The long-term sustainability
of public finance in Germany –
an analysis based
on generational accounting

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Abstract

This paper analyses the sustainability of German public finance between 1996 and 2000 using a generational accounting approach. In contrast to previous studies based on generational accounting, the results are adjusted for cyclical and other temporary effects. This reduces the impact of exceptional factors obtaining in the base year and enhances the comparability of the results over time. First, a "status quo scenario" is considered as a comparatively transparent basis for assessing fiscal policy in the base year. In this setting it is assumed that the fiscal conditions obtaining in the base year will prevail in future years, too. Second, to obtain a more realistic picture of the real need for further fiscal policy action, a "policy scenario" is developed which includes already agreed measures that will take (full) effect only in the future. It is argued that, despite a substantial improvement in public finance in the second half of the 1990s, a sizeable sustainability gap persisted in 2000 under both scenarios. This is mainly due to the unfavourable demographic development, the consequences of which for government budgets are only partly compensated by the assumed catching-up of eastern Germany. In each of the years considered, already agreed measures taking effect in the future improved the sustainability of public finance on balance. Thus in each year the sustainability gap was narrower under the policy scenario than under the status-quo scenario.

Zusammenfassung

In diesem Papier wird mit Hilfe der Generationenbilanzierung die Entwicklung der Tragfähigkeit der öffentlichen Haushalte in Deutschland von 1996 bis 2000 untersucht. Im Gegensatz zu bisherigen Studien zur Generationenbilanzierung wird eine Bereinigung um konjunkturelle und andere temporäre Einflüsse vorgenommen. Auf diese Weise wird die Abhängigkeit der Ergebnisse von Sonderfaktoren des Basisjahres verringert und somit die zeitliche Vergleichbarkeit der Ergebnisse erhöht. Als vergleichsweise transparente Grundlage für die Beurteilung der Finanzpolitik des Basisjahres wird zunächst ein „Status-quo-Szenario" betrachtet, in dem die im Basisjahr beobachteten finanzpolitischen Bedingungen auch für zukünftige Jahre konstant gehalten werden. Um den noch bestehenden Handlungsbedarf realistischer abschätzen zu können, wird daneben auch ein „Politikszenario" analysiert. In diesem werden im Basisjahr bereits beschlossene, aber noch nicht (voll) wirksame politische Maßnahmen berücksichtigt. Es zeigt sich, dass trotz einer deutlichen Verbesserung der öffentlichen Finanzen in der zweiten Hälfte der neunziger Jahre auch im Jahr 2000 in beiden Szenarien noch eine beträchtliche Tragfähigkeitslücke bestand. Ausschlaggebend hierfür ist die ungünstige demographische Entwicklung, deren Folgen für die öffentlichen Finanzen durch den unterstellten Aufholprozess in Ostdeutschland nur teilweise kompensiert werden. Im Basisjahr bereits beschlossene, aber erst zukünftig wirksam werdende Maßnahmen verbessern die Tragfähigkeit der öffentlichen Finanzen per saldo in allen betrachteten Jahren, so dass die Tragfähigkeitslücke im Politikszenario generell niedriger liegt als im Status-quo-Szenario.

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List of symbols used

a	Index of the age of an economic subject
D	Highest age considered
g	Annual productivity growth rate
$GK_{t,k}$	Present value in t of all current and future net tax payments (generational account) of a person born in k
$h_{a,z,s}$	Real amount of payment type z (tax: +; transfer: -) of a person aged a in year s
k	Year of birth
$M_{y,k}$	Number of immigrants born in k and attaining resident status in Germany in y
$N_{t,k}$	Total burden (expressed as the present value in t) of the generation born in k
$P_{t,k}$	Number of persons of the generation born in k still alive in year t
r	Real interest rate, discount rate
s	Time index
$S_{s,k}$	Probability of a person born in k and resident in Germany surviving until period s
t	Base year
W_t	Net government wealth at the beginning of year t
z	Index of payment types considered

The long-term sustainability of public finance in Germany – an analysis based on generational accounting ^{*)}

I.   Introduction

Conventional indicators of fiscal policy such as the deficit and debt ratios say little about the long-term sustainability of public finance and the scale of the intergenerational redistribution of burdens brought about by government activity, particularly when society is undergoing demographic changes. The reason for the limited informative value of these "traditional" indicators in this respect lies in the fact that they do not take account of future perspectives. Furthermore, there can be no indication of expected net payments to the government during an individual's lifetime based on the development of the annual deficits and therefore no indication as to the government's influence on the expected lifetime consumption of an individual. As authors such as Kotlikoff (1993) have shown, fiscal measures can influence the intergenerational distribution without changing the government financial balance for that year. Or, vice versa, the financial balance can be changed without there having been an intergenerational redistribution. According to the neo-classical paradigm, however, the changes in the expected lifetime consumption have a decisive influence on the economic behaviour of the individual since this comes from an optimisation calculation over the total life cycle.

Ignoring future payment commitments of the government is unproblematic for the sustainability of public finance as long as these implicit liabilities are comparatively small or will more or less be matched by government revenue when they materialise. Over the past decades, however, the scale of the implicit liabilities has risen significantly, particularly following the sizeable extensions of the pay-as-you-go social security schemes. Furthermore, the implicit liabilities occurring in the future will increase sharply in the wake of the prevailing demographic development, whereas the revenue trend will tend to be dampened. The increasing dependency ratio emphasises the weakness of the conventional fiscal indicators and therefore also the need for more meaningful concepts for dealing with the issues outlined above.

Generational accounting was developed at the beginning of the 1990s by Auerbach, Gokhale and Kotlikoff[1] so as to better capture the intergenerational redistribution effects of government activity and the long-term sustainability of public finance. In the basic version, at least, the concept involves a forward projection of the fiscal status quo coupled with a forecast of the future demographic trend. From this we can derive not only the extent to which the intertemporal budget constraint of the government is satisfied by a forward projection of the status quo but also what intergenerational distribution effects arise from policy changes.

However, generational accounting also raises a number of theoretical and empirical objections (see section II (4)). This paper aims to clear up two of these critical points. First, the forward projection of age-specific payment profiles for individual levies and transfers means that exceptional factors prevailing in the base year are perpetuated. They are accounted for here by adjusting for cyclical and other important temporary effects in the base year. Second, strict adherence to the status quo fails to take into account that statutory measures may already have been adopted which could alter future payment commitments. For example, a not-yet-fully-introduced pension deduction for early retirement will result, *ceteris paribus*, in smaller average pension payments. As advocated in some of the literature, we counter this by incorporating the impact of policy measures that have already been adopted. To avoid diluting the indicative properties of generational accounting, however, such policy changes are initially disregarded in the status-quo scenario.

Following a brief explanation of the method of generational accounting in section II and a description of the data used and their processing in section III, key results under the status-quo scenario are presented in section IV. In section V payment streams between the government and individuals, broken down by age, are then adjusted for cyclical and other temporary effects. Section VI examines the extent to which the results are influenced by fiscal measures which were already adopted in the base year but which will have a (full) impact only in later years. A distinction is drawn between measures that change the age-specific payment profile of a payment type proportionally and measures which affect the relative position of individual age groups in the payment type. In addition, problems encountered in converting cross-sectional data to longitudinal data are briefly dealt with using pension benefits as an example. Section VII summarises the main results of the study.

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1   See Auerbach, Gokhale, Kotlikoff (1991, 1992, 1994).

II. The methodological approach of generational accounting

1. The basic concept of generational accounting

The objective of generational accounting is to determine the redistribution effects of fiscal policy between different generations. In addition, it permits conclusions to be drawn concerning the long-term sustainability of public finance. The concept is based on generational accounts computed for each living birth-year generation. The generational account describes the financial relationships between the government and an average member of the relevant age cohort over his remaining lifetime.

The first step in drawing up a generational account is to calculate the present value of all taxes and contributions made by a person to the government during that person's remaining lifetime. Then the present value of benefits received from the government is subtracted from this figure to arrive at the present value of all future net payments, which is also referred to as the net tax payment. In doing so, assumptions need to be made about the discount rate, the growth rates of government revenues and expenditures as well as age-specific survival probabilities.

In the basic version it is assumed that the "fiscal policy" prevailing in the base year will continue to apply throughout the residual lifetimes of all persons already born by the end of that year. "Fiscal policy" in the base year does not refer to the existing legal framework but rather to the age-specific payments observed between the government and individuals. The age-specific per capita amounts of the individual levy and transfer types z prevailing in the base year are projected into the future in line with the assumed productivity growth rate (g).[2] In year $t+1$, therefore, a person aged a must anticipate an amount higher by g than a person aged a in year t:[3]

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[2] Particularly in older studies, no age-specific distribution is made for payment types for which no age-specific payment profiles are available or for which no corresponding monetary payment is received by the individuals concerned (e.g. expenditure on internal and external security or general administration). We follow the approach adopted by ter Rele (1997) and Raffelhüschen (1999), who distribute this expenditure on a per-capita basis – after netting with the relevant revenue. Otherwise the net burden recorded in the generational account would not include the utility of these government activities (which is equated to the corresponding government expenditure). Hence the welfare change occasioned by government activity for an average member of a generation would be presented too unfavourably. See Bonin (2001), p 22ff. for a discussion of the pros and cons of this approach. (The pages cited here and below relate to the dissertation edition, and therefore differ slightly from those in the source indicated in the bibliography).

[3] For simplicity of notation, the population breakdown by gender, region (eastern and western Germany) and nationality undertaken in practice is dispensed with here.

$$h_{a,z,s} = h_{a,z,t}(1+g)^{s-t} \qquad a = 0,...,D; \quad s > t . \qquad \text{s: time index} \tag{1}$$

Thus the generational account of a member of a particular living age cohort is:

$$GK_{t,k} = \sum_{s=t}^{k+D}\sum_{z} h_{s-k,z,s} S_{s,k} \frac{1}{(1+r)^{s-t}} . \tag{2}$$

In this equation, D represents the highest age considered and $S_{s,k}$ the likelihood of a person born in k and resident in Germany in t to survive until period s, while r denotes the discount rate.

Changes in generational accounts as a result of fiscal measures are interpreted as an approximation of changes in welfare and therefore allow conclusions to be drawn concerning their intergenerational distribution effects.

Generational accounts can also be determined for future generations, i.e. all cohorts born after the respective base year. The starting point is the requirement that the present value of all future government expenditure must equal the present value of all future government revenue (the intertemporal budget constraint on the government). Put another way, the present value of government revenue must correspond to the present value of primary expenditure plus net government debt. The present value of all present and future net government revenue (i.e. of the primary surpluses) is derived from the sum-total of the generational accounts of all economic agents living today and in the future. In addition to residents, net payments by migrants also need to be considered.[4] The size of the burdens to be assumed by future generations born inside the country can thus be determined by deducting the sum-total of the generational accounts of living generations and net payments of future immigrants from net government debt. If the net contributions to the government by living generations and by immigrants do not suffice to cover the government net debt, the remaining balance will need to be financed by positive net payments by future generations.

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[4]   Cf. Ablett (1997) and Bonin, Raffelhüschen, Walliser (2000). As is customary in the literature, net immigration figures are likewise used as a basis in this respect. This is based on the assumption that an immigrant has the same demographic and fiscal properties as an emigrant of the same age. This need not necessarily be the case, since immigrants and emigrants can differ both in terms of their survival probabilities and fertility rates and their age-specific net tax payments.

$$\sum_{s=1}^{\infty} N_{t,t+s} = ND_t - \sum_{k=t-D}^{t} N_{t,k} - \sum_{y=t}^{\infty} \sum_{k=y-D}^{y} M_{y,k} GK_{y,k}^{M} (1+r)^{t-y}$$

with

$$\sum_{k=t-D}^{t} N_{t,k} = \sum_{k=t-D}^{t} P_{t,k} GK_{t,k}$$

$$\sum_{s=1}^{\infty} N_{t,t+s} = \sum_{k=t+1}^{\infty} P_{k,k} \frac{GK_{k,k}}{(1+r)^{k-t}}$$

In order deduce from this total burden the individual burdens on those born after the base year, i.e. the generational accounts of future generations, an assumption has to be made concerning the distribution of the total burden (see the following section). Disregarding migration movements, the imposition of the intertemporal budget constraint underscores the zero-sum nature of generational accounting: whatever is given to one particular generation must be taken away from another.

2.   Choice of indicators: intergenerational redistribution and sustainability

The choice of indicators depends on which of the two objectives of generational accounting – measuring sustainability or intergenerational redistribution – is to take centre stage. If the key issue is *sustainability*, it is more appropriate to focus on payment streams from the government's perspective. In this case it will not be necessary to calculate the generational accounts of future generations. Instead, the fiscal conditions of the base year, i.e. the age-specific amounts of the individual payment types – apart from the adjustment for the productivity growth rate – can be kept constant for future generations as well. Sustainability is achieved if the (discounted) future outgoings of the government (excluding interest) plus its net debt are covered by future income. If not, the intertemporal budget constraint on the government is met via the so-called sustainability gap, which is computed as a residual.[5] It denotes the present value of all future fiscal consolidation measures required to move from the fiscal conditions of the base year to a policy that

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[5]   See Auerbach (1994), Boll (1996) and Raffelhüschen (1999).

guarantees compliance with the government budget constraint without necessitating any further fiscal policy changes.[6]

The sustainability gap is frequently expressed as a percentage of GDP of the base year in order to relate it to the economic potential of the country in question. However, since the sustainability gap is the outcome of future payment streams, it makes sense to relate it to the future economic potential as well as that prevailing today. For instance, a country with a structurally high future productivity growth rate and high population growth will find it easier to close a given sustainability gap expressed as a percentage of GDP of the base year than a country with a stagnating productivity growth and a declining population.[7] In this study the sustainability gap is therefore additionally expressed as a percentage α of the present value of future GDP (annual sustainability gap, annual consolidation requirement). This is equivalent to the percentage of GDP that needs to be generated in each future year in the form of increases in revenue or cuts in the government's primary expenditure in order to be able to meet the intertemporal budget constraint on the government without any further policy changes.[8]

If, by contrast, the centre of interest is the *intergenerational distribution effects*, the focus needs to shift from a perspective geared to payment streams and based on aggregates to one based on the individual and utility. The different viewpoints are not necessarily congruent, since government activity can result in utility without giving rise to payment streams. For instance, if the government makes infrastructural facilities available free of charge, this certainly generates utility for economic agents. In general, however, this provision of utility produces no equivalent monetary streams.[9]

If intergenerational distribution effects are to be highlighted, it does not suffice to determine one particular consolidation requirement. In this case the status quo situation needs to be analysed and the point in time (and nature) of the policy change necessary to establish sustainability will need to be explicitly defined. Ultimately, however, the point in time and the nature of the policy change necessary to comply with the intertemporal budget

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[6]   Banks, Disney, Smith (2000) rightly point out that the sustainability gap need not be met exclusively by policy measures but that changes in behaviour, such as a higher workforce participation rate, can also make a contribution.

[7]   This also applies to the conventional debt-to-GDP ratio. See Bonin (2001), p 90.

[8]   The necessary projection of future GDP is achieved in this case by distributing GDP across the age classes according to the age profile of labour incomes. The age-specific per capita values are then extrapolated using the assumed productivity growth rate and summed with the aid of the population forecast to form aggregate figures for future years.

[9]   See section III.3.

constraint are quite arbitrary. A customary convention assumed in generational accounting is that all generations already living in the base year are excepted from the policy change. Accordingly, sustainability is achieved solely by those born after the base year (including immigrants born after the base year). Only this produces differences in burdens between newly born persons belonging to different birth-year cohorts.[10] In older studies the nature of the policy change was not clearly specified. It was merely assumed that the lifetime tax rates, i.e. the net burden in relation to lifetime income, is the same for all future generations.

In the final analysis, however, sustainability can be achieved by an infinite number of policy variations that differ according to their time dimension and the payment categories to which they apply. This also means, however, that their intergenerational distribution effects may differ greatly. For example, a tax increase entering into force in ten years' time will affect different generations than an immediate cut in pension benefits, even if both policies are structured in such a manner that they close the sustainability gap. An argument in favour of the conventionally selected nature of the policy change is that it permits us to measure the extent to which the fiscal balance rule is being complied with. According to this rule, the individual lifetime net burden must be equal for all generations.[11] This benchmark rule is justified among other things by the fact that, in a neoclassical growth model, it describes an equilibrium path that is departed from only as a result of exogenous shocks.

