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Implicit Pension Debt and the Role of Public Pensions for Human Capital Accumulation: An Assessment for Germany

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Abstract

Implicit pension debt involved in existing pay-as-you-go public pension schemes is nowadays seen as an important determinant of the long-term sustainability of general government finances. Explicit up-dated calculations regarding its size are however largely lacking. The present paper takes up the lessons that emerge from the relevant literature and estimates the amount of implicit pension debt for the German Statutory Pension Scheme under the current legal framework as well as over the series of reforms that have been enacted during the last fifteen years. It is demonstrated that, through these reforms, implicit liabilities have been reduced substantially but are nevertheless still sizeable. Even if future contribution rates are increased as prescribed by current rules, there will be a notable gap in the German public pension scheme's total balance sheet. In the second part of the paper, it is also discussed that, by the way they are conventionally designed, unfunded pension schemes may have a negative impact on human capital accumulation and, hence, on future contributions. A proposal for how this source of potential intrinsic instability could be removed by redesigning the German public pension scheme is then sketched.

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PART A: IMPLICIT PENSION DEBT IN GERMANY

1 Introduction

Conventional economic wisdom has it that a public pay-as-you-go pension scheme inevitably involves an implicit type of government debt (for early references that received much attention at an international level, see van den Noord and Herd 1993, 1994).[1] This debt is introduced when the system is phased in and, by definition, starts to pay out benefits immediately based on current contributions. During an initial phase, benefits accrue to individuals of retirement age who have not – at least, not over their entire active life span – contributed to financing the scheme. In the extreme case of a pure pay-as-you-go scheme, funding for these benefits fully exhausts the contributions collected among those who are currently active, and none of the contributions are accumulated. Instead, early contributors are given the promise – or, in most cases, a legal entitlement – that they will receive a pension later on. As these outstanding benefits will, in turn, be financed from future contributions that are collected using the coërcive power of public authorities, they fully conform to the notion of public debt.

Once the system is matured, meaning that all existing pensioners have a full life-time record of contributions, the implicit debt will be simply rolled over from one generation to another. Within an overall system of revolving loans, part of the debt is continuously redeemed by paying out pension benefits, while current contributions always turn into fresh debt (see Sinn 2000 or Fenge and Werding 2003 for further details). There is thus always a certain amount of benefit entitlements that will become effective only in the future, but arises from contributions that have already been made.

Within the total balance sheet of a given public pension scheme, there are mainly two types of "assets" by which the implicit pension debt is effectively covered. First, in a partially funded system, where some fraction of the contributions is continuously accumulated to prefund for future benefits, there can be a substantial stock of financial reserves. Second, whatever the remainder of the implicit debt, it should be next to automatically covered by future contributions. However, calling these contributions an asset is an elusive concept, and accounting for them in any practical calculations regarding the size of the implicit pension debt requires a lot of care to avoid tautological conclusions and to allow for meaningful comparisons. We will keep this in mind and return to a number of details involved throughout the following considerations.

2 Lessons from the literature and the discussion so far

Early attempts at measuring the size of implicit pension debt for a limited number of industrialised countries were relatively rough in their methodology (see Hagemann and Nicoletti 1989, van den Noord and Herd 1993, 1994, or Kuné *et al.* 1993). Not surprisingly, the results turned out to be a multiple of current GDP in most cases and often dwarfed the figures for explicit government debt and the debt ratios officially recorded.

[1] We are well aware that, probably all over the industrialised world, economists have brought forth similar ideas much earlier at a national level, when existing pay-as-you-go pension systems were inaugurated or extended to an almost universal coverage after or even before the Second World War.

There has been a limited number of follow-up studies, some conducted at an international level[2] and a larger number dealing with single countries only[3]. At the same time, other authors pointed to ambiguities and possible sources of misinterpretation in any of the approaches taken in this strand of literature (see, *e.g.* Haveman 1994, Franco 1995 or Disney 2001).

Most of the subsequent work therefore turned to developing other indicators to address the role of public pay-as-you-go pensions and other types of government expenditure for the long-term sustainability of public finances.[4] For instance, EU-level authorities are currently working on new, sophisticated measures of fiscal sustainability (see EU Economic Policy Committee 2003) that are meant to support the EU-wide consultation process regarding sound fiscal policies and the observation of the criteria of the "Stability and Growth Pact", with a particular focus on the Eurozone countries. Unfunded liabilities of public pension schemes are an important ingredient in calculating any of these indicators, but explicit calculations regarding the aggregate size of implicit pension debt are no longer part of these efforts.

To some extent, this may have to change in the future, mainly because *not* including this type of debt within the accounting framework for the public sector creates opportunities to manipulate official figures on current public deficits and debts wherever these are under external surveillance. For instance, on several occasions during the last years the EU had to deal with cases where national governments took over unfunded pension liabilities from private, often formerly state-owned, corporations against the payment of a notable lump sum. With current accounting standards, such lump-sum payments reduce the current budget deficit, while the additional liabilities are nowhere recorded.[5] Another, and probably more important, reason is that international rating agencies have recently stressed their interest in including the amounts and future trends of implicit pension debt in the criteria for their country credit ratings (see, *e.g.*, Kraemer *et al*. 2005). If this is a serious ambition, not just relevant in cases of obvious fiddling with explicit debt figures, then national governments themselves might become interested in determining and publishing the relevant data.

At the same time, one has to acknowledge that accounting for implicit pension debt is not as straightforward as it may seem from our introductory remarks. The discussion that has unfolded over the last fifteen years provides a number of important lessons that will have to be dealt with in any related effort.

First, there are effectively different notions of implicit pension debt (see Holzmann *et al*. 2000), at least two of which are really important: those based on *accrued-to-date liabilities* (ADL) and on *open-system liabilities* (OSL). ADL is essentially what was sketched in the introduction of this paper, *viz*. outstanding bene-

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2 See, for instance, Chand and Jaeger (1996) or Frederiksen (2001).

3 For a survey, see Franco *et al*. (2005, Section 5, especially Table 4).

4 See, *e.g.*, Leibfritz *et al*. (1995) and Roseveare *et al*. (1996) whose work was extended, and much refined, for the comparative study documented in OECD (2001, ch. 4, 2002). This latter study was prepared in co-operation with the EU Economic Policy Committee (2001) that used it as a point of departure for further refinements.

Also, the host of studies based on the "Generational-accounting" methodology suggested by Auerbach *et al*. (1991) is based on a parallel idea. But like in the more recent OECD projects, numerous government budget items other than pension expenditure enter the notions of implicit debt and fiscal sustainability applied there, and the results are condensed to form other, more complex indicators of intergenerational equity. See Auerbach *et al.* (1999) or Kotlikoff and Raffelhüschen (1999) for collections and surveys of applied work in this area.

5 In a news release of 21 October 2003, Eurostat confirmed that this incomplete, hence misleading, accounting procedure is fully in line with the existing rules. Changing these rules might therefore be the only way out if the practice sketched above were adopted on a larger scale. Note that, while misperceptions of annual deficit figures could be avoided by *not* accounting for the lump-sum payment, misleading changes in accumulated debt still were next to inevitable if one would not want to introduce multiple time series regarding actual *vs* notional public debt.

In a sense, the practice sketched here runs counter to one of the standard objections to officially accounting for implicit pension debt, namely that entitlements to receive unfunded pensions cannot be traded (Franco 1995). While this may be true for individuals who are future beneficiaries, it does not equally apply to the government or other sponsoring bodies.

fit entitlements linked to past and current contributions, to be determined "as if" the scheme under scrutiny were closed for new accruals starting, say, the next year. Among the alternative definitions, ADL is certainly closest to the notion of explicit government debt. On the other hand, the concept may fail to fully capture larger shifts in future pension finances that can be due to massive changes in the population structure ("demographic ageing") or, no less important, to policy responses that become effective only gradually, over a long transition period. For this reason, other measures have been devised that address the expected continuation of the scheme and augment ADL measures by benefits linked to future contributions. In the limiting case, long-term projections regarding the pension scheme's budget can be extended to cover an infinite ("open") time horizon, in order to fully spell out the implications of current pension law in terms of OSL-type measures.[6] In this paper, for reasons that should become clear as we go along, we will present estimates regarding both kinds of measures for the German Statutory Pension Scheme.

Second, international comparisons regarding the size of implicit pension debt are very difficult to make. The problem is not so much that, in attempting to do so, one has to deal with lots of specific details of each of the pension schemes covered when preparing projections of future benefits (and contributions) – a point suggesting that one should involve national experts in one way or another in order to obtain reliable results. The main obstacle is that there is a deep-rooted conflict between reliability and comparability of projections for pension schemes in different countries. Going a long way in harmonizing assumptions regarding a host of relevant aspects of individual behaviour and macro-economic developments is likely to yield implausible, if not misleading, projections for some of the countries involved. On the other hand, with assumptions that are not fully harmonized to take care of country-specific features, it is difficult to assess what is effectively compared in such exercises: cross-country differences in institutions, such as the legal framework of national pension schemes, or differences in behaviour and in general economic conditions. What can be accomplished much more easily are comparisons that cover just one country over time, capturing the impact of changes in the legal framework, including the potential effects of future reforms. Therefore, this is what we will effectively restrict our attention to in this paper, assuming that our observations from Germany may involve some lessons, direct or indirect, for other countries as well. Hopefully, this is still true even if we acknowledge a further lesson that arises from the existing literature.

Third, when attempting to measure implicit pension debt, the appropriate perspective to be taken and the issues and sub-issues to be looked at vary substantially by systems and, hence, by countries. For instance, in a pay-as-you-go pension scheme with *notionally defined benefits* (NDB), such as the German one, it is really the implicit debt involved in future benefit entitlements that is of highest importance. By contrast, in *notionally defined contributions* (NDC) schemes, such as those in place in Italy and Sweden following major reforms enacted in these countries in the 1990s,[7] projecting future contributions is at least equally important. In the former case, contributions basically have to adjust to meet existing liabilities – and one may ask, whether this appears to be realistic –, while in the latter case, future pension benefits are the main political variable that has to adjust to expected revenues – and one might be interested in whether these benefits are likely to be adequate. In other words, setting up a full-scale balance sheet including a projected "contribution asset"

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[6] An alternative is to estimate the size of ADL not only for the current year, but as a time series of annual ADL figures over an extended time period into the future, as in Oksanen (2005). With the detailed simulations entering our ADL calculations below, however, this would be a difficult task.

[7] For relevant descriptions, see Franco (2002) and Palmer (2002).

Note that the distinction between DB-type and DC-type schemes was originally developed for private, funded schemes, mainly for employer-based pension plans. However, the discussion about the Italian and Swedish pension reforms has shown that it can be meaningfully applied to unfunded pension schemes as well, with the additional qualification that the relevant links are just "notional" in this case.

makes a lot more sense for the new NDC-type public pension schemes (see, for instance, Settergren 2005) than for traditional NDB-type schemes. In the following, we will therefore primarily focus on implicit (AD and OS) liabilities involved in the German public pension system, accounting for expected future contributions only to the extent that this is needed – in a way that is hopefully instructive, even though some of our findings turn out to be highly country-specific.

The on-going debate about the implicit debt entailed in pay-as-you-go public pension schemes implies, among other things, that schemes of this kind *are* funded, in a sense, by the earnings capacity of future contributors or, speaking more generally, by the human capital embodied in the future workforce. While this is, again, conventional economic wisdom, little attention is paid in actual pension policies to potentials links between the way most pay-as-you-go pension schemes are operated and the accumulation of human capital. Considering the existing body of theoretical and empirical research on this issue, it may be too early to include these links in standard estimates and calculations regarding the size of implicit pension debt. Yet, in Part B of the present paper, we will return to this issue, briefly reviewing the relevant literature and discussing how the view that pay-as-you-go pensions are built on some form of "human-capital funding" could affect the way such schemes are actually designed. Again, we will use the case of Germany as an example. The remainder of Part A is devoted to discussing some further conceptual issues involved in estimating implicit pension debt (Section 3) and to presenting up-dated estimates for the German Statutory Pension Scheme as it has evolved over a series of consecutive reforms taken since the early 1990s (Section 4).

3 Conceptual issues

3.1 Definition of liabilities

As was already explained, our calculations in this paper are based on two different notions of implicit pension debt, *viz. accrued-to-date liabilities* as well as *open-system liabilities*. The definitions of these two concepts are as follows.

Accrued-to-date liabilities (ADL) are given, for each point in time, by the present values of (*a*) outstanding benefit entitlements of current pensioners plus (*b*) future benefit entitlements of the active population to the extent that these are linked to their past and current contributions. Here, "benefit entitlements" refer to the full package of benefits – disability pensions, old-age pensions and survivor pensions – that regular contributors are entitled to receive simply by paying the standard rate of contributions. Determining the extent to which future benefits are "linked to" contributions already made is relatively easy in ("Bismarckian") pension schemes with an explicit, and largely proportional, link between earnings or contributions on the one hand and benefit entitlements on the other. But even in the other limiting case of so-called flat-rate (or "Beveridgean") pensions, benefits are usually assessed based on periods of contributions (or residence, if nothing else) on a simple *pro-rata* basis, so that existing accruals can be identified in some sense.

Open-system liabilities (OSL) include parts (*a*) and (*b*) of the definition of ADL. They add the present values of (*c*) future benefit entitlements of the currently active population that will arise from their future contributions, to be paid over the regular course of a working life, and (*d*) future benefit entitlements of all future contributors, estimated with an infinite time horizon. Against the ADL definition, the inclusion of future benefit entitlements that are not yet accrued is meant to reflect the expectation that the scheme under scrutiny will be continued based on the current legal framework – without an arbitrary choice of the relevant time horizon, that is, virtually forever. Note that the extension to an infinite time horizon does not raise fundamental technical problems: even if benefits are expected to grow on real terms, their discounted present

values will usually decline and converge towards zero, so that the sum of all future benefit entitlements should be finite.

