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II. AGING AND LONG-TERM FISCAL SUSTAINABILITY IN CYPRUS¹¹

A. Introduction and Summary

16. **Similar to other countries, Cyprus faces a significant aging of its population over the next 50 years.** The ratio of elderly to people of working age will more than double over this period. As the average age of the population increases, spending on pensions and health care will rise. At the same time, the shrinkage in the number of labor force participants will lower tax and social security contribution revenues. This will put pressure on public finances from both the expenditure and revenue side.

17. **This chapter looks at the fiscal burden facing Cyprus due to aging and the policy steps necessary to address it.** It gives a short description of the Cypriot pension and health care systems, and describes how aging will affect the costs of these systems. It then analyzes the development of age-related spending and the sustainability of general government finances under different scenarios. Finally, it quantifies the primary adjustment required to keep public finances on a sustainable path in the long term and presents a policy reform plan to achieve this. The main conclusions are the following:

- Compared to EU and other European countries, Cyprus currently spends relatively little on public pensions and health care; however, it faces the same relative aging of the population, with an expected doubling of the elderly share.
- The pronounced aging of the population will not only translate into more people claiming pensions and in need of health care, but the increasing average age of elderly will in itself increase the demand for health care, giving rise to a “double-aging” problem.
- Since Cyprus’s pension system is a public pay-as-you-go system based on the notion of solidarity among generations, its financial sustainability cannot be examined in isolation. Instead, it should be seen in the wider context of long-term sustainability of general public finances. Thus, in such a system, the burden of aging is a fiscal burden.
- Based on current policies, age-related spending will increase by around 3 percent as a share of GDP and threaten long-term public finance sustainability, even under fairly optimistic assumptions about the success of pension reforms and economic growth. Under less optimistic assumptions, age-related spending will rise by up to 6½ percent as a share of GDP and place public finances onto an unsustainable path.
- Therefore, to safeguard long-term sustainability the authorities need to take timely measures to contain the fiscal pressures associated with aging. Such measures should *first and foremost include pension reforms*, such as increasing the effective retirement age; moving toward price indexation of pensions in the lower band; and increasing

¹¹ Prepared by Leif Lybecker Eskesen.

contribution rates. If needed, additional savings could be generated in other areas, for instance through tax increases, reforms of the civil service, or reductions in non-pension welfare entitlements. In all cases, early action would lessen the required fiscal adjustment.

B. The Cypriot Pension and Health Care Systems

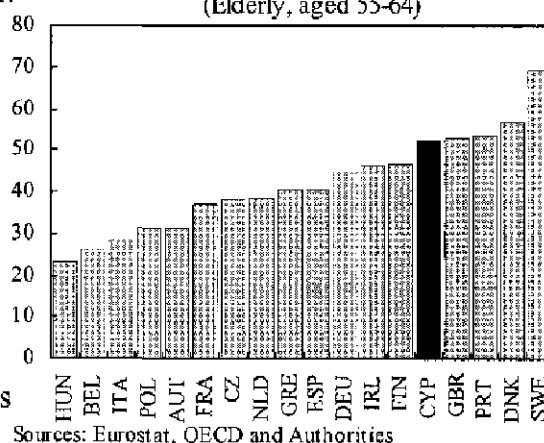
Pension system

18. **As in most continental European countries, the Cypriot public pension system is built on the concept of solidarity among generations.** The public pay-as-you-go pension system provides the principal source of income for retirees, while private fully funded pension schemes are still not very important despite a build-up over recent years. There are basically two main public schemes: one for private and public sector employees, which is part of the contribution-financed social insurance scheme, and a second, tax-financed scheme for civil servants.

19. **Public pension schemes provide old-age, disability, and widows' pensions.** Eligibility for old-age pensions in the social insurance scheme depends on the length of the contribution period and age. The statutory retirement age in the social insurance scheme is 65, but with a sufficiently long contribution period it is possible to receive old-age pension from the age of 63. However, eligibility for old-age pension is not contingent on retirement from regular employment--benefits can be drawn independently from employment status. In the civil service scheme the pension age is 60, but earlier retirement is possible. Disability pensions are subject to medical certification and length of contribution, and widows pensions to marital status (and widower pensions to certain conditions of dependence).

20. **Retiring before reaching the regular pension age is the rule rather than the exception.** In 1997, more than 85 percent of new pensioners were 63, with the remainder being older. Consequently, the average age of new pensioners is significantly below the statutory pension age. In 1997, the average retirement age in the social insurance schemes was around 63 years for both men and women. Civil servants typically retire from civil service at the age of 60.¹² However, the average age of pensioners in Cyprus and the labor force participation rate among elderly are higher than in most EU countries (Figure 1). The latter can also partly be explained by the right of old-age pensioners to continue to work without loss of pension benefits.

Figure 1. Cyprus: Participation Rates (Elderly, aged 55-64)



¹² Civil servants are also eligible for a pension from the social insurance scheme from the age of 63, but this is means-tested and is reduced to take into account their civil service pension.

21. **Pension benefits have two components: a basic pension and a supplementary pension based on the level of insurable earnings.** The earnings on which contributions and benefits are calculated (insurable earnings) are divided into a “lower” and an “upper” band, with the “lower band” consisting of earnings up to a certain “basic” level (fixed at USD 2,180 in 2002) and the “upper band,” consisting of earnings in excess of the “basic” level. Gross insurable earnings can reach a maximum of six times the basic level. The basic pension, amounting to 60 percent of the average work life’s “lower band” earnings, is supplemented by a pension equivalent to 1.5 percent of cumulative work life “upper band” earnings. In addition, the basic pension is increased by $\frac{1}{3}$ for the first dependant and by $\frac{1}{6}$ for each of the second and third dependants. Basic pensions are indexed to wage growth and supplementary pensions to inflation. Postponement of receipt of pension from age 63 to 68 will entitle the beneficiary to an increase of 0.5 percent in the old-age pension for each month of postponement. Old-age pensioners continuing to pay contributions from 63 to 65 are entitled to an increase in pensions equal to 1.5 percent of the associated insurable earnings. Spending on pension benefits in Cyprus is low by international standards—total spending on pensions in 2000 was around 5.4 percent of GDP, around half the EU average (Table 1).