Yet even if this convention is followed and responsibility for closing the sustainability gap is left to future generations alone, this tells us little about the intergenerational distribution.[12] This is because it is next to impossible to empirically determine the lifetime tax rates of cohorts born before the base year . This means that the fiscal balance rule must be confined to a comparison of persons born in t and in t+1. But if the living generations (born before t) make corresponding net payments to the government, any particular lifetime tax rate for those born in the base year is also sustainable for future generations. The redistribution in this case does not take place between newly born and future generations but between persons already living and those born in the base year (and later). Even if persons born in the base year and future generations have to bear the same lifetime tax rates, the intergenerational distribution has not been established because the size of the tax

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[10]   The generational accounts of persons born before the base year are not directly comparable with those of the newly born since they only capture payment streams of one part of the life cycle, namely that of the expected remaining life-span.

[11]   According to the ability-to-pay principle, by contrast, a higher lifetime tax rate for future generations could be considered appropriate in the context of rising real incomes.

[12]   In relation to this paragraph see Bonin (2001), p 69f.

rate depends on the payments anticipated from those already living in the base year. The higher their net payments, the lower the tax rate can be for the newly born and for future generations.

There are additional drawbacks to the conventional approach to calculating the intergenerational redistribution. If, instead of extrapolation using the productivity growth rate, forecasts are used for individual payment categories and/or different mortality rates are assumed for future birth-years (increasing life expectancy), this can lead to the generational accounts of future generations being dependent on the year of birth when extrapolating the status quo. In this event it will no longer be appropriate to postulate the same lifetime tax rate for all future generations.

In addition, the relationship of lifetime tax rates of the newly born and future generations frequently used in the past is unsuitable as an indicator, *inter alia* because it depends on the definition of non-assigned government expenditure and tends towards infinity for generational accounts of newly born cohorts close to zero.[13] These weaknesses can be avoided by assuming that the fiscal status quo will also apply to future generations and that the sustainability gap will be closed by means of a specific policy instrument. For instance, this may be the required percentage change in levies of future generations.[14] However, the drawback of this indicator is that it depends on the extent and age-specific distribution of the levy burden under the status quo.[15] For this reason, following Bonin, the annual per capita tax required from each member of future generations is used as an indicator.[16] The transformation of the absolute difference between the generational accounts of newly born and future generations into an annual payment (adjusted in line with the productivity growth rate) leads to a smaller sensitivity to changes in the discount rate and productivity growth rate.

However, this likewise does not alter the fact that the choice of timing for the policy change is ultimately arbitrary. For this reason – and because the sustainability of public

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[13] See Raffelhüschen (1996).

[14] In the volume edited by the European Commission with country-specific studies for European countries, the required change in all levy payments of future generations is used *inter alia* as an indicator (see Jägers, Raffelhüschen (1999)). The absolute difference between the generational accounts of present and future generations likewise contained in that work has the drawback that it is not matched against economic potential or individual consumption potential. This may lead to significant changes in sensitivity analyses.

[15] While the first drawback can be resolved by expressing the required change as a percentage of GDP, this percentage may change in the course of time since it depends on the population size of the individual age classes.

[16] See Bonin (2001) p 91ff.

finance from a macroeconomic perspective is more relevant in terms of monetary policy than are intergenerational redistribution effects – the focus of this study is the long-term sustainability of fiscal policy. As regards the intergenerational distribution effects, we focus on the implications of specific reform projects. As for the latter the timing of the (planned) introduction and the nature of the policy change are known, an artificial contrasting of present and future generations is not absolutely essential.[17]

3.   Indicator or forecasting instrument?

Not only does the choice of the suitable indicator depend on the specific objective in mind, but also the extent of the switch from a mechanical extrapolation of the status quo to a more realistic forecast. If generational accounting is to serve above all as an indicator of the sustainability of fiscal policy in the base year, it does not make much sense to replace the simple extrapolation of age-specific payment profiles in line with the assumed productivity growth rate by more realistic forecasts. Otherwise, the sustainability could be improved, e.g. by measures planned for the future, without changing the policy in force in the base year. However, this would weaken its meaningfulness as an indicator of the orientation of the *present* fiscal policy, since this would also mean that some fiscal policy measures planned for the future would be included in the calculations. Moreover, the measures might be subsequently suspended or postponed. In addition, long-term forecasts of individual government revenue and expenditure categories are highly uncertain and require a great deal of effort.[18] The results frequently depend to a considerable degree on more or less arbitrary choices by the forecaster that are hard for outsiders to appraise. While this might make the results more realistic, at the same time they are more difficult to interpret. Using forecasts with a shorter time horizon rather than long-term forecasts helps to invalidate this objection. However, this also means that little is gained in relation to the status-quo projection since the government reached on the horizon of the forecast is extrapolated.[19] An additional problem for Germany is that no sufficiently disaggregated official forecast is available to serve as a basis. In this study, therefore, the age-specific profiles are extrapolated under the status-quo scenario solely in line with the productivity growth rate.

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[17]   If the measure being considered fails to fully close the sustainability gap, it is not necessary to assign this amount to particular generations. The outstanding sustainability gap can also be shown instead as an aggregate figure.

[18]   For instance, such long-term forecasts are made for the United States by the Congressional Budget Office and by the Office of Management and Budget (see Congressional Budget Office (2000) and the Office of Management and Budget (2001)).

[19]   One of the reasons why short-term forecasts are frequently used in studies of generational accounting is because the influence of the economic situation in the base year is reduced if an approximately normal level of capacity utilisation is achieved at the end of the forecast horizon. This problem is avoided in our study by the cyclical adjustment described in section V.

Both automatic changes inherent in the current fiscal system and changes in the statutory framework already adopted but not yet in force are disregarded. The results of the status-quo scenario therefore describe the effect of combining the fiscal conditions of the base year with the assumed demographic evolution.

On the other hand, such a strict interpretation of the status quo has the drawback that it does not accurately capture the remaining need for action obtaining in the base year. For instance, if measures have been adopted which will only enter into full force and have a full impact in the future, the sustainability gap measured under the strict status quo scenario is wider than the consolidation requirement in the sense of new decisions needing to be taken. For example, cuts have already been adopted in the statutory pension insurance scheme that are due to come into force in the future. Simply extrapolating the age-related payment profiles of the base year ignores such measures and thus overstates the outstanding reform requirements.

Besides the initial scenario with a strict interpretation of the status quo, we therefore consider a second scenario (policy scenario) which focuses more on the outstanding consolidation requirement. No attempt is made to fully capture the *legislative* status quo, however. Since nominal amounts are defined in much benefits legislation (nursing rates in the statutory long-term care insurance scheme, social assistance rates, etc.), this would mean that in the long run these payments would tend towards zero in relation to lifetime income, given positive productivity growth and inflation rates. On the other hand, bracket creep would lead to a continuously increasing tax ratio. This would ignore the fact that the volume of these payments is adjusted at irregular intervals. Moreover, in key branches of the social insurance system the legal status quo, which does not permit credit financing, would trigger an automatic adjustment of revenue to expenditure trends by adjusting contribution rates. Hence by definition no sustainability gaps can occur in these key areas apart from the effects of increasing Federal grants. If the accounts always balance, then the present value of revenue minus the present value of expenditure likewise equals zero. Accordingly, constant rates of contribution are assumed in this study. Given these problems, the effects of the main measures which were already adopted but were not yet (fully) effective in the base year are used here rather than an extrapolation based on the legislative status quo.[20]

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[20] The change in aggregate figures can often be quantified by using the estimates made in the respective draft law. Compared with the status-quo scenario, however, only the difference vis-à-vis the development as gauged by extrapolating the age-specific payment profiles in line with the productivity growth rate leads to different results.

Using this approach, one can determine first of all what kind of sustainability gap arises using the strict status-quo scenario, which is easier to interpret. In a second step one can then examine to what extent this sustainability gap will be closed by the effects of major measures already adopted (and what the associated intergenerational redistribution effects will be).

4.   The limitations of generational accounting

The methodological and empirical limitations of generational accounting have already been discussed at length in the relevant literature.[21] Nevertheless, the most important points of criticism are reiterated below in order to avoid misinterpretations.

The concept of generational accounting is based on the life-cycle hypothesis. This means that economic agents have at least a rough idea of the income they will receive during their remaining lifetime and adjust their economic behaviour accordingly. The planning horizon for economic agents is therefore their remaining life-span . Both in the case of a significantly shorter timeframe and especially a longer-term planning horizon, the information content of generational accounting declines in respect of the likely intergenerational redistribution effects.[22] If inheritance motives are included so as to take account of the welfare of future generations in the individual's decisions (Ricardian equivalence theorem)[23], the results can no longer be used as a yardstick for changes in individual utility since the intergenerational redistribution effect of government activity would be at least partly cancelled out by countervailing private transfers between generations. If, by contrast, the planning horizon of individuals is shorter than their lifetime, the utility of a particular lifetime income is no longer independent of its spread over time. One reason for this could be liquidity constraints resulting from imperfect capital markets. On the whole, inferences concerning the long-term sustainability of public finance are less dependent on the postulate of the life-cycle hypothesis.

A further point of criticism relates to incidence assumptions: it is mostly assumed that there is no pass-on effect, i.e. levies actually burden those who pay them and that the recipients of transfers are the actual beneficiaries. This ignores the fact that the tax payment and the real invidence of, say, a factor tax may affect different groups of people in a manner that is hard to determine. This is attributable to tax-induced changes in behaviour which may lead

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[21]   See, for example, Haveman (1994), Buiter (1995), Boll (1996), Diamond (1996), Deutsche Bundesbank (1997), Raffelhüschen (1999), Feist, Raffelhüschen (2000).
[22]   See Buiter (1995).
[23]   See Barro (1974).

to changes in pre-tax prices and generate an excess burden. Moreover, fiscal measures or the demographic evolution can lead to changes in the macroeconomic setting, for instance in interest rates, the productivity growth rate and the level of wages. Since second-round effects are disregarded in generational accounting, changes in generational accounts in the wake of policy measures cannot be directly interpreted as changes in welfare. These problems could only be overcome by embedding generational accounting in a dynamic, general equilibrium model with overlapping generations. There is a certain trade-off, however, between the improvement in the results and the transparency, simplicity and interpretability of the method. Fehr, Kotlikoff (1997) conclude on page 25 that "in general, changes in generational accounts provide fairly good approximations to generations' actual changes in utility". This tends to apply more to living rather than future generations and less if the policy change in question markedly alters the degree of progression of the tax system or if there are significant adjustment costs to the capital stock.[24] In order to avoid a model dependence of the results and to keep the method as simple and transparent as possible, such secondary effects are disregarded in this study. This needs to be taken into consideration when interpreting the results. Generally speaking, this simplification impairs the meaningfulness of the results less in terms of sustainability than in terms of intergenerational burden comparisons because the former (at least in the strict status-quo version) is calculated exclusive of policy changes, which may entail behavioural reactions.

As already indicated, non-recurring exceptional influences obtaining in the base year have a major impact on the results of generational accounting because they are projected into the future. It follows that the results may fluctuate sharply over time owing to cyclical and other temporary effects in the respective base year. This problem is taken into account by the adjustment described in section V.

The choice of the appropriate discount rate likewise causes difficulties. If the values of future payment streams were certain and known, the real yield curve for risk-free bonds could be used.[25] However, that is not observable because even government bonds are subject to a certain default risk – in addition to their price risk.[26] Moreover, in relation to the individual utility of government activity it must be borne in mind that future payment streams between the government and individuals are subject to uncertainty. This can be caused, for example, by the fact that the individual future income situation and the

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[24] By contrast, policy changes with significant macroeconomic repercussions may even lead to qualitatively different results. See also Raffelhüschen, Risa (1997).

[25] See Auerbach, Kotlikoff (1999), p 37. This is based on the assumption that the individual time preference rate coincides with the risk-free market interest rate.

[26] Moreover, inflation-indexed government bonds, which could be used as a close proxy of the risk-free interest rate, do not exist in Germany.

associated levy and transfer payments are uncertain. But it may also be caused by uncertainty relating to the general economic trend and possible changes in the legal framework. Given risk aversion, uncertain payment streams produce a smaller utility than certain ones. According to the expected utility theory, in this case shadow prices would need to be defined for the uncertain payments, which would then have to be discounted using the risk-free interest rate. For simplification, the expected value of a payment is frequently discounted using an interest rate increased by a risk premium. In the context of calculating generational accounts, it must be borne in mind that uncertain levy payments must be discounted at a *lower* rate than the risk-free interest rate.[27] Otherwise – i.e. if the discount rate were increased by a risk premium – the present value of the payment stream would be reduced, which would mean that, for a given expected value, an uncertain tax payment would be given preference over a certain one. The introduction of uncertainty would therefore cause the utility from the present value of transfer payments to decrease and the burden resulting from the present value of tax payments to increase compared with a situation characterised by certainty. The aggregate net utility from government activity would thus decline.

Account also needs to be taken, however, of correlations of the fluctuations of various payments to and from the government both between one another and with other income, since the fluctuations in lifetime income determine individual utility. However, these fluctuations can also be reduced by uncertain net payments to the government if the latter ensures an inter- (or intra-)generational risk diversification by allowing the generational accounts to be negatively correlated with other income.[28] Little empirical evidence is available concerning the different factors that need to be included in an appropriate treatment of uncertainty. Therefore, generational accounting studies customarily include a sensitivity analysis using various discount rates.

The statements on sustainability are less affected by the problems associated with the choice of discount rate than statements on intergenerational distribution. As sustainability focuses on the solvency of the government, individual changes in utility arising from the introduction of uncertainty in connection with individual risk aversion are irrelevant. A risk premium, possibly differentiated according to transfers and levies, is unnecessary from a government perspective. The crucial requirement for determining the solvency of the government is that the discount rate corresponds to the interest rate payable for government borrowing or which can be earned on government assets. If the discounting factor were

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[27] See Havemann (1994), p 104.

[28] The appropriate discount rates can vary, depending on the generation in question. See Auerbach, Kotlikoff (1999), p 39.

higher, this would imply that the interest payments on government debt were higher than the actual payments and the sustainability gap would thus be overstated. On the whole, therefore, it seems reasonable to make the real yield on government bonds outstanding as the uniform discount rate the starting point for sensitivity analyses.

To sum up this section, it may be said that the results need to be interpreted with caution, especially in terms of the intergenerational redistribution effects of public finance, whereas they appear more reliable in respect of sustainability. The results should certainly not be understood as an attempt to forecast future trends, since reactions by the government and individuals and the consequences thereof for the overall economy are not analysed.

III.   Data pool

Critical issues limiting the meaningfulness of generational accounting exist not only at the theoretical level. The data pool on which the calculations are based also constitutes a problem. The first component of the empirical basis necessary to calculate generational accounts - future demographic trends - is by its very nature subject to uncertainty, while often only data derived from samples are available for the second component - the relative age-specific payment profiles of the individual payment categories necessary to assign the national accounts figures to individual birth-years. Moreover, their classification can differ from that of the national accounts figures. This necessitates much recourse to estimates. Some assumptions are necessary, too, as regards the aggregate national accounts figures, especially relating to breakdowns for eastern and western Germany. The final component that needs to be determined are the relevant macroeconomic parameters (such as the productivity growth rate and the discount rate).

1.   Population evolution

The future population trend constitutes a central element of generational accounting. In the basic approach it is the only real forecast included in the calculations. The key data required for the calculations – broken down by east Germans, west Germans and foreigners and by gender – are the age-specific survival rates in the base year and their development in the future, the age structure of the population in the base year, the number of persons born in future years as well as the number and age structure of immigrants. The population forecast used here is largely based on the assumptions of variant 1 of the 9th coordinated

population forecast of the Federal Statistical Office.[29] The structure of the population as at 1 January 1999 serves as the starting point.

