to increasing concerns about the potential impact of population ageing the sustainability of public finances has become one of the key issues in fiscal assessments. This paper briefly reviews the different theoretical benchmarks and empirical tests for sustainability and assesses the sustainability of public finances in euro area countries on the basis of the latest projections of the Ageing Working Group of the EU Economic Policy Committee. Two alternative operational indicators for fiscal sustainability are proposed and appropriate policy options to restore fiscal sustainability are explored for three individual euro area countries. Pre-funding strategies that create the budgetary room that is needed to finance ageing costs in advance require important consolidation efforts for most euro area countries and can imply aiming at significant budgetary surpluses in the coming years for some. However, a simplified technical exercise assessing the evolution of the fiscal burden of the average worker shows that such strategies generally imply a more even distribution of the fiscal burden across generations than more gradual adjustment strategies.

JEL classification: H55, H60

Keywords: population ageing, fiscal sustainability, medium-term objectives for fiscal policy

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## **1. INTRODUCTION**

The usefulness of headline annual budgetary balances and the official public debt figures for assessing the medium-term and long-term soundness of public finances has gradually decreased. On the one hand, governments that have to comply with simple numerical budgetary rules such as those that apply in the EU have been implementing all kinds of temporary and self-reversing measures on a large scale. On the other hand, it is clear that the sweeping demographic changes in many industrialised countries will imply an increasing burden on government budgets in the not so distant future. Against this background, the sustainability of public finances has become one of the key issues in the analysis and assessment of budgetary positions.

In the context of EU fiscal surveillance, EU Member States are required to outline the strategies to ensure the sustainability of public finances in their stability or convergence programmes while the Ageing Working Group (henceforth the AWG), attached to the Economic Policy Committee, is responsible for producing common projections of the budgetary impact of population ageing. Based upon these projections, the European Commission routinely calculates quantitative sustainability indicators.

The aim of this paper is to analyse fiscal sustainability in the euro area using the most recent ageing cost estimates of the AWG and to explore appropriate policy choices for individual countries.

The remainder of the paper is organised as follows. The following section will focus on the meaning of fiscal sustainability and very briefly discuss the different theoretical interpretations and the wide range of operational definitions. Section 3 will then assess fiscal sustainability in the euro area and introduce alternative sustainability indicators. The fourth section addresses the appropriate policy choices for a number of individual euro area countries while the fifth section concludes the paper.

## **2. WHAT IS FISCAL SUSTAINABILITY?**

### **2.1 Theoretical benchmarks**

The general intuition of fiscal sustainability is self-evident: sustainable policies are those that can be continued indefinitely while unsustainable policies will ultimately have to be modified. In principle, fiscal sustainability is typically a multidimensional concept as the reasons for a discontinuation of fiscal policies could be diverse and e.g. pertain to a persistent failure to comply with fiscal rules, the lack of support of the voting population in democratic societies, etc. However, the interpretation is usually narrowed down to specific limits on the government debt or debt accumulation.

Balassone and Franco (2000) provide a detailed overview of the different specifications proposed in the literature and of the definitional and conceptual issues involved. With respect to the former,

three main benchmarks can be distinguished. The first and oldest specification, going back to Domar (1944), requires the public debt ratio to converge to a finite value in order to avoid a continuously growing tax ratio. A second specification, used by Buiters (1985) and Blanchard et alii (1990), requires the debt ratio to converge back to its initial level. Finally, Blanchard et alii (1990) also propose a tougher restriction in that the present discounted value of all future primary surpluses should be equal to the current level of public debt. If this restriction is expressed in nominal values (and the discount rate is the interest rate on public debt), it implies that the debt ratio should converge to zero<sup>1</sup>.

While there seems to be no unique theoretical benchmark for fiscal sustainability, most specifications would imply that an ever-growing debt ratio is not sustainable. In addition, fiscal sustainability is typically assessed in a partial equilibrium framework ignoring any impact of alternative budgetary policies on the economic environment.

With respect to the definitional issues, Balassone and Franco (2000) point out that it is not always straightforward to choose appropriate real-world equivalents for the theoretical concepts of government debt and deficit. Different options can be taken regarding gross or net debt levels, real or nominal variables, the nominal or market valuation of government securities, the delineation of the government sector (especially including or excluding public enterprises), etc.

## **2.2 Operational definitions**

In view of the conceptual and definitional problems described in the previous section, it is hardly surprising that a wide range of operational definitions have been used to assess the sustainability of public finances. In this connection, it is useful to distinguish between backward-looking and forward-looking approaches.

### *2.2.1 Backward-looking approaches*

The backward-looking approaches have in common that they try to test econometrically whether the development of fiscal variables in a given period in the past suggests that policies have been affected by the government budget constraint.

A first group of tests assess the univariate statistical properties of individual public finance variables. Early examples include Hamilton and Flavin (1986) who pioneered this strand of the empirical literature and Trehan and Walsh (1991). Both studies test the stationarity of public debt and the

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<sup>1</sup> However, Balassone and Franco (2000) show that if it is expressed in ratios to GDP, it can be consistent with the undiscounted value of the debt ratio converging to any finite value or even diverging (depending on the interest and growth rates).

primary surplus in the US with non-stationarity interpreted as an unsustainable policy. In both cases, fiscal data were assessed to be consistent with the sustainability hypothesis.

A second group of tests focus on the relation between different fiscal variables. In this respect, several studies assess fiscal sustainability by formally testing the co-integrating relations between government revenue and expenditure and more specifically whether the coefficient of expenditure in the co-integration regression with revenue as a dependent variable is not below 1<sup>2</sup>. Afonso (2000) finds that the hypothesis of a co-integration between government revenue and expenditure should be rejected for most EU15 countries. In addition, for the three countries for which the existence of a co-integration vector between revenue and expenditure could not be excluded, the expenditure coefficients were smaller than 1 suggesting that also for these countries fiscal policies may be unsustainable. Marinheiro (2005) used a similar approach.

Bohn (1991, 1998, 2005), on the other hand, assesses fiscal sustainability by econometrically testing for a positive relationship between the primary surplus and the initial public debt ratio. The sustainability indicators developed by Croce and Juan-Ramon (2003) are based upon a similar approach: fiscal sustainability is defined as a sufficient yearly adjustment in the primary balance towards a target ratio consistent with a country-specific target debt ratio. Hence, in their interpretation, a rising public debt can be sustainable as long as it is below the target ratio (which seems to be chosen rather arbitrarily however).

While all these backward-looking studies provide valuable insights concerning the way fiscal policy was designed in the past, there is obviously no guarantee that the same policy regime will apply in the future and, hence, they can in principle not provide robust conclusions regarding the current sustainability of public finances.

### 2.2.2 Forward-looking approaches

The forward-looking approaches have in common that they try to assess fiscal sustainability by analysing the future development of public finances based upon the currently available information and a number of macroeconomic and demographic assumptions. They differ, however, in the way in which the results are presented.

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<sup>2</sup> However, it should be stressed that the lag structure might matter. The absence of a 'simultaneous' co-integrating relationship between revenue and expenditure of time  $t$  does not preclude that the government can correct an expenditure slippage by raising revenue in a following period and ensure sustainability in this way.

a) Long-term projections

The most basic approach consists in simply projecting government deficit and debt dynamics over a long time period. The development of these projections has been fuelled by growing concerns over the long-run budgetary impact of population ageing.

They typically define a limited number of budgetary items which are sensitive to ageing (such as pensions, health care, education expenditure, etc.) and project their evolution taking into account the expected changes in the size and the composition of the population. In addition, the impact of ageing on economic activity growth is usually assessed taking into account the projected evolution of the working-age population and assumptions concerning the participation and structural employment rates<sup>3</sup>. The change in the ratio of these ageing-related budgetary items to GDP over the period under review is then considered as the 'total cost of ageing'.

Typical examples of such studies are the work by the aforementioned AWG that will be discussed in section 3 and the annual Reports of the Belgian Study Group on Ageing (e.g. Conseil Supérieur des Finances, 2005).

Taking into account these estimates of the total ageing costs, the sustainability of public finances can be assessed by analysing how the budget balance and public debt would evolve if ageing costs would materialise as projected. This requires additional assumptions on the development of variables such as the implicit interest rate on public debt, the level of deficit-debt adjustments and, especially, the budgetary items that are deemed not to depend directly on the age structure of the population. An unsustainable fiscal policy is then defined as one that leads to a high and rising debt ratio at the end of the period considered.

It should be stressed that elaborating long-term projections of public finances necessarily implies a high degree of uncertainty. However, the latter is also true for the other forward-looking approaches discussed below as they are based upon these projections.

b) Synthetic indicators

On the basis of the long-term projections of deficit-debt dynamics different synthetic indicators are proposed in the literature that try to measure which adjustment effort is required to reach a certain sustainable debt ratio at a given point in the (distant) future.

One of the early examples is the tax-gap indicator proposed by Blanchard et alii (1990). It measures the average tax rate that, given the projected development of primary expenditure, would generate at the end of the period considered a public debt ratio which is identical to the one prevailing at the

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<sup>3</sup> In principle, ageing and, in particular, the average age of the workforce could also affect total labour productivity but this is rarely modelled explicitly.

beginning of this period. If the actual average tax ratio is below that level, public finances are considered unsustainable and an adjustment is needed. Apart from the shortcomings listed by Balassone and Franco (2000) related to the rather arbitrary choice of the period and the initial debt ratio as the 'sustainable benchmark', it should be pointed out that closing the tax gap, i.e. bringing the tax ratio to the level suggested by the indicator, only leads to a given debt *level* at the end of the period but does not restrict debt *dynamics* after that date in any way. Hence, an adjustment to the sustainable tax ratio which is then maintained indefinitely could actually be consistent with an exploding debt ratio after the period considered by the indicator, which is somewhat counter-intuitive.