By their definition, ADL measures correspond to acute liabilities that are very close to any conventional definition of explicit government debt. When assessed on relative terms, for instance, as a percentage of current GDP, they are mainly a function of the "system participation rate", that is, the fraction of the active population that is actually covered by the public pension scheme, and of the "quasi-replacement rate" of average benefits over average wages (for further details, see Fenge and Werding 2003). For instance, the implicit pension debt in terms of ADL should be lower for categorical systems, covering only part of the labour force, than for universal systems that cover the entire labour force, or even the entire population. At the same time, ADL debt should be higher for relatively generous, earnings-related pension schemes than for basic pension schemes. Interestingly, these two dimensions are usually combined in such a way that comparing ADL measures across countries does not necessarily lead to patterns that are easily predictable. Also, note that changes in the ADL-to-GDP ratio that are a result of demographic ageing do not have a clear sign.[8] Their movement mainly depends on how labour productivity, hence wages, respond to changes in the population structure and on how this feeds through to current and future benefits. While the former is a matter of technology and economic conditions, the latter is an institutional feature that can be manipulated deliberately in order to contain the amount of implicit pension debt.

By and large, all of these properties also extend to the OSL definition of implicit pension debt. As was already mentioned, the main advantage in using this broader definition is that the ADL measure may be too narrow to fully capture the impact of long-term demographic change or of policy responses that take effect only over long transition periods. The timing of prospective changes still matters for the present values entering OSL-type debt measures, but important parts of future developments are no longer cut off based on a strict "accrued-to-date" rule. An important difference is that, while estimating ADL based on outstanding benefits can be meaningful in itself, OSL measures are obviously incomplete if they are not accompanied by parallel estimates regarding future contributions. At least, interpreting the sum of *all* future benefit entitlements that will potentially arise in an existing public pension scheme as an unconditional measure of current implicit public debt would not make sense. Note that, if future contributions are taken into account as well, the analysis of OSL measures, then called "open-system *net* liabilities", effectively tries to exploit the intertemporal government budget constraint that is at the core of recent sustainability analysis (see Blanchard 1990, Auerbach *et al*. 1991). As was already mentioned, however, this should be done in a non-tautological way, *i.e.*, not just highlighting the simple *ex-post* identity of benefits and contributions that the pay-as-you-go mechanism ultimately rests on.

3.2 Accounting for contributions

From a technical point of view, estimating future contributions is no more difficult than estimating future benefits is.[9] In doing so, however, one has to be careful regarding what kinds of results can be used for mean-

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[8] Yet, if demographic ageing comes about as a large group of "baby boomers" gradually working themselves through the age distribution, it is highly likely that ADL per GDP increases substantially in the years when the relevant age cohorts are approaching retirement.

[9] Accounting for future contributions is, of course, difficult if benefits are tax financed, using revenues from the general government budget. The ADL definition of implicit pension debt that is based on outstanding benefits alone is unaffected by this difficulty. To determine OS *net* liabilities, one could forecast the revenues needed to fund future benefits based on the percentage of GDP which is currently spent on this purpose.

ingful comparisons with the size of outstanding pension liabilities and for meaningful comparisons across different scenarios.

In some countries, current contribution rates are fixed by law, and any changes in these would require new legislation. These contribution rates can certainly be used as a benchmark to see whether the respective pension scheme is viable at current parameter values or, conversely, what portion of future benefits cannot be covered at current contribution rates. In other countries, however, the current law does not fix the contribution rate but, instead, defines a rule by which the rate has to be adjusted if otherwise the annual budget would be unbalanced. A naïve "current policy scenario" would then conclude that the implicit pension debt, whatever its size, is always covered. Results of this kind could never be compared across countries, even not across different scenarios constructed for the same scheme. Again, keeping the contribution rate constant at its current level offers a useful benchmark and leads to results that are much more telling.

Parallel estimates regarding pension liabilities and future contributions are possible for ADL-type measures of implicit pension debt. Here, they make sense if the results are to be compared at an international level. At least, for reasons explained in the preceding section, directly comparing ADL-to-GDP ratios across countries may be less instructive than comparing those parts of ADL that are not covered by contributions at current rates. With the ADL definition of implicit pension debt, one has to take into account that, the more one moves into the future, an increasing fraction of current contributions will be needed to finance for other benefits than those already accrued at present. Proportional corrections are thus needed in order not to overstate the present value of relevant future contributions.

Parallel estimates for implicit liabilities and future contributions are actually required with respect to OSL-type measures because estimating the present value of all future benefits over an infinite time horizon is useful only if one is also able to determine to what extent these liabilities can be covered at some benchmark rate of contributions collected over the same, infinite time horizon.

3.3 Estimating implicit pension debt

What are the main ingredients needed to calculate the size of implicit pension debt, and of future contributions that could be used to cover it, for a given pension scheme? It should be clear that most of the information entering these calculations is forward-looking, spanning relatively long periods of time, so that the final results are effectively good estimates, at best. These should be based on reliable long-term financial projections for future expenditure and revenues of the pension scheme under scrutiny, probably covering a multitude of baseline, sensitivity and policy scenarios. The projections, in turn, require long-term demographic scenarios, information regarding labour-force participation and actual coverage of the pension scheme both among the active and the retired population, assumptions regarding future developments in any of these areas plus, as features that are also very important for the size of implicit pension debt, assumptions regarding future wage growth and a proper modelling of benefit assessment and relevant indexation rules.

To estimate ADL-type measures of implicit pension debt, long-term projections regarding the pension scheme's budget actually have to be more detailed than for OSL measures. The reason is that, according to the narrower definition of ADL, one has to distinguish throughout between benefit entitlements already accrued at the time the calculation refers to and entitlements that will accrue only in the future. Therefore, information regarding benefits already awarded has to be related, in some way, to the age structure of those in retirement. Ideally, a detailed record is also needed of past and future work biographies of members who are still active. Assumptions regarding future work biographies are relevant at least to determine expected transitions into retirement. Also, to isolate the existing insured – those still active and those already retired – from

future members of the pension scheme in broader projections, one also needs a demographic scenario with zero-immigration that reaches about 60 years into the future.

Estimating OSL measures of implicit pension debt requires rougher projections only, covering annual flows of all future benefits and contributions, regardless of whom they accrue to or who is paying for them. However, any long-term projection necesarily has a maximum time horizon. The final year should be in a sufficiently remote future that expected future changes – mainly those regarding demographic aspects, labour-force participation and institutional features of the pension scheme – are fully captured. Ideally, there should even be a fictitious no-further-change period during which the economy and the pension scheme can be expected to adjust to something like a new steady state. Under these conditions, final year results for benefit expenditure and contribution revenues can be used to estimate their open time-horizon present values, taking as given the discount rate as well as the (ideally, next to constant) growth rates of these aggregates over the final decade and using the textbook formula for converting infinite geometrical progressions that are converging towards zero into finite numbers.

Finally, note that assumptions regarding interest rates are rather important for estimating the size of implicit pension debt. The same does not so much apply to financial projections for the respective pension scheme, at least not if the scheme does not entail any substantial reserves that could earn compound interest over time. But the present value of estimated future benefits and contributions is highly sensitive to the discount rate that enters these calculations. Basically, the rate that is used for this purpose should correspond to the interest rate paid on long-term government bonds. As this rate is usually not too sensitive to short and medium-term changes, its current value may offer an acceptable proxy. But the longer the time horizon covered by the estimates, *i.e.*, with OSL-type measures more than with ADL measures, the more the final result will be influenced by this particular assumption.

3.4 Interpreting the results

An important aspect to note is that, whatever definition is used, implicit pension debt can be really sizeable. With the narrow ADL-type definition, the amount of implicit debt involved in a broad-based pension scheme, covering a substantial fraction of the labour force of a given country, or even the entire population, corresponds to a projected stream of old-age income, based on benefit entitlements already accrued and assessed on net present value terms, for all current pensioners and workers, or for the entire adult population, over their remaining life time, that is, a period of about 60 years or more. With extended definitions that are more forward-looking, the size of implicit pension debt increases much more, and even “net” liabilities corrected for future contributions to be collected at current rates can exceed current GDP by factors substantially larger than unity if there is rapid population ageing.

Up to a point, if accounting for implicit pension debt in official statistics of public-sector finances were adopted as a new standard, politicians, the public administration, all kinds of outside observers and the greater public would simply have to get used to such high figures and to new levels of total public debt. In itself, including implicit debt in official records does not at all change the current and prospective situation of public finances. It just makes visible what was already there and, perhaps more importantly, renders any hidden transfers from explicit deficits and debts to implicit ones impossible. However, some attention is needed regarding precisely what definition of implicit pension debt can be used for determining amended figures on total public debt. Calculating OSL-type measures of implicit debt is useful for reasons explained earlier on. But, by their definition, they are certainly not comparable to existing explicit debt. ADL measures, net of any financial assets included in the pension scheme’s balance sheet, are actually the only candidate for such

amendments. The fact that their size is, so far, mostly estimated by researchers and outside bodies using long-term projections for the pension scheme's budget that are sometimes more, sometimes less rough in their construction should not be a real obstacle to taking this concept to official use. At least in the case of the German public pension scheme, it should be no problem for the pension administration, with unrestricted access to the richness of their administrative data, to start calculating very hard figures regarding current ADL debt on a yearly basis using a very limited amount of assumptions that could be determined publicly and monitored externally.

Note, however, that in spite of all the similarities that have been pointed out so far, there are also important differences between explicit government debt and implicit pension liabilities. The main difference is not, or not in the first place, that implicit pension debt is based on mandatory arrangements, not on voluntary contracts (see Franco 1995). However, one of the implications is that, in sharp contrast to explicit debt, the amount of implicit debt can be altered through one-sided decisions of the debtor. We will see in the following that simply by changing pension law, estimated amounts of implicit debt of the German Statutory Pension Scheme have been reduced substantially over the course of the last fifteen years. For industrialised countries, defaulting on (part of) their explicit debt in a similar fashion is scarcely an option. There are thus good reasons always to keep figures for implicit debt separate from those for explicit government debt. Still, providing reliable information regarding the former type of figures would definitely be useful, if only to demonstrate the necessity of reforms and to highlight their effects.

4 Implicit pension debt in Germany

4.1 The German Statutory Pension Scheme: some basic features

The German Statutory Pension Scheme is a prototypical social insurance scheme based on "notional individual accounts", with a strong link between individual contributions – or, rather, earnings – and individual benefit entitlements. Furthermore, it is of the traditional NDB-variant of pay-as-you-go public pension schemes where, in the absence of pension reform, benefits are assessed based on some kind of predetermined rule and contribution rates are then adjusted annually to meet the resulting obligations. After a long period of depleting small amounts of funds that were meant to isolate the scheme against business-cycle fluctuations of current contribution revenues, it nowadays holds virtually no financial reserves.[10]

The Statutory Pension Scheme is a categorical scheme in that it does not cover the entire labour force. There is a separate public scheme for civil servants;[11] private, but mandatory, schemes exist for some groups of the self-employed;[12] individuals in dependent employment with earnings below the social insurance threshold (about 15 % of average wages of the insured) have no insurance cover at all and may be entitled to receive means-tested social assistance benefits at old age if they never moved out of this status over their entire active life-span. Currently, the Statutory Pension Scheme covers about 70 % of the active workforce. About 75 % of the population that has completed the statutory retirement age, being 65 or older, that is, has at least some amount of old-age pension benefit entitlements in this scheme.

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[10] According to latest official forecasts, reserves will be about 1.4 bn Euro at the end of 2005 (Genzke 2005), just enough to cover pension expenditure for two days.

[11] Note that, in Germany, civil servants form a particular sub-group of public-sector employees. "Regular" public employees are also covered in the Statutory Pension Scheme.

[12] Other groups of the self-employed are compulsory members of the Statutory Pension Scheme for a limited number of years. All other individuals in self-employment have to seek private cover on a voluntary basis.

The link that the German public pension scheme establishes between individual earnings and individual pension benefits is largely linear across all earnings brackets as well as over the period covered with contributions. In each year, individual earnings that are subject to contributions – between a lower and an upper earnings threshold, that is – are converted into "pension points" reflecting their ratio to average earnings of all insured individuals in the same year. When individuals enter retirement, the sum of these pension points, which then represents an up-rated average of life-time earnings, is simply multiplied with a current nominal "pension value" to obtain monthly benefits. Disability pensions are assessed in a similar fashion, based on fictitious extensions of benefit entitlements actually accrued until age 60. Survivor benefits are basically some percentage of benefit entitlements of the deceased spouse or parent, with additional rules governing reductions if survivor benefits coincide with own, non-derived benefit entitlements of the survivor. All in all, there is thus little redistribution involved in the system, and expected future benefit entitlements can be related very clearly to individual contributions made in each year of active labour-force participation.[13]

The nominal value attached to pension points is subject to annual up-ratings that can be basically described as wage indexation. The general set-up of the scheme described here so far has been largely unchanged since 1957, when the scheme was redefined for the post-war period. Later on, it took German politicians a while to address the fact that their country is now among those hit most strongly by demographic ageing. But since the early 1990s, there has been a series of reforms, becoming effective in 1992, 2001 and 2004, that were meant to make the scheme more sustainable in the face of expected long-term changes in the population structure. In these reforms, a number of measures were taken – limiting options for early retirement, tightening access to disability pensions, reducing survivor benefits, *etc.* – that contribute to their total effect. However, the precise indexation mechanisms applied in annual benefit up-ratings are what really makes a difference across the several steps to reform. Since we will look at the effects of any of these reforms in the following, Table 1 lists the indexation rules entailed in the different arrangements.

