

FISCAL SUSTAINABILITY AND EMU: AN EVOLVING RELATIONSHIP

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INTRODUCTION

WITH THE LAUNCH OF THE EUROPEAN Monetary Union (EMU), for the first time in recent history a number of sovereign countries adopted a common currency while retaining independent fiscal policies. Fiscal soundness was deemed necessary and European countries decided to safeguard it by means of fiscal rules. The intrinsic myopia of the most relevant rule, setting mandatory limits to annual fiscal outturns, was later corrected by setting up an international working group to produce forecasts of age-related expenditure items and summary indicators of fiscal sustainability based on common demographic forecasts and macroeconomic assumptions. The paper briefly reviews the rationale for EMU fiscal rules in the second section, describes the development of long-term fiscal forecasts in the third section, discusses open methodological issues in the fourth section, illustrates the importance of long-term forecasts in the assessment of the legacy of the recent crisis in the fifth section, and concludes by arguing that the impact of sustainability indicators in guiding the formulation of fiscal policy will very much depend on the effective dissemination of the analytical results to the general public in the sixth section.

EMU, SUSTAINABILITY, AND FISCAL RULES

Fiscal sustainability is a central tenet of EMU. Article 109 of the Maastricht Treaty makes a sound government financial position an explicit criterion for a country's eligibility to EMU. Unsound fiscal policy has adverse effects on price stability, growth, and employment. In EMU there is the additional risk that the policy of any given country negatively affects other member states. As already mentioned, fiscal rules were introduced to safeguard fiscal soundness. Some arguments were put forward against the introduction of such rules at the European level. It was noted that fiscal rules may

have costs in terms of stabilization policy and may hamper the achievement of allocative and distributive objectives. It was also pointed out that if rules lead to an unduly tight fiscal stance in one or more countries, pressure may mount on the European Central Bank (ECB) to deliver a monetary offsetting. However, the prevailing view in the policy debate was in favor of the introduction of formal rules. It was argued that the factors which had led to fiscal profligacy in several countries over previous years had not disappeared. It was also noted that without strong rules the legal independence of the ECB may turn out to be an empty shell in the face of pressure by high-debt countries for ex ante bail-out (refraining from raising interest rates in conditions of inflationary tensions) or ex post bail-out (debt relief through unanticipated inflation). Finally, it was argued that, in a monetary union, governments may be less inclined to preserve fiscal rectitude since they face a flatter interest rate schedule than under flexible exchange rates.¹

In devising fiscal rules for EMU, a pragmatic approach was chosen. The Treaty of Maastricht identified fiscal sustainability with compliance of annual fiscal outturns with arbitrarily predetermined parametric standards: no sophisticated sustainability indicators came into play. The rules chosen for the Treaty of Maastricht stated that budget deficits should not exceed 3 percent of GDP unless under exceptional circumstances, such as deep recessions, and for a limited period of time. The Treaty also required that the ratio of general government gross debt to GDP should be lower than 60 percent or, if higher, it should be diminishing "sufficiently" and approaching the 60 percent threshold "at a satisfactory pace." If the deficit exceeds the 3 percent limit, a procedure intended to force corrective measures by the deviating country sets off. In case such measures are not taken, monetary sanctions would be issued, increasing as the excessive deficit persists.

While simple, this approach was also consistent with the available theory. Lacking an agreed upon explanation of the long-term interactions between the public budget and the economy, economists explored the mechanics of fiscal sustainability

*The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banca d'Italia.