Delbecque and Bogaert (1994) follow a different approach for Belgium and calculate a required primary balance that would allow a reduction in this balance equal to the estimated ageing costs over a certain period and generate a balanced budget at the end of this period. The sustainability gap is the (positive) difference between this required primary balance and the current one. Apart from updating this indicator for Belgium Langenus and Eugène (2005) also propose a required primary balance that would allow a reduction in this balance equal to the estimated ageing costs over a certain period and generate a debt-stabilising budget balance at the end of that period. Both indicators will be used in the third section of this paper.

In the European context the most well-known indicators are undoubtedly the sustainability gaps that are now routinely calculated by the European Commission for all EU-25 Member States (e.g. European Commission, 2005b). The Commission typically calculates these indicators for the period up to 2050 as this is also the time horizon for which ageing-related cost pressures are projected by AWG. In addition, the indicators are calculated for two different base years, the current one and the final year of the medium-term projections.

The first indicator, the so-called S1, is a variant of the aforementioned tax-gap indicator: it measures the difference between the average tax ratio required to generate a debt ratio equal to 60 p.c. (rather than the initial level) at the end of a given period and the actual one. Again, a positive S1 is thought to signal an unsustainable policy. However, as acknowledged by the European Commission (2005b) and similarly to the tax-gap indicator, even a negative S1 can be consistent with unsustainable public finances as the debt ratio might be on an explosive path after the end of the period (while it could also be consistent with a rising debt ratio during part of the period).

The second indicator, S2, is based upon the aforementioned second definition of sustainability according to Blanchard et alii (1990) and measures the change in the tax ratio required to equalise the present discounted value of all future primary balances to the current gross public debt. This indicator is also translated into a required primary balance concept, RPB, i.e. the average primary balance in the first five years of the projection that would be equivalent to S2 and allow the government to comply with its intertemporal budget constraint.

While the S2 (and RPB) indicator avoids the risk of unfavourable debt dynamics at the end of the period due to its time horizon being, in principle, infinite, it in practice narrows down fiscal sustainability to convergence to a relatively low debt ratio, as acknowledged by the European Commission (2003)<sup>4</sup>. This might be somewhat too restrictive as, taking into account positive growth of the nominal GDP, relatively significant debt ratios could also be sustainable and consistent with the new EU fiscal rules after the March 2005 reform of the Stability and Growth Pact. The latter introduced country-specific medium-term benchmarks that might include deficits of up to 1 p.c. of GDP for a number of Member States. Taking into account reasonable assumptions for trend nominal GDP growth, a persistent deficit of 1 p.c. of GDP would be consistent with steady-state debt ratios of 20 to 30 p.c. of GDP.

All in all, both the S1 and S2 indicators can only be considered as rough approximations of the sustainability gap. As noted by the European Commission (2005b), the sign and the order of magnitude of the indicators are more important than the exact value. These indicators would only signal whether a fiscal adjustment is required (the sign of the indicator) and feasible without large structural reforms (the order of magnitude). The European Commission is typically very cautious in interpreting the results of these indicators and tends to refrain from giving specific quantitative recommendations to individual Member States concerning the appropriate adjustment efforts<sup>5</sup>.

c) Generational accounting

Generational accounting exercises such as those contained in Auerbach, Kotlikoff and Leibfritz (1999) also calculate the required fiscal adjustment in order to comply with the government's intertemporal budget constraint but add an intergenerational perspective.

The key principle of those studies is that they focus on the intertemporal fiscal burden for different generations. More specifically, for each presently-living generation and taking into account current policies the present value of total remaining net payments to the government (taxes minus transfers) is calculated. Then, given the government's intertemporal budget constraint, the average fiscal burden for unborn generations can be derived by subtracting the sum of all these generational burdens of present generations from the government's net debt and the present value of the flow of planned government consumption and investment (or all expenditure items which have not been allocated to different generations).

Fiscal sustainability or the generational balance is then assessed on the basis of the difference between the generational burden of the unborn generation and that of the youngest presently-living generation. If this difference is positive, then the policy is considered to be unsustainable and a fiscal adjustment is required. In this classical generational accounting set-up the focus is on

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<sup>4</sup> As indicated in the previous section, the intertemporal budget constraint expressed in nominal values rather than ratios to GDP even implies convergence to a zero debt ratio.

<sup>5</sup> Typically, the S1 and S2 indicators are only used to put Member States into different groups according to their 'sustainability risks'.

calculating the generational imbalance and it is assumed that the adjustment effort equally affects the generational burden of all future generations (corrected for productivity growth) but leaves the fiscal burden of presently-living generations unchanged; a change in the tax or transfer rules is considered to only apply to future generations. Balassone and Franco (2000) argue that this feature produces an upward bias in the measurement of the adjustment effort. However, the results of generational accounting studies can also be translated into other indicators such as the permanent increase in the average tax ratio or the permanent decrease in the average pension that would be necessary to equalise the generational burden of the youngest living generation and that of the future generations.

The main value added of generational accounting studies compared to the long-term projections and the synthetic indicators discussed above is that they do not only signal sustainability problems but also clearly show their potential implications in terms of intergenerational fairness. They can be used to assess the impact of alternative policy responses on the welfare of different generations. However, full-fledged generational accounting exercises tend to be very data-intensive and require an even more important number of assumptions than the synthetic indicators. Hence, their results should be interpreted with caution.

### **3. FISCAL SUSTAINABILITY IN THE EURO AREA**

#### **3.1 Most recent AWG estimates of the ageing costs**

In February 2006 a new report prepared by the Economic Policy Committee and the European Commission concerning the budgetary impact of ageing was published (European Commission, 2006). This report is an update of earlier, albeit slightly less comprehensive studies in 2001 and 2003.

The demographic projections used in the 2006 AWG report were prepared by Eurostat and indicate that, all in all, the total population in the present euro area countries would remain virtually constant in the 2004-2050 period. Population decreases in some countries such as Italy, Germany and Portugal are projected to be roughly offset by increases in other countries such as France, Ireland, the Netherlands and Belgium. However, the structure of the population is set to change dramatically in nearly all euro area countries: the working-age population would decline by some 16 p.c. on average (with increases projected for Ireland and Luxembourg only) whereas the elderly population would increase by some 75 p.c. by 2050.

With respect to the macroeconomic parameters used in the projections for the euro area, participation rates are projected to increase by 6 percentage points on average while unemployment rates would drop by 2.5 percentage points by 2050. This would to a large extent cushion the dramatic fall in the working-age population. The number of people employed in the present euro area countries would still grow until 2025 - by an average of 0.4 p.c. a year - but

decline thereafter; the whole 2004-2050 period would see a decrease of more than 6 million persons, i.e. much less than the decline of around 30 million in the working-age population. This is due to limited increases projected for some countries such as France, Ireland and the Netherlands being more than offset by larger reductions in other countries such as Germany, Italy, Portugal, Spain and Greece. Labour productivity growth in the euro area was estimated to work out at 1.1 p.c. of GDP in the 2004-2010 period but to increase to 1.8 p.c. in the 2010-2030 period and decline marginally to 1.7 p.c. in the following two decades. Taking into account the projections for employment and labour productivity, potential activity growth would average 2.1 p.c. in the 2004-2010 period and slow down to 1.7 p.c. in the 2010-2030 period and 1.2 p.c. in the 2030-2050 period.

**Table 1 - Timing and size of ageing-related budgetary pressures**  
(increase in age-related public expenditures during ascending phase, percentages of GDP)

	Period	Increase	p.m. increase 2005-2050
<b>country</b>			
Portugal <sup>1</sup>	2005-2050	9.4	9.4
Spain	2015-2045	9.1	8.6
Luxembourg	2010-2045	8.7	8.3
Ireland	2005-2050	8.1	8.1
Belgium	2010-2045	6.7	6.4
Netherlands	2005-2040	5.7	5.3
Finland	2005-2035	5.6	5.4
Germany	2015-2050	4.2	3.0
France <sup>1</sup>	2005-2045	3.1	3.0
Italy	2015-2040	3.1	1.8
Austria	2015-2035	2.5	0.4
Greece <sup>1,2</sup>	2020-2050	1.5	1.3
euro area	2010-2050	4.4	3.9
<b>p.m. other EU countries</b>			
Cyprus <sup>1</sup>	2005-2050	11.8	11.8
Slovenia	2010-2050	9.8	9.6
Czech Republic	2015-2050	7.8	7.1
Hungary <sup>1</sup>	2005-2050	6.8	6.8
Denmark	2005-2040	5.3	4.8
United Kingdom	2010-2050	4.2	4.0
Slovakia	2015-2050	4.2	2.6
Sweden	2010-2040	3.7	2.6
Lithuania	2015-2050	2.6	1.4
Malta	2005-2025	2.3	0.3
Latvia	2015-2035	2.1	-0.7
Estonia <sup>1</sup>	2045-2050	0.1	-3.1
Poland	none	none	-6.4

<sup>1</sup> Excluding long-term care.

<sup>2</sup> Excluding pensions.

Source: European Commission (2006).

Against this background, the report presents the projected increases in five different expenditure categories sensitive to population ageing: pensions, health care, unemployment benefits, long-term care and education expenditure<sup>6</sup>. In the euro area as a whole spending for these five items would increase by 3.9 p.c. of GDP in the 2005-2050 period<sup>7</sup>. The outlays for pensions, health care and, to a lesser extent, long-term care would rise while both education and unemployment expenditure would drop.

However, the timing and the size of these ageing-related cost pressures differ significantly across euro area countries. In Portugal, Ireland, Finland, the Netherlands and France ageing would already push up expenditure in the 2005-2010 period while spending pressures would only start to materialise in the 2010-2015 period in Luxembourg and Belgium and in the 2015-2020 period in Spain, Germany, Italy and Austria. Expenditure would also reach its peak earlier in countries like Austria and Finland than in other countries where ageing costs would continue to increase during the last-five year period considered in the 2006 AWG report, i.e. from 2045 to 2050. The total impact of ageing over the whole 2005-2050 period varies from a mere 0.4 p.c. of GDP in Austria to more than 8 p.c. of GDP in Portugal, Spain, Luxembourg and Ireland. In the non-participating Member States the change in ageing-related expenditure in the 2005-2050 period varies from minus 6.4 p.c. of GDP in Poland to close to 12 p.c. of GDP in Cyprus.