With regard to birth statistics, it is assumed that the total fertility rate of west German women (foreign women) is constant at 1.38 (1.49), which roughly corresponds to the values of 1998 (1996). It is assumed that the total fertility rate of east German women of 1.09 in 1998 will converge with that of west German women by 2005. In terms of mortality trend, it is assumed that the life expectancy of the newly born, which according to the mortality chart of 1996/98 amounts to 74.4 (80.5) years for men (women) in western Germany, will rise to 78.1 (84.5) years by 2050 and will remain constant thereafter. While the same age-specific survival probabilities are assumed for immigrants as for west Germans, it is assumed that the life expectancy of east Germans - initially 72.4 (79.5) years for men (women) - will converge with the corresponding west German figures by 2025. The migration surplus will rise from 90,000 persons in the year 1999 to initially 150,000 in the year 2003.[30] Thereafter it will decrease continuously owing to the declining number of ethnic German immigrants to reach a constant level of 100,000 persons per annum in the year 2040. The results are influenced quite significantly by the size of the net migration and also by the age and gender profile of the migrants. In line with the 9th coordinated population forecast, the average profile obtaining between 1994 and 1996 is used also for future years.

The result is a contracting population. While this contraction, starting from a population of 82.0 million persons at the beginning of 1999, is quite small for a time, it will accelerate noticeably after the first decade of this century. By 2050 the population will already have decreased to 65.3 million and will fall to little more than half of the starting level by the end of the century. This process of contraction will be accompanied by an increasing ageing of the population. The elderly dependency ratio, which here is the ratio of the number of people aged 60 or more to the number of persons aged between 20 and 59, will double from its initial level by the middle of the century and will subsequently decline only marginally.

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[29] See Sommer (2001). The slight differences in the results compared with the 9th coordinated population forecast are partly attributable to the fact that a more up-to-date population base was used here and a distinction was drawn between Germans and foreigners.

[30] Internal migration between eastern and western Germany is not taken into account. For one thing, the net migration is quite small and for another the fiscal (and demographic) characteristics do not necessarily change on account of a change in location. Moreover, any resulting distortion is limited by the period assumed until convergence between eastern and western Germany.

Table III.1: Results of the population forecast

on January 1 of year ...	1999	2010	2020	2030	2040	2050	2100
Total Population (million)	82,0	81,3	79,0	75,4	70,7	65,3	42,1
of which aged 20 up to 60 (%)	56,2	55,5	53,3	47,9	47,5	46,8	47,0
of which aged 60 or more (%)	22,4	25,4	29,0	35,0	36,1	37,2	36,5
Dependency ratio 1)	39,8	45,8	54,3	73,0	75,9	79,6	77,8

1) Ratio of those aged 60 or more to those aged betw een 20 and 60 (in per cent).

2. Age-specific payment profiles

The task of calculating generational accounts requires not only the population trend but also the age-specific payment profiles - broken down by population group - for the various government revenue and expenditure categories. These payment profiles were predominantly derived from the 1998 income and expenditure survey conducted by the Federal Statistical Office. Other sources used were the Socio-economic Panel managed by the *Deutsche Institut für Wirtschaftsforschung* and a number of other data sources, particularly those of the social security funds. The profiles for some payment categories need to be supplemented by estimates. Frequently the higher age classes in particular have a fairly low incidence, which means that the figures are subject to some uncertainty, at least for specific age cohorts. Bearing in mind, too, that the classifications often do not exactly match those in the national accounts and that sometimes the data relate only to the tax base,[31] it is clear that the payment profiles obtained in this way and extrapolated to cover the population as a whole deviate more or less sharply from the figures shown in the national accounts. For this reason we adopt a two-stage approach – as is customary in the literature. In the first stage the age-specific payment profiles are calculated from the various data sources. In the second stage the age-specific per capita amounts are multiplied by a scaling factor which is uniform for all age and population groups. This scaling factor is defined so as to ensure that in the aggregate - taking into account the size of the age classes - the respective national account figure is reached. In other words, while in the first stage only the relative positions of the birth-year groups (and population groups) are matched, in the second stage the absolute payment profiles are calculated.

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[31]　For instance, in the case of turnover tax it is not the actual tax payment that is directly recorded but rather expenditure on goods and services liable to turnover tax (broken down by the full and reduced tax rate). In the case of taxes on capital income, income from renting and leasing and from financial assets is used as an approximation of the tax base.

This two-stage approach not only ensures consistency between absolute age-specific payment profiles and the national accounts data but also allows these profiles to be calculated on a relatively timely basis - the database for calculating the relative payment profiles is available as a rule only after a considerable time-lag and in some cases is not even compiled annually.[32] However, the relative payment profiles typically change little over time. Hence it is often possible to use relative payment profiles which were obtained before (or after) the base year, without this involving a major error. By contrast, the national accounts data needed for calculating the absolute payment profiles (which are subject to stronger fluctuations) are available on a relatively timely basis.

In line with the fundamental assumption that the payment burden of levies (and transfers) is not passed on, child-rearing benefits, for instance, are assigned to parents (predominantly to mothers). By contrast, we allocate child benefit to children even though it is formally paid to parents.[33] A further exception from this incidence assumption are social insurance contributions, which – in deviation from the standard approach – are debited in full to employees. For these levies, therefore, it is assumed that the burden of the employer's contribution, too, is borne by the employee. A particular problem is presented in apportioning data which are not person-related but are only available at the household level. First of all, this relates to taxes on capital income, property acquisition, mineral oil, motor vehicles and insurance taxes as well as the other excise taxes (or the relevant tax bases). These payment categories are assigned to individual age classes by allocating equal shares of the household amount to all members of a household who are older than 18. The average payment amount for a particular birth-year is determined by adding up the relevant shares and dividing them by the size of the respective cohort. Electricity tax and turnover tax can likewise only be calculated at the household level at the first stage. For these payment types a per capita distribution was made to all persons living in the household, without any age restrictions.[34] But even in the case of person-related data, the data base is unsatisfactory to some extent. For instance, the allocation of expenditure of the statutory long-term care insurance scheme causes special problems. The income and expenditure survey only records cash benefits; however their distribution across the age classes can deviate significantly from that of non-cash benefits. For this reason, we use the data on expenditure of private long-term care insurance schemes provided by the German

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[32] The income and expenditure survey is only performed every five years. The relative payment profiles used in this case are predominantly based on surveys conducted in 1998.

[33] This allocational scheme makes it possible to map a more realistic view of future payments of child benefit and (given constant fertility rates) also of child-rearing benefits.

[34] Some of the literature also contains other approaches. For instance on page 49f. ter Rele (1997) allocates indirect taxes not on a per capita basis but according to net income. Equivalence figures are also occasionally used.

association of private health insurance institutions (*Verband der privaten Krankenversicherungen*), but these are only available for Germany as a whole. This assumes that the relative position of the individual birth-years in the private and statutory long-term care insurance schemes do not differ. A further assumption is that the age-specific per capita amounts in western and eastern Germany are identical.[35] A total of 38 different relative payment profiles were used per population group in order to apportion the national accounts data to the individual birth-years.

Whereas for most payment categories fairly reliable relative payment profiles can be calculated separately for eastern and western Germany, broken down by gender, the payment profiles of immigrants cause far greater difficulties. Since the payment profiles of future immigrants are inherently non-observable, the fiscal characteristics of foreigners living in Germany were used as an approximation in this study. This means that the group of ethnic Germans relocating to Germany was not taken into account in determining these profiles. In addition, the payment profiles of immigrants depend on the number of years they have already spent in Germany and on the structure of migration (guest workers, family members joining persons who migrated to Germany earlier, asylum seekers, etc).[36] Such changes in the fiscal characteristics of immigrants are barely captured by the approach adopted here. Since the population forecast is based solely on net migration, the effects of immigration may be distorted also because the payment profiles of emigrants differ from those of immigrants.[37] For the second generation of immigrants, i.e. all those born in Germany, a full convergence with the payment profiles of west Germans is assumed.[38]

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[35] This assumption can be justified on the basis of the maximum nursing-care rates, which are uniform throughout Germany. On the other hand, the age-specific long-term care probability in the two parts of Germany may differ as long as respective life expectancies have not converged.

[36] The early years of integration may involve lower levy payments and higher transfers, whereas the payment profiles of immigrants who have already lived in Germany longer than the average of all foreigners may be expected to converge further towards those of German citizens. From a theoretical point of view it would be desirable to simulate the process of assimilation using payment profiles linked to the number of years spent in Germany.

[37] However, the resulting distortion is likely to be limited by the fact that the share of Germans among the emigrants is relatively small.

[38] The payment profiles of west Germans were chosen because foreigners live almost exclusively in western Germany. Moreover, in a scenario envisaging convergence of the payment profiles of east Germans to the west German level, it would otherwise have been implicitly assumed that the immigrants settling in eastern Germany would likewise have been subject to this inner-German convergence process.

Chart III.1: Age-specific net payments by population group
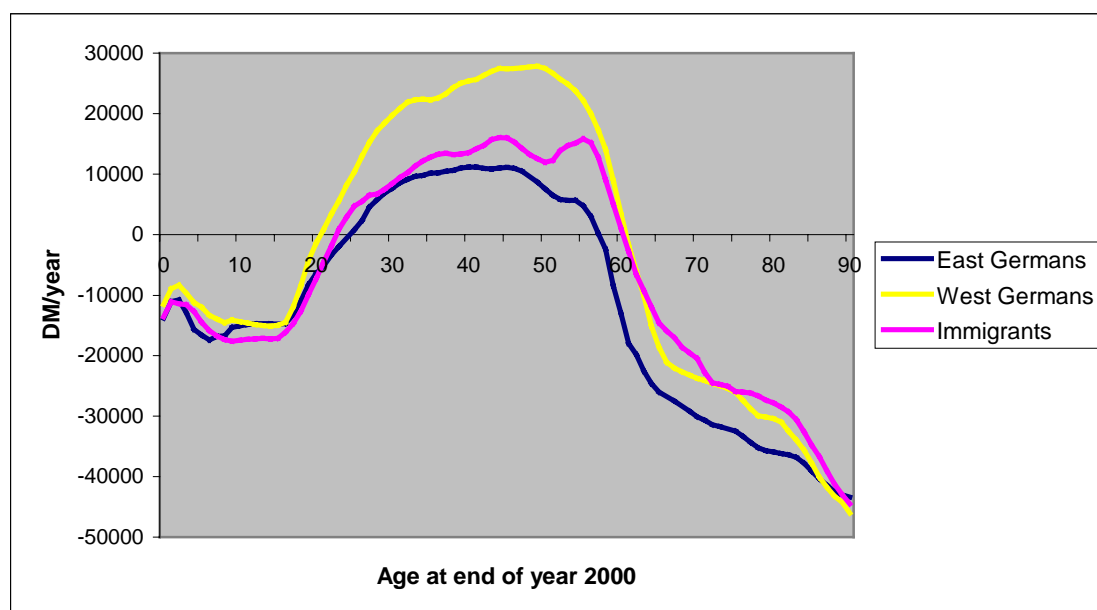
Since very few data sources facilitate separate records for foreigners, the age-specific profiles of this population group were derived from the Socio-economic Panel. Owing to the comparatively small size of the sample of this panel, however, we followed the approach of Bonin (2001) and only calculated the relative position of foreigners vis-à-vis German nationals of the same age and gender. This relationship, which differs according to age and gender, was then applied to the relative payment profiles of German nationals derived from other data sources.[39]

3. National accounts data

In line with the approach outlined above, progressing from relative to absolute payment profiles for the individual payment types and population groups requires using the national accounts figures for the various government revenue and expenditure categories. These can be taken from the relevant statistical data of the Federal Statistical Office. A distinction can be made both on the revenue and on the expenditure side of the budget between categories distributed age-specifically and those that cannot be assigned to specific birth-years and therefore have to be allotted on a per capita basis. Furthermore, several payment categories are not distributed at all but can be disregarded for the purpose of generational accounting.

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[39] This approach was departed from in a few cases. Thus the profiles for indirect taxes were determined by examining the different lifetime incomes of foreigners and west Germans. The profiles of west Germans were used for expenditure of the statutory health and long-term care insurance schemes as well as for revenue and expenditure categories for which no reliable values could be determined owing to the small number of cases available. The precise procedure adopted is described in Bonin (2001), p 182ff.

In addition, adjustments are required for various payment categories, which are briefly explained below.[40] The results of the conversions for the year 2000 and Germany as a whole are shown in Table III.2.

Government expenditure starts with the benefits paid by the statutory pension insurance scheme. This only takes account of benefit payments. By contrast, the administrative expenditure is assumed, as in the case of the other branches of social insurance, to be independent of the age structure of the population and is therefore allocated to non-age-specificly distributed expenditure.[41] The apportionment to retirement pensions, surviving dependants' pensions and disability pensions is effected with the aid of the relative payment profiles. Contrary to the approach mostly adopted in the literature, no adjustment is made for contribution payments of the statutory pension insurance scheme to the pensioners' health insurance scheme and the pensioners' long-term care insurance scheme. While these contributions do not accrue to individuals but to another sub-sector of government and therefore at first sight do not represent a utility for pensioners, it may be notionally supposed that pensions are initially correspondingly higher and the contributions to the health and long-term care insurance schemes are then paid from these higher pensions. Moreover, if individual branches of social insurance were viewed in isolation this adjustment would result in a distorted picture.[42] Since the revenues of the health insurance scheme would then also have to be reduced by the transfer from the pension insurance scheme, the burden from this branch of social insurance would be understated. At the same time the transfers from the pension insurance scheme would be understated by the same amount.[43] For the same reasons, no adjustments are made for other payment streams between public budgets.

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[40]   Detailed discussions on this subject relating to Germany are to be found e.g. in Boll (1994), p 105ff., Raffelhüschen, Walliser (1999), p 282ff. and Bonin (2001), p 126ff.

[41]   The consequence of this approach is that the administrative expenditure of the statutory pension insurance scheme is not affected by the assumed change in the age structure. It is assumed that administrative expenditure is incurred not only for the recipients of benefits but also for the insured working population. However, the scale of the administrative expenditure, at DM 7.6 billion in 2000, amounts to only a tiny fraction of the sum used for transfers.

[42]   See Bonin (2001), p 128.

[43]   An aggregate view would therefore correct the picture again, but only if the streams between the levels were not recorded in the respective relative payment profiles either (or if such recording does not lead to a change in the profiles). In the case in question, therefore, in the event of an adjustment the contributions of the statutory pension insurance scheme to the pensioners' health insurance scheme may neither be included in calculating the relative payment profile of the health insurance contributions nor in that of pension benefits. Otherwise an aggregated view, too, can lead to differences vis-à-vis the unadjusted results because the distribution of the adjusted national accounts figure to the individual birth-years is based on an incorrect relative payment profile.

The (non-contributory) civil servants' pensions include health assistance paid to retired civil servants because this assistance is not recorded separately by the Federal Statistical Office. An error can result from this only in as far as the age profile of the assistance payments differs from that of the pension payments to civil servants. The financing deficit to be covered by government of the Post Office benefit funds used to finance the pensions of retired civil servants of the successor organisations to the German Post Office was reallocated from current transfers to civil servants' pensions in order to ensure distribution according to the correct age profile.[44]

The (health) assistance paid to working civil servants are distributed according to the relative profile of health insurance expenditure (albeit excluding persons older than 60). While a separate age-specific profile for assistance payments to civil servants can be derived from the income and expenditure survey, which means that a separate distribution is likewise possible, the profile is less accurate than the very good profile for expenditure of the statutory health insurance schemes, in part because the corresponding data are only available at the household level. The profiles are quite similar in any event, and the scale of these assistance payments to civil servants, at DM 5.9 billion in 2000, is comparatively small.

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[44] Bonin (2001) concludes on p 123f. that the share of government employees with civil servant status (*Beamte*) in the overall population varies significantly with age. He therefore does not transfer the observed cross-sectional data to the longitudinal view but instead models the development of the age-specific shares of this group in the overall population separately. We do not follow that approach as a larger share of civil servants or retired civil servants leads c.p. to a smaller share of pensioners in the statutory pension insurance system. Only to the extent that the average civil servant pension (given equal individual preconditions) differs from the average pension paid under the statutory pension insurance system will this lead to a certain distortion. For the same reason we do not explicitly model the eventual cessation of payments made by the Federal Railways Fund and the Post Office benefit funds. Should that lead to an actual reduction in the share of civil servants in future cohorts and to a corresponding rise in the share of contributors to the statutory social insurance schemes, the revenue of the latter would tend to rise (which under current law, however, would result in corresponding cuts in the contribution rates).