Table 1: Indexation rules involved in the past and current legal framework

	Indexation mechanism
Pre-1992 law	Pure gross-wage indexation
Pension reform act 1992	Pure net-wage indexation (gross wages minus average tax rate and all employees' social insurance contributions)
Pension reform act 2001	Modified net-wage indexation (gross wages minus pension contributions and a "recommended" rate of precautionary savings)
Pension reform act 2004	Modified net-wage indexation augmented with a "sustainability factor", reducing up-ratings if the "system dependency" (*i.e.*, pensioner-to-contributor) ratio has increased

Another change that is important for our estimates is that, starting from 1999 at the latest, the Statutory Pension Scheme is no longer exclusively financed by contributions. Before, the scheme had received a sub-

[13] Of course, for the sake of simplicity, we leave out many details here. A comprehensive description of the German Statutory Pension Scheme, together with lots of comparative information regarding the systems in other EU countries, can be found in the European Commission's database MISSOC_online

(via http://europa.eu.int/comm/employment_social/social_protection/missoc_en.htm).

sidy from the federal government's budget meant to cover a limited amount of non-contributory benefits: pensions paid to "war victims" who are now quickly dying out and "minimum pensions" guaranteed for individuals with at least 35 years of (very low) contributions, a programme that was phased out starting from 1992. Over the entire 1990s, there were discussions whether the subsidy was actually large enough to fully cover these kinds of benefits, and it was increased repeatedly on an ad-hoc basis, also removing up-ward pressure from the contribution rate. In 1999, this policy was put on a firmer footing, accompanied by another substantial increase of the subsidy. It now covers about 20 percent of total benefit expenditure, so that current cost rates (needed to cover regular benefits) clearly exceed current contribution rates. At the same time, consumption taxes and, mainly, energy taxes were increased to raise the additional tax revenues needed. The rationale behind these changes was to reduce non-wage labour costs implied in higher contribution rates, thus limiting unfavourable incentive effects regarding employment. While this idea may be defendable in itself, it is a strategy exactly opposite to the introduction of "demographic buffer funds", such as the OASDI Trust Funds in the US, that has been chosen in other industrialised countries.

In the 2004 reform, the government postponed decisions regarding another element of reform that had been strongly recommended by an official reform commission (see *Kommission* 2003), *viz*. an increase in the statutory retirement age. After the 2005 election, however, it is now highly likely that this plan will be adopted in the near future, while the new "grand" coalition has so far indicated no other plans for further pension reform. The schedule that had been suggested, a gradual increase from age 65 to 67 between 2011 and 2035, may even be speeded up, but final decisions are yet to be taken. In any case, we will include this option, based on the original schedule, in our following projections and estimates as an additional reform scenario.

4.2 Assumptions and intermediate results

The long-term projections entering our estimates regarding the size of implicit pension debt involved in the German Statutory Pension Scheme are prepared using the CESifo Pension Model (2005 version), a comprehensive accounting model that meanwhile covers expenditure and revenues of all branches of the German social insurance system. Among other things, it provides all the information needed to estimate ADL and OSL-type measures of implicit pension debt (see Section 3.3).[14] Calibration of the model is based on observations taken from past and current data that is available for up until 2004. The demographic scenario that enters the simulations is taken from official projections prepared by *Statistisches Bundesamt* (2003), spanning the period until 2050. Also, assumptions regarding future developments of labour-force participation rates (differentiated by gender and age) and unemployment rates imply that any expected changes in these parameters eventually level out until 2050. Explicit projections then cover the period until 2100, the time from 2050 onwards essentially being a period of convergence. Table 2 summarises the main assumptions and, in addition, a number of intermediate results regarding labour market outcomes and economic performance. All in all, for the period until 2050, these assumptions are meant to reflect a meaningful "baseline" scenario for the future development of the German economy and for the German social insurance system that is neither particularly optimistic nor pessimistic.

[14] The richness in details covered in this model has its cost. Most importantly, it does not capture general-equilibrium effects of changes in parameters assumed in, or predicted by, the simulations. In particular, it does not include any endogenous labour-supply responses to expected large increases in social insurance contributions. In this sense, any of the long-term scenarios derived from this model could be regarded as overly optimistic.

Table 2: Assumptions used for the long-term projections

	2004	2010	2020	2030	2040	2050	2075	2100
				Population:				
Total fertility rate	1.36	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Life expectancy at birth								
males:	75.4	76.1	77.4	78.6	79.9	81.1	81.1	81.1
females:	81.2	81.9	83.1	84.3	85.4	86.6	86.6	86.6
Net immigration (thsds.)	270	230	215	205	200	200	200	200
Total population (mill.)	82.8	83.1	82.8	81.2	78.5	75.1	65.3	56.8
Old-age dependency[a)] (%)	27.6	30.0	33.8	43.7	49.1	50.5	51.4	51.3
				Labour market and employment:				
Labour-force participation (%)								
males (15–64):	81.1	82.4	81.6	81.5	82.6	82.5	82.9	83.2
females (15–64):	67.2	69.7	70.9	71.8	73.1	72.8	73.4	73.8
Total employment (mill.)	38.9	39.5	38.8	36.1	34.5	32.7	28.7	25.2
Unemployment rate[b)] (%)	9.2	7.2	7.0	6.5	6.2	5.9	5.1	4.5
				Macro-economic performance:				
Labour-productivity growth[c)] (%)	+ 1.22	+ 1.69	+ 1.74	+ 1.74	+ 1.75	+ 1.75	+ 1.75	+ 1.75
GDP growth[c)] (%):	+ 1.6	+ 2.2	+ 1.3	+ 1.1	+ 1.3	+ 1.1	+ 1.2	+ 1.3
Interest rate[c)] (%)	2.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5

a) Population 65+ per population 15–64. b) In % of the total labour force.
c) On real terms *p.a.*

Sources: *Statistisches Bundesamt*; CESifo Pension Model (2005 version).

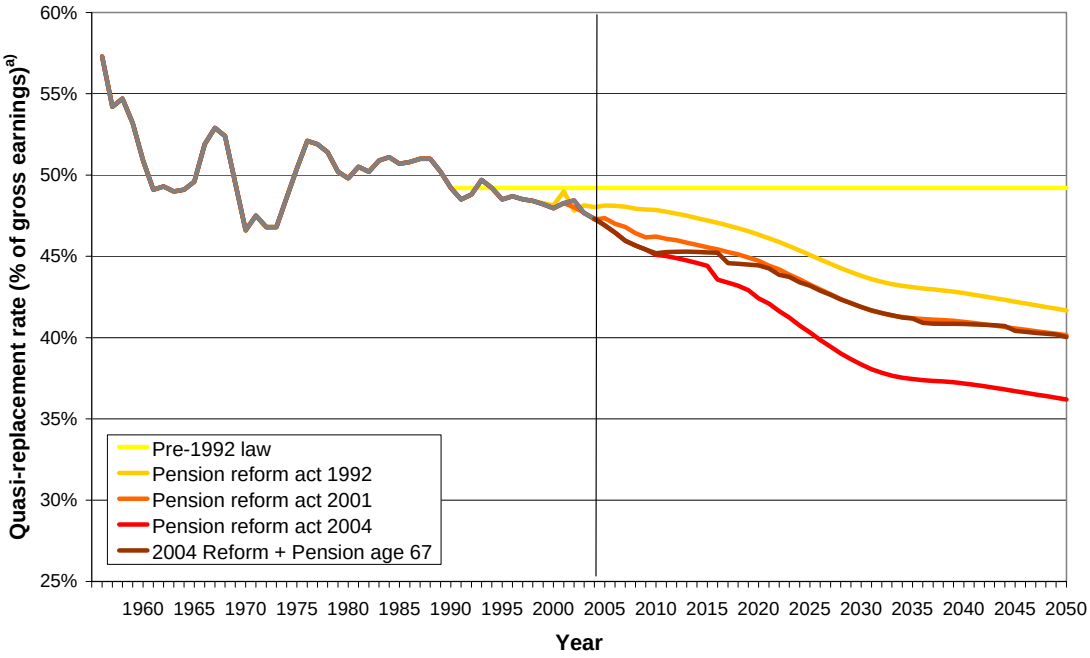
It has been demonstrated through earlier applications that the results obtained from the CESifo Pension Model are not too sensitive to changes in assumptions regarding productivity growth – at least, if results are expressed on relative terms: as future *levels* of pension benefits, future contribution *rates*, or future expenditure-to-GDP *ratios*, *etc*. (see Werding and Blau 2002 or Werding and Kaltschütz 2005). This finding should extend to estimates of implicit pension debt if, again, these are measured in terms of per-GDP ratios. The reason is that, in the current legal framework, pension benefits still are basically indexed to wages, so that any growth in the latter simply feeds through to the former. Also, in themselves, projected developments of pension benefits and contributions should not be affected by different assumptions regarding real interest rates,[15] simply because the scheme does not hold any financial reserves. However, changes in interest-rate assumptions are very likely to affect both the size and level of implicit pension debt. In the following, we will therefore comment on the sensitivity of our final results to this particular assumption. At the same time, we will refrain from conducting a larger set of further sensitivity analyses – based on changes in assumptions regarding life expectancy, migration, labour force participation, unemployment, and so forth – as these would lead to results that are easily predictable and, with changes in single parameters and with plausible ranges of variation, never make a fundamental difference.

Last but not least, the CESifo Pension Model can be easily adjusted to reflect the various legal arrangements that the German Statutory Pension Scheme has been subject to over the last fifteen years. The following figures highlight the most important intermediate results obtained from the model with respect to future trends in benefit levels (as indicated by "quasi-replacement rates" comparing standardised benefit entitlements to current average gross wages; see Figure 1), pension contribution rates (as officially determined for each year; see Figure 2) and actual cost rates (which were required to balance the pension scheme's annual budget; see Figure 3) under any of the different policy scenarios considered here. In these figures, we effectively concentrate on the time period until 2050 for which we are actively making assumptions and are not just keeping track of further internal adjustments.

It is easy to see that, over the course of the next four decades, the Statutory Pension Scheme's budget will be under substantial pressure that mainly arises from the projected consequences of demographic change in Germany. At the same time, the reforms enacted over the last fifteen years make a huge difference with respect to how the burden involved in population ageing is allocated to pensioners and to contributors, implying that they also have an impact on the intergenerational distribution. From a public pension scheme that may have been overly generous in terms of future benefit levels under the pre-1992 law, it has now evolved into a system where adequacy of benefits may really become an issue in the period after 2025. For this reason, the 2001 reform also introduced a new framework for supplementary private savings that were meant to partly compensate for the benefit reductions, encompassing subsidies, tax incentives and new regulation regarding suitable financial products. In addition, a major effect of an increase in the statutory retirement age which may be enacted in the near future would be to secure future pensioners a higher level of benefits that they are entitled to receive for a shorter period of time, not so much a further reduction in total benefit expenditure. In spite of all the reforms, however, contribution rates and, even more so, current cost rates must still be expected to increase substantially over the next thirty to forty years.

Figure 1: Level of pension benefits, 1957–2050

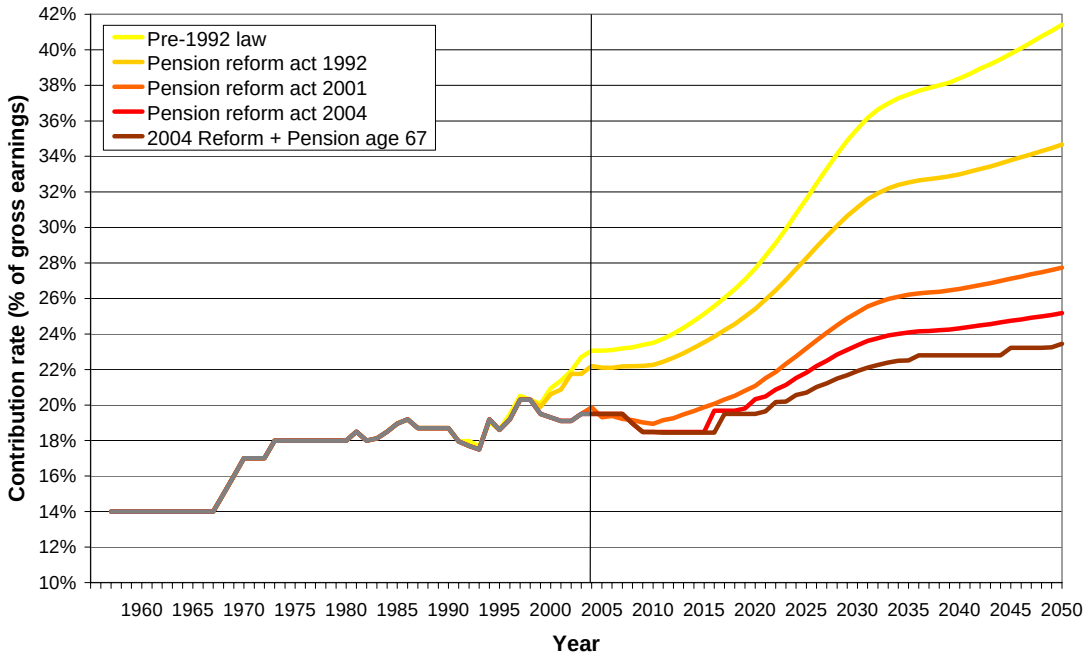
[15] Note that the real interest rate assumed in our "baseline" scenario, a constant 3.5 percent *p.a.* throughout the projection horizon, is based on an average of actual observations made from 1991 onwards. This assumption also conforms with the expectation that currently low interest rates will move up again in the near future.



a) Based on standardised benefit entitlements that are derived from a full life-time work record with average earnings throughout and on current average wages of the active insured, all gross of income taxes and social insurance contributions. (Note that, for obvious reasons, pensioners are exempted from paying contributions to the public pension scheme and to unemployment insurance, but have to pay contributions for public health insurance and public long-term care insurance.)

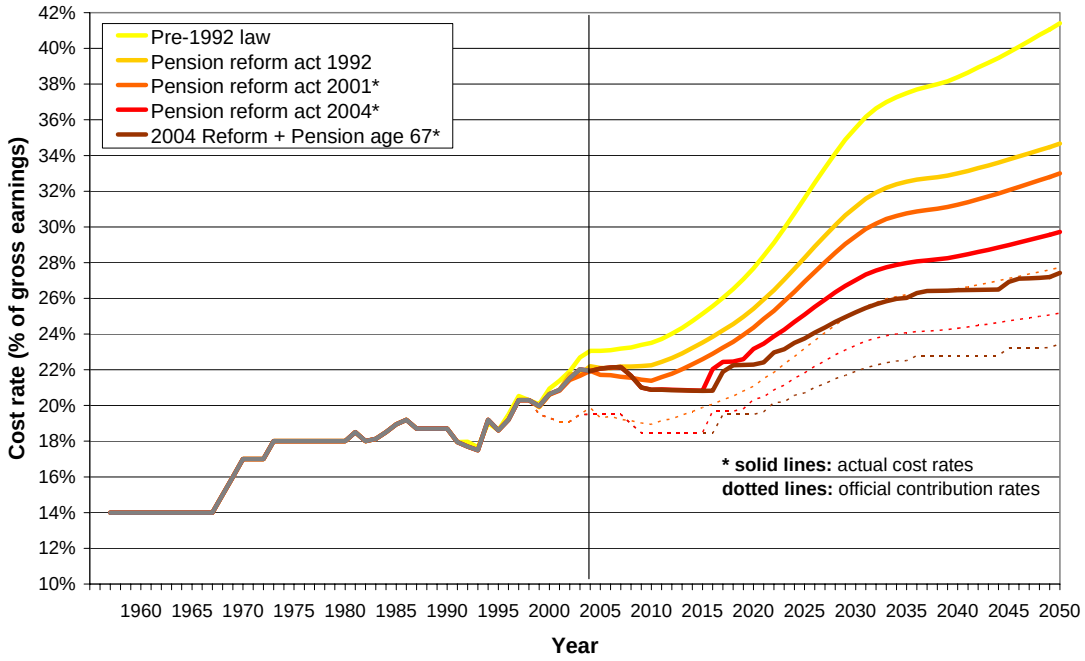
Source: *Deutsche Rentenversicherung*; CESifo Pension Model (2005 version).