It should be pointed out that the quantification of these ageing-related cost pressures depends upon a wide range of demographic, macroeconomic and policy assumptions. Hence, they come with a significant degree of uncertainty. In addition, the projections for different countries might not be fully harmonised: national institutions were responsible for carrying out pension projections and, apart from using their own models, took into account country-specific policy assumptions. With respect to the indexation of individual pension entitlements, for instance, projections are still based upon different rules ranging from mere price indexation to indexation to gross or net wages. While these assumptions may reflect current policies, it is unclear, however, to what extent those differences between pension systems in individual countries can be maintained over a long period, especially since the least generous systems might come under pressure due to the increasing weight of the elderly in the voting population<sup>8</sup>. Finally, one should bear in mind that the AWG only considers the impact of ageing on public expenditure ignoring possible effects on government revenue (e.g. rising tax receipts from levies on second- and third-pillar pensions).

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<sup>6</sup> However, for Greece no projections on pensions and long-term care are included. As, for most countries, pensions are the most important component of the total ageing costs, Greece will not be considered in the empirical part of this paper. Projections on long-term care expenditure are also not included for Portugal and France but the projected increases for this spending category tend to be less important such that the total ageing costs for these countries is likely to be biased to a smaller extent.

<sup>7</sup> For health care, in particular, different scenarios are considered. As in the 2006 AWG Report itself, the projections of the so-called AWG reference scenario are used here for aggregation with other components of the ageing costs.

<sup>8</sup> As shown for Belgium by the Conseil Supérieur des Finances (2005) and Langenus and Eugène (2005), a change in the assumption concerning the indexation rule of individual pension entitlements can have a substantial impact on the estimate of the ageing costs.

### 3.2 Debt dynamics

In order to assess the sustainability of public finances in the euro area countries it is worthwhile to analyse the impact of the aforementioned ageing costs on public debt. For this purpose, a technical exercise is carried out taking into account the European Commission's Autumn 2005 projections until 2007 and the macroeconomic framework used in the 2006 AWG report for the 2008-2050 period. The implicit interest rate on public debt is assumed to remain unchanged and deficit-debt adjustments to be zero after 2007. From 2008 onwards, the primary balance ratio is only affected by the evolution of the ageing-related components as projected by the AWG; the other primary balance components are assumed to remain constant relative to GDP. Due to the aforementioned different timing of the ageing costs, this implies that the primary balance worsens from 2008 onwards in France, Ireland, the Netherlands and Finland<sup>9</sup> while it first remains constant or even improves in the countries of the 'late ageing group'.

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**Table 2 - Impact of ageing on debt dynamics<sup>1</sup>**  
(percentages of GDP)

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	2050 budget balance	2050 government debt
Belgium	-8.5	127.7 and rising
Germany	-10.4	172.9 and rising
Spain	-14.3	175.4 and rising
France	-12.1	205.6 and rising
Ireland	-12.3	139.5 and rising
Italy	-11.7	228.1 and rising
Luxembourg	-15.1	208.0 and rising
Netherlands	-11.9	182.3 and rising
Austria	-1.5	49.8 and falling
Portugal	-30.0	433.9 and rising
Finland	-3.6	47.7 and rising

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<sup>1</sup> Budgetary developments taking into account the Autumn 2005 EC projections up to 2007 and assuming that the primary balance ratio only changes due to the ageing costs afterwards.

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Sources: European Commission (2005a and 2006), own calculations.

All in all, this exercise shows that only in Austria fiscal sustainability is not immediately jeopardised by population ageing. However, in Austria the 2050 deficit of 1.5 p.c. of GDP could be 'unsustainable' for other reasons than a rising debt ratio as it does not comply with the Stability and Growth Pact's current rules regarding the country-specific medium-term benchmarks for fiscal policy (the range of which is restricted by a deficit ceiling of 1 p.c. of GDP). In Finland, the 2050 deficit would exceed both the debt-stabilising level and the 3 p.c. of GDP reference value but public debt

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<sup>9</sup> In Portugal ageing costs increase from 2004 to 2005 but remain constant in the 2005-2010 period.

would still remain below the Maastricht reference value of 60 p.c. of GDP. All other countries would post double-digit deficits (with the exception of Belgium) and triple-digit and exploding debt ratios in 2050.

### **3.3 Alternative approach to sustainability gaps: RPB3 and RPB4**

From the above analysis of the impact of ageing on debt dynamics it is clear that for nearly all euro area countries doing nothing is not an option. However, as suggested by the differences in the level of the projected 2050 debt ratios, the fiscal adjustment required to avoid an explosion of the debt ratio may differ across countries. As indicated in section 2, the European Commission traditionally uses the S1 and S2 (or RPB) indicators to measure this required adjustment. In view of the fact that especially S1 but to a lesser extent also S2 (and RPB) can only be considered as rough indicators of the sustainability gap, two alternative approaches are proposed in this paper based upon the indicators used by Delbecque and Bogaert (1994) and Langenus and Eugène (2005).

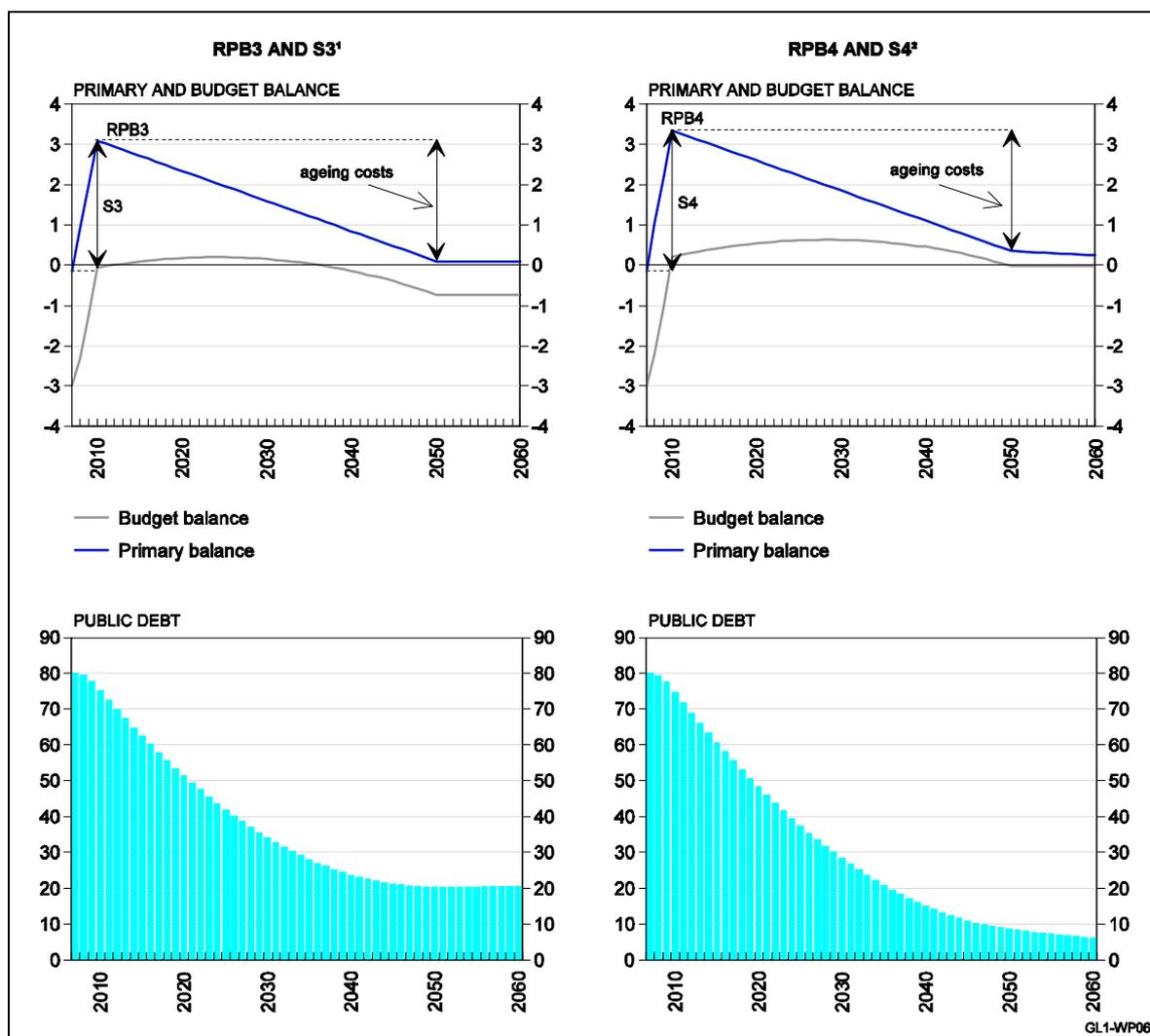
The first alternative approach tries to gauge sustainability in the most literal interpretation and considers the fiscal effort needed to reach a debt-stabilising budget balance at the end of the projection horizon, i.e. 2050 in the 2006 AWG report. This alternative indicator, say RPB3 (or S3), is operationally defined as the minimum primary balance (or the improvement in the primary balance) that is required in (by) the year that ageing costs start to materialise in order for the subsequent worsening of the budget balance due to the ageing costs not to lead to a budget balance that, if it remains constant after 2050, would increase the debt ratio. Put differently, it gauges the fiscal effort required up front in order to 'absorb' ageing costs without jeopardising fiscal sustainability.

The second alternative approach tries to capture the adjustment needed for a full pre-emptive financing or pre-funding of the estimated ageing costs. This indicator, say RPB4 (or S4) is operationally defined as the primary balance (or the improvement in this balance) required in the year that ageing-related spending starts to increase in order to allow the primary balance to worsen due to ageing costs afterwards and still generate a balanced budget in 2050.