by assuming that both the interest rate and the growth rate are exogenous to fiscal policy. This framework was first used by Domar (1944) to show that a constant overall deficit to GDP ratio ensures convergence of both the debt to GDP ratio and the interest to GDP ratio to finite values, so that taxes also needed to service interest payments (or, equivalently, the primary surplus) converge to a finite value as a share of GDP.² An analytical refinement to Domar's approach is the present value budget constraint (PVBC). This states that a necessary condition for sustainability is that "... the present discounted value of the ratio of primary deficits to GNP ... is equal to the negative of the current level of debt to GNP ..." (Blanchard et al., 1990, p. 12). This can be derived from the condition that the discounted value of the debt ratio tends to zero, equivalent to the no-Ponzi game condition that debt cannot be rolled over in full in every period to cover both principal and interest. Domar's paper answered concerns that the service of recurrent deficits would lead to an ever rising tax burden, but left open the question of the maximum sustainable debt ratio. In this respect, the PVBC is even looser than Domar's requirement of a constant debt-to-GDP ratio: convergence to zero of the discounted value of the debt ratio is consistent with its undiscounted counterpart converging to its initial value, any other finite value, or diverging though at a rate lower than the difference between the interest rate and the rate of growth of GDP. EMU's deficit ceiling, although arbitrary, is consistent with Domar's result; the debt ceiling complements it to avoid convergence to excessively high debt levels.

LONG-TERM PROJECTIONS AND SUMMARY INDICATORS OF FISCAL SUSTAINABILITY

A potentially critical weakness of the original EMU approach to fiscal sustainability is the intrinsic myopia of the chosen rules: they are based on annual outturns and therefore cannot take into account the risks posed by long-term budgetary trends. As pressure builds up in the budget, it may become increasingly difficult to comply with the annual deficit ceiling. If the necessary adjustment is delayed too much, it may become politically and economically unfeasible.

The policy relevance of long-term fiscal projections was recognized as early as in 1942, when a 30-year estimate of social expenditure in the United Kingdom was included in the Beveridge

Report. However, it is only from the mid-80s, when the ageing process became evident, that an increasing number of studies examined the long-term prospects for public budgets.³ They usually focus on the spending items which are particularly dependent on population ageing (pensions, health, education). The most basic approach provides estimates of the effects of demographic changes on public expenditure under the assumption that age-related per capita expenditure levels remain constant in real terms or as a share of per capita GDP over the projection period. In other words, it is assumed that present standards of transfers and services are maintained for all population age-groups and there is no behavioral response from governments or households.

Such mechanical estimates are only indicative measures of the likely effects of demographic change on public expenditure, since they do not take all relevant effects of demographic changes into account. First, they are based on the implicit assumption that the marginal cost of providing services to a smaller or a larger number of individuals in each age group in the future will be equal to the present average cost of these services, with no economies or diseconomies of scale. Second, mechanical estimates implicitly assume that demographic changes do not modify present age-related per capita expenditure levels, while they can actually affect them through many different channels, such as the cost of inputs used in services (e.g., a relative shortage of young workers may increase the cost of public services employing them) and the demand for some services (e.g., a reduction in the number of children per household may increase the demand for elderly care).

A more refined approach takes into account the effects of changes introduced in legislation, but not yet embodied in present expenditure profiles, and the continuation of structural expenditure trends. While several other factors can affect the dynamics of per capita transfers and services, by singling out these two factors one obtains estimates consistent with a constant policy approach.

The effects of legislative innovations not yet embodied in current expenditure profiles, are particularly relevant for pension expenditure projections, since eligibility criteria and transfer ratios can change considerably over time due to the maturation of pension schemes. On the one hand, pension coverage extensions and benefit improvements usually only produce their full effects after

many decades. On the other, reforms curtailing pension benefits are often implemented gradually and display their full effects a long time later.

The continuation of structural expenditure trends (i.e., the assumption that some non-demographic factors relevant in the past would continue to affect expenditure dynamics in the future) is especially relevant for health care expenditure projections. In several countries the health sector has for long periods recorded a price deflator substantially higher than the GDP deflator and a tendency towards a continuous increase in per capita consumption.