Table 1. Cyprus: Public Pension Spending in Selected European Countries in 2000 (In percent of GDP)

Austria	14.5
Italy	13.8
Greece	12.6
France	12.1
Germany	11.8
Finland	11.3
Poland	10.8
Denmark	10.5
Belgium	10.0
Portugal	9.8
Spain	9.4
Sweden	9.0
Netherlands	7.9
Czech Republic	7.8
Luxembourg	7.4
Hungary	6.0
United Kingdom	5.5
Cyprus	5.4
Ireland	4.6
EU	10.4

Sources: EU, OECD, Ministry of Finance, and Staff Calculations

22. **Contributions are currently sufficient to cover total spending on pensions in the social insurance scheme.** Total contribution rates for the social insurance scheme, which in addition to old-age pensions consist of unemployment benefits, sickness benefits, etc., differ between the employed and self-employed persons. Employed persons contribute 12.6 percent of their insurable earnings, shared equally between the employer and employees, while the self-employed contribute 11.6 percent of their insurable income. The central government contributes the equivalent of 4 percent of insurable earnings, bringing total contributions for employed to 16.6 percent. The social insurance fund has three separate accounts: (1) the General Benefit Account; (2) the Supplementary Benefit Account; and (3) the Unemployment Benefit Account. The General Benefit Account is credited with 9.5 percentage points of the contributions and is charged with the payment of all basic periodical benefits (including basic pensions), while the Supplementary Benefit Account is credited with 6 percentage points of the contributions and is charged with the payment of all supplementary earnings-related benefits (including supplementary pensions). The Unemployment Benefit account is credited with the remaining contributions of around 1 percentage point and is charged with payments of unemployment benefits. Both the General Benefit Account and the Supplementary Benefit Account currently receive sufficient

contributions to pay the periodical benefits, and the latter in particular has a big surplus, which to a large extent can be explained by the relative lower maturity of the upper band pension scheme (i.e. the number of recipients is low relative to contributors, and the recipients credited insurable earnings are likewise comparatively low).

Health care system

23. **Health care services are delivered by both public and private providers, but the privately provided health care services have increased in importance.** In general, there are three schemes for health services in Cyprus: public, private, and special schemes. Since the 1990s, the public sector's share of health care provision has been falling, and the private sector now provide over 50 percent of health services.

24. **Under the public health care scheme, services are provided free of charge through public facilities.** People eligible under this scheme are government employees, individuals earning less than C£6,000 per annum, households earning less than C£10,000, and households with more than three children. Individuals with an income between C£6,000 and C£9,000 and households with an income between C£10,000 and C£14,000 have health care provided at 50 percent of the prescribed rates. The range of services offered through the public health care scheme includes visits to general physicians, specialist consultations, inpatient stays, medical care given abroad in special fields not offered in Cyprus, and all prescription drugs. Furthermore, medical care is provided free of charge in all cases of accidents and emergency treatments, irrespective of the economic situation or the nationality of the person involved, including visitors. However, if hospitalization is needed in these cases, subsequent care fees have to be paid. Public provision of health care is funded out of general taxation; health spending, which amounted to 2.6 percent of GDP in 2000, is low relative to the EU average of 5.3 percent (Table 2). However, private spending is relatively high and total spending on health care is, consequently, more in line with spending levels among EU countries.

Table 2. Cyprus: Public Health Care Spending in Selected Countries in 2000 (In percent of GDP)

Czech Republic	7.5
Hungary	6.5
France	6.2
Finland	6.2
Sweden	6.0
Ireland	5.9
Germany	5.7
Portugal	5.4
Belgium	5.3
Austria	5.1
Denmark	5.1
Spain	5.0
Italy	4.9
Greece	4.8
Netherlands	4.7
United Kingdom	4.6
Cyprus	2.6
EU (weighted average)	5.3

Sources: EU Economic Policy Committee, and Ministry of Finance.