Both alternative sustainability indicators, RPB3 (S3) and RPB4 (S4), are graphically illustrated in chart 1 that considers a country with an initial public debt ratio of 80 p.c. and an ageing-related expenditure shock of 3 p.c. of GDP. In both cases the worsening in the primary balance between 2010, considered here as the year in which ageing-related expenditure starts to rise, and 2050, is exactly equal to the ageing costs. The RPB3 target for 2010 in addition generates a stable debt ratio in 2050 while the RPB4 target leads to a balanced budget in 2050. S3 differs from the traditional S1 in that it, by definition, avoids the risk of unfavourable debt dynamics at the end of the period considered. S4 differs from both sustainability indicators used by the European Commission as it explicitly targets a pre-funding of ageing costs and, hence, restricts the budget balance at the end of the period rather than public debt.

## Chart 1 - Alternative sustainability indicators: a graphic illustration

(percentages of GDP)



<sup>1</sup> Pre-ageing primary balance (RPB3) or increase in the primary balance (S3) required to generate a debt-stabilising budget balance in 2050 taking into account the budgetary impact of ageing up to 2050.

<sup>2</sup> Pre-ageing primary balance (RPB4) or increase in the primary balance (S4) required to generate a balanced budget in 2050 taking into account the budgetary impact of ageing up to 2050.

Source: own calculations.

These alternative sustainability indicators can be calculated for the euro area countries taking into account the macroeconomic framework used in the previous section, i.e. the framework described in the 2006 AWG report and additional assumptions on the implicit interest on government debt and the deficit-debt adjustments<sup>10</sup>. However, data on ageing costs are only reported by the European

<sup>10</sup> The calculations of RPB3 and S3 are also based upon the technical assumption that, for all countries considered here, productivity growth will continue to work out at 1.7 p.c. after 2050 (as assumed for the 2030-2050 period in the 2006 AWG report) while employment would stay at its 2050 level and inflation would remain 2 p.c. in the post-2050 period.

Commission (2006) for five-year intervals. Hence, the first year of the five-year period in which ageing-related expenditure starts to rise was chosen as the target year for the calculation of the alternative sustainability indicators. In addition, as indicated before, for some euro area countries ageing-related costs are already rising. For those countries 2010 was selected as the 'pre-ageing' target year. Finally, for all countries the Autumn 2005 fiscal projections of the European Commission were taken as given and fiscal adjustment towards the pre-ageing target year was modelled in a linear way from 2008 onwards.

**Table 3 - RPB3 and S3 indicators<sup>1</sup> for euro area countries**  
(percentages of GDP)

	RPB3	by	2007 primary surplus	S3	change in ageing- related expenditure <sup>2</sup>	required fiscal effort <sup>3</sup>		2050 debt
						total	per year	
	(1)		(2)	(3)=(1)-(2)	(4)	(5)=(3)+(4)		
Belgium	6.4	2010	3.4	3.0	-0.1	2.9	1.0	-22.3
Germany	4.2	2015	-0.4	4.6	-1.1	3.5	0.4	3.6
Spain	8.2	2015	1.2	7.0	-0.3	6.7	0.8	-162.1
France	3.0	2010	-0.7	3.8	0.1	3.8	1.3	22.0
Italy	3.2	2015	0.3	2.9	-0.4	2.5	0.3	93.7
Ireland	7.4	2010	0.9	6.5	0.1	6.6	2.2	-138.4
Luxembourg	9.6	2010	-2.0	11.5	-0.1	11.5	3.8	-94.0
Netherlands	5.1	2010	1.0	4.1	0.1	4.1	1.4	-15.3
Austria	1.8	2015	1.4	0.4	-0.6	-0.2	0.0	62.9
Portugal	8.2	2010	-1.6	9.8	0.0	9.8	3.3	-129.5
Finland	4.9	2010	3.6	1.3	0.2	1.5	0.5	-27.0

<sup>1</sup> Pre-ageing primary balance (RPB3) or increase in the primary balance (S3) required to generate a debt-stabilising budget balance in 2050 taking into account the budgetary impact of ageing up to 2050.

<sup>2</sup> Estimated by linear interpolation of the 2005 and 2010 levels of ageing-related expenditure.

<sup>3</sup> Required increase in revenue or reduction in non-ageing-related primary expenditure.

Sources: European Commission (2005a and 2006), own calculations.

The calculations for RPB3 reveal that, after 2007, all euro area countries considered have to improve their primary balance before ageing-related spending starts to increase in order to avoid the need to take additional consolidation measures afterwards to bring the public debt ratio on a sustainable path. However, the required adjustment, as measured by S3, differs substantially across countries, from a mere 0.4 p.c. of GDP in Austria to close to 10 p.c. of GDP or more in Portugal and Luxembourg. Taking into account the estimated evolution of ageing-related spending - rising for the 'early ageing' group consisting of France, Ireland, the Netherlands and Finland;

constant for Portugal; and falling for the other countries - the required change in non-ageing-related budgetary items is actually negative for Austria while the required increase in revenue or reduction in non-ageing expenditure in other countries ranges from 1.5 p.c. of GDP in Finland to 11.5 p.c. of GDP in Luxembourg. In view of the different timing of ageing-related cost pressures, Germany, Spain and Italy can spread out the adjustment effort over a longer period than other countries and would have to tighten the non-ageing part of the budget by some 0.3 p.c. of GDP (Germany and Italy) to 0.8 p.c. of GDP (Spain) per year until 2015. Apart from Finland, the required yearly adjustment is (much) higher for countries where ageing-costs start to rise earlier: from some 1 to 1.5 p.c. of GDP in Belgium, France and the Netherlands to close to or more than 3.5 p.c. of GDP in Portugal and Luxembourg.

In order to assess the appropriateness of actually implementing the fiscal policy suggested by the RPB3 indicator, it is helpful to look at the (steady-state) debt ratios that it generates in 2050. Only for France and Germany these are in the  $[0;0.6]$  interval although Austria would only marginally exceed the 60 p.c. of GDP limit. Italy would end up with a steady-state debt ratio of some 94 p.c. of GDP (and a matching 'excessive' deficit of 3.4 p.c. of GDP). Hence, this strategy might be unsustainable as it leads to a persistent violation of EU fiscal rules. Adjusting the budget in line with the S3 indicator would lead to (in some cases large) net assets in the other countries which suggests that it could be too ambitious.

The results for RPB4 are somewhat similar to the ones for RPB3. Austria is obviously again the country with the smallest required fiscal effort (although the latter remains slightly positive even taking into account the projected decline of ageing-related expenditure up to 2015 in Austria). Luxembourg and Portugal face the most important fiscal challenge. Compared to the S3 indicator, S4 is much higher in Austria and Italy (reflecting the fact that S3 generates high steady-state debt ratios for those countries), roughly the same in France and Germany and lower for all other countries. All in all, implementation properties are better than for S3. Debt ratios in 2050 are below 60 p.c. of GDP for all countries. Seven countries would still end up with net financial assets in 2050 but the level of those assets would be much lower than if S3 adjustment were to be implemented and asset and debt ratios would further converge to zero if the balanced budget is maintained in the post-2050 period.

**Table 4 - RPB4 and S4 indicators<sup>1</sup> for euro area countries**  
(percentages of GDP)

	RPB4	by	2007 primary surplus	S4	change in ageing- related expenditure <sup>2</sup>	required fiscal effort <sup>3</sup>		2050 debt
	(1)		(2)	(3)=(1)-(2)	(4)	total	per year	
						(5)=(3)+(4)		
Belgium	6.2	2010	3.4	2.8	-0.1	2.7	0.9	-9.3
Germany	4.3	2015	-0.4	4.7	-1.1	3.6	0.4	1.5
Spain	6.3	2015	1.2	5.1	-0.3	4.8	0.6	-64.1
France	3.3	2010	-0.7	4.0	0.1	4.1	1.4	9.1
Italy	4.2	2015	0.3	3.9	-0.4	3.5	0.4	39.3
Ireland	5.5	2010	0.9	4.6	0.1	4.7	1.6	-58.3
Luxembourg	7.5	2010	-2.0	9.5	-0.1	9.4	3.1	-38.6
Netherlands	4.9	2010	1.0	3.9	0.1	4.0	1.3	-6.6
Austria	2.5	2015	1.4	1.1	-0.6	0.5	0.1	26.7
Portugal	6.9	2010	-1.6	8.5	0.0	8.5	2.8	-53.8
Finland	4.5	2010	3.6	0.9	0.2	1.2	0.4	-11.1

<sup>1</sup> Pre-ageing primary balance (RPB4) or increase in the primary balance (S4) required to generate a balanced budget in 2050 taking into account the budgetary impact of ageing up to 2050.

<sup>2</sup> Estimated by linear interpolation of the 2005 and 2010 levels of ageing-related expenditure.

<sup>3</sup> Required increase in revenue or reduction in non-ageing-related primary expenditure.

Sources: European Commission (2005a and 2006), own calculations.

It could be argued that the requirement of a balanced budget in 2050 is too strict as, for countries with a low public debt and high potential growth, the reformed Stability and Growth Pact allows structural deficits up to 1 p.c. of GDP as medium-term objectives. Hence, a variant of the aforementioned RPB4 and S4 indicators, say RPB4<sup>MTO</sup> and S4<sup>MTO</sup>, could consider the requirement of posting the medium-term objective rather than a balanced budget in 2050.

Member States should define these medium-term objectives themselves in their stability (or convergence) programmes while the Council may invite them to adjust their programmes if it considers that the medium-term objective should be strengthened. However, Member States may present more ambitious medium-term objectives than implied by the aforementioned criteria related to public debt and potential growth if they feel their circumstances call for it. At the time of writing it was not fully clear what the minimum requirements were for the medium-term objective of each Member States.