Figure 2: Contribution rates, 1957–2050



Source: *Deutsche Rentenversicherung*; CESifo Pension Model (2005 version).

Figure 3: Annual cost rates, 1957–2050



Source: *Deutsche Rentenversicherung*; CESifo Pension Model (2005 version).

4.3 Implicit pension debt: accrued-to-date liabilities

Building on the financial projections presented in the preceding section, we can now calculate estimates regarding the size of implicit pension debt involved in the German Statutory Pension Scheme under different legal arrangements. In doing so, we will first look at implicit debt in terms of accrued-to-date liabilities (ADL). In Section 3.2 it was pointed out that, in this case, it is really the entire present value of outstanding benefit entitlements already accrued, net of the very limited amount of financial reserves of the German public pension scheme (see footnote 10), that can be interpreted as an additional stock of public debt. Table 3 reports the main results.

Table 3: Accrued-to-date liabilities, 2005

	Implicit pension debt[a)]	
	€ bn.	per GDP[b)]
Pre-1992 law	6,354	291.4%
Pension reform act 1992	5,756	264.0%
Pension reform act 2001	5,549	254.5%
Pension reform act 2004	5,302	243.1%
2004 Reform + Pension age 67	5,308	243.4%

a) Net present value of pensions already awarded and pension entitlements accumulated until 2005, incl. disability and survivor benefits, over the remaining benefit period, minus existing reserves.

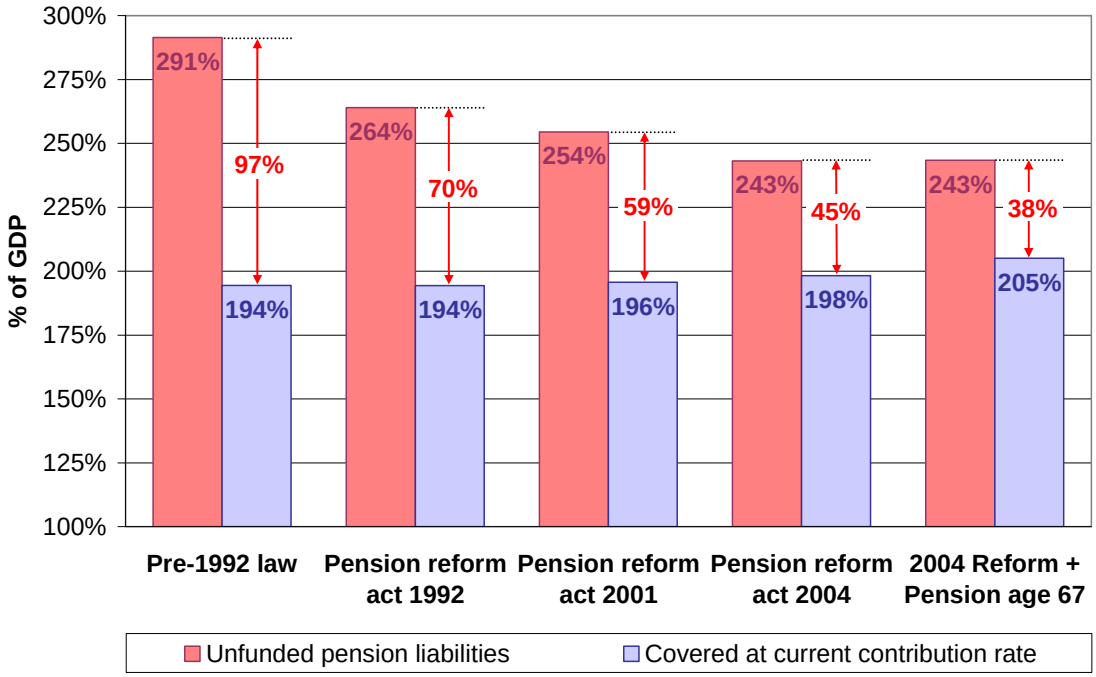
b) Per GDP in 2005 as predicted in the Joint Institutes' Forecast of Fall 2005, amounting to € bn 2,244.

Source: CESifo Pension Model (2005 version).

The results included in Table 3 clearly confirm that the long-term fiscal risks associated with financing the Statutory Pension Scheme under the conditions of expected demographic change in Germany have been substantially reduced through the reforms enacted since 1992. Estimated values for implicit pension debt in terms of ADL measures have been reduced from about 290% of current GDP to about 240%, by about one sixth,[16] through a series of adjustments in the indexation mechanism, and a number of other changes in the legal framework. An interesting observation is that, on top of the latest reform, an increase in the statutory retirement age would have virtually no effect on the ADL debt measure. The reason is not only that the suggested schedule is very gradual, becoming effective rather slowly between 2011 and 2035. Furthermore, for those affected, this reform essentially means they receive relatively higher benefits for a shorter period of time – two effects that appear to almost exactly cancel out here.

As was explained in Section 3.2, we may compare these implicit liabilities, which are effectively all unfunded, to expected revenues that would be available for covering the relevant benefit payments if the contribution rate were held constant (see Figure 4).

Figure 4: Accrued-to-date liabilities and future contributions, 2005



Source: CESifo Pension Model (2005 version).

Keeping the contribution rate constant (at its current level of 19.5%) is required here in order to make the gaps between implicit pension liabilities and future contributions comparable across the different scenarios.[17] Again, we can see how the consecutive pension reforms have contributed to closing these gaps. Also, as there

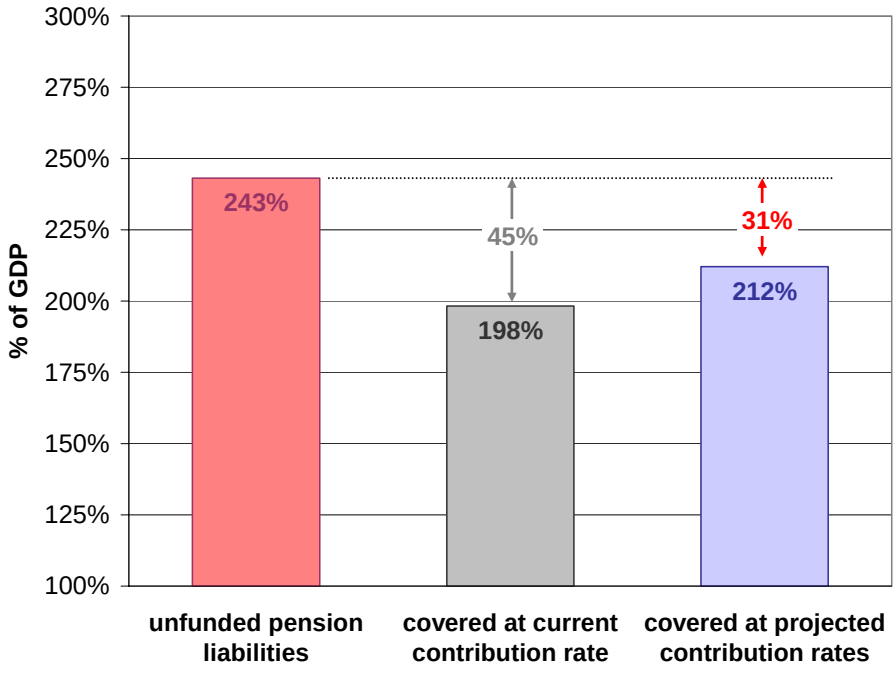
[16] To check for sensitivity of these results with respect to the interest rate assumed, we can also report results for the alternative case where the real interest rate is set to 3% (in brackets: 4%) throughout the entire projection horizon. Implicit debt in terms of ADL is then 320% (267%) of GDP for the pre-1992 law, and 266% (223%) of GDP for the current legal framework, as after the 2004 reform.

[17] Since there are rules by which contribution rates will effectively have to rise, at different speeds, the results shown in Figure 4 do not necessarily imply that the Statutory Pension Scheme's budget has been, or still is, unbalanced in the sense that an important fraction of outstanding benefits will not be covered by future contributions. We will return to this interesting aspect in a minute. Whether it is plausible that the projected contribution rates shown in Figure 2 would have, or will, materialise is a different issue, though.

are differences in the shares of total annual revenues which can be used to finance for benefit entitlements already accrued, the present values of future contributions entering these calculations are not perfectly equal across scenarios. Increasing the retirement age, for instance, would make a higher share of contributions available for covering accrued benefit entitlements during many years so that the gap between relevant benefits and contributions becomes smaller when compared to the current-law scenario.

Finally, we want to highlight an important implication of the difference between official contribution rates and actual cost rates implied in the current law. Before, we have argued that, for a pure pay-as-you-go public pension scheme with a closed budget, comparing existing liabilities to future revenues at projected contribution rates would not make sense: by definition, the two figures should exactly cancel out. However, things are different with the German public pension scheme under the current law. Figure 5 shows that, even if contribution rates were increased as projected in Figure 2, there would be a gap between benefit entitlements already accrued and future contributions that are available for covering these entitlements. According to the current law, this gap will have to be filled by series of annual tax-financed subsidies from the federal government's budget.

Figure 5: Accrued-to-date liabilities and future contributions under the current law



Source: CESifo Pension Model (2005 version).

In spite of some similarities, one might be reluctant to account for implicit pension debt – currently around 240% of GDP for Germany, according to the estimates presented here – in exactly the same way as one does for explicit government debt – about 68% of GDP by the official, or explicit, German government debt ratio. At least, one should certainly not simply add up or confuse these two numbers. However, the ratio of about 31% of GDP[18] that we have identified here as being a part of the total implicit pension debt, based on benefit entitlements already accrued, which will not be covered by future contributions is very closely akin to explicit debt measures: according to the current law, it creates a liability for future tax-payers who

[18] With alternative assumptions regarding the future real interest rate (see footnote 16), this figure varies between 28% and 34% of GDP.

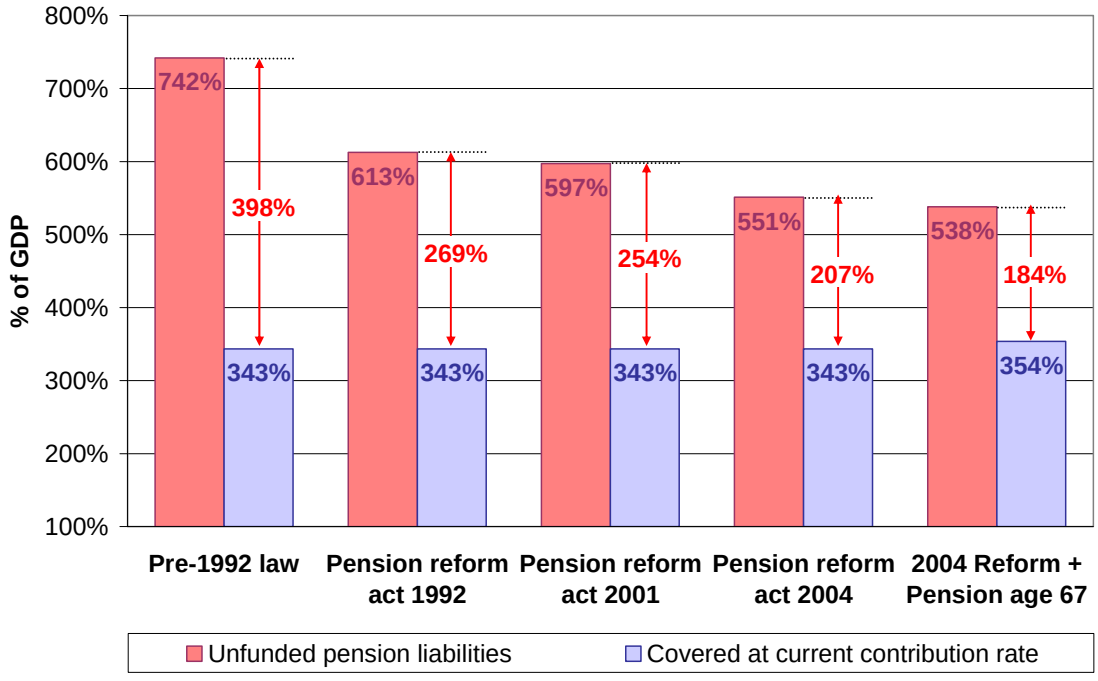
will have to fund the federal government's budget so that it can continue to subsidise the German public pension scheme. The only difference is, once more, that the relevant laws could be changed in such a way that the burden is shifted on to future contributors or pensioners.

4.4 Implicit pension debt: open-system liabilities

In line with the reflections made in Section 3.1, we can now proceed to calculating the size of implicit pension debt in terms of open-system liabilities (OSL). We are then moving away from producing implicit debt measures which, at least conceptually, can be compared to current explicit government debt. On the other hand, we will obtain a more complete picture of the long-term implications of pension reforms. Also, in this case, we should directly compare implicit liabilities to future contributions (collected at current rates) and focus on net liabilities. Following the procedures for estimating open-system liabilities over an infinite time horizon described in Section 3.3, we arrive at the final results illustrated in Figure 6.