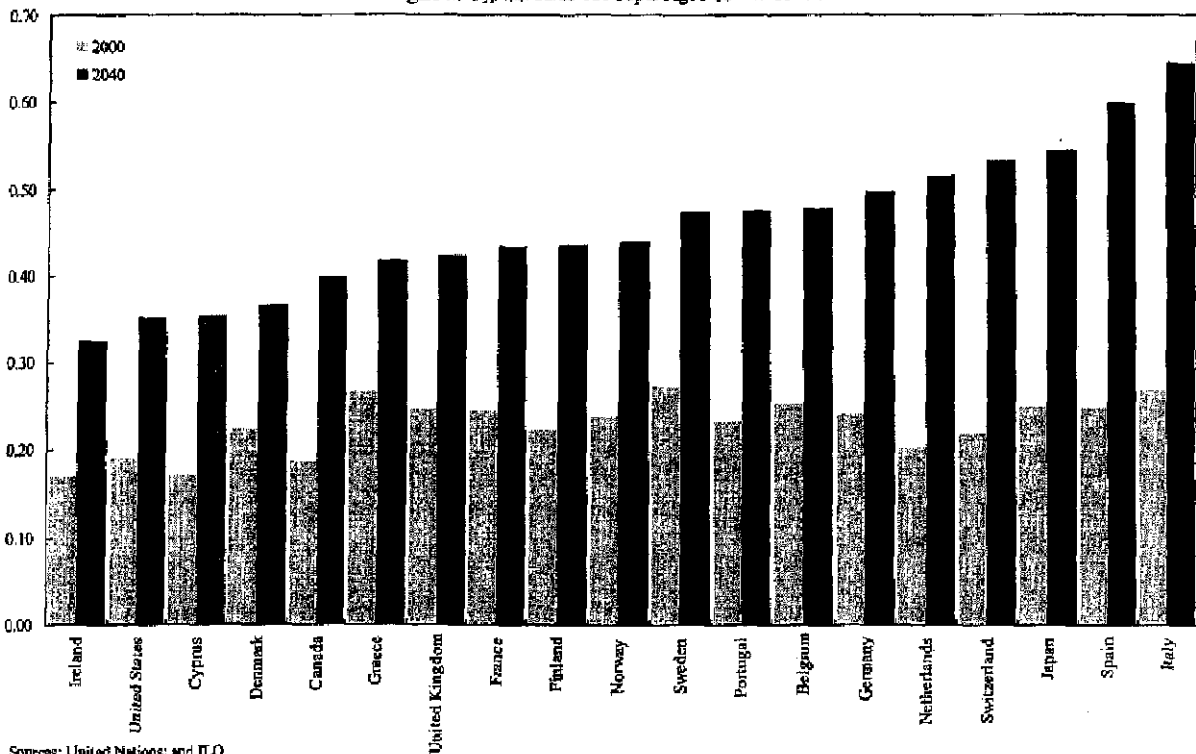
25. **Private health care provision is financed out-of-pocket and dominated by a large number of physicians in individual practice.** A number of polyclinics have also been established in urban areas with several physicians offering a range of medical services. The Special Schemes include employees and dependants covered under schemes with medical services reimbursed by the Trade Unions (mostly primary health care) or employers, all of which finance medical care mainly provided through public health facilities.

26. **The government is planning a reform of the health care sector.** The present health care system has long been criticized for the fragmentation of services, the lack of coordination between the public and private health system, the lack of equity in its financing, and, in general, its inability to respond to the expectations of the population. On April 20, 2001, the House of Representatives enacted a law for the introduction of a National Health System (NHS) scheduled for around 2006. It will be universal as regards population coverage, and will be financed by contributions from the state, employers, employees, self-employed, pensioners, and all those who have nonemployment incomes. The NHS will be administered by the Health Insurance Organization, a public law body managed by a tripartite Board. The Organization will purchase health services from the Government and private medical institutions and services.

C. The Effect of Aging on Pension and Health Care Spending in Cyprus

27. **Like other industrialized countries, Cyprus faces a significant demographic shift over the next 50 years.** A strong decline in fertility and mortality rates since the 1960s will result in an increase in the number of elderly and a fall in the number of working-age people over the next five decades. According to projections by the International Labor Organization, the ratio of elderly (over 64 years of age) to working age people (15-64 years of age) will double by 2040 from its current level of around 0.17, but remain low in international comparison (Figure 2). In addition, the share of very old people (over 79 years of age) will rise by even more.

Figure 2. Cyprus: Ratio of People Aged 65+ to 15-64



28. **The aging of the population creates a distributional challenge, since the number of contributors will fall relative to the number of recipients.** The increasing number of elderly will lead to higher age-related expenditures on pensions and health care. At the same time, the decline in the labor force will erode the tax and social security contribution base. Absent reforms, these trends will widen the deficit of the pension and health care system, necessitating increasing transfers from general tax revenues. This, in turn, will challenge the solidarity among generations underlying the current welfare system.

29. **Rising outlays on pensions will be the main driver of age-related spending pressures.** In addition to demographics, developments in employment and the generosity of the pension benefit system—both with respect to eligibility and to the benefit level—will have effects on the outcome. The increase in pension spending will depend on the development of four factors (see Appendix I):

- the relative number of elderly (*aging effect*);
- the share of working-age people in employment (*employment effect*);
- the share of elderly receiving pensions (*eligibility effect*);
- the pension level of recipients (*benefit effect*).

Thus, both labor market and pension reforms aimed at increasing the labor force participation rate of the elderly and others (including women), as well as tightening eligibility for—and lowering the level of—benefits (pension, unemployment, etc.) will be important to accommodate the spending pressures. On the other hand, pension spending is not very sensitive to the age structure of pensioners and the rising share of very old people will therefore not have an effect on outlays.

30. **Consumption of health care services is also very sensitive to the aging of the population.** Spending on health care services generally increases with the age of the recipient. The rising age profile of spending reflects the fact that health diminishes with age. This means that spending on these categories will not only rise because the share of the elderly rises, but also because the share of very old (aged 80 and older) is projected to increase reflecting higher longevity. There is thus a “double aging” effect on health care spending.

31. **Finally, the demographic shift will also reduce the number of contributors to the welfare state.** The shrinkage in the size of the working-age population and the labor force resulting from aging will reduce the number of wage earners paying taxes and social contributions. Absent tax increases or hikes in social security contribution rates, this will result in lower revenues.

D. Scenario Analysis: Impact of Age-related Spending on the Public Finances

32. **Long-term projections of age-related spending and its effect on general government finances are very sensitive to the underlying structural and macro economic assumptions.** Assumptions about demographic changes and the impact of labor market policies and pension reforms have large effects on the path of age-related spending. In addition, aging-induced demand for health care services can absent health care reform

significantly increase public health spending, adding to the age-related spending increase. Furthermore, when spending is measured relative to the size of the economy, the assumptions about economic growth, interest rates, and other macroeconomic variables also play an important role for the outcome of the projections. Altogether, these assumptions determine how much the rise in pension and health care expenditures will impact public finances.