**Table 5 - RPB4<sup>MTO</sup> and S4<sup>MTO</sup> indicators<sup>1</sup> for euro area countries**  
(percentages of GDP)

	RPB4 <sup>MTO</sup>	by	2007 primary surplus	S4 <sup>MTO</sup>	change in ageing- related expenditure <sup>2</sup>	required fiscal effort <sup>3</sup>		2050 debt
	(1)		(2)	(3)=(1)-(2)	(4)	total	per year	
						(5)=(3)+(4)		
Belgium	5.9	2010	3.4	2.5	-0.1	2.4	0.8	7.3
Germany	3.9	2015	-0.4	4.3	-1.1	3.2	0.4	17.9
Spain	6.0	2015	1.2	4.8	-0.3	4.5	0.6	-47.3
France	3.0	2010	-0.7	3.8	0.1	3.8	1.3	25.4
Italy	3.9	2015	0.3	3.6	-0.4	3.2	0.4	55.5
Ireland	5.1	2010	0.9	4.2	0.1	4.3	1.4	-42.2
Luxembourg	6.8	2010	-2.0	8.8	-0.1	8.7	2.9	-22.3
Netherlands	4.6	2010	1.0	3.6	0.1	3.7	1.2	9.1
Austria	2.2	2015	1.4	0.8	-0.6	0.2	0.0	42.7
Portugal	6.6	2010	-1.6	8.2	0.0	8.2	2.7	-37.6
Finland	4.2	2010	3.6	0.6	0.2	0.9	0.3	5.3

<sup>1</sup> Pre-ageing primary balance (RPB4<sup>MTO</sup>) or increase in the primary balance (S4<sup>MTO</sup>) required to generate a 1 p.c. of GDP deficit in 2050 taking into account the budgetary impact of ageing up to 2050.

<sup>2</sup> Estimated by linear interpolation of the 2005 and 2010 levels of ageing-related expenditure.

<sup>3</sup> Required increase in revenue or reduction in non-ageing-related primary expenditure.

Sources: European Commission (2005a and 2006), own calculations.

For illustrative purposes, RPB4<sup>MTO</sup> and S4<sup>MTO</sup> indicators were calculated taking into account the lowest possible medium-term objective, i.e. a deficit of 1 p.c. of GDP, for all countries. Despite the weaker 2050 objective, consolidation requirements remain substantial for some countries (especially Luxembourg and Portugal) while four countries would still end up with - relatively - important net assets in 2050 although the latter would be declining if the budget balance remains constant in the post-2050 period.

#### **4. POLICY IMPLICATIONS: AN APPLICATION TO BELGIUM, SPAIN AND ITALY**

The above calculations suggest that in all euro area countries, except Austria, current fiscal policies are not sustainable. Hence, an - in most cases - important fiscal adjustment will be required in the following years. However, the timing of this effort needn't be the same for all countries as ageing-related cost pressures materialise earlier in some countries than in others. In addition, as shown by the calculations presented in the previous section, restoring fiscal sustainability before ageing costs start to rise - i.e. pre-emptively financing the budgetary costs caused by ageing - will require

substantial consolidation efforts and lead to the creation of a relatively important net asset position in certain countries. This raises the question whether such a 'pre-funding' policy is actually appropriate or whether it wouldn't be preferable to only take consolidation measures if and when spending pressures actually materialise. In addition, it is widely recognised that pre-funding through increased fiscal consolidation is only one aspect of a multi-pronged strategy to deal with population ageing that should also include efforts geared towards increasing the employment rate and productivity and directly curbing unsustainable expenditure trends in pension and health care systems.

The extent to which long-term cost pressures, such as those related to ageing, should be reflected already in medium-term budgetary objectives, i.e. the extent of pre-funding of estimated ageing costs, is the subject of debate. The Code of Conduct for the reformed Stability and Growth Pact (Ecofin Council, 2005b) explicitly indicates that increasing implicit liabilities due to ageing should not yet be taken into account when setting the new medium-term objectives for fiscal policy until 'criteria and modalities' (for doing so) 'are appropriately established'. In March 2005 the Council has invited the European Commission to report on progress achieved towards the methodology for completing the analysis by incorporating such liabilities (ECOFIN Council, 2005a). In this context, Coeuré and Pisani-Ferry (2005) propose country-specific deficit targets that are based upon objectives for the net value of the government taking into account long-term budgetary projections but apply a 50 p.c. 'haircut' to the estimated ageing costs. However, no specific reasons are given for the size of the extra discount on ageing costs.

A key issue in this connection is the fact that different extents of pre-funding obviously imply different burdens for different generations. This is important as policies might be assessed as inappropriate if they lead to an inequitable burden sharing between generations. Hence, this section will shift the focus to 'fairness' considerations and try to gauge whether a more gradual financing of the ageing costs is not more equitable than full pre-funding.

For this purpose, the method suggested by Langenus and Eugène (2005) is applied here to three different countries. The analysis is based upon a stylised technical exercise comparing the implications of different budgetary strategies for the evolution of the monetary contribution to the government's primary balance of the average worker over time. Workers typically contribute more to the primary balance in a given year than non-workers, e.g. because they pay more taxes and receive less transfers from the government (no unemployment benefits or pensions and less health care).

In order to calculate the contribution of an average worker to the government's primary balance for a given base year a number of extremely simplifying assumptions were used. First, pensions, expenditure for long-term care and unemployment benefits were entirely allocated to the group of non-workers. Second, health care spending and current taxes on income and wealth are distributed

between workers and non-workers using the ratio between the per capita contribution of a worker and that of a non-worker found by Langenus and Eugène (2005) for Belgium.<sup>11</sup> Third, all social contributions are allocated to workers. Finally, all other budgetary items - such as consumption taxes, government investment and government consumption excluding health care - are distributed proportionally between workers and non-workers. It should be stressed that this only gives a very rough approximation of the actual contribution of an average worker and the figure resulting from this exercise only serves as a point of comparison for the changes in this level projected for later years.

The latter are determined on the basis of the following assumptions. First, as workers are thought not to benefit directly from government expenditure for pensions, long-term care and unemployment benefits, the changes projected in the 2006 AWG report for these budgetary items are allocated to the group of non-workers. Second, health care consumption for the average worker is assumed to grow in line with GDP and the remaining increase in health care spending projected by the AWG is allocated to non-workers. Third, both workers and non-workers are assumed to benefit proportionally from government spending on education<sup>12</sup>, for which the 2006 AWG report projects a decline for all euro area countries in the 2005-2050 period, and other primary expenditure which is assumed to remain constant relative to GDP. Fourth, the contribution of an average non-worker to government revenue is assumed to grow in line with GDP<sup>13</sup>. Finally, the contribution of an average worker to the government's primary balance is adjusted in order to meet the primary balance targets implied by the budgetary strategy considered.

This is a necessarily simplifying framework. It is based upon a very rough allocation of budgetary items to workers and non-workers and disregards, for instance, the fact that workers might be hurt more than proportionally by the likely decline in family allowances (following the substantial reduction in the number of young people projected in the 2006 AWG report). More importantly, it assumes that budgetary means to finance ageing costs can only be extracted from workers and excludes the possibility, for instance, that the required budgetary adjustment may imply a larger contribution from non-workers (in particular the retired older generations), e.g. through an increase in taxes such as VAT and excise duties or a reduction in expenditure such as public investment to

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<sup>11</sup> An average worker is assumed to pay about 10.25 times more current taxes on income and wealth than an average non-worker while workers would on average consume some 55 p.c. less government-paid health care services than non-workers.

<sup>12</sup> For this assumption, in particular, other options could have been chosen. Rather than assuming that society as a whole - including pensioners - ultimately reap the benefits of better education, one could also argue that only parents with children in school benefit from education. Hence, a more than proportionate share of this expenditure should be allocated to workers as they are more likely to have children in school. However, the exact assumptions on the distribution of education expenditure do not have a significant impact on the comparison of different budgetary strategies on the basis of the required contributions from workers to government's primary balance.

<sup>13</sup> Note that this assumption could imply bigger outlays for pensioners relative to their income, especially if individual pension entitlements are not fully adjusted to wages.

which they contribute in a proportional way<sup>14</sup>. Finally, this technical exercise disregards any impact of changing tax levels on activity growth.

The time horizon over which the evolution of the contribution of an average worker to the government's primary balance will be assessed, is the 2005-2100 period. For the years up to 2050, the macroeconomic parameters are those assumed in the 2006 AWG report and briefly discussed in the previous section. Beyond the 2050 horizon, both the size and the composition of the populations are assumed to remain constant - with employment rates also staying at their 2050 level - while labour productivity and, hence, real GDP, would grow by 1.7 p.c. for all countries as is the case for labour productivity in the 2030-2050 period as projected in the 2006 AWG report. As in the previous section, the Autumn 2005 projections of the European Commission will be used for the years 2006 and 2007 and the implicit interest rate on government debt is assumed to remain constant and deficit-debt adjustments to be zero after 2007 while yearly inflation would work out at 2 p.c. throughout the 2008-2100 period.

In the remainder of this section different budgetary strategies will be compared on the basis of the time profile that they generate for the contribution to the primary balance of an average worker. This approach differs from a fully-fledged general accounting exercise as contributions to the government's primary balance are measured and compared for individual years rather than over the total lifetime of subsequent and unborn generations<sup>15</sup>. Notwithstanding the partial nature of this analysis, it may shed some light on the intergenerational fairness of different budgetary strategies. Intergenerational fairness is defined here as a situation in which successive generations of workers contribute roughly the same amount, corrected for nominal wage growth such that this concept can be thought of as a contribution out of a constant wage, to the government's primary balance<sup>16</sup>.