Growing awareness of population ageing has led to a substantial increase in the resources devoted to long-term public expenditure projections. All countries in the European Union (EU) have now developed models for projecting pension spending, but until the mid-1990s the availability of projections was uneven and quality was sometimes unsatisfactory, which explains to a large extent why long-term projections did not feature prominently in the original EMU fiscal framework. Better forecasting was boosted by the decision to start joint projection exercises at the EU level. In 1999 the Ageing Working Group (AWG) was set up to examine the economic and budgetary implications of ageing populations and provide expenditure projections.

The AWG projects public expenditure on pensions, health care, long-term care, education, and unemployment transfers and produces a number of indicators of fiscal sustainability (European Commission and Economic Policy Committee, 2009). Projections involve the use of the forecasting models developed by national authorities but are based on common demographic forecasts and macroeconomic assumptions (on labor market developments, productivity growth, and real interest rates). The exercises increase the comparability of national forecasts, while leaving responsibility for the projections to the national authorities, which have the best institutional and statistical knowledge. They refer to a current policy scenario, which does not necessarily represent the most likely development, and run under the assumption of no behavioral response by economic agents.⁴ Based on these projections, the European Commission (EC) computes two summary indicators to provide quantitative estimates of the budgetary adjustments required for a member state to ensure sustainable public finances and compliance with EMU fiscal rules (EC, 2009).

The first indicator (called S1) is of the tax gap type (see Blanchard et al., 1990). It measures the difference between the current tax ratio and the constant tax ratio required to reach a 60 percent debt-to-GDP ratio in 2050. The second indicator (S2) indicates the change in tax to GDP ratio that would guarantee consistency with the government PVBC. In this case there is no cut-off date and it is assumed that after 2050 age-related expenditures remain constant as a ratio to GDP at the level projected for that year.

It should be noted that the simple and intuitive metric adopted by these indicators does not immediately translate into policy indications. For example, a positive S1 signals some budgetary pressure in the future, but says nothing about its timing. Over the period taken into consideration, both the deficit and the debt ratios may experience “unsustainable” peaks. For this reason it is important that data on summary indicators always be accompanied by a fully fledged discussion of the underlying long-term projections.

In the European fiscal framework, both long-term projections and summary indicators of fiscal sustainability feed back into the implementation of fiscal rules. They are used in assessing national fiscal policies and they will be used in setting medium-term fiscal targets: the worse the expected long-term scenario, the more ambitious the targets.

TWO OPEN ISSUES: HEALTH CARE AND SOCIAL SUSTAINABILITY

Health Care

Health care is a major source of fiscal pressure. Over the last 50 years it has been growing faster than GDP in all developed countries. Over recent decades it accounted for a growing share of general government expenditure. In the EU15, public spending on health care accounts for almost 7 percent of GDP.

Some specific features make forecasting trends in health expenditure particularly difficult: (1) decisions are taken by a large number of different and interacting agents: consumers, producers, insurers and regulators; (2) exogenous and endogenous factors interact in determining both demand and supply (morbidity rates, population structure, income level, behavioral and social factors, technology, and regulations) with relevant problems of asymmetric

information and moral hazard; and (3) most of these factors can change rapidly over time.

The line representing the level of health consumption by age is typically U-shaped. However, this does not imply that ageing leads to higher spending as one needs to estimate the share of the additional years of life that will be spent in good or bad health.⁵ There is also considerable uncertainty on the impact of income growth: whether the elasticity of expenditure to income will remain higher than one. Finally, technological development is widely considered as one of the main factors increasing health expenditure. But there is again uncertainty concerning its impact on the cost of medical services in the future. Analyses of past trends in health expenditure (Organisation for Economic Co-operation and Development [OECD], 1993) reveal that ageing explains only a very small part of the total increase in expenditure over the period 1960-1990, while income growth and supply effects (technology, employment) played a major role.

These issues have been addressed by the AWG (European Commission and Economic Policy Committee, 2009) and by OECD (2006). The different assumptions of the two institutions, the choice of simple and rather arbitrary assumptions, and the wide range of outcomes reached in the alternative scenarios (the projected increase in health expenditure ranges between 1 and 4 percentage points of GDP) point to sizeable uncertainty concerning the health expenditure outlook.⁶

Similar problems affect projections of long-term care expenditure, which has also steadily increased in the past years and is projected to grow further in the future as population ages.