33. **The sensitivity of age-related spending and thus public finances to the economic outlook and to the effectiveness of structural reforms is illustrated in a number of different scenarios.** The scenarios are divided into two groups that explore the outlook for spending and the public finances under (1) “current policies” with different assumptions about economic growth and labor market outcomes and (2) “new policies” with assumptions of additional pension reform and other measures:

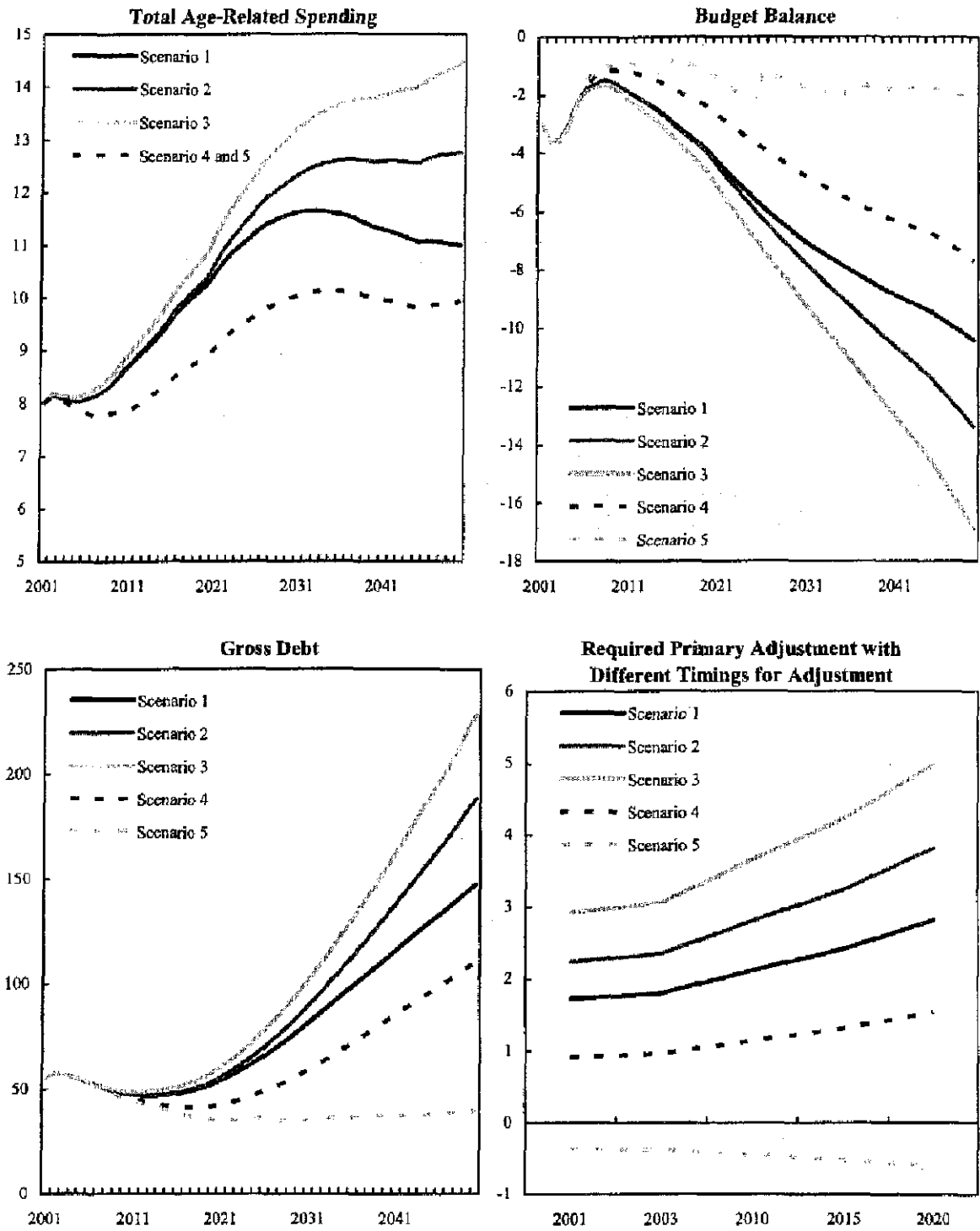
Current-policy scenarios

Scenario 1: Assuming that employment growth will remain robust, and that productivity growth is maintained at or above historical levels throughout the projection period (both in line with the authorities’ assumptions according to the 2002 Pre-Accession Economic Program) will help contain the increase in pension spending. However, this will not be sufficient to counter the impact of the rise in the dependency ratio, and pension spending is projected to increase by 1.6 percent as a share of GDP. Together with a projected rise of 1.4 percentage points in health care spending, total age-related spending will rise by 3 percentage points by 2050 (after topping in 2032 almost 4 percent above current levels). Combined with lower pension related revenues, this puts public finances under pressure (Figure 3). Absent compensating measures, the debt-to-GDP ratio will rise by almost 100 percentage points.¹³ To maintain the debt ratio below the 60 percent Maastricht ceiling, the primary balance would need to be permanently improved by around 1¼ percent of GDP if the entire adjustment took place in 2003, and by close to 3 percent if the adjustment was postponed to 2020 (see Appendix II).