The analysis is performed for three different countries: Belgium - with a high but falling public debt, a roughly balanced budget and important ageing costs; Italy - with a high public debt, a high deficit but less important and later ageing-related cost pressures; and Spain - with a low public debt, a roughly balanced budget but important ageing costs. For each country, the full pre-funding strategy in line with the S4 indicator introduced in the previous section is compared with alternative budgetary strategies. In order to make the budgetary strategies considered as comparable as possible, all of them are calibrated to generate zero public debt at the end of the period.

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<sup>14</sup> However, making the retired or older generations pay for ageing-related cost pressures would obviously be tantamount to directly curbing the rise of ageing-related expenditure (e.g. by reducing individual pension entitlements).

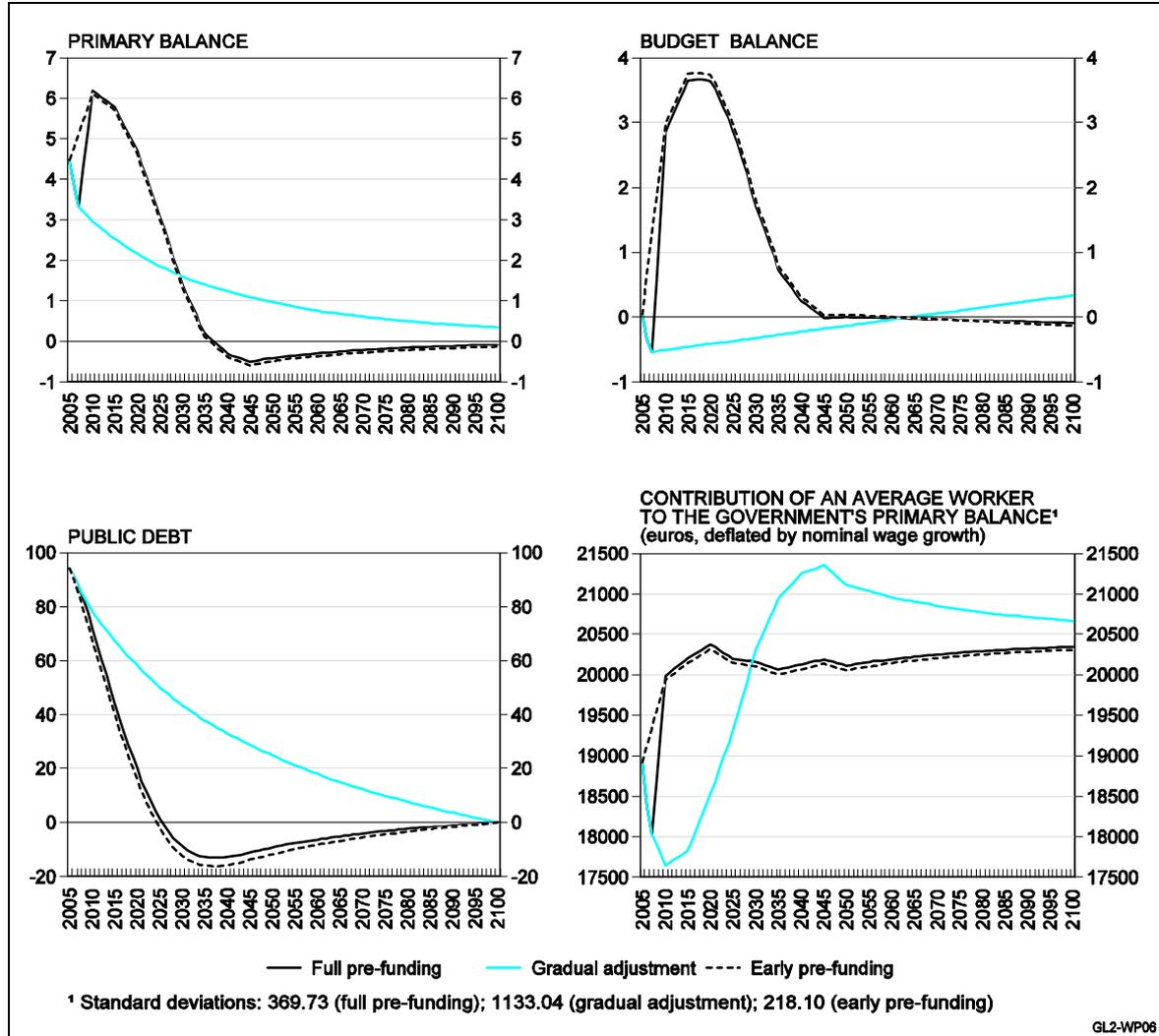
<sup>15</sup> In addition, the assumption on the financing of the required fiscal adjustment is different: while in the classical generational accounting set-up the adjustment does not affect presently-living generations, this is not the case here as generations of future workers can obviously already be born today.

<sup>16</sup> This approach is conceptually close to the one proposed by Oksanen (2003) but differs from other fairness concepts that look at after-transfer income. In the approach followed here substantial differences in the net contribution to the primary balance across working generations would be considered unfair even if the after-transfer income levels remain relatively constant.

## 4.1 Belgium

**Chart 2 - Assessment of alternative budgetary strategies: Belgium**

(percentages of GDP, unless indicated otherwise)



Sources: European Commission (2005a and 2006), own calculations.

As indicated by the RPB4 indicator, full pre-funding would require a primary surplus of slightly more than 6 p.c. of GDP by 2010 in Belgium. This surplus still significantly exceeded that level throughout the 1998-2001 period (reaching 7.1 p.c. of GDP in 2001) but has been gradually reduced since and worked out at some 4.5 p.c. of GDP in 2005. If, as projected by the European Commission (2005a), the primary surplus ratio would shed another percentage point in the 2006-2007 period, then full pre-funding would require a rather steep increase - by some 0.9 p.c. of GDP a year - in the three following years. This budgetary effort would turn the small budgetary deficit that is projected to appear in 2006 and 2007 to a surplus of some 3 p.c. of GDP by 2010 and significantly speed up the reduction in public debt.

When ageing costs start to rise from 2010 onwards, the primary balance gradually worsens to a deficit of close to 0.5 p.c. of GDP by 2050. The overall budget balance still improves to some 3.7 p.c. in the 2015-2020 period due to the continued drop in interest charges but then falls to zero by 2050 with a zero public debt by 2100 implying a slight deficit in the 2050-2100 period. Public debt would be paid off completely by 2025 and net assets, reaching a maximum of some 13 p.c. of GDP in the 2035-2040 period, would be built up afterwards.

This budgetary path implies a (further) reduction of the contribution of the average worker to the government's primary balance, corrected for nominal wage growth, in 2006 and 2007. However, this contribution then has to increase again to meet the 2010 pre-funding target. After 2010 the burden on successive generations of average workers would remain relatively constant. Overall, the maximum difference in the burden of successive working generations, expressed in contributions out of a constant 2005 wage, is less than 2,350 EUR and pertains to the 2007 and 2020 generations.

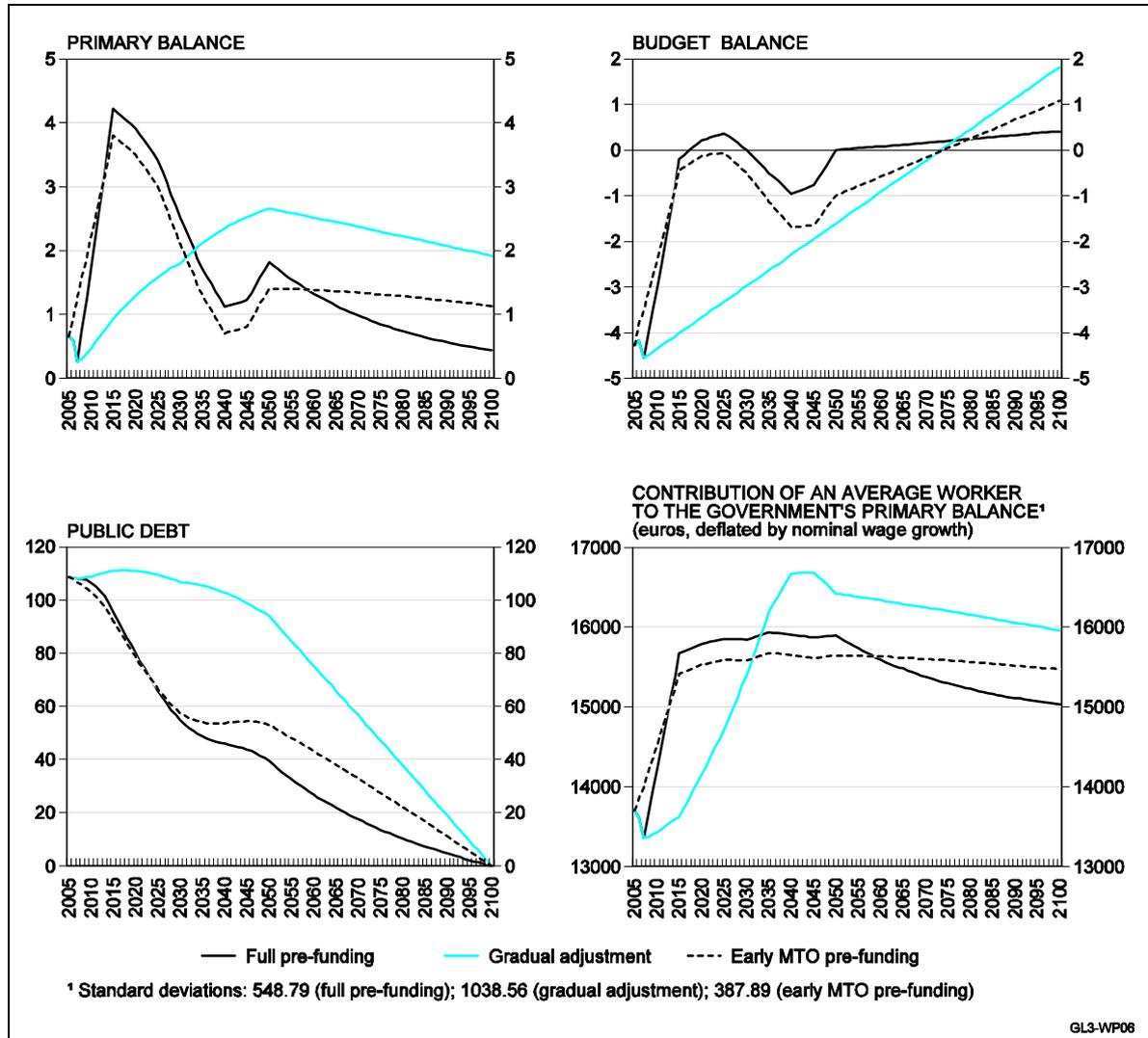
An alternative budgetary strategy could consist in a much more gradual adjustment of the budgetary balance after 2007 towards a level in 2100 that would be sufficient to pay off all debt by that year. This would allow a further gradual decline in the primary surplus to some 0.3 p.c. of GDP by 2100. More importantly, this strategy might seem more appealing than the full pre-funding option as it would produce the same debt ratio in 2100 without the relatively important fiscal adjustment in the coming years and the creation of net assets. However, the implied time profile for the average worker's contribution to the government's primary balance seems much less equitable. The contribution would decrease significantly until 2010 but would have to be increased steeply thereafter in order to finance the ageing costs. From 2030 onwards, workers would have to contribute (much) more to the primary surplus than in the full pre-funding strategy. The maximum difference in their burden measured for different years is much higher - some 3,700 EUR between the 2010 and 2045 generations - than in the latter strategy.