Table III.2: Government revenue and expenditure (Germany as a whole) in the year 2000

Government expenditure (DM bn)	2000	Government revenue (DM bn)	2000
1. Expenditure distributed by age-specific profiles	**1183,5**	**1. Revenue distributed by age-specific profiles**	**1684,9**
Statutory pension insurance scheme	417,6	Statutory pension scheme contrib.	297,5
Old-age pensions	299,3	Health insurance contributions	252,3
Surviving dependants' pensions	78,6	Accident insurance contributions	20,5
General disability pensions	39,6	Unemployment insurance contributions	93,2
Civil servants' pensions	71,2	Nursing insurance contributions	31,9
Health insurance [1]	249,8	Wage tax, adjusted [3]	342,6
Statutory accident insurance	17,3	of which: solidarity surcharge	16,3
Unemployment insurance	73,8	Turnover tax [4]	281,7
Unemployment benefits	46,8	Capital income taxes [5]	210,4
Other	27,0	Property acquisition tax	10,3
Statutory nursing insurance	30,9	Excise taxes	
Unemployment assistance cash benefits	25,8	Mineral oil tax	75,5
Other benefits in eastern Germany	0,1	Electricity tax	6,7
Statutory child benefit	60,8	Taxes on foods, bev. and tobac.	31,3
Child-rearing benefit	6,7	Insurance taxes	14,1
Housing allowance	6,4	Motor vehicle taxes (of households)	10,6
War victim benefits	6,9	Suppl. pension contrib. of gov. staff	6,3
Educational allowances	1,7		
Social assistance	53,7		
Youth welfare benefits	16,4		
Grant to home buyers	13,4		
Education, excl. investment	124,5		
Supplement. pensions for govt. staff	6,6		
2. Expenditure not distributed on an age-specific basis	**483,5**	**2. Revenue not distributed on an age-specific basis [6]**	**173,2**
Residual ("goverment consumption") [2]	483,5		
3. Expenditure not to be distributed	**176,8**	**3. Revenue not to be distributed**	**-14,3**
Payments to the rest of the world	43,6	Taxes, contrib. from rest of world	8,1
Interest on public debt	133,2	Bundesbank profit	2,6
		Other investment income	21,4
		Deficit [7]	-46,4
Total	**1843,8**	**Total**	**1843,8**

1) Including assistance for working civil servants. 2) Including gross capital formation. 3) Before deduction of child benefit. 4) Including turnover tax on imports and customs duties. 5) Assessed income tax (before deduction of grant to home buyers), wealth tax, direct taxes on firms, non-assessed taxes on earnings (households), trade tax, land tax, motor vehicle tax for firms. 6) Sales, assumed social contributions, other income. 7) Including fiscal balance of supplementary pension fund for government staff.

Contrary to the generally adopted approach, the amounts for social assistance and youth welfare assistance were not taken from the national accounts but from the government financial statistics.[45] For one thing, the relevant personnel expenditure and inputs are not listed under these expenditures in the national accounts. However, it makes sense to distribute these expenditure categories, too, according to the age-specific profile of social and youth welfare expenditure. For another, according to the Federal Statistical Office the national accounts include the cash benefits but not the non-cash benefits for youth welfare under social welfare expenditure. Finally, expenditure on social and youth welfare cannot be precisely separated in the national accounts. However, since they follow very different age profiles, reverting to the government financial statistics appears expedient, even though each switch between different data sources harbours the danger that data may be either duplicated or not recorded at all owing to definitional differences. While the social welfare expenditure total as given in the government financial statistics is only slightly higher than the figure in the national accounts, the expenditure on youth welfare given in the government financial statistics is significantly higher than that shown in the national accounts for the reasons cited.

The benefits paid by and the contributions paid into the supplementary pension funds for (non-civil servant) government employees are likewise not taken from the national accounts. Since the changeover of the German national accounts to the 1995 European System of Accounts (ESA 1995), the supplementary pension funds for government employees are no longer assigned to the government sector and are no longer recorded separately. These supplementary pension schemes, which are quite different in terms of their individual composition, operate on a partially funded basis and thus, in addition to a certain level of capital cover, they include a pay-as-you-go component. In future their expenditure will rise distinctly faster than the contributions, which follow a different age-specific profile. The future burdens on public budgets would therefore be understated if these systems were not explicitly taken into account.[46]

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[45] This information is available in *Fachserie 14, Reihe 3.1* of the Federal Statistical Office. Since this information is only published with a substantial delay, the figures for both transfer types are extrapolated for the current period using the growth rate of social assistance as defined in the national accounts (which, in terms of cash benefits, includes a substantial part of youth welfare assistance).

[46] Owing to the nature of the data pool, only the *Versorgungsanstalt des Bundes und der Länder* (VBL) is recorded. However, since this is not only the biggest supplementary pension fund for government employees but also has a particularly low level of assets, it is likely that a substantial part of the burdens stemming from the supplementary pension funds for government employees has been captured. Although an age-specific payment profile for the benefits paid by these funds is available from the income and expenditure survey, the number of cases is fairly small. Moreover, this profile derived from cross-sectional data cannot simply be transferred to a longitudinal view because the share of persons insured under the government supplementary pension insurance schemes in the overall population varies

Government expenditure in 2000 distributed on an age-specific basis totalled DM 1,183.5 billion. Of the residual expenditure, interest expenditure has to be factored out of the calculations. Since the net wealth position, which includes government debt, is included in the intertemporal budget constraint on government as a stock variable, interest cannot be additionally included as a flow variable. Otherwise debt would be counted twice, because on a present-value view, future interest payments equal the current level of debt.[47] For the same reason, the financing deficit and investment income must not be taken into account on the revenue side. Payments to the rest of the world are not distributed here either. There is a certain conflict between the objectives of sustainability and intergenerational redistribution. On the one hand, these payments – less the corresponding revenue – need to be financed; on the other, they do not represent a utility for domestic residents.[48] This conflict can be overcome by excluding net payments to the rest of the world from expenditure (thus no utility arises either). To satisfy the requirement that they nevertheless need to be financed, the present value of future net expenditure is deducted from the government's net wealth.[49]

Residual items on the expenditure side are the expenditure categories that cannot be distributed on an age-specific basis but which are included in the government's intertemporal budget constraint. We distribute this expenditure (like the respective revenue) across the cohorts on a per capita basis for the reasons indicated in II.1. It comprises government capital formation and other government payments (especially expenditure on domestic and external security and general administration as well as subsidies). It is assumed that government investment is not (partly) self-financing through induced return flows to the government. This can be justified by arguing that the bulk of the government's non-financial assets, particularly the publicly provided infrastructure, is

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depending on the cohort. To the extent that this variation is not attributable to a constant age-specific fluctuation, therefore, it must be assumed that the age-specific shares will change in future. For this reason, we revert in this instance to the age-specific payment profile of the statutory pension insurance scheme. The impact of this deficiency is mitigated by the more constant evolution of the age-specific share of the members of the statutory pension insurance scheme in the overall population. For contributions we rely on the age-specific profile of contributions to the statutory pension insurance scheme since the levy assessment bases are largely identical for government employees.

[47] Differences between the current level of debt and the present value of interest expenditure can arise if the discount rate used does not correspond to the average interest rate payable on government debt. See Bonin (2001) p 48 and the calculations in ter Rele (1997).

[48] The argument that payments (especially net payments to the European Union) are offset by a political benefit is not convincing, because this would imply conversely that, say, the high net payments of the EU to Ireland should be interpreted as compensation for political damage caused by Ireland's joining the EU.

[49] McCarthy, Bonin (1999) p 111 appear to follow the same approach in a country study on Ireland.

made available to economic agents free of charge.[50] It is further assumed that (gross) capital formation is to be accounted for in full in the period in which it was undertaken. This is appropriate for the objective of sustainability which is to the fore here since the actual cash flow occurs in this period.

If, by contrast, greater emphasis is placed on the objective of intergenerational distribution effects, it would need to be taken into account that the utility of gross capital formation is spread over a number of future years and that the utility for economic agents in the base-year is determined by the level of the government's capital stock. This utility of the government's capital stock could be estimated via the consumption of fixed capital and a rate of return on the capital invested.[51] Accordingly, the capital stock would need to be factored into the government's net wealth position and (gross) capital formation would need to be factored out of the intertemporal budget constraint on government.[52] A difference in relation to the approach selected here arises if government capital formation does not ensure that the per capita utility resulting from the government's capital stock, adjusted for productivity growth, remains constant. If actual gross capital formation is higher than this level, the per capita capital stock will rise and, therefore, (given unchanged depreciation and return rates) so will the utility to be derived from it in the future. Conversely, i.e. if the level of investment in the base year is particularly low, the utility derived from the capital stock in future years will decline.[53]

The sum-total of government expenditure in 2000 amounting to DM 1,843.8 billion does not correspond exactly to the figure given in the national accounts since it also includes the

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[50] The Scientific Advisory Committee of the Federal Ministry of Finance (2001), p. 23 likewise considers special treatment of investment expenditure unwarranted. By contrast, Boll (1996) p. 11 assumes that the present value of government expenditure is equal to zero as it is completely self-financing by means of future return flows. In justification, he argues that government investment expenditure engenders productive effects, enabling the government to generate higher tax revenues as the level of private incomes increases. What he overlooks is that the productivity growth rate which constitutes the basis for the extrapolation of tax revenue is calculated on the basis of past values and therefore already includes the growth- and income-boosting effects of (past) investment.

[51] This is based on the assumption that the utility of government investment projects is equal to their cost.

[52] See ter Rele (1997), p 11ff.

[53] In these cases the approach selected here implies a change in policy. The utility of government activity for economic agents changes over time if gross capital formation is extrapolated in line with the productivity growth rate. If, in the extreme case, no investment is made at all, the capital stock will decline and the resulting utility will reach zero in the long run, and the corresponding services either have to be dispensed with or financed privately. The drawback that the base scenario may include a certain change in policy will need to be accepted in this case because the Federal Statistical Office at present does not calculate any values for government net capital at replacement cost (see Schmalwasser 2001). At the same time, the approach selected here also takes account of a perspective geared to payment streams.

payments of the supplementary pension funds for government employees and nets payments to with receipts from the EU.

On the revenue side of public finance, almost all taxes and social insurance contributions can be assigned on an age-specific basis. Wage tax (including the solidarity surcharge) is shown prior to the deduction of child benefit since the latter is listed as an expenditure item. For the same reason assessed income tax is likewise shown before deduction of grants to home buyers. It is recorded under capital income taxes, which altogether are allocated to the individual age classes according to the age-specific distribution of income from financial assets as well as from renting and leasing.[54] In addition to assessed income tax, capital income taxes comprise the (expiring) wealth tax, the other direct taxes on corporations, non-assessed taxes on the earnings of households (including the flat-rate tax on interest income), trade tax, land tax and motor vehicle tax payable by companies. Turnover tax is reported in line with the principle explained above of non-adjustment for payments by one government entity to another, including taxes paid by government to itself (especially for non-cash benefits liable to turnover tax of the statutory health insurance schemes, social assistance, public investment and other inputs). Since the relative profiles derived from the income and expenditure survey only record the expenditure of households, they need to be supplemented by these payments.[55] As the national accounts likewise show social insurance contributions inclusive of amounts paid by other government agents, the relative payment profiles from the income and expenditure survey have to be supplemented accordingly here, too. Specifically, the contributions to the statutory pension, health and long-term care insurance schemes have to be supplemented by the contributions paid by the Federal Labour Office for recipients of wage substitutes and for the contributions for recipients of unemployment assistance paid by the Federal Government.[56]

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[54] In the literature the bulk of assessed income tax is occasionally assigned to wage tax because, in addition to tax payments on investment income, it includes retrospective tax payments on wages and salaries and tax payments made by the self-employed (see, for example, Bonin (2001) p 127f.). This ignores the fact that tax refunds to assessed employees (including the previous end-of-year recomputation of wage tax) are booked at the expense of assessed income tax. As a working hypothesis, therefore, assessed income tax is assigned here to capital income taxes.

[55] The age-specific distribution of turnover tax paid by government to itself differs significantly from that of taxes paid by households.

[56] In principle, the relevant profiles need to be supplemented on the expenditure side, too. However, since the contributions paid by the Federal Labour Office or by the Federal Government are roughly proportional to the transfers actually made to the beneficiaries, the *relative* profiles are little changed by such a supplementation.

Revenue distributed on a per capita basis includes above all sales (chiefly fees and charges), other current revenues and the assumed social insurance contributions.[57] Items that are not distributed – as explained above – are the deficit, taxes and contributions from the rest of the world and other investment income (including the Bundesbank profit).

In addition to the government revenues and expenditure, the government's net wealth position at the beginning of the base year[58] is also factored into the government's intertemporal budget constraint. It comprises the government's financial assets less gross government debt.[59] Apart from this, the (low level of) assets of the *Versorgungsanstalt des Bundes und der Länder* are to be included and the present value of future net payments to the rest of the world must be subtracted. In line with this definition, for early 2000 this results in a negative government net wealth position of DM 3,113 billion (excluding the present value of future net payments to the rest of the world: DM 1,644 billion).

In order to be able to model the east German convergence process, not only the relevant payment profiles but also the national accounts figures have to be determined separately for eastern and western Germany. Since such a separation is no longer made in the national

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[57] In some earlier German studies on generational accounting, the assumed social contributions were assigned to revenue not to be distributed (see, for example, Bonin (2001), p 127; the deficit, which is substantially higher than the national accounts figure, in Bonin, Raffelhüschen, Walliser (1999) p. 60 might likewise be attributable to this factor). If on the expenditure side no appropriate adjustment is made of personnel expenditure increased by assumed social contributions, the result is that this item (which *per se* is deficit-neutral) is only recorded on the expenditure side and therefore an excessively high burden on the government budget is reported (2000: DM 41.3 billion).

[58] As Bonin (2001), p 129, indicates, the key figure is the value at the beginning of the base year (or on 31 December of the prior year) because the subsequent stock changes are already recorded in the flow variables.

[59] The gross debt corresponds to the Maastricht definition, while government financial assets are taken from the national financial accounts (Deutsche Bundesbank 2000a). In the literature the stock of financial assets are frequently calculated as the present value of investment income (see, for example, Auerbach, Gokhale, Kotlikoff (1991), p 73). For one thing, however, this excludes reinvested profits. For another, the distributed profits may be subject to major annual fluctuations and hence lead to undesirable base-year effects. As investment income is the nominal return on the government stock of financial assets, it is the nominal interest rate that should be used for discounting in this case. If the real interest rate were used, this would mask the fact that part of the nominal return is needed to maintain the stock of financial assets in real terms. If calculated in this way, the financial assets (including the present value of the Bundesbank profit) would be reduced on average by about DM 120 billion, despite the exceptionally high Bundesbank profits distributed during the period under review. In some studies - such as the country-specific studies published by the European Commission - investment income is distributed on a per capita basis across the age classes (see reference in Bonin (2001) p 46). This approach appears inappropriate in that it is implicitly assumed that, for a given stock of assets, government investment income depends on the development of the population and the productivity growth rate. However, that contradicts the assumption of an exogenously defined discount rate. Extrapolation using the productivity growth rate implies that, in addition to the normal return, the government stock of financial assets yields an "additional return". Calculated in this way, the government stock of financial assets would be DM 175 billion higher on average than the figure shown in the national financial accounts, despite disregarding reinvested profits.

accounts, the disaggregation of the pan-German figure normally follows the breakdown in the government financial statistics. In cases in which no breakdown is available in those statistics either or where it is not meaningful, the distribution is effected with the aid of the relative age-specific payment profiles. To this end, the absolute payment profiles are determined directly and separately for eastern and western Germany in line with the calibration procedure described under III.2, without having to make a "detour" in terms of separate national account figures.

4.   Macroeconomic parameters

In order to be able to calculate the generational accounts, assumptions are necessary concerning the future productivity trend, the discount rate and the time required for east German payment profiles to converge with those of western Germany. For the productivity trend and the discount rate, past developments are used as the guideline because there are hardly any other indicators to depict the long-run future trend (see Table III.3). Accordingly, in the base scenario a productivity growth rate of 2% is assumed along with a real discount rate of 4%. This roughly corresponds to average GDP growth per head of the population and to the yield on outstanding government bonds in the past 25 years, adjusted for the inflation rate.[60]

The growth rate of GDP per employed person was slightly lower than 2%, averaging 1.7%. This is attributable above all to the 1990s, when the share of part-time employees rose substantially, causing the growth rate to be distorted downwards. Nor did the GDP growth rate per capita of the population in the past decade, especially in the first half, reach the chosen reference value. As real economic growth in western Germany from 1991 to 1995 was nearly equivalent to (pan-German) growth[61] in the second half of the decade, this cannot be attributed to the recession of 1993. Instead, the primary factor is the sharp population rise in western Germany at the beginning of the decade owing to the very high level of immigration at that time. As immigrants presumably did not immediately achieve the productivity of an average western German (indeed, many were initially actually prohibited from working), the immigration wave had a dampening impact on per capita growth. In the second half of the 1990s, as this exceptional factor subsided, the GDP growth rate per capita of the population also rose substantially. Finally, the 1990s were characterised by the special burdens occasioned by Germany's reunification. All in all,

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[60]   For the real interest rate trend see Deutsche Bundesbank (2001b).