Scenario 2: This (Staff baseline) scenario explores the outlook for public finances under less optimistic assumptions about employment and productivity growth. Thus, relative to scenario 1 employment growth is expected to average around 0.1 percent less, while average productivity growth is assumed around 0.5 percent lower to reflect a fall in productivity as the economy matures. This significantly affects the combined spending share of pensions and health care, which rises by almost 5 percent of GDP by 2050 (Figure 3). Hit also by lower pension related revenues, the debt ratio will rise rapidly and reach almost 200 percent by the end of the forecasting horizon. Ensuring

¹³ In all scenarios it is assumed that total public spending and revenues equal IMF projections from 2001-2007 and that non-pension spending and revenues are calculated as residuals during this period. Thereafter, non-pension spending and revenues are assumed to remain constant as a share of GDP at the 2007 level throughout the forecasting horizon.

Figure 3. Cyprus: Public Finances and Necessary Fiscal Improvement to Ensure Sustainability Under Scenarios 1-5



Sources: ILO and Staff estimates

that the Maastricht criteria is respected would demand a primary improvement of public finances of 2-4 percent of GDP, depending on the timing of the adjustment.

Scenario 3: In addition to the difficulties of reaching the higher employment and productivity growth rates envisaged by the authorities under current policies, there is the risk that the cost of health care services could rise even further than contemplated in scenario 1 and 2. This could be driven by the collective effects of the current supply constraints on health care services, the planned introduction of a comprehensive health care system, and the rising demand for these services as the population ages. Assuming that health care costs rise annually by an additional $\frac{3}{4}$ percent, more than doubles health care spending as a share of GDP. Together with the rise in pension spending, public finances deteriorate even further, and the debt ratio is projected to exceed 200 percent (Figure 3). This in turn would require significant primary savings on other fiscal components to keep the debt ratio under control.

Reform policy scenarios

Scenario 4: If it is assumed that the government takes timely steps to contain the rise in pension spending, the effect on public finances would be significant. Thus, assuming that the government increases the effective retirement age from 63 to 65 by 2010 and switches to price indexation of lower-band pensions, the rise in pension spending will be limited to around $\frac{1}{2}$ percent of GDP, the fall in social security contributions will be more modest, and employment growth will be supported. As a consequence, the debt ratio is projected to rise by around 80 percentage points less than projected in scenario 2 (Figure 3). But, the debt ratio will still reach almost twice the Maastricht criteria of 60 percent. In addition, the debt ratio will still be rising at the end of the forecasting horizon at an unsustainable rate.

Scenario 5: The basic assumptions are the same as in scenario 4, except that the contribution rates are assumed to increase gradually to ensure coverage (on average) of the pay-as-you-go costs on pensions. This will further raise revenues and stabilize the debt ratio, while maintaining it below the Maastricht ceiling, thus ensuring sustainability of public finances (Figure 3).

34. **These scenarios illustrate a number of points.** *First*, even under optimistic assumption about the macro economic environment and labor force participation rates, the fiscal pressures associated with the aging of the population would still increase significantly. *Second*, under less optimistic assumptions, the fiscal outlook would rapidly and substantially deteriorate. This deterioration would be even more pronounced if the cost of health care increased faster than currently foreseen. *Third*, additional pension measures could ensure public finance sustainability, but the timing is crucial. For example, early action to increase the effective retirement age will have important dynamic effects as savings are realized earlier. Combined with indexation of lower band pensions to inflation instead of wages, and higher contribution rates, this could secure long-term sustainability by stabilizing the debt ratio at a comfortable level. The same effect could be achieved through other measures, such as expenditure savings through civil service reform and higher taxes. Measures could also be

taken to avoid the escalation of health care spending by ensuring a need-driven use of services, for example by introducing user fees.

E. Concluding Remarks

35. **Over the next 50 years, Cyprus faces a major fiscal challenge from the aging of the population, requiring early and sustained fiscal policy action to tackle it.** Age-related spending is projected to increase significantly, threatening the sustainability of public finances. Bold measures are needed, and their timing is crucial for two reasons. First, the demographic effects will start setting in around 2010, leaving a window of opportunity during the current decade to design and implement the necessary structural reforms to the pension and labor market system. Second, early savings will have considerable positive dynamic effects and thereby reduce the required primary improvement.

36. **To bring about the necessary primary improvement, the authorities have a number of options.** One is additional pension reform, aimed at increasing the effective retirement age by narrowing eligibility and strengthening disincentives to earlier retirement; reducing benefit generosity, for example by moving towards price indexation of individual lower-band pensions; and increasing contribution rates. Since the problem of Cyprus' s public pay-as-you-go and solidarity-oriented pension system can also be solved in the wider context of public finances, other options include savings on non-pension spending and tax hikes. Finally, it will be important for the government to adhere to fiscal discipline over the long term. Even relatively modest deviations from the primary balance requirement to ensure sustainability may have large dynamic effects in the long term. In this context, adopting a more formalized medium-term fiscal framework could help ensure time consistency of fiscal policy.

DECOMPOSITION OF PENSION SPENDING

37. The evolution of pension spending as a share of GDP depends on the development in the age structure of the population, pension generosity and eligibility, and the productivity of employment. Thus, the pension share to GDP can be written as

$$(1) \quad \frac{\text{Pension Spending}}{\text{GDP}} = \left(\frac{\text{Number of Pension Recipients}}{\text{Employment}} \right) * \left(\frac{\text{Average Pension Benefit}}{\text{Average Productivity}} \right)$$

38. The ratio of pensioners to employed can be decomposed further into the product of three ratios: (i) the dependency ratio; (ii) the inverse of the employment ratio; and (iii) the eligibility ratio (Dang, Antolin, and Oxley, 2001). This gives

$$(2) \quad \frac{\text{Pension Spending}}{\text{GDP}} = \left(\frac{\text{Population} \geq 55}{15 \leq \text{Population} \leq 64} \right) * \left(\frac{15 \leq \text{Population} \leq 64}{\text{Employment}} \right) * \left(\frac{\text{Recipients}}{\text{Population} \geq 55} \right) * \left(\frac{\text{Average Pension Benefit}}{\text{Average Productivity}} \right)$$

The first three ratios on the right-hand side are the dependency, inverse employment, and eligibility ratios, respectively. This shows that pension spending as a share of GDP increases with the dependency and eligibility ratios and with the generosity of pensions to average productivity, and decreases with the employment ratio.