The picture we obtain is basically the same as that with ADL-type measures, but debt measures as well as changes across the different scenarios become a lot higher. Implicit ("gross") pension debt in terms of OSL measures now varies between 740% and 540% of current GDP, by about one fourth, that is.[19] Pension debt net of future contributions that could be collected at current rates[20] varies between almost 400% and less than 200% of GDP, by about one half. Also, we now see an effect of increasing the statutory retirement age on the OSL debt measure which is due to the fact that, at each point in time until infinity, there will be fewer pensioners than with the current law.[21]

Figure 6: Open-system liabilities and future contributions, 2005



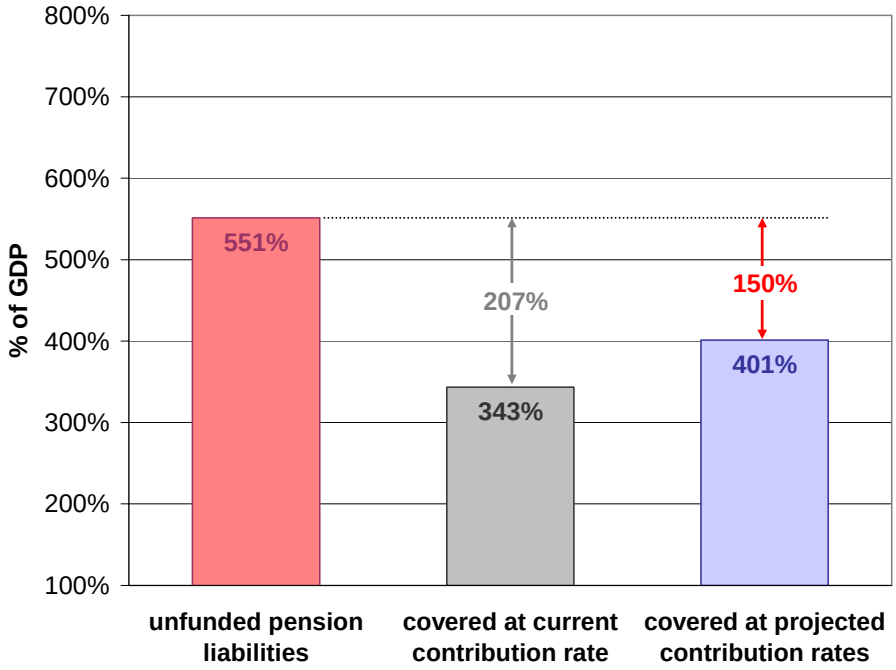
Source: CESifo Pension Model (2005 version).

[19] If, alternatively, the real interest rate is set to 3% (in brackets: 4%), implicit debt in terms of OSL is 995% (586%) of GDP for the pre-1992 law, and 729% (441%) of GDP for the current legal framework. Interest-rate assumptions obviously make a huge difference over the infinite time horizon.

[20] See footnote 17 on the nature of the remaining net debt.

[21] Furthermore, the net present value of future contributions increases against the other scenarios because all individuals have to pay contributions, at constant rates, for a longer period of time now.

Figure 7: Open-system liabilities and future contributions under the current law



Source: CESifo Pension Model (2005 version).

When compared to the results for the 2004 law, however, the additional effect of an increase in the retirement age is a lot weaker than was predicted by the German Council of Economic Advisors (*Sachverständigenrat* 2003) in their annual report for 2003–04. Perhaps, the estimates presented there are missing the fact that, when combined with the "sustainability factor" introduced in the 2004 reform, increasing the retirement age implies stronger benefit up-ratings. The reason is that the future pensioner-to-contributor ratio tends to grow more slowly, so that the mechanism for moderating annual pension indexation that has been intentionally created through this factor becomes less effective.

As with implicit pension debt in terms of ADL, we may also compare future pension liabilities to contributions that could be collected, under the current law, if rates were regularly adjusted (see Figure 7). Again, there is a gap between future benefits and contributions even under these assumptions which usually imply a balance sheet in full equilibrium. According to our estimates, this gap amounts to no less than 150% of current GDP. [22] On the other hand, because of the infinite projection horizon and the conceptual differences between acute explicit government debt and extremely forward-looking, OSL-type measures of implicit debt, this is not nearly a similarly "hard" number of additional public debt as the parallel result based on the ADL measure.

In the first part of this paper, we followed a two-fold ambition. First, we wanted to take up some of the lessons emerging from the existing literature on implicit pension debt. In spite of some limitations, we do think that explicit calculations of its size are useful to obtain a fuller picture regarding the long-term sustainability of public finances. They may actually be needed in the light of recent practices of shifting public liabilities between the categories of explicit and implicit government debt. Second, we wanted to come up with up-dated, and rather detailed, estimates regarding the size of implicit debt involved in the German Statutory Pension Scheme. Going through a number of differing definitions and perspectives, we were hopefully able

[22] With alternative assumptions regarding the future real interest rate (see footnote 16), this figure varies between 117% and 206% of GDP.

to make some interesting observations and illustrate potential applications that might be useful for other countries as well.

In the second part of the paper, we will turn to a related, yet less conventional issue that might deserve additional attention. The growing body of literature about the potential impact of pay-as-you-go public pension schemes on fertility rates and on human-capital accumulation in general could imply, among other things, that future streams of pension contributions – such as those entering our estimates above – should never be simply taken as given. While this is obviously true for many other causes as well, there might even be good reasons to re-design existing systems in order to keep them viable.

PART B:
PAY-AS-YOU-GO PENSIONS AND HUMAN CAPITAL ACCUMULATION

6 Another introduction: fiscal effects of raising children

In pay-as-you-go public pension schemes, current contributions of the active insured are, by definition, not used to prefund for future pension benefits accruing to the same set of contributors. Instead, their contributions are needed to finance current pensions of those who contributed to the scheme at an earlier stage. Economically, the basis of future benefits is the earnings capacity, or the human capital, that is embodied in the next generation of contributors and will be utilised when the currently active are retired. In other words, the pay-as-you-go mechanism of financing pension benefits could be seen as a particular type of "human-capital" funding.

When looked at more closely, human capital has a quantitative and a "qualitative" dimension (Becker 1960),[23] that is, it is made up by the number of future contributors as well as their average qualifications. Against this background, most of current discussions regarding the long-term sustainability of public pension schemes and public finances in general is motivated by the fact that the number of future contributors and tax-payers – on relative terms, compared to the number of future pensioners, but in most cases also on absolute terms – will be declining very fast over the next three to five decades, due to a broad-based decline in fertility rates that has been observed virtually everywhere in the industrialised world during the last fifty years. At the same time, average qualifications of future contributors may continue to increase, as they have done in the past, but the net effect of these two trends on future stocks of human capital is an open question and has so far not been explored.

The economic theory of ("endogenous") fertility that has been developed based on the seminal work by Becker (see Hotz *et al*. 1997 for a survey), offers three major potential explanations as to why fertility has continued to decline in most industrialised countries over the second half of the 20th century.[24]

– *Quantity-quality interaction*: With rising income, potential parents may first of all wish to spend more resources on the "quality" of each child that they raise, at the expense of the number of their children (Becker and Lewis 1973).

[23] We acknowledge the fact that there is a slight equivocation implied in taking Becker's child "quality", as perceived by potential parents, to be basically the same as the human capital embodied in the children themselves (see Becker 1962). For the main thrust of our argument, however, a more careful distinction would not make a difference of first-order significance.

[24] Economic theory alone may be less suited to explain the early period of the demographic transition, in which total fertility rates declined from levels as high as 5.0 or more (births per woman) to somewhere around a replacement level of fertility, with total fertility rates of about 2.1. For these changes, a breakdown in habits and norms in place in agricultural societies, together with tremendous reductions in child mortality, may play a decisive role (Birg 1995)

– *Increasing opportunity cost*: A change in women's preferences *vis-à-vis* the options of participating in the labour market or taking care of children may have induced an increase in the opportunity cost of children and, again, a substitution away from having children (Willis 1973).[25]
– *Fiscal externalities*: Public interventions – most notably, the introduction and expansion of pay-as-you-go financed public pension schemes – may have created a rising fiscal externality of bringing up a child which may also have contributed to the fertility decline (Cigno 1986,1993).

These different explanations are by no means mutually exclusive. Rather, they may interact and re-enforce each other. An interesting aspect to note, however, is that the first two sets of explanations must be basically seen as rational adaptations of parents, or mothers, to a changing environment,[26] while the third one openly points to a potential source of inefficiency. Here, taking action to reduce distortions of potential parents' decisions may be really required.

In most existing fiscal systems, there are a number of instruments of family policy in a broad definition, such as direct child benefits, child-related tax allowances, subsidies to, or public provision of, child-care institutions, free access for children to public health care or public education, *etc*. that are reducing the total cost involved in raising a child (for an extensive survey, see, *e.g*., Bradshaw and Finch 2002). Whether this is seen as being justified or not, instruments of this kind should generally induce potential parents to have (more) children – sometimes with a particular focus on low-income parents, single parents or other subgroups, for reasons that are mainly distributional in their nature. Very often, however, the positive effect of these instruments for the family's budget are set off, or even turned over, by the fiscal effects of large-scale public pay-as-you-go pension schemes. These latter effects have been shown to be essentially a "fiscal externality" of raising children that is created through the introduction of pay-as-you-go public pension schemes and increases with any expansion of such schemes (Sinn 1997, 2000). Therefore, they must also be expected to interfere with parental fertility decisions at the individual level, with a potentially negative impact on aggregate human capital accumulation in the countries affected or, in the terminology of Part A of this paper, on expected future contributions that will be collected by the same unfunded pension schemes. Similar effects may even extend to parental choices regarding the "quality" of their children, although the parallel use of subsidised, or publicly provided, education might effectively help in containing these additional distortions.

Public pensions often involve a substantial fraction of total government expenditure. According to latest comparative figures for the year 2000 (OECD 2001, 2002), the average of OECD countries for which data were available spent about 8 percent of GDP on public pensions, another 5.7 percent on public health care and long-term care, where age-related profiles of expenditure, hence fiscal effects and problems related to population ageing, are very similar to those in the case pension schemes, while about 6.2 percent of GDP were spent on child benefits and education. In quite a number of single countries, these proportions are even substantially more biased towards payments accruing to the elderly.[27] Therefore, pension systems, when con-

[25] Note that, in themselves, higher qualifications, higher wages and higher participation rates for women that are observable throughout the industrialised world are not exogenous determinants of fertility. Instead, they should be seen as the result of choices shaped by preferences which, in turn, must have shifted in this particular direction (Rosenzweig und Schultz 1985).

[26] Only, from a welfarist point of view the actual size of opportunity costs arising at the individual level could be considered "too high" if there are rigidities with respect to the choice of individual working time, availability of child-care facilities, *etc*. Employers as well as public bodies could therefore do something to mitigate existing conflicts between the different options for time use.

[27] Furthermore, this imbalance, if one may call it like this, will definitely increase in the future. According to the same comparative study, average GDP shares of pension expenditure and health care expenditure are expected to rise by 3.7 and 3.2 percentage points, respectively, until 2050, while expenditure on children and families will largely stay constant.

sidered in isolation, must be expected to create a huge fiscal externality of raising an additional child and even after deducting public spending on children, they leave a substantial net externality.

Whether these effects really matter for parental decisions regarding fertility and human capital investment is partly a matter of the appropriate model of parental decision-making in this area, partly a matter of relevant elasticities. In the following, we will address any of these aspects in turn, explaining the nature of the fiscal externality and discussing the relevant theoretical and empirical literature in a little more detail (Section 6). Then, we will introduce a specific proposal of how the problems that arise can be dealt with in future reforms of the German public pension scheme (Section 7).

6 Pensions, fertility and human capital: Theoretical foundations and empirical evidence

There is, as of now, a growing body of theoretical literature that is increasingly technical and complex, dealing with the role of public pay-as-you-go pension schemes for fertility and human capital formation. Subthemes that are currently discussed in this literature are heterogeneity among agents in terms of their preferences towards having children and investing in their human capital, uncertainty with respect to different aspects of the outcome of fertility (plus child-quality) choices, the role of different pension arrangements, such as earnings-related *vs* flat-rate benefits, or the interplay between pension schemes and usual child benefits. Important theoretical contributions that have been made to this literature over the last fifteen years are Cigno (1993), Kolmar (1997, 2001), Ehrlich and Lui (1998), Wigger (1999), Groezen *et al*. (2000, 2003), Abio *et al*. (2002), Cigno and Luporini (2003), Cigno *et al*. (2003), Cremer *et al*. (2003), Fenge and Meier (2003, 2004), or Sinn (2004). Here, we will neglect most of the details unearthed in this research. Instead, we will attempt to re-state the common bottom line – a theory which explains a link between individual fertility decisions and public pay-as-you-go pension schemes and implies that the latter may actually have negative repercussions on the former (see Werding 1998, ch. 4) – that serves as a point of departure for recent, much more sophisticated work.

Consider, for an easy exposition, a simple overlapping-generations model with endogenous fertility that entails a pay-as-you-go public pension scheme. We assume that a representative household, constituted by individuals who are economically active in period t and retire in t+1, maximises a quasi-concave, twice differentiable utility function of the generic form

$$U_t = U\big(c_t,\, z_{t+1},\, q_t(1+n_{t+1})\big). \qquad (1)$$

Household utility depends on goods consumption in periods t and t+1, c_t respectively z_{t+1}, as well as a compound measure of fertility (as in Becker 1960) that is determined by the number of children, $1+n_{t+1}$, and the "quality" of each child, q_t.[28] In other words, raising children increases parental utility through a consumption motive that determines their optimal fertility choice – where we do not disentangle qualitative from quantitative aspects in our model – irrespective of any considerations regarding old-age provision and a potential investment motive for having children that could add to this picture.