[61]   Pan-German values have only been used since 1995 since prior to that they were influenced by the initially very high growth rates in eastern Germany following reunification.

Table III.3: Productivity growth and real interest rates in western Germany

	Average for the years			
	1976-1990	1991-1995	1996-2000	1976-2000
Growth of real GDP per capita of the population [1]	2.4%	0.8%	1.7%	1.9%
Growth of real GDP per employed person [1]	2,0%	1.5%	1.1%	1.7%
Real interest rate [2]	4.3%	4.1%	3.6%	4.1%
1) From 1995 Germany as a whole. 2) Yield on government bonds outstanding less the year-on-year change in the consumer price index for the cost of living of all private households year-on-year.				

therefore, it would appear justifiable not to extrapolate the unfavourable development during the past decade but to select a longer-run average value instead.

For the time needed for east German payment profiles to converge with those of western Germany, we follow the opinion of the Federal Government in the base scenario to the effect that by the year 2020 the consequences of Germany's division will have been overcome and equal living conditions will have been created in eastern and western Germany.[62] A significantly speedier convergence appears very unlikely in the light of the unfavourable trend since the mid-1990s.[63]

Given the uncertainty surrounding the "right" values for the productivity growth rate, the discount rate and the time of convergence between east and west German payment profiles, a study based on sensitivity analyses is performed below to measure the influence that changes in these parameters have on the results.

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[62] See Deutscher Bundestag (2001), p 1.
[63] See DIW (2001).

IV.   Results of the status-quo scenario

In this section the main results are presented in line with the assumptions of a strict status quo.[64] Measures which have already been adopted but which will only become (fully) effective in the future are disregarded, and no adjustments are made for cyclical and other temporary effects in the base year. It is assumed that east German payment profiles will converge with west German profiles by 2020, while the productivity growth rate is set at 2% and the discount rate at 4%. The results serve as a reference benchmark for the results after adjustment for cyclical factors and incorporating measures already adopted described in the following chapters. In addition, a sensitivity analysis is performed for the main parameters.

1.   Development during the reference period

In the period under review from 1996 to the year 2000, the annual fiscal consolidation requirement, measured as the ratio of the sustainability gap to the present value of future GDP, declined substantially. While this figure was as high as 6.1% in 1996, it was down to only 0.3% by the year 2000. In particular from 1999 to 2000, the annual consolidation requirement fell by 3.2 percentage points. However, this is predominantly associated with the non-recurring proceeds generated by auctioning off the UMTS mobile telephony licences in the year 2000, which the base calculation also assumed for each future year. Without this exceptional effect the year-on-year improvement would have amounted to only 0.6 percentage point.[65] Even adjusted for that effect, however, a decline of 3.2 percentage points remains over the period as a whole. This improvement is 1.5 percentage points greater than the increase in the primary surplus ratio from 0.3% in 1996 to 2% in the year 2000 (excluding the UMTS proceeds). At first glance, this is surprising in that within the scope of generational accounting essentially all government revenues and expenditure are distributed on an age-specific basis apart from interest payments, and in that it might therefore be supposed that changes in the primary balance from year to year would be reflected to the same extent in the annual consolidation requirement. The main reason for the deviation observed is the significant ageing of the population in the second half of the 1990s, as expressed in the increase in the dependency ratio from 37.5% at end-1996 to 42.7% in the year 2000. For this reason alone, a decline in the primary balance by over 1

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64   The findings were partly published in a Bundesbank Monthly Report (see Deutsche Bundesbank (2001a)). By contrast, the results stated in Deutsche Bundesbank (1997) and in the discussion paper of Boll (1996) are not directly comparable with the results shown below owing to a number of methodological changes .

65   The results reported below for the year 2000 are always adjusted for this exceptional effect unless explicitly stated otherwise.

percentage point would have been expected. However, deviations can also result for instance if the improvement in the primary balance is not evenly distributed across the individual age classes,[66] if there is a change in the (net) debt ratio or because the period until the dependency ratio peaks shrinks as the base year is moved forward and therefore the demographically induced deterioration of the primary balance is no longer so sharply discounted.

Table IV.1: Main results for the years from 1996 to 2000 under the status-quo scenario

	1996	1997	1998	1999	2000*
Annual consolidation requirement (as % of respective GDP)	6.1	5.2	4.4	3.5	2.9 (0.3)
Sustainability gap (as % of GDP of the base year)	242	204	172	138	114 (13)
Annual per capita tax (for future generations only, in DM at respective prices)	7,140	6,220	5,460	4,530	3,850 (440)

* Including the proceeds of the UMTS licence auctions (in brackets).

2.   Causes of the sustainability gap

The figures for the year 2000 illustrate the factors responsible for the high consolidation requirement. If the government had not run up DM 2,367 billion in gross debt by end-1999 but had been free of debt, the annual consolidation requirement would have been only 1.4%, ie 1.5 percentage points lower. Furthermore, the differences between the fiscal characteristics of east and west Germans which still persisted in 2000 contribute substantially to the large fiscal adjustment requirement. If the convergence process in eastern Germany had already been concluded in the year 2000, the consolidation requirement would only have amounted to 1.8%. However, demographic ageing exerts by far the biggest influence. If the age structure of the population were not to change in the future – which is well-nigh impossible in practical terms, however – this would actually result in a considerable surplus position.

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[66]   Strictly speaking, the improvements in the primary balance should follow the same age profile as GDP. An example of this is the significant increase in public grants to the Post Office benefit funds in 1999 which, as explained above, are assigned to civil servants' pensions.

3.   Sensitivity analysis

As some of the assumptions relating to the fundamental economic and demographic parameters are subject to some uncertainty, it is established practice to verify the stability of the findings by means of sensitivity analyses.

The assumptions concerning the productivity growth rate and the discount rate have a substantial influence on the results. As future payment streams increase with the productivity growth rate on the one hand but are discounted on the other, the results depend strongly on the difference between the respective values of the two determinants. Given an annual increase in per capita productivity of 2.5% and a discount rate of 3%, the consolidation requirement rises to 4.2% of GDP because in effect the future burdens arising from demographic ageing are barely discounted at all. By contrast, given a particularly large differential of 3.5 percentage points, the consolidation requirement will decline to 2.3% of GDP. However, the qualitative conclusions remain unaffected by various permutations of the discount rate and the productivity growth rate.[67]

Table IV.2: Sensitivity of the annual consolidation requirement (as % of respective GDP) to changes in the discount rate and the productivity growth rate

		Discount rate		
		3 %	4%	5%
	1.5 %	3.3	2.6	2.3
Increase in productivity	2.0 %	3.7	2.9	2.4
	2.5 %	4.2	3.3	2.6

The assumed period until completion of the internal German convergence process also exerts a considerable influence. As indicated above, the consolidation requirement would be reduced by over 1 percentage point if full convergence of eastern with western Germany had already been completed in the base year. By contrast, if full convergence is only

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[67]   Under the scenarios with policy changes and an adjustment for cyclical factors described in Chapter VI, the difference in the annual consolidation requirement between the extreme assumptions only amounts to 1.5 percentage points. The sensitivity therefore is considerably lower than under the status-quo scenario.

completed in the year 2030, the annual consolidation requirement increases by 0.4 percentage point. If there is no further convergence or if both eastern and western Germany converge towards the average values prevailing in the base year for Germany as a whole, the annual consolidation requirement will rise to as much as 6.3%.

Apart from assumptions relating to the economic parameters, the assumed population trend also has a major impact, even though the effect of higher net migration is fairly limited. If we assume, in line with the second variant of the ninth coordinated population forecast of the Federal Statistical Office, that the annual migration surplus will rise to 200,000 persons, the annual consolidation requirement will be only marginally below the value under the status-quo scenario. However, due to the higher headcount, the annual per capita tax for future generations required to close the sustainability gap will fall from DM 3,850 to DM 3,390. The annual consolidation requirement contracts by the somewhat more substantial margin of 0.5 percentage point if the total fertility rate rises to 1.8. In this case the annual per capita tax for future generations will decline even more sharply to DM 2,390. On the other hand, assumptions on mortality trends have the biggest single impact. If, instead of the assumed increase in life expectancy, the current mortality rate (disregarding the convergence between eastern and western Germany) is kept constant, the annual consolidation requirement is reduced by 1.8 percentage point to as little as 1.1%.

V.   Adjustment for cyclical factors

1.   Method

The economic situation in the respective base year can have a substantial impact on the results because the fiscal conditions of the base year are extrapolated into the future. For instance, if economic activity in a given year is markedly below the trend level, tax revenue will generally be particularly low and labour-market related expenditure particularly high. In order to avoid these temporary effects being constantly perpetuated into the future, in turn resulting in an excessively wide sustainability gap, the results need to be adjusted for cyclical factors. In past studies on generational accounting, no explicit adjustment for cyclical influences was made. Especially in studies applicable to the United States, efforts are frequently made to circumvent the problem by resorting to budget forecasts of official agencies.[68] The level of economic activity in the base year will hardly affect the results of generational accounting, if the extrapolation oriented to the productivity growth rate is only

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68   See, for example, Auerbach, Gokhale, Kotlikoff (1994).

applied to the forecast horizon because at this point a return to normal capacity utilisation is frequently assumed. On the other hand, as explained in Chapter II.3 the drawback of this approach is that the results become more difficult to interpret because the more or less subjective assumptions, which no forecast can do without, are difficult to understand for outsiders. Moreover, in many countries (including Germany) no sufficiently detailed medium-term estimate of budget trends by official agencies is available.

The Norwegian ministry of finance, which has been presenting generational accounting results since the mid-1990s, follows a different approach.[69] As the main indicator of the sustainability of public finance it uses the reduction in government expenditure that is not distributed age-specifically, which is required in order to comply with the government's intertemporal budget constraint.[70] The cyclical component of the budget balance derived from other sources is added to this amount in order to arrive at an indicator adjusted for cyclical factors. Using this approach, the results can certainly be immunised against cyclical influences to a considerable degree. In doing so, however, it is implicitly assumed that the changes due to conjunctural economic activity are not age-specific. However, in practice the cyclical effects are concentrated on persons of working age. They bear the lion's share of cyclically sensitive levies and are simultaneously recipients of labour-market related transfers. Moreover, the method adopted by the Norwegian ministry of finance has the drawback that it cannot be directly transposed to numerous other generational accounting indicators.

We have therefore adopted a different adjustment approach. The values of the individual budget positions of the base year are directly corrected to take account of cyclical influences. To this end, the disaggregated approach presented in Mohr (2001) is resorted to, which facilities a cyclical adjustment for individual budgetary items.[71] The first step is to determine the cyclical component of the macroeconomic assessment bases of various government revenue and expenditure items. For this the time series are decomposed using a statistical filter into a trend and a cyclical component. The deviation from the trend due to cyclical factors may vary for the individual macroeconomic reference values. The second step is to determine the influence of these cyclical components of the macroeconomic assessment bases on individual budget positions using fiscal elasticities. Finally, revenue and expenditure positions adjusted for cyclical factors are derived by subtracting the cyclical component from the unadjusted national account values. On the expenditure side,

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[69]   See Gjersem (2001).

[70]   Expressed as a percentage of GDP, this indicator is quite similar to the annual consolidation requirement.

[71]   For a detailed account of this method, see Mohr (2001) and Deutsche Bundesbank (2000b).

adjustments are thus made above all for the transfer payments from the statutory pension insurance scheme and unemployment benefits, and on the revenue side for social insurance contributions and all taxes distributed age-specifically.[72]

By adopting this approach, the cyclical impact on the government budget can be adequately assigned to the individual cohorts.[73] This makes it possible to present all indicators used in generational accounting both before and after cyclical adjustment.

Besides cyclical effects, however, other temporary influences on public finance can also distort the results of generational accounting. This is particularly evident for the base year 2000, in which the non-recurring proceeds from auctioning the UMTS mobile telephony licences amounting to almost DM 100 billion showed up in the budget accounts. Since such one-off effects are not captured by cyclical adjustment, they would be extrapolated into the future if the standard extrapolation method using the productivity growth rate were employed. To avoid this, an adjustment is made not only for cyclical factors but also for other temporary exceptional factors that have a substantial weight.[74] All values denoted below as "adjusted" have been additionally corrected to take account of such temporary effects.

2.   Results

As can be seen in Table V.1, cyclical and other temporary factors – except for the UMTS proceeds in the year 2000 – did not have a major impact on public finance in the second half of the 1990s. The cyclically adjusted government financing deficit never amounted to more than 1/2 percentage point of GDP, whereas it had reached a peak of 1.3% in the first half of the decade. The cyclical component of the annual consolidation requirement was barely higher, disregarding the exceptional factors which lowered the deficit ratio by 0.2

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[72] In contrast to Mohr (2001), no cyclical adjustment is made inter alia for government personnel expenditure. Also, the cyclically induced contribution receipts of the statutory pension insurance system are not netted with the cyclically induced pension payments because contribution revenue and pension payments follow very different age-specific profiles.

[73] It is implicitly assumed that the age-specific profiles of budget categories affected by cyclical fluctuations do not change in response to the business cycle.

[74] Specifically, the following adjustments were made. The 1999 figures were corrected for the non-recurring additional surplus of DM 8.6 billion necessary to top up the fluctuation reserve of the statutory pension insurance system. The national accounts figures of 2000 were corrected to take account of compensation payments to wartime forced and slave labourers (DM 4.5 billion) and the proceeds of UMTS licence auctions which are booked on the expenditure side (DM 99.45 billion). No exceptionally high or low Bundesbank profit transfers need to be considered here because instead of the flow variable the stock figure for the government's financial assets reported in the national financial accounts is used in the calculations (see section III.3). No corrections were made for the years from 1996 to 1998.

Table V.1: Results for the years from 1996 to 2000 under the status-quo scenario after adjustment

	1996	1997	1998	1999	2000[5]
Annual consolidation requirement[1]					
Unadjusted	6.1	5.2	4.4	3.5	0.3
Adjusted	6.0	4.6	4.1	3.7	2.7
Cyclical component[2]	0.1	0.6	0.3	-0.2	-2.4
Memo item: cyclically induced deficit ratio	0.0	0.5	0.3	0.1	-0.1
Sustainability gap[3]					
Unadjusted	242	204	172	138	13
Adjusted[2]	239	182	162	144	105
Annual per capita tax[4]					
Unadjusted	7,140	6,220	5,460	4,530	440
Adjusted[2]	7,050	5,580	5,120	4,720	3,570

[1] As % of respective GDP. [2] Including temporary effects. [3] As % of GDP in the base year [4] In the case of a policy change, only for future generations, in DM at prices prevailing at the time. [5] Unadjusted figures including the UMTS proceeds.

and 2.4 percentage points in 1999 and in the year 2000, respectively. In addition, the age-specific impact of the cyclical fluctuations on public finance was quite low since, except for these exceptional factors, the difference in relation to the cyclically induced deficit ratio never amounted to more than 0.1 percentage point.[75]

Over time, the adjusted view gives a somewhat different pattern than before adjustment for the years in question, despite the comparatively low cyclical influence overall. While the unadjusted figures show a continuous and (except for the year 2000) fairly constant decline in the annual consolidation requirement, the adjusted values show that the principal consolidation success was achieved in 1997. Whereas the consolidation requirement fell by almost 1 ½ percentage points in that year, it declined at a weaker rate in subsequent years.

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[75] The adjustment method adopted by the Norwegian ministry of finance may lead to larger differences because the consolidation requirement in that method is measured in the form of a reduction of government expenditure that is not distributed age-specifically. If this indicator is adjusted for the cyclically adjusted deficit, it is implicitly assumed that the cyclical effects are evenly distributed across all age classes. However, this would lead to a lower level of coincidence with the actual profile of cyclical effects than with the GDP profile implicitly used here, which was distributed by labour income.