Finally, one might also consider a strategy, say the early pre-funding one, that starts the required adjustment towards the 2010 target in 2006 already. The primary surplus would then have to be hiked by a more limited 0.3 p.c. of GDP per annum. This would avoid the reduction in the net fiscal burden of an average worker in 2006 and 2007 that would have to be clawed back afterwards. All in all, the time profile of the burden of the average worker would be even flatter than in the full pre-funding strategy from 2008 onwards. Hence, starting the adjustment towards a sustainable fiscal position immediately - rather than delaying it by a further two years - seems to be preferable from an intergenerational fairness point of view.

## 4.2 Italy

**Chart 3 - Assessment of alternative budgetary strategies: Italy**

(percentages of GDP, unless indicated otherwise)



Sources: European Commission (2005a and 2006), own calculations.

In Italy ageing-related cost pressures are projected to materialise later and to have a much smaller budgetary impact than in Belgium. For this country, the full pre-funding strategy described by the RPB4 indicator implies a primary surplus of 4.2 p.c. of GDP by 2015. Similarly to the situation that prevailed in Belgium, the Italian primary surplus already significantly exceeded that level throughout the 1995-2000 period. However, from 2001 onwards it has dropped significantly. Taking into account the projected further fall of this surplus in the 2006-2007 period (European Commission, 2005) it would have to be increased by about 0.5 p.c. of GDP in every year from 2008 until 2015 in order to reach the 2015 pre-funding target. This would gradually reduce the deficit - which would still

exceed the 3 p.c. of GDP level until 2010 however - and lead to a government budget including interest charges that is almost balanced in 2015.

Ageing would then erode the primary surplus until 2040 but the public debt ratio would continue to decline to less than 40 p.c. in the middle of the century. In order to pay off the entire debt by 2100 a gradual improvement in the budget balance, to 0.4 p.c. of GDP in that year is required. Unlike in Belgium, public debt would not become negative in the period considered.

The contribution of an average worker to GDP would decrease in 2006 and 2007 and rise rather sharply in the 2008-2015 period. Afterwards it would remain in a narrow band before declining significantly from 2050 onwards. Over the whole period the maximum difference is between the 2007 and 2035 generations and amounts to close to 2,600 EUR out of a constant wage.

An alternative budgetary strategy consists in reimbursing public debt by 2100 in a more gradual way and implies a slow but continuous improvement in the budget balance from a deficit of 4.6 p.c. of GDP, as forecast by the European Commission (2005a) for 2007, to a surplus of 1.8 p.c. of GDP at the end of the century. The fiscal burden of an average worker would have to increase from 2008 onwards but the hike is much less steep than in the full pre-funding strategy. However, the increase lasts longer and is larger and all generations from 2034 onwards will face a larger fiscal burden than in the pre-funding strategy. The maximum difference in the burden for an average worker - working out at more than 3,300 EUR between the 2007 and the 2045 generations - significantly exceeds that in the pre-funding strategy. Hence, the more gradual strategy seems less equitable as it shifts too much of the adjustment burden to distant generations.

Finally, a third alternative strategy could explicitly target a flatter profile for the fiscal burden of the average worker than the one generated by the full pre-funding strategy. This implies avoiding the decline in the 2006-2007 period and beyond the 2050 horizon. One way to achieve this is to start the adjustment process in 2005 already and to target a 1 p.c. of GDP deficit - the limit for Member States' medium-term objectives - in 2050 rather than a balanced budget. This strategy, say the early MTO pre-funding, would imply a more gradual and less important increase in the primary surplus of some 0.3 p.c. of GDP a year from 2006 onwards to a level of 3.8 p.c. of GDP by 2015. The budget deficit would drop to just above the 3 p.c. of GDP reference value in 2008, continue to decline to close to zero in 2025 but then widen again before reaching the 1 p.c. of GDP target in 2050. After that, it has to be gradually turned into a surplus of roughly the same size by the end of the century in order for public debt to be paid off completely by that time.

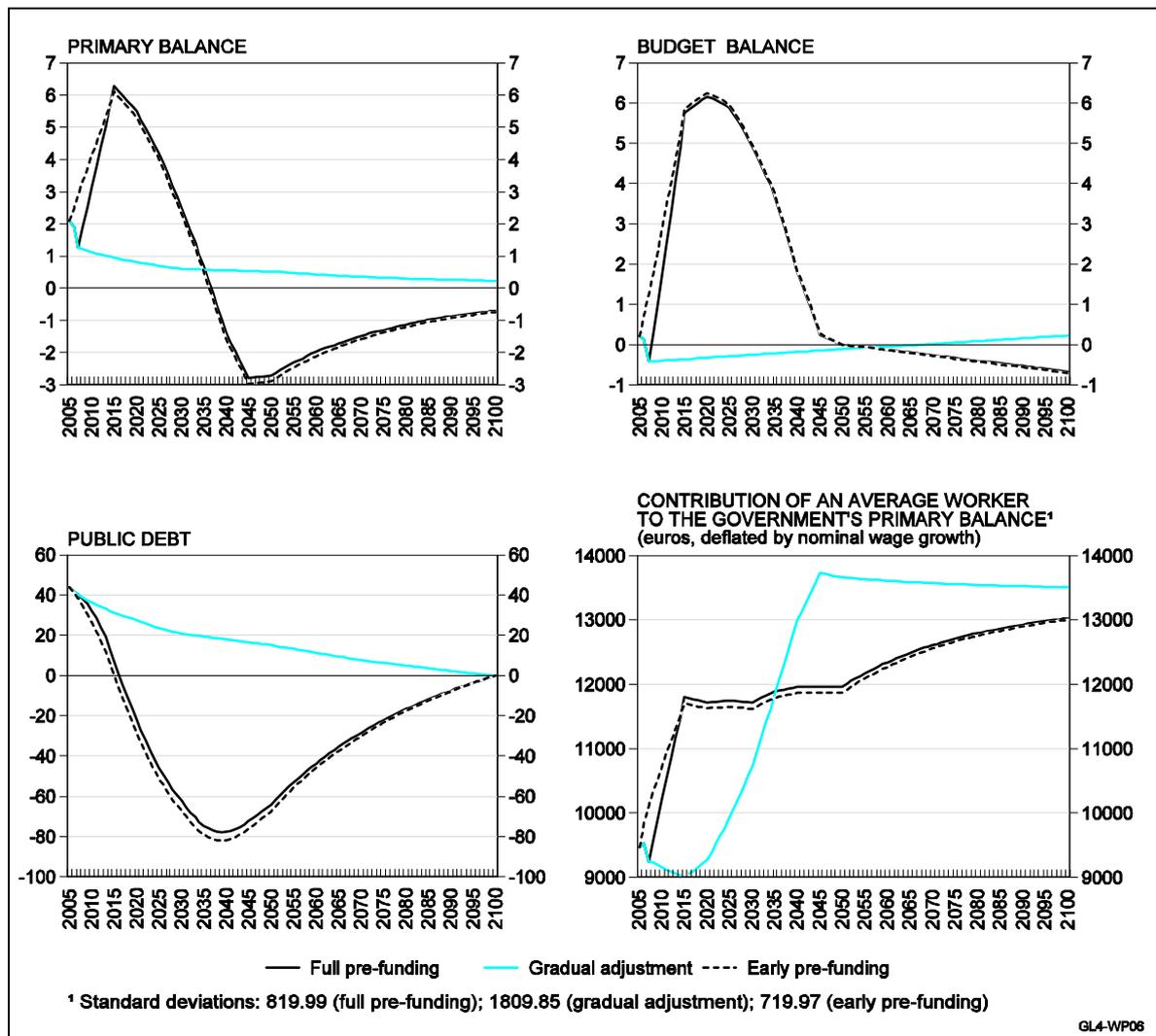
The maximum difference between the contributions of different generations of average workers to the government's primary balance is the one between the 2005 and 2035 generations, working out at less than 2,000 EUR, i.e. much less than in the two previous strategies. Hence, all in all, an

earlier but more partial pre-funding strategy could be the most equitable choice for the design of fiscal policy in Italy.

### 4.3 Spain

**Chart 4 - Assessment of alternative budgetary strategies: Spain**

(percentages of GDP, unless indicated otherwise)



Sources: European Commission (2005a and 2006), own calculations.