Social Sustainability

A pattern in which, under current legislation, pension spending is stable or declining suggests, *prima facie*, that the system is economically sustainable. However, this does not necessarily imply that it is socially or politically sustainable. In particular, where there is a sizeable reduction in individual pensions with no offsetting increase in other forms of income, the drop in retirees' living standards may make some discretionary rise in pensions likely or even inevitable.⁷ Advanced industrial societies do not appear to accept widespread old-age poverty. This attitude can be expected to strengthen as the electoral strength of the elderly increases.

Pension indexation plays an important role. In recent years, in various European countries, a revision of the indexation mechanism has been a key tool in curbing outlays. About two-thirds of the total savings achieved by the Italian reform of 1992 and the French reform of 1993 is estimated to come from such measures. This approach may have been dictated by the fact that the burden of the revision of the indexation mechanism is shared by all pensioners and felt gradually over time. The combination of a relatively young retirement age and price-only indexation is particularly problematic. In actuarial terms, a pension that is initially high and indexed to prices may be equivalent to one that is lower at first but then indexed to the earnings of active workers. However, while price indexing preserves the purchasing power of pensions, it entails a gradual worsening of the relative position of pensioners *vis-à-vis* active workers and the more recently retired. Failing a clear perception of the issue on the part of workers, this may result in a tendency for people to seek to retire earlier. In the long run many pensioners could come to be considered poor, or at any rate could so consider themselves, even if their purchasing power remained intact. This could generate pressure for discretionary increases to pensions. In the past this was a common practice: between 1960 and 1990 the actual increases in average pension amounts did not differ greatly from country to country, even where indexation rules were different (Vording and Goudswaard, 1997). Projections that postulate indexation only to prices, though reflecting the current rules, are likely to prove overoptimistic.

In conclusion, accurate simulations of the effects of current rules are crucial but are only a starting point in sustainability analysis. Social sustainability is evidently a difficult issue, but it cannot be ignored in evaluating on long-term fiscal developments.

THE IMPORTANCE OF LONG-TERM PROJECTIONS: A POST-CRISIS EXAMPLE FROM ITALY

The global financial and economic crisis is having major implications for the public finances of most countries. During normal recessions, weakened fiscal positions are predictable and do not carry over worrying implications for long-term fiscal sustainability. However, since the current downturn does not represent a run-of-the mill recession, it raises new concerns for sustainabil-

ity. The availability of long-run fiscal projections allows an assessment of such risks.

The downturn affects sustainability in three ways: (1) it immediately increases the debt level, potentially increasing interest expenditure and the debt-stabilizing primary balance; (2) it may worsen the structural primary balance either because of permanent discretionary measures taken to sustain the economy, or because of the loss of output, in a context in which a part of expenditure (e.g. pensions) is not related to output; and (3) it may affect potential output growth. Moreover, there is a possibility that the crisis increases for a certain period of time the interest rate on public bonds.

Higher Debt Ratios

Declining fiscal revenues, direct support provided to the financial sector and discretionary fiscal stimulus bring about a widespread fiscal deterioration, particularly strong for advanced economies. The IMF (2009) estimated that, compared to 2007, the fiscal balance of the advanced G-20 countries will accrue a cumulative worsening of 8 percentage points of GDP over 2008-2009; as a result, the ratio of government debt to GDP will increase by 20 percentage points.

The EC (2009) projects the aggregate deficit of the 16 member states which have adopted the single currency to reach 6.4 percent of GDP in 2009, 5.8 percentage points higher than 2007. Based on a no-policy-change assumption, a further deterioration to 6.9 percent of GDP is projected in 2010. Gross public debt for the EU-16 is expected to reach 78.2 percent of GDP in 2009 (84.0 percent in 2010) from 66.0 percent in 2007, mostly due to the deterioration of the primary balance.