VI. The influence of fiscal measures

Although the status-quo scenario described thus far provides a good basis for analysing the sustainability of fiscal policy prevailing in the base year, it does not permit inferences to be made concerning the required extent of future consolidation action as measures may already have been adopted whose (full) effect may only be felt in future years (see also section II.3). Accordingly, this chapter describes an alternative scenario (policy scenario) identifying the consolidation requirement remaining after the effects of the main measures adopted by the end of the base year are included in the calculations.

The policy changes dealt with in the first section are relatively unproblematic: although they change the aggregate figures derived from the national accounts, the relative age-specific payment profiles are largely unaffected. But it is more difficult to gauge the effects of changes in policy that modify the age-specific payment profiles (section VI.2), such as the introduction of deductions from statutory pensions for premature retirement. Yet it is not only policy decisions that may lead to changes in age-specific payment profiles. Other factors such as the higher pension entitlements of younger cohorts may also hinder the straight projection of the profiles observed for the base year into the future. Section VI. 3 discusses such problems arising from applying the cross-sectional data to the life-cycle perspective (longitudinal view). This is followed by a presentation of the results allowing for these measures.

1. "Age-neutral" impact of statutory changes on national accounts data

The impact of policy decisions merely resulting in changes in aggregate national accounts figures after the base year can be assessed by modifying the absolute payments of all age cohorts uniformly by the percentage by which the aggregate figure changes. For example, the increase in mineral oil tax on 1 January 2001 yielded additional revenues of DM 4.1 billion or 5.4%, so that the mineral-oil tax payments for all age groups are increased by this percentage. The estimates of the budgetary impact of the various policy measures are mostly taken from the financial sections of the draft laws in question.[76] However, compared with the status-quo scenario, only the difference between the trend stemming from extrapolating the age-specific profiles using the productivity growth rate leads to disrepancies. If, for example, a planned increase in child benefit matches the figure derived

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[76] In the case of legal amendments whose impact is already reflected either partially or fully in the aggregate figures, it initially appears to make sense to focus on the changes observed. In actual fact, however, the consequences of specific policy measures on public-sector finances can rarely if ever be isolated even ex post. The approach adopted here automatically corrects the erroneous estimates in the base year in which the financial ramifications of the policy change materialise.

from extrapolation using the productivity growth rate, taking additional account of this policy change has no impact. In this connection, special attention must be paid to changes in income tax rates as both real and inflation-induced increases in average per capita earnings result in particularly high additional revenues on account of the tax progression built into the taxation system. Tax cuts which merely offset these progression effects cannot be viewed as easing the situation compared with the extrapolation of the age-specific payment profiles using the productivity growth rate. We therefore reduced the estimated revenue shortfalls resulting from lowering income tax rates to allow for the effect due solely to the reduction in progression.[77]

As is generally the case in this study, possible macroeconomic implications are not taken into account. For example, is it not assumed that tax cuts result in a higher productivity growth rate. In addition to the reasons set out in section II.3, this is also due to the fact that tax cuts merely cause an intertemporal shift in the tax burden as long as they are not "generated" by savings on the expenditure side. Moreover, a higher productivity growth rate would actually result in this calculation in a greater consolidation requirement as not only government revenue but also government (primary) expenditure would then be extrapolated at a higher growth rate, with the effect weighing more heavily on the expenditure side (see Table IV.2).

Only selected major policy changes (as a rule amounting to at least 0.1% of GDP) were included in the policy scenario.[78] As Table VI.1 shows, the inclusion of policy changes already adopted but which do not have their full effect in the base year (excluding the benefits side of pension insurance dealt with in the next chapter) does not have any major impact on the results for the years viewed here (with the exception of 2000).

2. Policy measures in the field of statutory pension insurance: modification of the age-specific payment profiles

The effect of most policy measures on the relative payment profiles of the payment categories concerned is negligible. One key exception to this is the step-by-step raising of the threshold age for receiving various types of statutory pensions following the Pension Reform Act of 1992 as well as the ensuing modifications provided for in the Growth and Employment Promotion Act of 1996 and the Pension Reform Act of 1999. As a result, the eligibility age for an old-age pension (after a certain adjustment period) is 65 years also in

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[77]   An elasticity of tax revenue of 1.8 was assumed in relation to average per capita earnings. See Mohr (2001), p 8ff.

[78]   Annex 1 shows the measures taken into account for the individual base years.

the case of early retirement in connection with unemployment or pre-retirement part-time working, for women and for persons insured over a particularly long time. Premature retirement now incurs a deduction of 0.3% for every month prior to the standard retirement age. Thus, a person retiring at the earliest possible age of 60 years is faced with a total deduction of 18%. Under current law, no person under the age of 62 will generally be able to claim an old-age pension after 2012 (see Appendix 2). Whereas cohorts born before 1940 are barely affected by these changes,[79] they will have a full effect on persons born after 1950.

The change in the relative payment profile of the benefits paid under the statutory pension insurance scheme is due to the fact that only new pensioners are affected by the deductions. Whereas the average per capita pension for older cohorts is initially not affected, younger cohorts are subject to the deductions. This shift in the relative position of the individual birth-years will not cease until the last pensioner who was able to claim a pension during the transitional period ending in 2012 has died. The extent of the changes depends on how many people come under the new arrangements and what percentage of them are willing to accept the deductions, take other types of pensions or postpone their retirement. As only a very small number of people are so far affected by the new arrangements, it is hardly possible to determine expected behavioural responses on an empirical basis. We thus follow the assumptions of the German national pension federation VDR according to which 40% of the people affected will delay retirement until they reach the statutory pension age, 30% will retire at the same age as before but accept a lower pension and 30% will opt for a reduced earning capacity pension, which entails a deduction of 10.8%.[80] The per capita pension of persons aged between 60 and 64 years will decline for two reasons. Firstly, the pension per pensioner is declining on account of the deductions and, secondly, the proportion of pensioners in the total population is dropping as a greater portion now retires at a later age. The per capita pension of persons aged 65 years or over is affected to a lesser extent even in the "mature phase" of the systems. For one thing, the aforementioned effect does not manifest itself in these age brackets as those who postpone their retirement will also retire at 65 years. For another, those who have postponed their retirement age will have worked for a greater number of years and hence also have more remuneration points

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[79] People born before 1940 were hardly affected by the gradual increase in the eligibility age for old-age pensions after unemployment or pre-retirement part-time working as of 1997 as they were mostly able to make use of transitional arrangements. Under these arrangements, people who in February 1996 were already unemployed and aged over 55 years or had been members of the compulsory pension insurance scheme for more than 45 years were entitled to claim an old-age pension free of any deductions.

[80] See Hain/Müller (1998), p 112 ff.

than under the previous status quo and hence will claim a higher per capita pension.[81] The impact of the deductions on surviving dependants' pensions is likely to be small on account of the relatively small influence on the pensions of over 65 year-olds and has been ignored here.

In addition to the effects of the deductions on statutory old-age pensions, it should also be noted that people postponing their retirement to avoid the deductions pay higher social insurance levies and income tax on the one hand but claim greater unemployment benefits on the other. For this purpose, it is assumed that the people postponing their retirement account for the same per capita amounts as the previous non-pensioners in the same age brackets.

The complexity of the deduction arrangements and the difficulty of estimating the reaction of the individuals concerned results in a relatively large uncertainty margin when assessing their impact.[82] On the basis of the assumptions made here, the legal situation produced by the Growth and Employment Promotion Act results in a reduction in the annual consolidation requirement of about 1 percentage point. The increase in the earliest possible retirement age from 60 to 62 years in 1999 under the Pension Reform Act passed at the end of 1997 yields greater savings (around 1.2 percentage points).[83] This is due to the fact that the size of the deductions has not been calculated according to strict actuarial principles.[84] This means that, in spite of the deductions, premature retirement still entails a greater present value of pension benefits and hence higher government expenditure. However, the 1999 Pension Reform Act curtailed the possibility for retiring at an earlier age. Chart VI.1 makes it clear that the position of persons aged between 60 and 65 is impaired by the deduction arrangements.

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[81] For this purpose, it is assumed that men postponing their retirement acquire 1 remuneration point per additional year and that women acquire only ¼ remuneration point on account of their lower average earnings and lower participation rate in the workforce.

[82] If the deductions were calculated using actuarial principles and it were not possible to opt for the reduced-working capacity pension, the individual choice of retirement age would not have any ramifications for the present value of pension benefits as the longer pension payment period connected with premature retirement would be offset on average by the lower pension level due to the deductions.

[83] The impact varies slightly from base year to base year due partly to the fact that the share of pension recipients in a given age cohort, and hence the number of persons potentially affected by the deduction arrangements, changes over time.

[84] See, for example, Börsch-Supan (2000).

In addition to the raising of the pension entitlement age over the past few years, many other steps which will affect future pension benefits have also been adopted.[85] We expressly model the demographic factor, the temporary suspension of the pension formula in favour of a smaller inflation adjustment and the impact of the notional contributions to supplementary private pension plans in the wake of the 2001 pension reform. Although these policy changes are not themselves associated with an alteration of the relative positions of the individual age cohorts, they relate via pension benefits to the same profiles as the deduction arrangements, which do have an age-specific effect, and are therefore closely linked to those arrangements.

Chart VI.1: Impact of the introduction of deductions on the age-specific payment profile of old-age pensions (women in western Germany)[1]
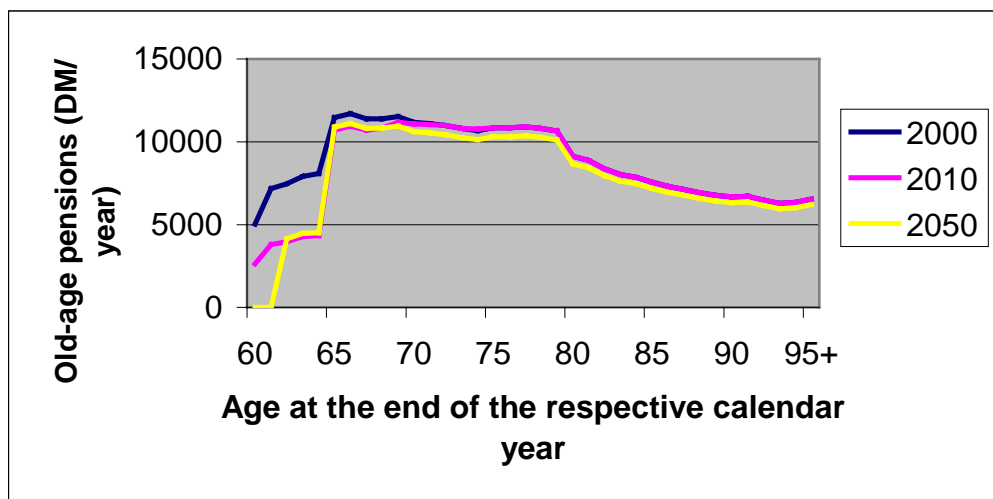
[1] Including benefits to persons opting for the reduced-working capacity pension. Current value of pension in 2000 excluding growth-induced extrapolation.

The demographic factor (*DF*) was inserted into the pension calculation formula by the Pension Reform Act passed at the end of 1997 and linked the net pension level to rising life expectancy. The net pension level was to be cut as of 1999 by half of the percentage increase in the average survival age of 65-year-olds ((LEW^{65}), with the increase of eight years ago used as a basis.

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85 Borgmann, Krimmer, Raffelhüschen (2001) examine the implications of various reform proposals for the sustainability of German fiscal policy and intergenerational distribution using generational accounting.

$$DF_t = \frac{LEW^{65}_{t-9} - LEW^{65}_{t-8}}{LEW^{65}_{t-8}} * 0{,}5 + 1$$

The inclusion of the demographic factor would have reduced by half the increase in the individual present value of the expected pension benefits resulting from rising life expectancy. However, the demographic factor never took effect. In 1998, the introduction of the demographic factor was initially postponed to 2001 and in 1999 to 2002, before being entirely abolished by the Pension Reform Act passed in 2001. The demographic factor would have reduced the annual consolidation requirement by around 0.8 percentage point.[86]

Instead of implementing the demographic factor, the new German federal government decided to adjust pensions in 2000 and 2001 not according to the change in net wages but only in line with the inflation rate for the previous year. The 1999 draft budget consolidation law estimated that this would lower the pension adjustment by 3 (just under 2) percentage points in 2000 (2001). In actual fact, however, the adjustment compared with the old pension calculation formula produced a reduction of only 1 percentage point in 2000. Hardly any savings at all would probably have been achieved in 2001 if the inflation-indexing had not already been abandoned again in 2000.[87] The effect of the temporary inflation-based adjustments on the annual consolidation requirement is very small (0.1 percentage point).

In 2001, the Act promoting private pension plans provided for the statutory pension insurance system, which operates on a pay-as-you-go basis, to be supplemented by an additional funded private pension component. For one thing, future benefits paid by the statutory pension insurance system are to be cut by a new pension adjustment formula, thus increasing the need for private cover. For another, private old-age provision is to be substantially subsidised by the government as an incentive for taking out this additional cover. At the same time, the level of increases in the contribution rate has been capped. Under the new pension adjustment formula, the notional contributions to supplementary private pension plans reduce the size of the pension adjustment. Regardless of the actual size of these contributions, the private pension savings component (AVA) was defined as 1/2 percent of the average gross compensation of employees in 2002 and rises by 1/2

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[86] This takes account of the fact that the demographic factor would have been suspended if it had caused the net benchmark pension level to drop below 64%.

[87] The calculations used here are based on actual savings and not on the more favourable assumptions used in the draft law. In this connection, it should be noted that part of the savings from the lower pension adjustment in 2000 did not show up in the national accounts until 2001 as pension rates are always adjusted in the middle of the year.

percentage point per year until 2009. The new pension calculation formula will reduce pension increases by over 0.6 percentage point per year from 2003 to 2010.[88]

$$aRW_t = aRW_{t-1} * \frac{BE_{t-1}}{BE_{t-2}} * \frac{100 - RVB_{t-1} - AVA_{t-1}}{100 - RVB_{t-2} - AVA_{t-2}}$$

aRW: "current pension value" (aktueller Rentenwert)
BE: average gross compensation of employees
RVB: contribution rate to the statutory pension insurance scheme

AVA: private pension savings component

These savings result in a reduction of 0.6 percentage point in the annual consolidation requirement.

However, this effect will be mitigated by the growing subsidisation of supplementary private pension plans until 2009.[89] According to the draft law, this will ultimately result in tax shortfalls of DM 20.7 billion per year.[90] Although the tax shortfalls should narrow in the long term as the private additional cover is still subject to tax liability (except that benefits rather than contributions will be taxed), it will take more than half a century for these return flows to be generated in full and their present value is correspondingly small. What is more, the tax rate applicable during old age is generally lower than during the working phase. Under current law, many pensioners are likely to incur no tax liability on their taxable income derived from supplementary private pensions plans. The reduced tax shortfalls caused by the subsequent taxation of benefits from such plans has therefore been ignored here especially as there are no official estimates on the size of this effect. To that extent the increase in the annual consolidation requirement by 0.4 percentage points as a result of government subsidisation of private additional pension cover is overstated.

All told, the expenditure of the statutory pension insurance scheme that will be saved as a result of introducing supplementary private pensions plans and the additional burden on the

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[88] See Hain, Tautz (2001), p 361 ff. Further differences compared with the old net adjustment formula arise in that changes in the wage tax rate are no longer included in the pension adjustment calculation. Of the changes in the employee component of social security levies, only the pension insurance contributions are included in pension adjustment calculations, although these now also include the employer component. However, as these parameters are assumed here to be constant, these changes have no impact on the development of pension expenditure. This also applies to the post-2010 modification of the new pension calculation formula.

[89] See also Federal Ministry of Finance for more details (2001).

[90] However, as these shortfalls are calculated at current prices, they have been converted to the base year on the basis of an assumed nominal growth rate of 3.5% p.a. The same procedure was applied to calculate the tax shortfalls caused by the 2000 tax reform.

government budget as a result of the subsidisation provided will result in only a marginal improvement in sustainability (with the annual consolidation requirement contracting by 0.2 percentage point).[91] Compared with the legal situation prevailing at the end of 2000, in which the demographic factor would have taken effect in 2002, the annual consolidation requirement rises by as much as 0.7 percentage point.