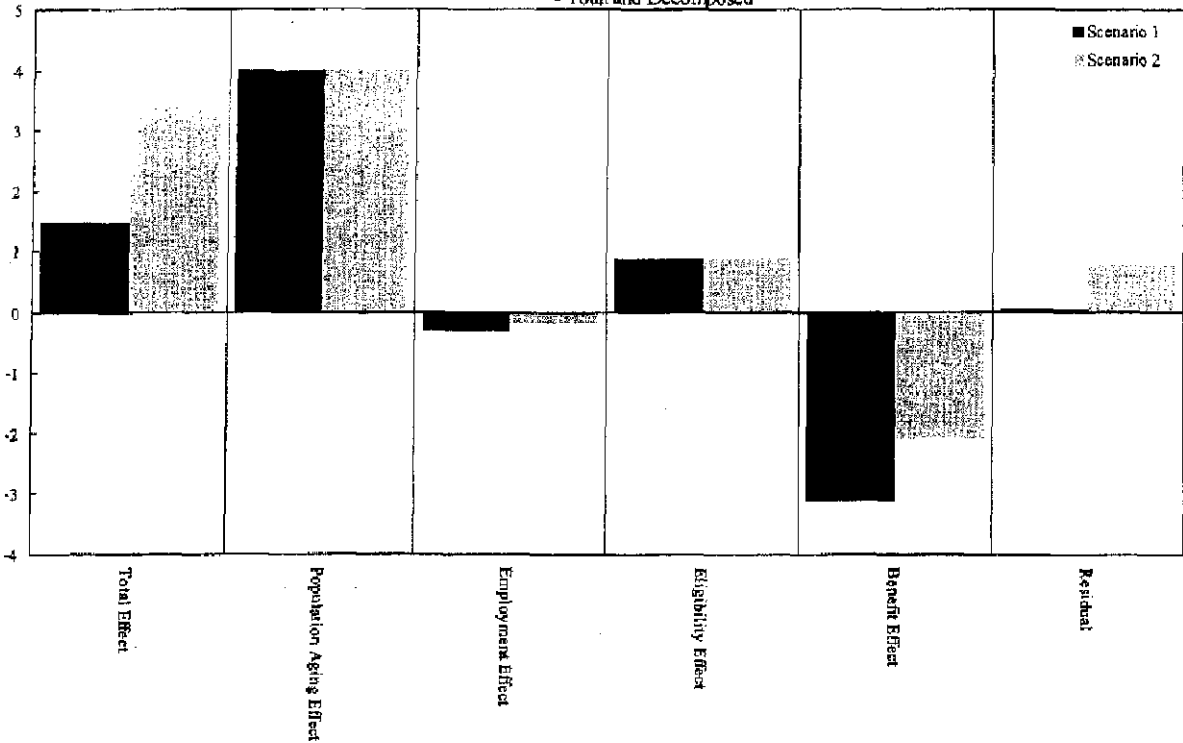
39. The contribution of each of these four ratios to the change in the overall share of pension spending to GDP can be approximated by the linear decomposition

$$(3) \quad \frac{\partial \left(\frac{\text{Pension Spending}}{\text{GDP}} \right)}{\partial t} \cong \left(\frac{\partial \log(1)}{\partial t} * ps_{t=0} + \frac{\partial \log(2)}{\partial t} * ps_{t=0} + \frac{\partial \log(3)}{\partial t} * ps_{t=0} + \frac{\partial \log(4)}{\partial t} * ps_{t=0} \right) + \varepsilon$$

where $ps_{t=0}$ is current pension spending as a share of GDP and ε is the residual from the log linearization. To minimize the significant residuals normally following from a linearization of a non-linear function with large changes over long periods, one can calculate (3) for shorter sub-periods and add the resulting changes up.

40. An approximated decomposition for the projected pension spending under scenario 1 and 2 presented in section IV are presented in figure 4 below.

Figure 4: Change in Pension Spending 2001-50 in Percent of GDP
 - Total and Decomposed



As can be seen, the largest driver of pension spending in both scenarios is the aging and eligibility effect, which is of the same magnitude in both scenarios. Although the employment effect is negative in both scenarios (largest in absolute terms in scenario 1) due to the assumption of an increase in participation rates among 15-64-year olds, the effect is minimal. On the other hand, the benefit effect helps importantly to counter the rise in pension spending, due to the implicit assumption of relatively high productivity growth, especially in scenario 1. It should, however, be noted that these calculations are only indicative and associated with some uncertainty.

ENSURING LONG-TERM PUBLIC FINANCE SUSTAINABILITY

41. Pension and health care reform is not the only answer to accommodate the projected bulge in age-related spending. Thus, the problem of growing age-related spending in a public pay-as-you-go system based on solidarity among generations should not be thought of as simply an actuarial problem. The sustainability of such a system should be analyzed in the broader context of fiscal sustainability. This section looks at the theoretical concept of fiscal sustainability, its practical application, and presents calculations illustrating a time profile for the primary balance improvement necessary in Cyprus to maintain long-term sustainability under the different scenarios.