Higher debt ratios will require higher primary balances to keep public debt on a sustainable path. The OECD estimated that the weighted average debt of OECD countries will be above 100 percent of GDP in 2010 (OECD, 2009); it was around 80 percent in 2008. According to OECD's estimates, due to this projected increase of debt-to-GDP ratios, the debt stabilizing primary balance in 2010 will equal 4.5 percent of GDP, 0.4 percentage points higher than the level required in 2008.

Worse Structural Balances

In response to the crisis, most countries have supported their economies with substantial discretionary measures. To the extent that such interventions are not temporary, they will imply

a deterioration of the public finances in structural terms. Net of cyclical factors and one-off and other temporary measures, the projected deterioration in both the euro area and the EU in 2009 is smaller than that of the headline deficit, but still significant. In particular, the structural balance is estimated to deteriorate by 2.1 percent of GDP in the euro area (EC, 2009). A further deterioration is projected for 2010, amounting to another 0.4 percent of GDP in the euro area.

But the crisis may also worsen the structural balances because of the loss of output, in a context in which a part of expenditure displays a trend of growth which is only gradually affected by the output loss. This is typically the case of age-related expenditure, for which the output loss recorded in 2008 and 2009 will significantly increase the share of age-related expenditure to GDP. The trend growth of these expenditures will determine a worsening structural primary balance through time and is likely to pose challenging pressures on the sustainability of public finances.

The projected worsening of the structural balance increases the fiscal correction required to reach the primary balance that will stabilize the debt-to-GDP ratio.

Lower Potential Growth

The downturn reduces capital spending; the increase in unemployment may negatively affect human capital accumulation; many firms may go bankrupt; the financial systems are partly dysfunctional; and, as a consequence, the process of reallocation of resources may be impaired. This prompts the question of the extent to which the worsened short-term outlook would have implications for growth over the medium- and longer-term (i.e. the extent to which the crisis has affected potential growth).

In the 2009 Ageing Report, the EC and the AWG envisaged three growth scenarios with different implications for the public finances. In the first scenario ("*rebound*"), the GDP growth rate remains lower than the value forecasted before the crisis (*baseline*) until 2010, but it then overshoots the baseline until 2020 so that GDP reaches its expected pre-crisis level by 2020. In the second scenario ("*lost decade*") there is no overshooting of the pre-crisis baseline in the period 2011-2020. The GDP growth rate is assumed to reach its pre-crisis level in 2020. This implies that the GDP level is lower than in the baseline during all of the

projection period. In the third scenario (“*permanent shock*”), the GDP growth rate is kept permanently lower than in the baseline (by 0.8 percentage points between 2011 and 2020 and about 0.3 thereafter).

To provide a detailed assessment of worsened initial fiscal position and of the effect of different growth scenarios on sustainability, we refer to the case of Italy. It should be noted that in the AWG forecast scenario Italy is one of the countries where the budgetary pressure from ageing is lowest. In a “*Pre-crisis*” scenario, we use the European Commission and Economic Policy Committee (2009) *baseline* estimates to project the level of nominal GDP and age-related expenditures until 2050. We find that in the pre-crisis environment, in the absence of fiscal adjustment, the debt-to-GDP ratio would reach the level of 128.3 percent in 2050 (105.7 in 2008); and that, in order to bring the stock of debt to 60 percent of GDP by 2050 (assuming that the adjustment takes place entirely at the beginning of the simulation period), a 1.3 percent of GDP raise in taxes or cut in non age-related expenditure was required.