Under the current legal situation, the reforms to the statutory pension insurance system analysed – excluding the tax shortfalls ensuing from the Act promoting private pension plans – result in a combined reduction in the annual consolidation requirement of 2.0 percentage points compared with the status-quo scenario.[92] However, it was not possible to take account of all changes taking effect in the future. For example, the impact of the reform of the reduced working capacity pension and the greater offsetting of surviving dependants' pensions against income was not examined. Similarly, the effects of rising pension contributions on pension levels written into the pension adjustment formula were ignored since constant contribution rates were assumed for the reasons given in section II.3.

3. Problems involved in transforming cross-sectional into longitudinal data

It is not only policy measures that may trigger changes in relative payment profiles. Cohort effects and changes in behaviour may likewise affect the relative payment profiles derived from cross-sectional data over time, which would result in errors if the cross-sectional data were mechanically transformed to the cohort perspective.[93] Future changes in the behaviour of private-sector economic agents are not looked at in any greater detail here in accordance with the objective of supplying an indicator of fiscal policy in the base year. Allowing, for example, for a future rise in the participation ratio under the base scenario would have amounted to something like a forecast, thus weakening the indicator properties for the purpose of generational accounting.[94]

This does not apply to changes in behaviour already observed in the past which will result in changes to the payment profiles in the future. Special attention should be paid to the rising participation ratio of women recorded in the past. As the level of the individual

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[91] The contributions to the supplementary private pensions plans and the corresponding post-retirement return flows are irrelevant since in a perfect capital market their present value is zero and because they must be allocated to private economic agents and not the government sector.

[92] Without the cohort effect descrived in the next chapter.

[93] See also Banks, Disney, Smith (2000).

[94] As ter Rele (1997) has shown, the assumption of a rising participation ratio may result in a substantial change in the generational accounting results.

pension entitlement is largely determined by past remuneration subject to social security levies and hence the personal work-force participation, an overall increase in the female participation ratio means that the old-age pensions of women who have only recently retired are higher than those of older cohorts. Thus the normal method of transforming cross-sectional data into longitudinal data would produce a picture according to which the pensions of younger female pensioners would fall as they grow older (ignoring the extrapolated productivity growth rate). In actual fact, however, the individual pension does not change after retirement - disregarding the annual adjustment in accordance with the pension calculation formula which affects all age cohorts equally. For this reason, the future pension payments for women were not derived from the cross-sectional profile but by extrapolating the new pensions.[95] Chart VI.2 shows that this results in substantially higher pension payments for an average member of the elderly cohorts in 2030, the year in which the long-term steady state is practically achieved. This cohort effect increases the annual consolidation requirement by around 0.4 percentage point.

Chart VI.2: Impact of cohort effects on future old-age pensions for west German women[1)]
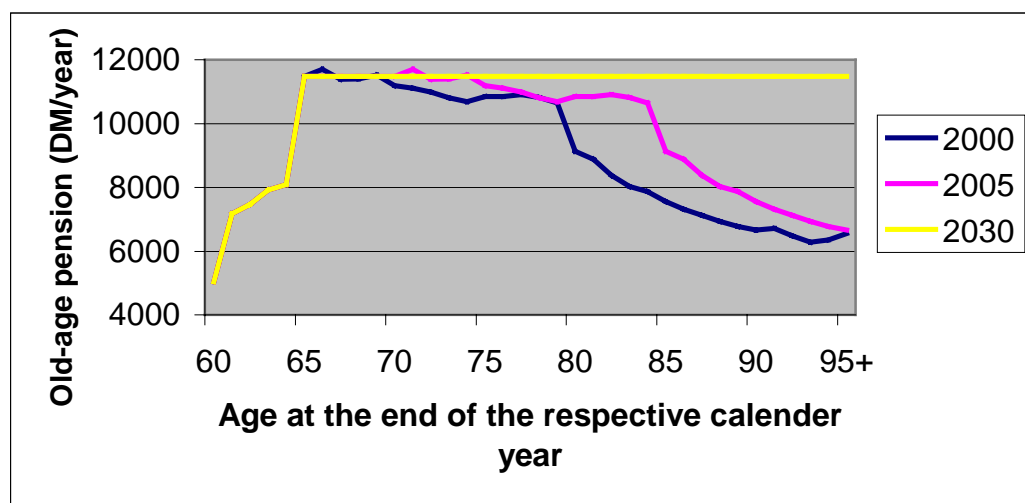
[1)] Current pension value in 2000, excluding growth-related extrapolation

Men do not exhibit similar cohort effects. The old-age pension for an average 85-year old man differs only marginally from that of a 65-year old in the cross-sectional profile. Only for men aged over 90 is the pension of an average cohort member substantially lower. However, in this age group, too, the average pension per pensioner is not smaller than the

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95 Bonin (2001) uses this method not only for old-age pensions for women but also for pensions for surviving dependants and men.

figure for young pensioners. The decline in the per capita amount is due solely to the fact that the proportion of pensioners in the cohort falls with rising age. This is attributable to an above-average life expectancy on the part of people who are not members of the statutory pension insurance scheme (particularly civil servants and the self-employed).[96] Accordingly, future pensions for men were not derived from new pensions.[97]

Similarly, future new pensions were not adjusted to allow for previous trends in gainful employment. According to a study published by the Association of German Pension Funds, projected pension entitlements held by women in the western German states born between 1951 and 1955 are higher than those held by women now retiring.[98] However, there is no such effect in the new German states, while men's pension entitlement is in fact declining in both parts of Germany. Accordingly, this is not likely to exercise much influence on the results.

Further cohort effects may arise in connection with expenditure on statutory health insurance as well as statutory long-term care insurance. This is because, as implicitly assumed in the cross-section data, the amount of this expenditure does not depend on absolute age alone but also on mortality. As it is assumed that life expectancy is increasing and mortality is therefore declining, the relative payment profile of these expenditure categories could therefore be flatter in the future.[99] However, the resultant exaggeration of the sustainability gap is only small and has therefore been ignored here.[100]

4. Results under the policy scenario

Including measures which had already been adopted but were not yet fully effective in the base year substantially changes the evolution of the annual consolidation requirement in the second half of the 1990s (see Table VI.1).[101] In the cyclically adjusted status quo scenario

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[96] According to the 2001 Welfare Report, civil servants aged 60 years have a residual life expectancy more than two years greater than that of the average for the population as a whole (see *Bundesministerium des Innern* (2001), p 39). Generally speaking, there is evidence suggesting that the higher the income the greater the life expectancy (see, for example, Philipson, Becker (1998)).

[97] As the surviving-dependants pensions for women are coupled to the old-age pensions of their husbands, it is not necessary to make any adjustments to the profiles for this type of pension. For all intents and purposes, men do not receive surviving-dependants pensions.

[98] See Kortmann, Schatz (1999), page 65 et seq.

[99] See, for example, Breyer (1999).

[100] Moreover, it is offset by the surviving-dependants pension. The rising life expectancy of pensioners means that the age-specific payment profile for surviving-dependants pensions is shifting in favour of higher age groups, something which has not been allowed for here.

[101] Bonin (2001) computes an annual consolidation requirement of 4.9% of GDP for 1996 in a scenario with low mortality which roughly matches the population assumptions used here. Borgmann, Krimmer,

the largest consolidation was recorded in 1997 and 2000 (annual consolidation requirement cut by 1.4 and 1.0 percentage points, respectively). In the policy scenario, the decline in the annual consolidation requirement was even greater in 1997 (2.5 percentage points), while there is also a substantial drop in the consolidation requirement in 1999. On the other hand, this scenario produces a sharp increase in the annual consolidation requirement in 2000. In absolute terms, the annual consolidation requirement initially dropped to 1.2% in 1999, i.e. 2.5 percentage points below the adjusted status-quo scenario. With the return to a higher sustainability gap in 2000, however, this difference narrowed to 0.6 percentage point.

Table VI.1: Evolution of the annual consolidation requirement under various scenarios between 1996 and 2000

Year	Status-quo scenario [1]	Adjusted status-quo scenario [2]	Policy scenario [3]	Change in relation to adjusted status-quo scenario due to policy changes	
				excl. stat. pension benefits	incl. stat. pension benefits [3]
1996	6.1	6.0	5.1	-0.3	-0.6
1997	5.2	4.6	2.6	-0.3	-1.7
1998	4.4	4.1	2.4	0.0	-1.7
1999	3.5	3.7	1.2	-0.6	-1.9
2000	0.3	2.7	2.1	1.3	-1.8
2000[4]	0.3	2.7	2.8	1.7	-1.6

[1] Incl. UMTS auction proceeds in 2000. [2] Adjusted for cyclical factors and other temporary effects. [3] Including cohort effects of pension payments to women. 4) Policy scenario including key elements of Pension Reform 2001 (curtailing of pension adjustments owing to deduction of notional contributions to and government promotion of private pension plans and abandonment of the demographic factor).

What is the reason for this trend? As early as in 1996, the inclusion of measures which have been adopted but did not have their full effect until the future results in a 0.9 percentage point drop in the annual consolidation requirement compared to the adjusted status-quo scenario. The crucial factor here is the deductions for premature retirement, which take effect in the future and result in a fall of roughly 1 percentage point. This is offset by the higher future pension expenditure for women (roughly 0.3 percentage point) as a result of the above-mentioned cohort effect. Measures not targeted at the benefits side of the statutory pension insurance system also reduce the annual consolidation requirement compared with the adjusted status-quo scenario (by a total of 0.3 percentage point). The main reason for this was the increase in the contribution rate to the statutory pension

Raffelhüschen (2001) calculate a sustainability gap of 127% of GDP in the base year for 1998. However, both studies differ from the approach used here in terms of the method and underlying assumptions.

insurance system from 19.2% to 20.3% adopted at the end of 1996 and taking effect on 1 January 1997.

In 1997, too, policy changes having a future effect outside the benefits side of the statutory pension insurance system resulted in an improvement of 0.3 percentage point. The effect of certain tax reductions, particularly the cut in the solidarity surcharge from 7.5% to 5.5% from 1 January 1998, was offset by a substantial increase in revenues from the raising of value added tax by 1 percentage point on 1 April 1998 and reduced expenditure on coalmining subsidies.[102] More important were the savings in the pension insurance system, the scale of which was substantially boosted by the 1999 Pension Reform Act passed at the end of 1997. The introduction of the demographic factor alone would have reduced the annual consolidation requirement by 0.8 percentage point. This was reinforced by the abolition of the ability to retire prematurely before the age of 62 years as of 2013. This resulted in a further improvement in the sustainability of public finance as the deductions were not calculated according to actuarial principles. Compared with the previous year, the improvement caused by measures having their effect in the future increased substantially overall. As the annual consolidation requirement under the adjusted status-quo, too, fell substantially compared with 1996 on account of budgetary austerity, the annual consolidation requirement under the policy scenario contracted by 2.5 percentage points.

In 1998, the decisions taking effect in the future but allowed for in the policy scenario (excluding the restrictions on benefits in the statutory pension insurance system) had no impact on the annual consolidation requirement on balance. An extra burden was imposed by the 1999 Tax Relief Act with the increase in child benefit, the lowering of the income tax threshold rate as well as the reduction in the contribution rate to the statutory pension insurance scheme from 20.3% to 19.5% on 1 April 1999. On the other hand, the increase in value added tax in 1998 had not yet had a full impact on revenue. Further relief came from the future cuts in coal subsidies as part of the "coal compromise". On the benefits side of the statutory pension insurance system, the demographic factor was initially suspended by the newly elected government until 2001, although this had only a marginal impact on the sustainability gap. All told, the relief afforded by measures already adopted was down slightly on the previous year. Accordingly, the policy scenario produces only a marginal improvement over 1997, whereas the annual consolidation requirement under the adjusted status-quo scenario fell 1/2 percentage point.

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[102] The abolition of trade capital tax was ignored as it was financed by restricting the ability to set aside provisions. As in all other years, allowance was made for the effects of the gradual transition of home-ownership promotion from the special tax allowance pursuant to section 10e of the Income Tax Act to the home buyer's grant.

In 1999, a series of measures were adopted outside the statutory pension insurance system having an effect in the future. On balance, these improved the sustainability of public finance by 0.6 percentage point over the adjusted status-quo scenario. A number of cuts in taxes and levies (particularly as a result of the 1999/2000/2002 Tax Relief Act) and a further increase in child benefit at the beginning of 2000 was offset above all by the staggered increase in mineral-oil tax and the (new) electricity tax introduced as part of the ecological tax reform.[103] In the statutory pension insurance system, further cuts were adopted in 2000 and 2001 by limiting the pension adjustment to the prior-year inflation rate. In this connection the demographic factor was suspended for a further year until 2002. Compared with the previous year, the measures with a future effect provided substantially greater relief for public-sector budgets. Whereas the annual consolidation requirement under the adjusted status-quo scenario dropped by 0.4 percentage points compared with 1998, there was an improvement of 1.2 percentage points under the policy scenario.

In 2000, the policy changes with a future effect (excluding restrictions to benefits in the statutory pension insurance scheme) caused the sustainability of public finance to worsen substantially compared with the adjusted status-quo scenario. This was due to the extensive tax relief adopted as part of the tax reform for future years. Thus, the Tax Reduction Act, which entails the reform of corporate taxation, the bringing-forward of the third phase of the Tax Relief Act to 2001 and further cuts in income tax in two steps up to 2005, will alone give rise to additional tax shortfalls of DM 63 billion in the final year. Of far lesser importance was the cut by 0.2 percentage point in the contribution rate to the statutory pension insurance scheme from 1 January 2001.[104] The measures on the benefits side of the statutory pension insurance system resulted in marginally lower relief for the public-sector budget compared with the previous year as part of the inflation adjustment was already reflected in the national accounts figures for 2000 and is thus already included in the status-quo scenario. All in all, the policy changes not yet in force had a substantially lower relief effect than in 1999. Hence although the annual consolidation requirement dropped by 1 percentage point compared with 1999 under the adjusted status-quo scenario, it rose under the policy scenario from 1.2% to 2.1%.

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[103] The cut in the contribution rate to the statutory pension insurance scheme adopted at the end of 1999 was not included as it was financed by additional revenues gained from the compulsory contributions for part-time low-paid workers. The future cuts or smaller increases in contribution rates due to the partial financing of statutory pensions out of the inflow of revenues from the ecological tax reform are likewise not taken into account here for the above-mentioned reasons. As in previous years, however, the cuts in coal subsidies and the replacement of section 10 of the Income Tax Act by the home buyer's grant continued to have an effect.

[104] The measures adopted in previous years under the 1999/2000/2002 Tax Relief Act continued to impose burdens beyond 2000, while the further steps of the ecological tax reform and the coal compromise provided relief.

The extensive tax cuts constitute a heavy ongoing burden for the sustainability of public finance as (so far) they have not been counter-financed by corresponding cuts in government expenditure. However, if it proves possible not only to recoup the shortfalls arising from the future stages of the tax reform but also - as announced by the German federal government in its updated stability programme - to reduce the general government budget deficit to zero by 2004, this will mark a major step towards achieving the long-term sustainability of public finance.

The parts of the pension reform adopted at the beginning of 2001 taken into account here have not on balance provided any relief for government budgets. Rather, compared to the legal status prevailing at the end of 2000, which envisaged the introduction of a demographic factor in 2002, they in fact entail additional strain.[105] This increases the annual consolidation requirement by 0.7 percentage point. The cuts in the pension adjustments to allow for notional contributions to supplementary private pension plans in the new pension calculation formula are not sufficient to compensate for scrapping the demographic factor (a difference of ¼ percentage point). On top of this, the annual consolidation requirement is being additionally increased by the shortfall in government revenue (0.4 percentage point) as a result of the generous subsidisation of supplementary private old-age provision. Including the pension reform (i.e. the parts analysed here), the policy scenario consequently shows an annual consolidation requirement of 2.8% for 2000.

Even if the demographic factor is considered to have been "clinically dead" already in 2000, the introduction of supplementary private pension plans in connection with the pension reform improves the long-term sustainability of public finance only marginally (the annual consolidation requirement is lowered by 0.2 percentage point). Nevertheless, it entails considerable intergenerational redistribution effects. Chart VI. 3 shows that the reduction in the pension adjustments as a result of allowing for notional contributions to supplementary private old-age provision exerts particular pressure on age groups which have already reached retirement age or are about to do so. For 60-year-olds this means additional charges of around DM 13,000 over their remaining lifetime. On the other hand, people still at the beginning of their careers benefit particularly from the subsidisation of private additional cover as they will benefit from it over a long period of time. This results in relief of some DM 9,000 for 20-year-olds. The closer to retirement age, the smaller is the utility from the government subsidisation. All in all, the combination of lower pension adjustments and government subsidisation for supplementary private old-age provision will

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[105] However, the calculations do not include all of the measures taken in connection with the pension reform (see Chapter VI.2).

place an appreciable strain on pensioners as well as persons close to retirement age, whereas younger age groups are in fact given slight relief.