The intertemporal budget constraint of the household, aggregated across both sub-periods, is given by

[28] Here, the number of children is expressed in terms of their ratio over the number of parents, hence as a growth factor of cohort size. This allows for an easy interpretation later on. Child quality is denoted by a simple indicator which is scaled in such a way that it effectively modifies future wage growth that is due to other reasons by an additional factor related to human capital investment.

$$c_t + p_t q_t (1+n_{t+1}) + \frac{z_{t+1}}{1+r_{t+1}} = (1-\tau_t) w_t + \frac{\pi_{t+1}}{1+r_{t+1}}. \qquad (2)$$

The present value of goods consumption in t and t+1 as well as the total cost of raising children, arising from the quality and number of children and the price per quality unit, p_t, must be equal to gross wages earned during the active period of life, w_t, minus pension contributions paid at a rate τ_t and plus the present value of pension benefits accruing in the retirement period, π_{t+1}. To make them comparable with nominal amounts from period t, period-t+1 expenditure and income are discounted at a market rate of interest, r_{t+1}, that is taken to be given. Private savings (or liabilities) that could be used to transfer resources between the two periods drop out from equation (2), as it is assumed that they must be run down, or fully redeemed, over the course of the life cycle.[29]

The pension benefit included in (2) is modelled as an exogenous parameter. Nevertheless, the model may capture schemes with flat-rate pensions à la Beveridge as well as Bismarckian schemes with earnings-related pensions. In the latter case, benefits are derived from individual contributions based on the scheme's internal rate of return that is basically determined by payroll growth (Aaron 1966) and should be the same across all insured individuals in a given age cohort.[30] As long as labour-supply responses of insured individuals (as well as other reasons for potential differences in their earnings) are ignored, the two types of pension systems are fully equivalent.

In the model, household decisions govern the timing of goods consumption and fertility. From the first-order conditions that characterise the optimum, we can determine the marginal rates of substitution between current and future consumption, in equation (3a), and between current consumption and the compound fertility measure, in (3b):

$$\frac{U_c}{U_z} = 1 + r_{t+1} \qquad (3a)$$

$$\frac{U_c}{U_{q(1+n)}} = \frac{1}{p_t} \qquad (3b)$$

Equation (3a) is a familiar condition that governs optimum amounts of saving, indicating that goods consumption should be allocated to periods t and t+1 in such a way that the ratio of marginal utilities in both subperiods is equal to the interest factor – as a shadow price of period-t consumption in the light of reductions in period-t+1 consumption that are required. Equation (3b) is an analogous condition stating that the ratio of marginal utilities derived from c_t und q_t (1+n_{t+1}) in period t should correspond to the relevant price ratio.

In making decisions that are optimal from the point of view of the respective household, however, the effects of raising children on the future financial situation of the pension scheme, together with the effects on individual pension benefits are entirely neglected. In a pure pay-as-you-go scheme, the periodic budget constraint of the pension scheme implies that, in t+1,

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[29] In other words, the model abstracts from intergenerational transfers through bequests. Some amount of transfers *inter vivos* may however be implied in p.

[30] We abstract from child-related pension benefits that could, and actually do, exist in schemes of both types as well. At the moment, we want to investigate the effects of regular benefit entitlements based on active membership, contributions or earnings, *etc*. Everywhere, these benefits defined in a traditional way are quantitatively far more important than additional entitlements based on child-rearing activities that have been added more recently.

$$\pi_{t+1} = \tau_{t+1} w_{t+1} \frac{N_{t+1}}{N_t} \equiv \tau_{t+1}(1+g_{t+1})\, q_t (1+n_{t+1}) w_t . \qquad (4)$$

According to (4), average pension benefits correspond to aggregate contributions collected from N_{t+1} contributors who are active in period t+1, divided by the number of pensioners, N_t. Abstracting from possible changes in the contribution rate τ_{t+1} against τ_t, future contribution revenues are determined by the growth of wages, by a factor $1+g_{t+1}$, modified by the child-quality factor q_t, and of the active population, which is given by $1+n_{t+1}$ chosen by an average household.

Substituting equation (4) into the intertemporal household budget constraint to see what decisions regarding $q_t\,(1+n_{t+1})$ would be optimal if these links were taken into account gives

$$c_t + p_t(1+n_{t+1}) + \frac{z_{t+1}}{1+r_{t+1}} = \Big(1-\tau_t\Big(1-\frac{\tau_{t+1}}{\tau_t}\frac{(1+g_{t+1})\,q_t(1+n_{t+1})}{1+r_{t+1}}\Big)\Big) w_t \qquad (2')$$

instead of (2).[31] The modified optimality condition (3b) reads

$$\frac{U_c}{U_n} = \frac{1}{p_t - \tau_{t+1} w_{t+1}/(1+r_{t+1})}, \qquad (3b')$$

while (3a) remains unchanged.[32] The ratio of marginal utilities with respect to c_t and $q_t\,(1+n_{t+1})$ is now larger than in equation (3b), indicating that in a social optimum – taking into account the link between raising children and financing future pension benefits – individuals should consume less and spend more resources on children in period t than appears to be optimal from a purely private point of view. As long as these links affect individuals only via the aggregate budget constraint of the pension scheme, individual decisions regarding higher $q_t\,(1+n_{t+1})$ mainly have an effect for third parties – through average benefits that are marginally higher or contribution rates that are marginally lower. Therefore, the household-level optimum represents a symmetric Nash-equilibrium that goes along with substantial fiscal externalities, created through the way the pension scheme is constructed and pension benefits are usually assessed. Consequently, total expenditure on children – and, by the way in which q_t and $1+n_{t+1}$ typically interact, above all the number of children – are too small from a social point of view.

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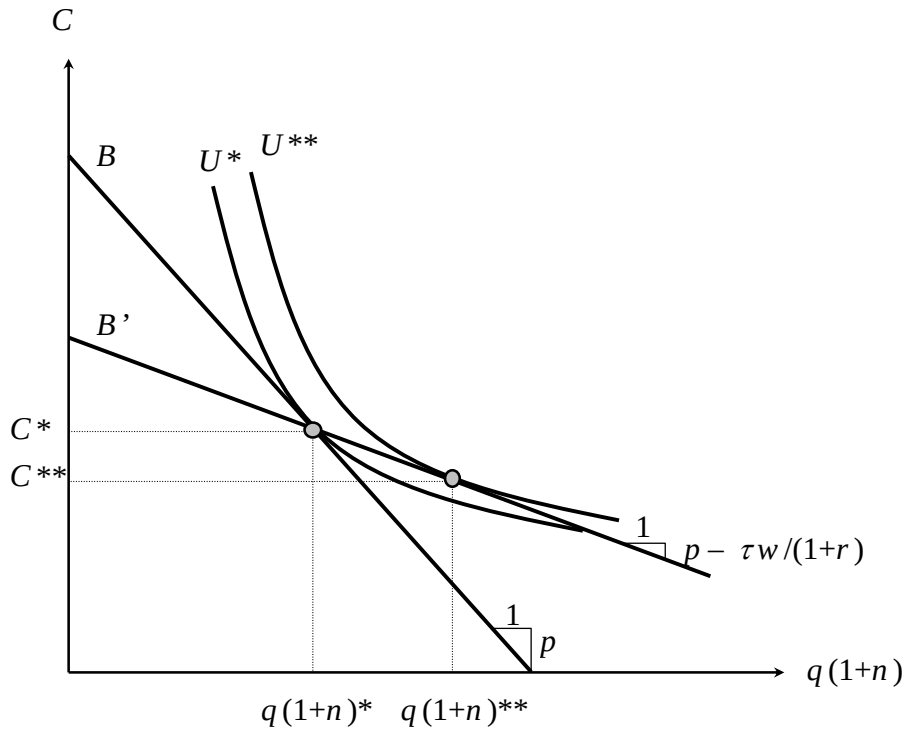
[31] The term $(\tau_{t+1}/\tau_t)\,(1+g_{t+1})\,q_t\,(1+n_{t+1})$ represents the internal rate of return involved in a pay-as-you-go pension scheme (in flat-rate pension schemes: for the average insured), which is fudamentally governed by payroll growth. Over longer periods of time, this growth rate should be smaller than the market rate of interest. The larger term $\tau_t\,(1-...)$ represents an "implicit tax" involved in the pension system which arises from the fact that, on present value terms, benefits received in period t+1 are usually smaller than contributions paid in t (Sinn 2000, Fenge and Werding 2003).

[32] Fully separating choices regarding $1+n$ and q in models such as the present one can lead to formal complications, implying that an interior solution regarding these two dimensions of fertility does not necessarily exist, that are related to the quantity-quality interaction discussed in Becker and Lewis (1973). Note that this is a problem involved in formal optimising probably much more than a problem affecting real-world decision-making. In any case, we confine our attention to looking at the broad fertility measure $q\,(1+n)$ here.

Figure 8: Fertility under pay-as-you-go pension schemes – private *vs* social optimum



At the same time, it can be easily demonstrated that the utility of a household whose members are active in period *t* would increase if everyone would choose higher fertility in accordance with equation (3b'). Building on the above model, Figure 8 illustrates the choice of an average household between goods consumption over the entire life cycle, $C = c + z/(1 + r)$ and broad fertility, $q\,(1+n)$. The budget line *B*, with a slope p^{-1}, and the indifference curve *U** characterise the household-level optimum $\{C^*, q(1+n)^*\}$. As consuming this bundle would also be feasible if the externality highlighted above were internalised, the budget line *B*' that corresponds to equation (2') goes through this point, but has a smaller slope, *viz*. $(p - w/(1 + r))^{-1}$, than line *B*. With standard assumptions regarding the shape of the utility function, this implies that the utility level *U*** that can be reached at the social optimum $\{C^{**}, q(1+n)^{**}\}$ must exceed *U**.

Finally, one could assume that children have played a role for old-age provision of their parents before the public pension scheme was introduced – in a kind of intra-family pay-as-you-go system implying that fertility choices were governed by a condition like (3b'). In this case, the new fertility level $q(1+n)^*$ is not only "too low" from a social point of view, as was shown above. It is also lower than if the pension scheme were absent. Introducing a public pay-as-you-go pension scheme then leads to a crowding out of earlier, private arrangements and socialises the returns to parental investment in children to a large extent. Consequently, fertility in terms of the combined result of choices regarding the number of children and expenditure per child is reduced.

It is important to note that this latter result is not too model-specific. What makes all the difference is that fertility is assumed to be endogenous, as it should be in the context of choices regarding old-age provision considering the long period of time spanned by private life-cycle decisions or public pension arrangements. The same effect of a reduction in fertility would obtain in a model where parents were assumed to be altruistic towards their children (as in Becker and Barro 1988) instead of pursuing an "investment" motive of providing for old age through child-rearing. In this case, parents would want to compensate their children for the transfers that the latter are forced to make through the pension scheme to the generation of their parents, but this would increase the cost of having children, rather then reducing the returns from children. Only if chil-

dren are seen as pure consumption goods by their parents and if there is no further intergenerational link – through an implicit mutual exchange of services and financial support at different stages of the family life cycle or through altruistic arguments in the utility function of parents – fertility behaviour would not be affected by the introduction or expansion of a pay-as-you-go public pension scheme.

In terms of a broad array of relevant theoretical models, the negative impact of public pension schemes on fertility and human capital accumulation sketched above is thus evident. What may be debatable is whether it is really empirically relevant, for instance, because the elasticities of demand for children and child quality could be very low, so that the effect becomes negligible. In the meantime, however, there is also a number of empirical studies that conform with current methodological standards and support the theoretical predictions in that they find a significant and substantially negative effect of the introduction and expansion of pay-as-you-go public pension schemes on parental fertility decisions, controlling for a host of alternative explanations.[33]

Ehrlich and Zhong (1998) and, as a follow-up study, Ehrlich and Kim (2005) run broad-based multi-country panel analyses for no less than 57 countries and a time period of more than 30 years finding, among other things, a clear negative relationship between the share of pension expenditure in GDP and annual fertility rates. Cigno and Rosati (1992, 1996, 1997) investigate a narrow selection of OECD countries based on single-country time-series analyses that, by the specification of the model and by the more differentiated data that are available, are closer to microeconomic models of parental fertility choices. Again, they are able to show that, in terms of robust, long-term relationships which are re-enforced through short-term, error correction adjustments, the "coverage" of public pay-as-you-go pension schemes (*i.e.*, pension expenditure per population 65+, punishing generous early-retirement programmes) has a negative impact on total fertility rates in all of the countries considered (Italy, the US, the UK, Germany, and Japan). In Cigno *et al.* (2003), the same authors are using an extremely flexible VAR model that predetermines no specific direction of causality and clearly confirms their results using improved data for Germany. The recent paper by Boldrin *et al.* (2005), who use a broader set of industrialised countries as a cross section, points in the same direction as the other econometric work mentioned here.

It appears that there are thus good reasons to accept that pay-as-you-go public pensions do interfere with fertility decisions and human capital accumulation in general and that their respective impact is negative, hence unfavourable for the future viability of the same pension scheme. The effects should be the stronger, the more generous the pension scheme is and the higher the fraction of the labour force, or the total population, that is covered. Yet, effects of this kind have been shown to exist even in countries with relatively low levels of publicly provided pensions, such as the UK or the US. If pay-as-you-go public pensions schemes in their traditional form turn out to be intrinsically unstable in the sense that they contribute to a long-term erosion of their own tax base, or their implicit future "funds", the question arises of how this could be avoided. We will address this question in the following section. Before, we will illustrate the problem more fully using observations from Germany.

7 Redesigning pay-as-you-go pensions: A proposal for Germany

[33] In the introduction to Part B of this paper, it was already stressed that fiscal externalities are not the only, probably not even the dominant, reason for the continued decline in fertility rates in industrialised countries. What matters is that – next to increased opportunity cost and a shift in demand towards fewer children of higher "quality" – they do contribute to the on-going fertility decline.

When looked at from a different angle, the fiscal externality created through pay-as-you-go pensions is equal to the net injection each child is making into the pension budget over his or her entire life cycle. It has been demonstrated that this effect amounts to no less than the present value of all of the child's life-time contributions (Sinn 1997, 2000). The reason that only contributions matter is that, at least as an *ex-ante* expectation based on average behaviour, the child's future pension benefits will be paid for by his or her (grand-)children, *etc.* In most industrialised countries, life-time pension contributions are a very substantial amount of money. It was already said that there are other fiscal effects of children, arising from child benefits, public education, *etc.*, that could potentially balance the account of their total transactions with the public budget. At least in Germany, however, it appears that this does not happen.