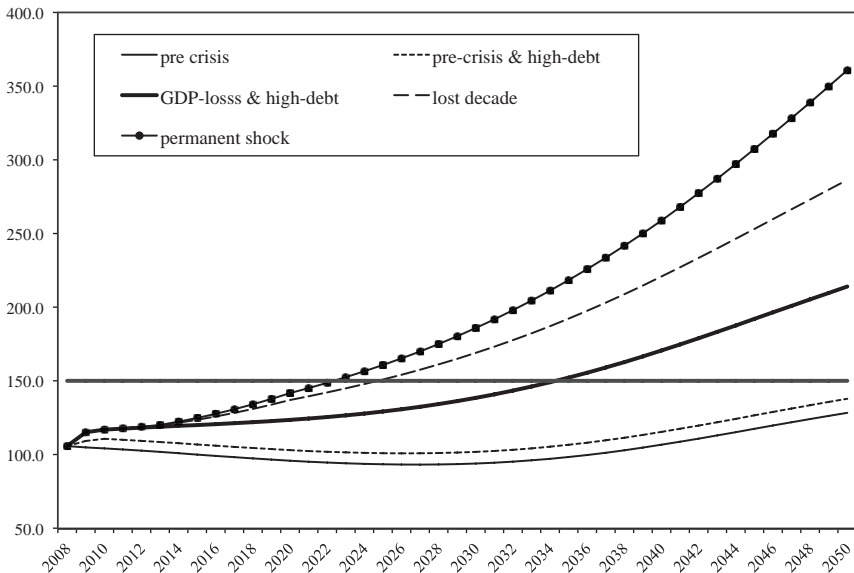
We then estimate the impact of a higher stock of debt in 2009 and 2010 as a consequence of the crisis. We construct a new scenario (“*Pre-crisis & high debt*”) by imposing that the nominal value of

the public debt in 2009 and 2010 is the one officially projected by Italian authorities in 2009. In this scenario, the debt-to-GDP ratio would reach 137.9 percent of GDP in 2050, 9.6 percentage points higher than in the pre-crisis scenario. The fiscal adjustment required to bring the debt-to-GDP ratio to 60 percent by 2050 is 1.6 percent: the pure effect of the higher public debt (accumulated in 2009 and 2010) implies a 0.3 percentage points increase in the consolidation effort.

Next, we can estimate the impact on fiscal sustainability of the output loss currently expected for 2009 and 2010. The scenario “*GDP loss & high debt*” is the same as “*Pre-crisis & high debt*” except for nominal GDP growth in 2009 and 2010: we use Italy’s Stability Program assumptions (-2.5 and 2.6 percent approximately) to replace those of the AWG (2.8 percent). Here the debt-to-GDP ratio would reach 214.0 percent by 2050, 74 p.p. higher than in the pre-crisis and high debt scenario; the required fiscal adjustment to bring the debt ratio to 60 percent amounts to 3.2 percent of GDP, twice as much as in the *Pre-crisis & high debt* scenario.⁸

Last, we build a “*Lost decade*” and “*Permanent shock*” scenarios by amending the “*GDP loss & high debt*” scenario to introduce, respectively, the growth dynamics from the AWG “*Lost decade*”

Figure 1: Italy’s Debt Dynamics under Different Scenarios



and “*Permanent shock*” scenarios. In the “*Lost decade*” scenario, the debt ratio would be above 280 percent in 2050 and the required adjustment would be 3.3 percentage points higher than in the *pre-crisis* scenario. In the “*Permanent shock*” scenario the debt ratio would reach above 360 percent in 2050 and the required consolidation would be 4.5 percentage points higher than before the crisis. Figure 1 plots debt dynamics under each scenario analyzed in this section. Our exercise cannot provide a precise estimate of such dynamics because of the simplifying assumptions made. However, it generates a broad estimate which, to some extent, may be interpreted as a lower bound. Regardless of the end point of our simulations, it is worth noticing that in all the scenarios which include the effect of the crisis on GDP, the debt ratio goes beyond 150 percent relatively soon. Therefore, risks to debt sustainability are likely to materialize already in the medium term. Similar, or even worse, is the outlook for other European countries.