Together with Portugal and Luxembourg Spain is among the euro area countries that would be hit most by population ageing. As suggested by the RPB4 indicator, full pre-funding in Spain would require a primary surplus of 6.3 p.c. of GDP, a level which is unprecedented in recent Spanish fiscal history. Taking into account the significant fall in this surplus projected by the European Commission (2005) for the 2006-2007 period it would have to be increased by 0.6 p.c. of GDP in

each of the eight following years. This would create an overall budget surplus of 5.7 p.c. of GDP and bring about an accelerated debt reduction.

As of 2015 the primary surplus would decline due to the impact of ageing but the public debt ratio would continue to fall and, as of 2017, net assets would be created that would reach a maximum level of close to 78 p.c. of GDP around 2040. The latter would then be gradually reduced to zero by 2100 as the budget balance would worsen from a surplus of more than 6 p.c. of GDP around 2020 to a small deficit of some 0.7 p.c. of GDP at the end of the century.

This budgetary strategy would require a substantial hike in the contribution of the average worker to the government's primary balance in the 2008-2015 period (following a minor decrease in 2007). Afterwards the fiscal burden of the average worker would slowly drift further upwards. Over the whole period, the maximum difference works out at some 3,780 EUR out of a constant wage and pertains to the 2007 and 2100 generations.

As in Belgium and Italy, an alternative fiscal strategy could be considered that would gradually reduce the debt ratio to zero by 2100 without creating net assets in the intermediate years. This would imply a very slow continuous improvement in the budget balance from a deficit of 0.4 p.c. of GDP in 2007, as projected by the European Commission (2005a), to a small surplus of 0.2 p.c. of GDP in 2100. This strategy would allow the fiscal burden for the average worker to decline in the coming years. However, between 2015 and 2045 this burden would have to be increased substantially. After 2045 it would drop marginally. The maximum difference in the contribution of an average worker to the government's primary balance is between the 2015 and 2045 generations and works out at 4,725 EUR, i.e. significantly more than in the full pre-funding strategy. Hence, while the gradual adjustment strategy may appear more reasonable as it avoids the creation of important net government assets, it seems less equitable as a more than fair share of the burden of financing the ageing costs is shifted to future generations.

Finally, an early pre-funding strategy, similar to the one considered for Belgium, could start the adjustment to the 2015 primary surplus target already in 2006. This would allow the required fiscal effort to be spread over a longer period such that the primary surplus would have to be increased by some 0.4 p.c. of GDP a year in the 2006-2015 period. The development of the budget balance and public debt is similar to the one in the full pre-funding strategy. The fiscal burden of the average worker increases earlier but less than in the latter strategy. The maximum difference in this indicator is still 3,535 EUR, only slightly less than in the benchmark pre-funding strategy.

All in all, the adjustment effort in Spain is much higher than in Belgium and in Italy. Even full pre-funding strategies still seem to imply an inequitably large fiscal burden for distant generations. This suggests that the group of non-workers should contribute more to the financing of ageing-related cost pressures.

## 5. CONCLUDING REMARKS

Mainly due to the growing concerns about the potentially large budgetary impact of population ageing, the sustainability of public finances has become a key issue in fiscal surveillance. While a number of different theoretical specifications are proposed in the literature depending on which public debt ratio is deemed sustainable, the general intuition is that sustainable policies can in principle be continued indefinitely.

The empirical research on fiscal sustainability consists in both backward-looking and forward-looking approaches. The backward-looking studies provide valuable indications about the extent to which fiscal policy has been constrained in the past by the government's intertemporal budget constraint but regime changes can never be excluded and the assessment of the current sustainability of public finances typically requires a forward-looking approach. The latter studies aim at quantifying the budgetary impact of ageing, detecting sustainability problems by assessing deficit-debt dynamics and, in the case of the synthetic indicators and generational accounting, measuring the sustainability gaps.

For the EU Member States, the European Commission now routinely calculates the S1 and S2 sustainability indicators based upon the projected ageing costs and the requirement of a 60 p.c. of GDP debt ratio by 2050 and compliance with the government's intertemporal budget constraint respectively. In this paper two alternative sustainability indicators - S3 and S4 and the corresponding required primary balances - are proposed. They quantify the fiscal effort that would be needed in order to fully pre-fund the budgetary costs of ageing and generate a debt-stabilising budget balance or a balanced budget in 2050.

A number of conclusions can be drawn from the empirical part of the paper. First, taking into account the most recent projections of the Ageing Working Group (European Commission, 2006), public finances seem to be unsustainable in all euro area countries except for Austria<sup>17</sup>. This implies that, given the present macroeconomic and demographic outlook, fiscal adjustments will be needed to deal with population ageing. Second, as measured by the sustainability gaps calculated in this paper, the magnitude of these required adjustments varies greatly across euro area countries. They are particularly sizeable in Luxembourg and Portugal but much smaller in Finland. Third, implementing this required adjustment in the coming years before ageing-related expenditure starts to rise significantly, i.e. pre-funding the ageing costs, would lead to the reimbursement of public debt and the creation of net government financial assets in a number of countries.

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<sup>17</sup> No reasonable assessment could be made for Greece as AWG projections of pension expenditure are currently not available for that country.

This raises the question whether such a policy would actually be appropriate or to what extent medium-term objectives for fiscal policy should already take into account the estimated ageing costs, an issue which is important in the context of the reformed Stability and Growth Pact. The ECOFIN Council (2005a) has suggested that these medium-term objectives should not only depend on government debt and potential growth but also on the size of the implicit liabilities related to ageing.

In this paper it is stressed that different budgetary strategies, i.e. different degrees of pre-funding, have different implications for the fiscal burden of subsequent generations of workers. This is illustrated for Belgium, Italy and Spain. This analysis shows that, while full pre-funding may require a relatively important fiscal effort in the coming years, it generally implies a more even distribution of the fiscal burden across generations than a more gradual adjustment strategy. More specifically, gradualism comes at a cost: postponing the required adjustment only increases the fiscal burden for future generations. Against this background, some pre-funding of ageing costs seems appropriate and for some governments this might imply targeting budgetary surpluses rather than balanced budgets or small deficits in the medium term.

## **List of references**

- Afonso, Antonio, 'Fiscal policy sustainability: some unpleasant European evidence', ISEG Working Papers, Department of Economics, Technical University of Lisbon, WP 2000/12, August 2000.
- Auerbach, Alan J., Laurence J. Kotlikoff and Willi Leibfritz, 'Generational accounting around the world', NBER, 1999.
- Balassone, Fabrizio and Daniele Franco, 'Assessing fiscal sustainability: a review of methods with a view to EMU' in Banca d'Italia, 'Fiscal sustainability', essays presented at the Bank of Italy workshop held in Perugia, 20-22 January 2000.
- Blanchard, O., J.C. Chouraqui, R.P. Hagemann and N. Sartor, 'The sustainability of fiscal policy: new answers to an old question', OECD Economic Studies, No. 15, 1990.
- Bohn, Henning, 'The sustainability of fiscal policy in the United States', CESifo Working Paper, No. 1446, April 2005.
- Bohn, Henning, 'The Behavior of U.S. Public Debt and Deficits', The Quarterly Journal of Economics, August 1998.
- Bohn, Henning, 'Budget Balance through Revenue or Spending Adjustments? Some Historical Evidence for the United States', Journal of Monetary Economics, 27, June 1991.
- Buiter, W.H. 'A guide to public sector debt and deficits', Economic Policy, No. 1, 1985.
- Coeuré, Benoît and Jean Pisani-Ferry, 'Fiscal policy in EMU: towards a sustainability and growth pact', Bruegel Working Paper, N° 2005/1, December 2005.
- Conseil Supérieur des finances, Comité d'Étude sur le vieillissement (2005), *Rapport annuel*.
- Croce, Enzo and V. Hugo Juan-Ramon, 'Assessing Fiscal Sustainability: A Cross-Country Comparison', IMF Working Paper 03/145, July 2003.
- Delbecq, Bernard and Henri Bogaert, 'L'incidence de la dette publique et du vieillissement démographique sur la conduite de la politique budgétaire: une étude théorique appliquée au cas de la Belgique', Bureau du Plan, Planning Paper n° 70, November 1994.
- Domar, E.D., 'The burden of the debt and the national income', American Economic Review, December 1944.
- ECOFIN Council, 'Improving the implementation of the Stability and Growth Pact', March 2005a.
- ECOFIN Council, 'Specifications on the implementation of the Stability and Growth Pact and Guidelines on the format and content of Stability and Convergence Programmes, October 2005b.
- European Commission, 'The impact of ageing on public expenditure: projections for the EU25 Member States on pensions, health care, long-term care, education and unemployment transfers (2004-2050) - Report prepared by the Economic Policy Committee and the European Commission (DG ECFIN)', European Economy, Special Report n° 1/2006.
- European Commission, 'General government data', Autumn 2005a.
- European Commission, 'Public Finances in EMU', European Economy, No.3, 2005b.
- Hamilton, James D. and Marjorie A. Flavin, 'On the limitations of government borrowing: a framework for empirical testing', American Economic Review, No. 76, 4, September 1986.

Langenus, Geert and Bruno Eugène, 'Fiscal policy setting in a forward-looking environment: the case of Belgium' in 'Les finances publiques: défis à moyen et long termes', papers presented at the 16th Congrès des Economistes belges de Langue française, CIFOP (2005).

Marinheiro, Carlos Fonseca, 'Sustainability of Portuguese Fiscal Policy in Historical Perspective', paper presented at the CESifo / LBI Conference on Sustainability of Public Debt, Evangelische Akademie Tutzing, 22-23 October 2004 (available at [http://www.cesifogroup.de/link/spd04\\_Marinheiro1-k.pdf](http://www.cesifogroup.de/link/spd04_Marinheiro1-k.pdf)).

Oksanen, Heikki, 'Population ageing and public finance targets', European Economy, Economic papers, European Commission, N° 196, December 2003.

Trehan, Bharat and Carl Walsh, 'Testing the Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits', Journal of Money, Credit and Banking, Vol. 23, No. 2, May 1991.

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