Table 4: The fiscal balance of an average child (born 2000) in the German tax-transfer system

	Fiscal effect[a)]
Social Insurance: contributions and benefits	240,500
of which:	
Statutory Pension Scheme	139,300
Public Health Insurance	69,800
Taxes	227,400
of which:	
Income taxes	102,000
Consumption taxes	125,500
Tax-financed benefits	– 391,000
of which:	
Public child care and public education	– 136,000
Child-related monetary transfers	– 64,900
Public share in opportunity costs (taxes foregone, *etc.*)	– 119,800
Balance	76,900

All amounts in Euro net present values related to the year of 2000.

a) Taking into account average gender proportions and survival probabilities, age and gender-specific participation rates for the education system and the labour force (as regular employees who are subject to the social insurance system, civil servants, self-employed, or "mini-job" holders), with average life-cycle profiles of earnings and old-age income in each of these cases, including the effects of an average number of expected descendants.

Source: Werding and Hofmann (2005).

Based on very detailed simulations, Werding and Hofmann (2005) estimate that, for an average child born in the year of 2000, the expected fiscal externality created in the German public pension scheme's budget is close to 140,000 Euro (see Table 4).[34] Parallel effects accruing in the public health insurance system and in public long-term care insurance imply that the total life-time fiscal effect of an average child for

[34] In calculating this figure, it is taken into account that not all children will actually enter the labour market, become employed, survive until retirement, *etc.*

the German social insurance system is even 240,500 Euro. In addition, an average child will also pay income and consumption taxes and, at the same time, receive a substantial amount of tax-financed transfers over his or her entire life cycle. As a result of all these transactions, there is a total fiscal externality of an average child born 2000 that amounts to about 77,000 Euro – based on a moderate estimate that tries not to overstate the effect wherever there are different options regarding how to quantify single items.

In Germany, bringing up a child effectively means transferring a small fortune to the public sector. According to the main source of the fiscal externality of a child, the proceeds are effectively used to finance public pensions (and other social insurance benefits) for the preceding generation. Those who benefit are thus the child's parents and all other members of the same age cohort: parents of other children plus a growing number of individuals who effectively remained childless. In a conventional pay-as-you-go social insurance scheme, all members of the parents' generation have equal access to social insurance benefits by a legal entitlement that does not reflect individual investment in the next generation's human capital, hence in the tax base that is needed to finance these entitlements. In doing so, pay-as-you-go schemes also discourage private saving as a precautionary measure that offers the main alternative way of providing for old age. In a sense, old-age provision offered by a conventional pay-as-you-go scheme is independent of having used *any* of the two basic precautionary arrangements that are feasible – investing in financial assets and physical capital or investing in human capital. It should not come as a surprise that, over time, an arrangement with such precarious incentives runs into financial trouble.

First of all, solving the problems involved in pay-as-you-go public pensions that have been highlighted here – the disincentives that they induce with respect to fertility and human capital investment through the fiscal externality they create – is a matter of efficiency. On the distributional side, the corresponding norm that could serve as a rationale in reforming the system is the benefit principle: a *quid pro quo* by which those who have children and invest in their human capital should be rewarded in one way or another for their contribution to keeping pay-as-you-go systems of social insurance financially viable in future years. Interestingly, a move in a similar direction is suggested by pure equity concerns. This is indicated by the fact that, in Germany, raising children is nowadays seen as one of the main poverty risks.[35] The coincidence of these two distributional norms is a rare exception as they are usually conflicting with each other.

Stepping back, a solution of the aforementioned problems can be achieved in several ways. First, by scaling back existing pay-as-you-go pension schemes; taken in itself, however, a change of this kind does not necessarily restore the incentive for (potential) parents to raise children. Second, by expanding existing measures of family policies in order to reduce the fiscal externality of a child, thus attempting to off-set negative effects of a public intervention through positive effects of additional interventions; such a policy is likely to stimulate fertility[36] but, because of the multiple distortions that all kinds of fiscal interventions are likely to create, it is unlikely to neutralise the negative effect of public pensions in a perfect way. Third, through changes within the public pension scheme by which individual benefit entitlements would be differentiated according to individual efforts to bring up and educate children – as the most basic case, by differentiating them by the number of children.

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[35] See the latest "poverty report" prepared on behalf of the German Federal Government (*Bundesregierung* 2005). Note that poverty is defined on relative terms in this report. The finding could therefore effectively suggest that families are not really "too poor" when compared to childless households but that the latter are "too rich" as they are able to free-ride on other people's investment in children regarding a substantial fraction of their old-age provisions.

[36] There are numerous empirical studies that confirm a positive effect of child benefits on parental fertility decisions; for a recent survey, see Meier (2005). A weak, but positive effect that directly counteracts the negative impact of pensions is also found in the papers by Cigno and Rosati (1996) and Cigno *et al*. (2003).

For the German Statutory Pension Scheme, a solution of the latter kind has been proposed by Werding and Sinn (2000, 2005) or Sinn (2005) on behalf of the Ifo Institute for Economic Research. The proposal takes as given that, in order to deal with on-going increases in life expectancy, an extension of the statutory retirement age (to age 67, like in the reform scenario considered in Part A of this paper) is definitely needed. In addition, the proposal entails three further changes against the current law.

– *Statutory Pension Scheme*: The rate of contributions to the existing scheme is definitely capped at its current level, and the large subsidy from the federal budget is gradually removed (and transferred to the new "child pension" scheme, for instance; see the next step). As a consequence of demographic change, the benefit level will then decline even more than is implied in the current law, in spite of the projected increase in the retirement age.
– *Child Pension Scheme*: For individuals who have children, the existing public pension scheme is supplemented by a second public, pay-as-you-go financed pillar. It is financed by contributions raised from *all employed* individuals (or simply by general taxation) and, for each child raised, offers an additional lump-sum benefit to *all parents*. This benefit is scaled in such a way that, for parents of three of more children, it fully makes up for future reductions in the level of pension benefits of the existing scheme against the current benefit level.
– *Supplementary savings*: At the same time, individuals who have few or no children are legally obliged to make supplementary savings for their old age, based on a saving rate that would again fully make up for losses against the current benefit level. Individuals are subjected to this obligation as soon as they enter employment; whenever they have a child (up to a maximum of three), their rate of mandatory savings is reduced (by one third), and part of the wealth already accumulated in this scheme becomes available for immediate use.

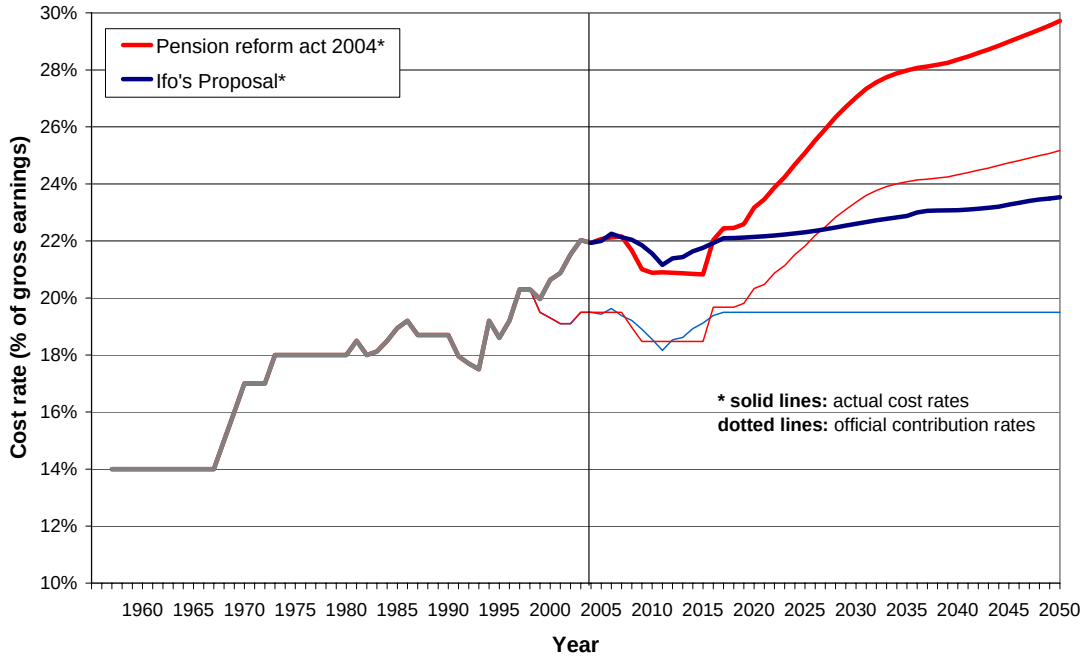
Figures 9 und 10 illustrate the effect of the reform suggested by Ifo on the main parameters of total public old-age provision, combining results for the Statutory Pension Scheme and for the new Child Pension Scheme.[37] Freezing the official contribution rate of the existing system is an important step towards containing the amount of intergenerational redistribution involved in any unfunded public pension scheme. Note that, in a sense, any increase in contribution rate necessitated in a "defined benefit" scheme could be seen as an introduction of an additional pay-as-you-go scheme on top of the existing one, with higher implicit debt and even stronger adverse effects for fertility and human capital accumulation. Implementing the new Child Pension Scheme as a universal system is the key ingredient for rewarding parental human capital investment and keeping up the total benefit level of those who actually have children, with effects that are not exclusively related to the limits defined by a categorical system.

Finally, the introduction of mandatory, supplementary savings for everyone else serves two further purposes. On the one hand, it is needed to avoid incentive problems regarding adequate old-age provisions that arise from the existence of other, means-tested instruments of income support. Since the future level of Statutory Pension benefits is likely to fall to a level where individuals would be entitled to receive such means-tested benefits as well, they would not have an incentive to make additional savings if this were left to their voluntary decisions. On the other hand, rules regarding savings rates and stocks of wealth that are differentiated by the number of children imply that the new system has a strong impact on current net household income whenever a child is born. Parents can then use part of their accumulated savings to cover child costs,

[37] Note that fertility is not endogenous in the simulation model and that there are no assumptions regarding changes in fertility *vis-à-vis* the simulations run in Part A of this paper. Further, favourable effects of Ifo's proposal that may matter for the pension scheme's budget starting from some point in time after 2025 are thus not included in the following figures.

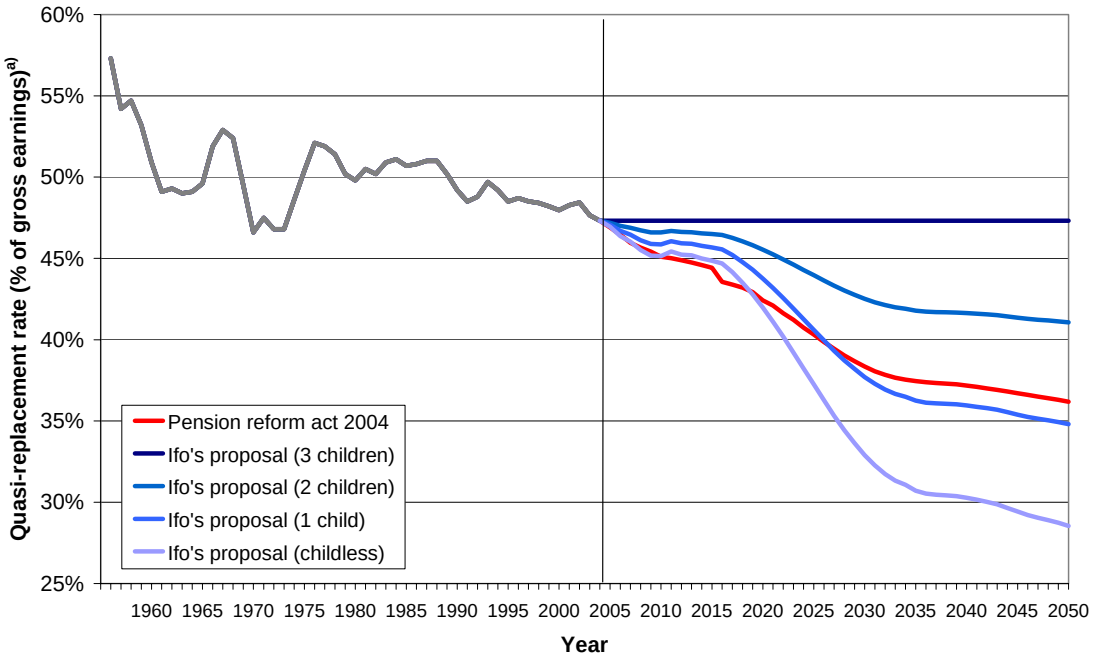
and they have to save less of their current income in subsequent years when they have higher current spending on children. For potential parents, the consequences of the new arrangement are thus not only relevant at old age, where they will be entitled to receive higher pension benefits, but they make a difference already during earlier stages of the family life cycle, when the children are young and the family budget is under high tension (see Figure 11 where these effects are demonstrated for the case of a family with two children). If the expectation to receive higher pensions in the future is effectively

Figure 10: Annual cost rates according to Ifo's proposal, –2050



Source: *Deutsche Rentenversicherung*; CESifo Pension Model (2005 version)

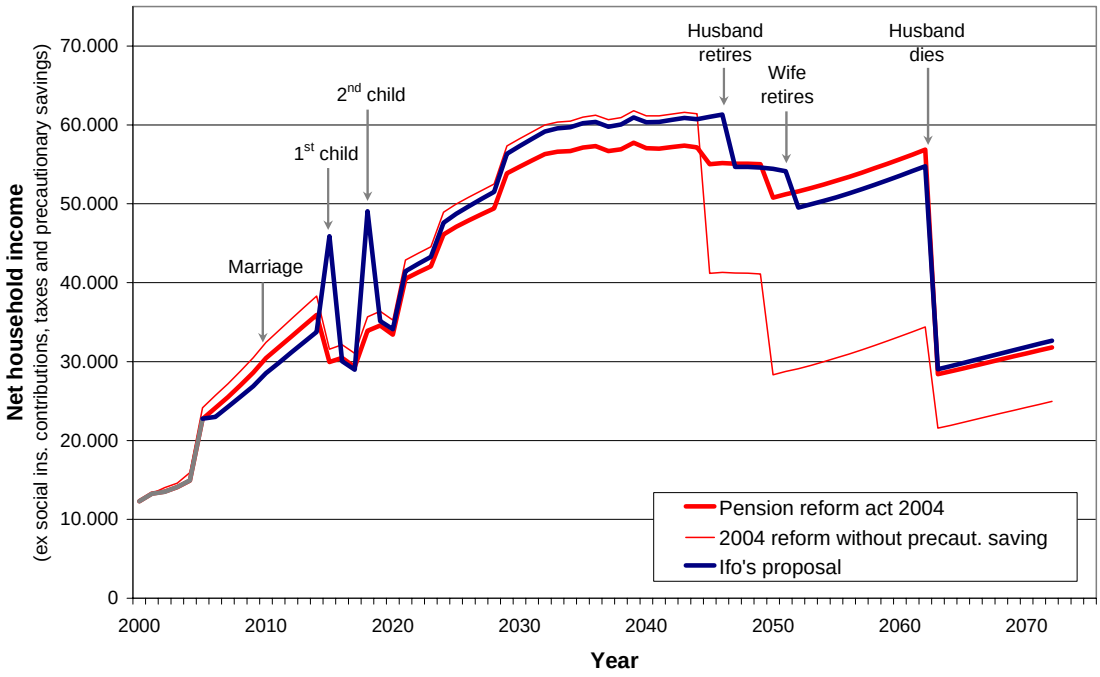
Figure 9: Level of pension benefits according to Ifo's proposal, –2050



a) See figure 1.