CONCLUSION

Long-term fiscal forecasts can help clarify the issue of fiscal sustainability. They can be instrumental in raising policy makers’ awareness of the need for intervention and building consensus for the implementation of corrective measures.

Information about the long-term consequences of governmental programs is being introduced in public reporting in many countries. The U.K. fiscal framework, for example, puts great emphasis on the long term. In 2002 the U.K. Treasury introduced detailed analysis of long-term fiscal trends in the Long-term Public Finance Report. In Germany the Federal Ministry of Finance in 2005 started publishing a report on the sustainability of public finances once every legislative period. As already mentioned, the assessment of the long-term sustainability of fiscal policy is also part of budgetary surveillance in the European Union. Member States are periodically called to produce long-term projection of age-related expenditures in a harmonized framework; such projections are then used by the EU Commission to prepare a report on “sustainability gaps.”

However, the use of sustainability indicators in the policy debate is still problematic. Most studies are carried out by governments and public institutes since they can better handle the costs of projection models and the issues of data availability, but this

may give rise to a conflict of interest. Also, in spite of the extensive reports and studies, the general public’s knowledge of the issue remains quite limited. Finally, as noted, the methodology still needs refinements.

The goal is worth the effort. Fiscal rules aimed at fiscal sustainability can be successfully implemented over a long period of time only if public opinion considers them a valuable contribution to policy making. In the words of Bastable (1927): “it but remains to again lay emphasis on the fact that good finance cannot be attained without intelligent care on the part of the citizens. The rules of budgetary legislation are serviceable in keeping administration within limits; but prudent expenditure, productive and equitable taxation, and due equilibrium between income and outlay will only be found where responsibility is enforced by the public opinion of an active and enlightened community.” (p. 761)

Notes

- ¹ For a review of the justifications put forward for the Pact and for an analysis of its potential macroeconomic implications see Buti and Sapir (1998) and Buti and Franco (2005).
- ² Of course, the limits of this approach have always been clearly perceived: “... the problem of the debt burden is a problem of an expanding national income. How can a rapidly rising income be achieved?” (Domar, 1944, p. 166); “... the issue rather is how interest service will affect the economy ...” (Musgrave and Musgrave, 1984, p. 689).
- ³ International economic organizations largely contributed to developing long-term projections. See, for example, OECD (1985) and the IMF study by Heller et al. (1986).
- ⁴ See Balassone et al. (2009) for a review of these projections and a discussion of the underlying risks.
- ⁵ Several studies noted that a sizeable share of health expenditure occurs in the final part of life. This implies that the number of deaths occurring each year also affects expenditure. It also implies that an increase in life expectancy may have limited effects on lifetime health expenditure.
- ⁶ The AWG assumes that half of the extra years of life will be spent in good health, that the income elasticity of the demand for health services, starting from 1.1, converges to 1 by 2060, and that unit costs will increase in line with per capita GDP. In the AWG reference scenario, public spending on health care in the EU would increase from 6.7 percent of GDP in 2007 to 8.4 percent in 2060 (7.6 percent assuming the number of years in bad health remains constant and the income

elasticity of demand is 1; 9.4 percent assuming unit costs increase as GDP per worker and income elasticity of demand is 1). OECD (2006) assumes that longevity gains translate into additional years of good health. As to income elasticity and technology, it considers two scenarios: one in which expenditure grows every year 1 percent faster than income (as in the past two decades) and one in which it grows at the same rate. Public health expenditure in OECD countries between 2005 and 2050 would increase from 5.7 percent of GDP to 9.6 percent in the first scenario, and to 7.7 percent in the second.

⁷ European Commission and Economic Policy Committee (2009) projects a significant decline in replacement ratios in many EU countries and notes the risks for social sustainability.

⁸ Since we keep the ratio of the non-age-related primary balance-to-GDP constant at the 2008 level (that is, it declines in absolute level given the contraction of GDP), we are likely to underestimate the stock of public debt in 2050.

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