Fig. VI.3: Intergenerational distribution effects of introducing supplementary private pension plans
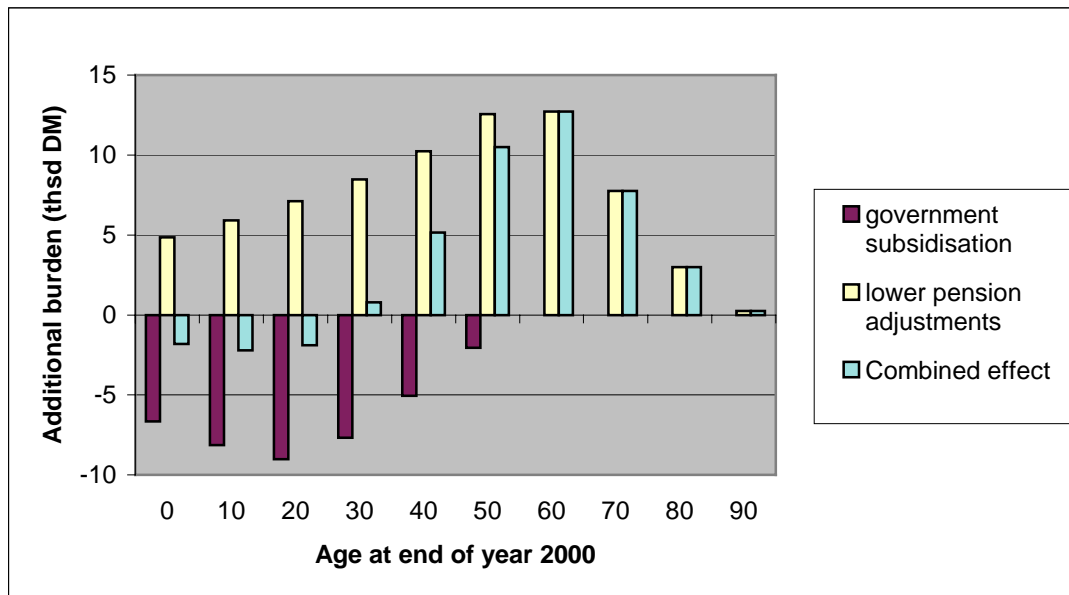
VII. Conclusions

The primary objective of this study was to eliminate cyclical and other major temporary influences from the results of generational accounting. For this purpose, the values derived from the national accounts for the individual government revenue and expenditure categories were decomposed into a cyclical and a trend component using the disaggregated approach described in Mohr (2001). This reduced the dependency of the results on non-recurring factors in the base year and so improved the informativeness of the results of generational accounting. At the same time, it enhanced the comparability of the results for different base years. The main indicator of the long-term sustainability of public finance was defined as the annual consolidation requirement, i.e. the amount expressed in percentage points by which the government primary deficit ratio must contract in each future year compared with the initial situation to ensure that the intertemporal budget constraint on the government can be complied with without any further policy changes. Under the status-quo scenario, in which the age-specific payment profiles of the base year are kept constant, there was a considerable consolidation requirement in 1996 of over 6

percentage points on an unadjusted basis. This was reduced by a good 2 1/2 percentage points by 1999 and almost completely eradicated in 2000. However, the sharp decline in 2000 was due substantially to cyclical factors as well as other temporary effects (particularly the windfall proceeds from the auction of mobile phone licences). Other than this, the impact of cyclical fluctuations and other temporary effects in Germany in the second half of the 1990s was limited to a maximum of 0.6 percentage point.

The status-quo scenario provides a relatively transparent indicator for formulating fiscal policy in the base year. In line with the second goal - to gauge more realistically what still needs to be done - a policy scenario was then additionally examined to determine the influence on the results of political measures which were adopted in the base year but had not yet had their (full) effect. To this end, a distinction was made between measures which only affect the aggregate figures in the individual government revenue and expenditure categories and those which also change the relative age-specific payment profiles. Cohort effects were also taken into account in connection with benefits under the statutory pension insurance system. The annual consolidation requirement under the policy scenario is lower than under the status-quo scenario for all years. However, the extent of policy changes already adopted but having an effect only in the future varies substantially from year to year. In particular, the 1999 pension reform adopted at the end of 1997 resulted in a substantially greater difference between the adjusted status-quo scenario and the policy scenario in the years between 1997 and 1999. However, this gap narrowed substantially again in 2000. This was due to the large future tax shortfalls caused by the Tax Reduction Act, which have not yet been offset by statutory consolidation measures. The introduction of supplementary private old-age provision as a core element of the 2001 pension reform caused the sustainability gap to widen even further as it replaced the demographic factor (which formally had only been suspended) and because the government subsidisation of supplementary private pension plans will result in substantial future revenue shortfalls.

The fact that the annual consolidation requirement is not substantially higher than the figure of just over 2 per cent under the policy scenario for 2000 is primarily due to the assumption that the payment profiles for eastern Germany will converge to western German levels. A large part of the rising government financing problems in the future arising from the demographic development will be offset by the assumed increase in net payments to government in eastern Germany.

However, the annual consolidation requirement under the policy scenario in particular must be interpreted cautiously. The budgetary impact of the individual measures is based on estimates, and the choice of the measures included in the calculations had to be arbitrary to some extent. Generally speaking, no allowance has been made either for macroeconomic

repercussions, for example. Moreover, the remaining annual consolidation requirement is a somewhat imprecise indicator of what fiscal action needs to be taken since other future developments (e.g. a change in the participation ratio) may increase or reduce the need for fiscal action.

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Annex 1: Measures taken into account in the policy scenario

The following section lists the measures adopted at the end of the base year in question but not having their (full) effect until sometime in the future, which were included in the policy scenario.

Base year Measure

1996   Contribution Relief Act (lower contributions, lower expenditure of the statutory health insurance scheme)

Second phase of long-term care insurance introduced (increased contribution rate, higher expenditure on long-term care, reduced social assistance payments)

1997   Annual Tax Act (wealth tax not enforced, inheritance tax reformed, land acquisition tax increased)

Contribution rate to statutory pension insurance scheme increased from 19.2% to 20.3%.

From earlier years: section 10 of the Income Tax Act replaced by home buyer's grant, child benefit increased as of 1997, introduction of deductions for premature retirement pursuant to the Growth and Employment Promotion Act.

1997   Cuts in coal subsidies

Solidarity surcharge cut from 7.5% to 5.5% on 1 January 1998.

Standard VAT rate increased by 1 percentage point on 1 April 1998.

1999   Pension Reform Act (demographic factor, change to introduction of deductions for premature retirement)

From earlier years: Second phase of long-term care insurance introduced (reduced social assistance expenditure), 1997 Annual Tax Act (wealth tax not enforced, land acquisition tax increased), section 10 of the Income Tax Act replaced by home buyer's grant

1998   1999 Tax Relief Act (increase in child benefit, reduction of threshold income tax rate)

Reduction in contribution rate to the statutory pension insurance scheme from 20.3% to 19.5% on 1 April 1999.

Suspension of demographic factor until 2001.

From earlier years: Cuts in coal subsidies, section 10 of the Income Tax Act replaced by home buyer's grant, standard VAT rate increased by 1 percentage point on 1 April 1998, 1999 Pension Reform Act (demographic factor, deductions for premature retirement)

1999   1999/2000/2002 Tax Relief Act

Ecological tax reform

Child benefit increased as of 2000

Pensions adjusted in line with previous year's inflation rate in 2000 and 2001, demographic factor suspended until 2002

From earlier years: Cuts in coal subsidies, section 10 of the Income Tax Act replaced by home buyer's grant, 1999 Tax Relief Act (reduction in threshold income tax rate), 1999 Pension Reform Act (demographic factor, deductions for premature retirement)

2000   Tax Reduction Act (corporate tax reform, bringing-forward of third phase of the Tax Relief Act to 2001, further cuts in income tax rates by 2005)

Contribution rate to the statutory pension insurance scheme lowered from 19.3% to 19.1%.

From earlier years: Cuts in coal subsidies, section 10 of the Income Tax Act replaced by home buyer's grant, 1999/2000/2002 Tax Relief Act, ecological tax reform, 1999 Pension Reform Act (demographic factor (suspended until 2002), deductions for premature retirement), pensions adjusted in line with previous year's inflation rate in 2000.

Annex 2: Increase in eligible retirement ages for receiving a deduction-free pension in the statutory pension insurance system

a) Statutory amendments in the 1990s

to end ...	pursuant to PRA 1992			pursuant to GEPA 1996			pursuant to PRA 1999		
	Ret. pension due to unemployment or pre retirement part-time working	Ret. pension for women	Ret. pension for persons insured over many years	Ret. pension due to unemployment or pre retirement part-time working	Ret. pension for women	Ret. pension for persons insured over many years	Ret. pension due to unemployment or pre retirement part-time working	Ret. pension for women	Ret. pension or persons insured over many years
1995	60,00	60,00	63,00	60,00	60,00	63,00	60,00	60,00	63,00
1996	60,00	60,00	63,00	60,00	60,00	63,00	60,00	60,00	63,00
1997	60,00	60,00	63,00	61,00	60,00	63,00	61,00	60,00	63,00
1998	60,00	60,00	63,00	62,00	60,00	63,00	62,00	60,00	63,00
1999	60,00	60,00	63,00	63,00	60,00	63,00	63,00	60,00	63,00
2000	60,00	60,00	63,00	64,00	61,00	64,00	64,00	61,00	64,00
2001	60,25	60,25	63,25	65,00	62,00	65,00	65,00	62,00	65,00
2002	60,50	60,50	63,50	65,00	63,00	65,00	65,00	63,00	65,00
2003	60,75	60,75	63,75	65,00	64,00	65,00	65,00	64,00	65,00
2004	61,00	61,00	64,00	65,00	65,00	65,00	65,00	65,00	65,00
2005	61,50	61,50	64,50	65,00	65,00	65,00	65,00	65,00	65,00
2006	62,00	62,00	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2007	62,50	62,50	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2008	63,00	63,00	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2009	63,50	63,50	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2010	64,00	64,00	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2011	64,50	64,50	65,00	65,00	65,00	65,00	65,00	65,00	65,00
2012	65,00	65,00	65,00	65,00	65,00	65,00	65,00	65,00	65,00

Premature retirement possible from age

2011	62,00	62,00	62,00	60,00	60,00	63,00	60,00	60,00	63,00
2012	62,00	62,00	62,00	60,00	60,00	63,00	60,00	60,00	62,50
after 2012	62,00	62,00	62,00	60,00	60,00	63,00	62,00	62,00	62,00

b) Current statutory situation by pension type

Pension commencing end ...	Old-age pension due to unemployment or following temporary old-age employment *)						Old-age pension for women *)					
	Birth year at end ...	Deduction-free pension possible from the age of	Deduction-free pension possible from end ...	Earliest possible pension commencing this year from the age of	Earliest possible pension commencing from end ...	Pension deductions in % of pension entitlement	Birth year at end ...	Deduction-free pension possible from the age of	Deduction-free pension possible from end ...	Earliest possible pension commencing this year from the age of	Earliest possible pension commencing from end ...	Pension deductions in % of pension entitlement
				Status: Pension Reform Act 1999 (RRG 1999)								
1995	1935	60	1995	60	1995	0,0%	1935	60	1995	60	1995	0,0%
1996	1936	60	1996	60	1996	0,0%	1936	60	1996	60	1996	0,0%
1997	1937	61	1998	60	1997	3,6%	1937	60	1997	60	1997	0,0%
1998	1938	62	2000	60	1998	7,2%	1938	60	1998	60	1998	0,0%
1999	1939	63	2002	60	1999	10,8%	1939	60	1999	60	1999	0,0%
2000	1940	64	2004	60	2000	14,4%	1940	61	2001	60	2000	3,6%
2001	1941	65	2006	60	2001	18,0%	1941	62	2003	60	2001	7,2%
2002	1942	65	2007	60	2002	18,0%	1942	63	2005	60	2002	10,8%
2003	1943	65	2008	60	2003	18,0%	1943	64	2007	60	2003	14,4%
2004	1944	65	2009	60	2004	18,0%	1944	65	2009	60	2004	18,0%
2005	1945	65	2010	60	2005	18,0%	1945	65	2010	60	2005	18,0%
2006	1946	65	2011	60	2006	18,0%	1946	65	2011	60	2006	18,0%
2007	1947	65	2012	60	2007	18,0%	1947	65	2012	60	2007	18,0%
2008	1948	65	2013	60	2008	18,0%	1948	65	2013	60	2008	18,0%
2009	1949	65	2014	60	2009	18,0%	1949	65	2014	60	2009	18,0%
2010	1950	65	2015	60	2010	18,0%	1950	65	2015	60	2010	18,0%
2011	1951	65	2016	60	2011	18,0%	1951	65	2016	60	2011	18,0%
2012	1952	65	2017	62	2014	10,8%	1952	65	2017	62	2014	10,8%
2013	1953	65	2018	62	2015	10,8%	1953	65	2018	62	2015	10,8%
2014	1954	65	2019	62	2016	10,8%	1954	65	2019	62	2016	10,8%
2015	1955	65	2020	62	2017	10,8%	1955	65	2020	62	2017	10,8%

Pension commencing by end ...	Old-age pension for long-term insured						Old-age pension for the severely disabled					
	Birth year end ...	Deduction-free pension possible from the age of	Deduction-free pension possible from end ...	Earliest possible pension commencing this year from the age of	Earliest possible pension commencing from end ...	Pension deductions in % of pension entitlement	Birth year at end ...	Deduction-free pension possible from the age of	Deduction-free pension possible from end ...	Earliest possible pension commencing this year from the age of	Earliest possible pension commencing from end ...	Pension deductions in % of pension entitlement
				Status: Pension Reform Act 1999 (RRG 1999)								
1995	1935	63	1998	63	1998	0,0%	1935	60	1995	60	1995	0,0%
1996	1936	63	1999	63	1999	0,0%	1936	60	1996	60	1996	0,0%
1997	1937	63	2000	63	2000	0,0%	1937	60	1997	60	1997	0,0%
1998	1938	63	2001	63	2001	0,0%	1938	60	1998	60	1998	0,0%
1999	1939	63	2002	63	2002	0,0%	1939	60	1999	60	1999	0,0%
2000	1940	64	2004	63	2003	3,6%	1940	60	2001	60	2000	0,0%
2001	1941	65	2006	63	2004	7,2%	1941	61	2003	60	2001	3,6%
2002	1942	65	2007	63	2005	7,2%	1942	62	2005	60	2002	7,2%
2003	1943	65	2008	63	2006	7,2%	1943	63	2006	60	2003	10,8%
2004	1944	65	2009	63	2007	7,2%	1944	63	2007	60	2004	10,8%
2005	1945	65	2010	63	2008	7,2%	1945	63	2008	60	2005	10,8%
2006	1946	65	2011	63	2009	7,2%	1946	63	2009	60	2006	10,8%
2007	1947	65	2012	63	2010	7,2%	1947	63	2010	60	2007	10,8%
2008	1948	65	2013	62,5	7/2010	9,0%	1948	63	2011	60	2008	10,8%
2009	1949	65	2014	62	2011	10,8%	1949	63	2012	60	2009	10,8%
2010	1950	65	2015	62	2012	10,8%	1950	63	2013	60	2010	10,8%
2011	1951	65	2016	62	2013	10,8%	1951	63	2014	60	2011	10,8%
2012	1952	65	2017	62	2014	10,8%	1952	63	2015	60	2012	10,8%
2013	1953	65	2018	62	2015	10,8%	1953	63	2016	60	2013	10,8%
2014	1954	65	2019	62	2016	10,8%	1954	63	2017	60	2014	10,8%
2015	1955	65	2020	62	2017	10,8%	1955	63	2018	60	2015	10,8%

*) Old-age pension on account of unemployment and old-age pension for women will only be paid to those born until end-1951.

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