Sustainability in theory and practice

42. Theoretical discussion of fiscal sustainability is typically based on the assumption that the government must satisfy both a static and intertemporal budget constraint (Chalk and Hemming, 2000). Assuming a closed-economy representative agent model and abstracting from monetary conditions, the static budget constraint or every-period condition is

$$(1) \quad B_{t+1} = (1+r_t) * B_t + PD_t$$

where B_t and B_{t+1} are the initial and subsequent-period nominal government debt levels, respectively, $1+r_t$ is the nominal discount factor between the two periods, and PD_t is the nominal fiscal primary deficit. To derive the intertemporal budget constraint, (1) needs to be solved forward to give

$$(2) \quad B_t = -\sum_{i=0}^{\infty} D(t, t+i)^{-1} * PD_{t+i} + \lim_{T \rightarrow \infty} D(t, t+T)^{-1} * B_{t+T+1}$$

where $D(t, t+i) = \prod_{k=0}^i (1+r_{t+k})$ is the discount factor between periods t and $t+i$.

43. According to the intertemporal budget constraint, fiscal sustainability is secured if the present value of future primary balances exceeds the difference between the present value of the terminal and the initial debt level. If the level of outstanding debt grows at a rate less than r , then the present discounted value of the terminal debt converges to zero over time,

$$(3) \quad \lim_{T \rightarrow \infty} D(t, t+T)^{-1} * B_{t+T+1} = 0$$

Therefore, assuming (3) is fulfilled, the government's intertemporal budget constraint holds if the excess of primary surpluses over primary deficits, in present value terms, matches the outstanding value of initial debt. This gives what is usually referred to as the government's present value budget constraint

$$(4) \quad B_t = -\sum_{i=0}^{\infty} D(t, t+i)^{-1} * PD_{t+i}$$

In simple terms, (4) says that a government that has outstanding debt must sooner or later run primary budget surpluses, and those surpluses have to be large enough to satisfy (4).

44. This theoretical concept of sustainability is, however, difficult to apply due to the assumption of an infinite time horizon. Practical applications of the concept of sustainability are based on finite horizons, which also means that the present value of the terminal debt level will normally be larger than zero and (3) will consequently not hold. Sustainability, as a result, boils down to preferences/targets for the end-horizon debt level, typically measured relative to output.

45. A number of indicators have been developed as tools to assess public finance sustainability. Buitier (1985) argued that a sustainable fiscal policy should maintain the ratio of public sector net worth to output at its current level. To assess fiscal sustainability, Buitier suggested an indicator comparing the current primary deficit to the deficit ensuring the stabilization of net worth. However, despite its intuitive appeal, Buitier's indicator has the problem that it is difficult to obtain accurate information on the net worth of the government. Blanchard (1990) suggested instead to look at the primary deficit or tax rate necessary to maintain the current debt ratio. Blanchard's *primary gap* indicator is calculated as

$$(5) \quad \overline{pd} - pd_t = (g_t - r_t) * b_t - pd_t$$

where $b_t = \frac{B_t}{Y_t}$ is the debt-to-output ratio, \overline{pd} is the primary deficit (in percent of output)

stabilizing the debt-to-output ratio, pd_t is the actual primary deficit (in percent of output), and g_t is the nominal growth rate of output. A positive value of the *primary gap* indicator suggests that the current primary deficit is sufficiently small (or the surplus sufficiently large) to stabilize the debt ratio, while the opposite is true for a negative value.

Long-term sustainability indicator for Cyprus

46. The indicator developed in this paper to gauge the long-term sustainability of Cyprus' public finances is built on the *primary gap* indicator suggested by Blanchard. Specifically, the indicator compares the average annual primary deficit \overline{pd}^t implied by the projected debt ratio in 2050 b_{50}^p with the average annual primary deficit \overline{pd} necessary to maintain the debt ratio at the current or targeted level. The average primary deficit implied by the projected debt ratio is given by

where g_a is the average annual growth rate for the entire forecasting period, and b_s and \bar{r} , respectively, are the debt ratio at time s ($1 \leq s \leq 50$) and the fixed interest rate. The equation says that the present value of the average implied primary deficit (discounted by GDP growth) equals the difference between the initial debt ratio and the present value of the terminal debt ratio (discounted by GDP growth). The implied deficit increases with the relative size of the terminal debt level and—for given initial and terminal debt levels—decreases with the spread between the interest and growth rate.

47. The primary deficit necessary to maintain the debt ratio at the current or some “target” level is given by

$$(7) \quad \sum_{t=s}^{50} \left(\frac{1+\bar{r}}{1+g_a} \right)^{-t} * \overline{pd} = -b_s + b_{50} * \left(\frac{1+\bar{r}}{1+g_a} \right)^{-(50-s)} ; b_{50} = b_s$$

$$\Downarrow$$

$$\overline{pd} = \frac{-b_s * \left(1 - \left(\frac{1+\bar{r}}{1+g_a} \right)^{-(50-s)} \right)}{\sum_{t=s}^{50} \left(\frac{1+\bar{r}}{1+g_a} \right)^{-t}}$$

Combining (6) and (7) and rearranging gives the *long-term primary gap* indicator developed in this exercise for Cyprus:

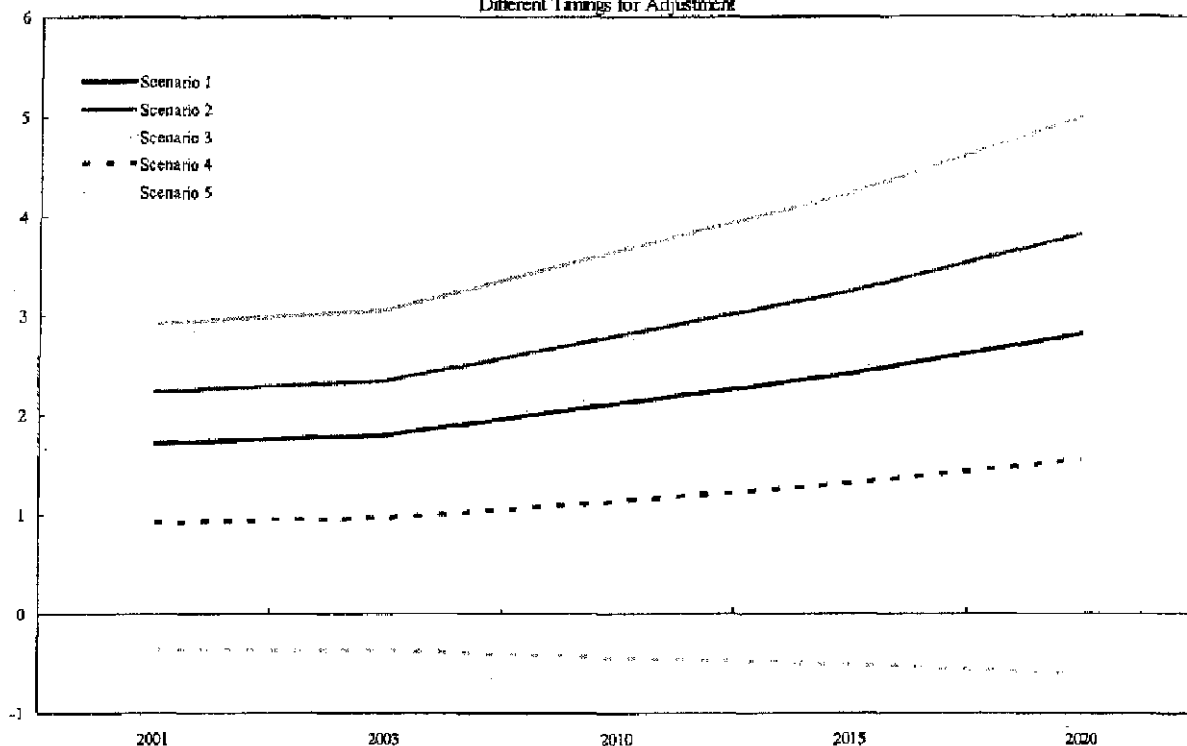
$$(8) \quad \overline{pd} - \overline{pd}^t = \frac{(b_s - b_{50}^p) * \left(\frac{1+\bar{r}}{1+g_a} \right)^{-(50-s)}}{\sum_{t=s}^{50} \left(\frac{1+\bar{r}}{1+g_t} \right)^{-t}}$$

A positive value indicates that the long-term projected fiscal policy is on a sustainable path, while a negative value indicates that projected primary balances are insufficient to keep the terminal debt ratio on target. The absolute size of the gap shows how much the primary balance at time $t=s$ would need to be permanently adjusted to maintain the terminal debt ratio below the current ratio or some other “sustainable” debt ratio target.

48. Calculations of the *long-term primary gap* for Cyprus are carried out for the scenarios presented earlier and under different assumptions about the timing of the adjustment (see below). The calculations show at different points in time the primary balance improvement necessary to keep the debt ratio in 2050 less than or equal to a 60 percent level, assuming that the total required adjustment is undertaken *once-and-for-all* at the given point in time. This, of course, is not the only possible policy option. There is an infinite number of primary balance time profiles that could achieve the terminal debt level target in each scenario. The objective could for example be reached by initially adjusting the primary balance by less than

suggested by the *long-term primary gap indicator* and later adjust it further. But in this case, the cumulative adjustment over the long term would need to be greater than an immediate once-and-for-all adjustment. For this reason, although the long-term primary gap indicator does not have an immediate prescriptive value, it is useful indicator of the cumulative effort required over the period to reach the target terminal debt level.

Figure 5: Required Primary Adjustment with Different Timings for Adjustment



49. The calculations highlight the need for an immediate improvement in the primary fiscal balance. They show (Figure 5) that the size of the required primary adjustment depends heavily on the assumption about the success of structural reforms, the macro economic environment, as well as on the timing of the adjustment. Even under fairly optimistic assumptions about economic growth and labor market outcomes under current policies (scenario 1), the primary balance still needs to be raised permanently from next year onward by almost 2 percent of GDP. If action is delayed to 2020, the required permanent adjustment rises to more than 2½ percent. In the staff's baseline scenario (scenario 2), the primary balance needs to be raised permanently by around 2¼ percent of GDP if the entire adjustment was undertaken in 2003 to achieve a debt ratio of 60 percent in 2050. Delaying the adjustment to 2015 increases the required improvement to 3 percent. In the event health care costs increase by more than expected (scenario 3), the required adjustment is even higher. Additional pension reform can help bring about the necessary fiscal adjustment (scenario 4) and ensure long-term sustainability. It should be pointed out that the primary adjustment requirement calculated for scenarios 1-4 only ensures that the terminal debt ratio is equal to or less than 60 percent in 2050. However, this is not sufficient to guarantee that the debt ratio is not increasing at an unsustainable rate at that time. Thus, to truly ensure sustainability the

debt ratio needs to be stabilized, therefore requiring additional measures than suggested by the single-measure primary gap indicator. This is done in scenario 5, where higher contributions are assumed ensure actuarial sustainability of the pension system and by that—in this scenario—sustainability of total public finances.

50. The analysis underscores the need for time consistency in fiscal policy. The calculations presented above assume that the authorities keep to the new primary balance path for the rest of the period. Deviations from this path could seriously worsen the outlook and increase further the primary adjustment required to ensure achievement of the terminal debt ratio and, hence, public finance sustainability. This emphasizes the importance of adhering to the chosen fiscal path over the long term.