Source: *Deutsche Rentenversicherung*; CESifo Pension Model (2005 version).

Figure 11: Net household income for a couple with two children
when Ifo's proposal is implemented



Source: CESifo Pension Model (2005 version).

not strong enough to induce young people to have children and invest in their human capital, these immediate effects should definitely have an impact.

All in all, this proposal for redesigning the German Statutory Pension Scheme – or, rather, the entire system of old-age provision in Germany – can therefore not only contribute to limiting the amount of implicit pension debt involved in the current system. In addition, it should bring about a substantially higher degree of pre-funding of future old-age income than the current system does *and* it should fix the problems that have been primarily addressed in Part B of this paper, making sure that the number of contributors and the stock of human capital that is available for covering unfunded pension liabilities in the future does not decline any further, driven by disincentives that the pension scheme itself is creating, as it may have done in the past and might otherwise continue to do in the future. In any case, the sustainability of the German public pension scheme should be greatly improved.

Among German politicians and in the greater public, the ideas discussed in part B of this paper are nowadays far from being popular. The small extensions of public pension benefits granted to mothers that have been introduced in the Statutory Pension Scheme starting from 1986 were mainly pushed through by a series of rulings of the German Court of Justice, rather then by voluntary decision of politicians.[38] There is now a wide-spread feeling that private fertility choices should have nothing to do with public old-age provision. This, in itself, can be taken to indicate the massive changes in habits and informal ways of thinking that more than 100 years of public pension provision have brought about, effectively destroying any public

[38] See, *e.g.*, *Bundesverfassungsericht* (1992). In this jurisdiction, the main argument was that, in a public pension scheme with earnings-related benefits, mothers who take a parental leave to take care of small children are automatically faced with a disadvantage regarding their benefit entitlements when compared to other individuals with more complete work records. The Court therefore obliged politicians to gradually reduce this disadvantage in any future reforms enacted for the Statutory Pension Scheme. The argument brought forth in this paper, taking pay-as-you-go pensions to be actually "funded" by the human capital investments of these mothers, goes beyond this point.

awareness of the fact that incentives which are operative at an individual level should correspond to economic linkages that still, and inevitably, exist at an aggregate level.

8 References

Abio, G., G. Mahieu and C. Patxot (2002), "On the optimality of PAYG pension systems in an endogenous fertility setting", *IRES Discussion Paper* No. 2002-6.

Auerbach, A., J. Gokhale and L.J. Kotlikoff (1991), "Generational Accounts: A meaningful alternative to deficit accounting", in: D. Bradford (ed.), *Tax policy and the economy*, Vol. 5, Cambridge: MIT Press, 55–110.

Auerbach, A., L.J. Kotlikoff and W. Leibfritz (1999), *Generational Accounting Around the World*, Chicago: NBER.

Becker, G.S. (1960), "An Economic Analysis of Fertility", in: NBER (ed.), *Demographic and Economic Change in Developed Countries*, Columbia Univ. Press: New York and London, 209–231.

Becker, G.S. (1962), "Investment in Human Capital: A theoretical analysis", *Journal of Political Economy* 70 (Supplement), 9–49.

Becker, G.S. and R.J. Barro (1988), "A Reformulation of the Economic Theory of Fertility", *Quarterly Journal of Economics* 103, 1–25.

Becker, G.S. and G. Lewis (1973), "On the Interaction Between Quantity and Quality of Children", *Journal of Political Economy* 81, S279–S288.

Birg, H. (1995), *World Population Projections for the 21st Century: Theoretical Interpretations and Quantitative Simulations*, Frankfurt and New York: Campus and St. Martin's Press.

Blanchard, O.J. (1990), "Suggestions for a New Set of Fiscal Indicators", *OECD Economic Department Working Paper* No. 79.

Boldrin, M, M. De Nardi and L.E. Jones (2005), "Fertility and Social Security", *NBER Working Paper* No. 11146.

Bradshaw, J. and N. Finch (2002), *A comparison of Child Benefit packages in 22 countries*, London: Dept. for Work and Pensions.

Bundesregierung (2005), *Lebenslagen in Deutschland: Der 2. Armuts- und Reichtumsbericht der Bundesregierung*, BT-Drs. No. 15/5015.

Bundesverfassungsgericht (1992), „Beschluss vom 7. Juli 1992", *BVerfGE* 87, 1–48.

Chand, S.K. and A. Jaeger (1996), "Ageing Populations and Public Pension Schemes", *IMF Occasional Paper* No. 147.

Cigno, A. (1986), "Fertility and the Tax-Benefit-System: A Reconsideration of the Theory of the Family", *Economic Journal* 96, 1035–1051.

Cigno, A. (1993), "Intergenerational Transfers without Altruism: Family, Market and State", *European Journal of Political Economy* 9, 505–518.

Cigno, A., L. Casolaro and F.C. Rosati (2003b), "The Role of Social Security in Household Decisions", *Finanzarchiv* 59, 189–211.

Cigno, A. and A. Luporini (2003), "Optimal policy with heterogeneous families, asymmetric information and stochastic fertility", mimeo.

Cigno, A., A. Luporini and A. Pettini (2003a), "Transfers to families with children as a principal-agent problem", *Journal of Public Economics* 87, 1165–1177.

Cigno, A. and F.C. Rosati (1992), "The Effects of Financial Markets and Social Security on Saving and Fertility Behaviour in Italy", *Journal of Population Economics* 5, 319–341.

Cigno, A. and F.C. Rosati (1996), "Jointly determined saving and fertility behaviour", *European Economic Review* 40, 1561–1589.

Cigno, A. and F.C. Rosati (1997), "Rise and Fall of the Japanese Saving Rate: the Role of Social Security and Intra-family Transfers", *Japan and the World Economy* 9, 81–92.

Cremer, H., F. Gahvari and P. Pestieau (2003), "Stochastic fertility, moral hazard, and the design of pay-as-you-go pension plans", mimeo.

Disney, R. (2001), "How Should We Measure Pension Liabilities in EU Countries?", in: T. Boëri *et al*. (eds.), *Pension: More Information, Less Ideology*, Kluwer Academic Publishers: Dordrecht NL, 95–112.

Ehrlich, I. and J. Kim (2005), "Social security, demographic trends, and economic growth: Theory and Evidence from the international experience", *NBER Working Paper* No. 11121.

Ehrlich, I.B. and F.T. Lui (1998), "Social Security, the Family, and Economic Growth", *Economic Inquiry* 36, 390–409.

Ehrlich, I.B. and J.-G. Zhong (1998), "Social Security and the Real Economy", *American Economic Review* 88, 151–157.

EU Economic Policy Committee (2001), *Budgetary challenges posed by ageing populations: the impact on public spending on pensions, health and long-term care for the elderly and possible indicators for the long-term sustainability of public finances*, EPC/ECFIN/655/01-EN final (24 October 2001), Brüssel.

EU Economic Policy Committee (2003), *The impact of ageing in populations on public finances: overview of analysis carried out at EU level and proposals for future work programme*, EPC/ECFIN/435/03 final (22 October 2003), Brüssel.

Fenge, R. and V. Meier (2003), "Pensions and fertility incentives", *CESifo Working Paper* No. 879.

Fenge, R. and V. Meier (2004), "Are Family Allowances and Fertility-Related Pensions Siamese Twins?", *CESifo Working Paper* No. 1157.

Fenge; R. and M. Werding (2003), "Ageing and Fiscal Imbalances Across Generations: Concepts of Measurement", *CESifo Working Paper*, No. 842.

Franco, D. (1995), "Pension Liabilities – their Use and Misuse in the Assessment of Fiscal Policies", Working paper, Rome: Banca d'Italia.

Franco, D. (2002), "Italy: a never-ending pension reform", in M.S. Feldstein and H. Siebert (eds.), *Social Security Pension Reform in Europe*, Chicago and London: The University of Chicago Press, 211–251.

Franco, D., M.R. Marino and S. Zotteri (2005), "EU Fiscal Rules: The Role of Pension Expenditure Projections and of Pension Liabilities", in: N. Takayama (ed.), *The Balance Sheet of Social Security Pensions*, PIE Proceedings No. 6, Institute of Economic Research, Hitotsubashi University: Tokyo, 62–111.

Frederiksen, N.K. (2001), "Fiscal Sustainability in the OECD. A Simple Method and Some Prelimininary Results", Finansministeriet Working Paper No. 3, Copenhagen: Dept. of Finance.

Genzke, J. (2005), "Die finanzielle Situation der gesetzlichen Rentenversicherung im Jahr 2005 und in den Folgejahren", *Die Angestelltenversicherung* 52, Issue 9/2005, 423–431.

Groezen, B. van, T. Leers and L. Meijdam (2000), "Family size, looming demographic changes and the efficiency of social security reform", *CentER Working Paper* No. 2000-27.

Groezen, B. van, T. Leers and L. Meijdam (2003), "Social security and endogenous fertility: pensions and child allowances as Siamese twins", *Journal of Public Economics* 87, 233–251.

Hagemann, R. P. and G. Nicoletti (1989), "Population Ageing: Economic Effects and Some Policy Implications for Financing Public Pensions", *OECD Economic Studies* No. 12.

Haveman, R. (1994), "Should Generational Accounts Replace Public Budgets and Deficits?", *Journal of Economic Perspectives* 8, 95-111.

Holzmann, R., R. Palacios and A. Zviniene (2000), "On the Economics and Scope of Implicit Pension Debt: An International Perspective", Paper prepared for the 2001 ASSA Meetings, New Orleans.

Hotz, V.J., J.A. Klerman and R.J. Willis (1997), "The Economics of Fertility in Developed Countries", in: M. Rosenzweig and O. Stark (eds.), *Handbook of Population and Family Economics*, Vol. 1A, Elsevier: Amsterdam, 275–347.

Kolmar, M. (1997), "Intergenerational Redistribution in a Small Open Economy With Endogenous Fertility", *Journal of Population Economics* 10, 335–356.

Kolmar, M. (2001), "Optimal intergenerational redistribution in a two-country model with endogenous fertility", *Public Choice* 106, 23–51.

Kommission „Nachhaltigkeit in der Finanzierung der Sozialen Sicherungssysteme" (2003), *Nachhaltigkeit in der Finanzierung der Sozialen Sicherungssysteme* (Final report), Berlin: Federal Dept. of Health and Social Protection.

Kotlikoff, L. J. and B. Raffelhüschen (1999), "Generational Accounting Around the Globe", in: *American Economic Review, Papers and Proceedings* 89, 161–166.

Kraemer, M., J. Chambers and B. Merino (2005), *In the Long Run, We Are All Debt: Ageing Societies and Sovereign Ratings*, Credit Ratings: Ratings Criteria (Report of 18-March-2005), Standard & Poors: London.

Kuné J.B., W.F.M. Petit and A.J.H. Pinxt (1993), "The Hidden Liabilities of Basic Pension Systems in the European Community", *CEPS Working Document* No. 80.

Leibfritz, W., D. Roseveare, D. Fore and E. Wurzel (1995), "Ageing Populations, Pension Systems and Government Budgets: How Do they Affect Savings?", *OECD Economics Department Working papers* No. 156.

Meier, V. (2005), *Auswirkungen familienpolitischer Instrumente auf die Fertilität: Internationaler Vergleich für ausgewählte Länder*, Ifo Forschungsbericht No. 26, Munich: Ifo Institute.

OECD (2001), *Economic Outlook* No. 69 (June 2001), Paris: Organisation for Economic Co-operation and Development.

OECD (2002), *Policy responses to the challenges of ageing populations – a synthesis*, DEELSA/ELSA/WP1 (2002) 3, Paris: Organisation for Economic Co-operation and Development.

Oksanen, Heikki (2005), "Actuarial Neutrality across Generations Applied to Public Pensions under Population Ageing: Effects on Government Finances and National Saving", European Commission, DG ECOFIN, *European Economy. Economic Papers* No. 230.

Palmer, E. (2002), "Swedish Pension Reform – How did it evolve and what does it mean for the future", in M.S. Feldstein and H. Siebert (eds.), *Social Security Pension Reform in Europe*, Chicago and London: The University of Chicago Press, 171–205.

Rosenzweig, M.R. and T.P. Schultz (1985), "The Demand and Supply of Births: Fertility and Its Life-cycle Consequences", *American Economic Review* 75, 992–1015.

Roseveare, D., W. Leibfritz, D. Fore and E. Wurzel (1996), "Ageing Populations, Pension Systems and Government Budgets: Simulations for 20 OECD Countries", *OECD Economics Department Working papers* No. 168.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2003), *Staatsfinanzen konsolidieren – Steuersystem reformieren* (Annual report 2003–04), Wiesbaden.

Sinn, H.-W. (1997), "The Value of Children and Immigrants in a Pay-As-You-Go Pension System", *NBER Working Paper* No. 6229 (reprinted in: *ifo Studien* 47, 2001, 77–94).

Sinn, H.-W. (2000), "Why a Funded Pension is Useful and Why it is not Useful", *International Tax and Public Finance* 7, 389–410.

Sinn, H.-W. (2004), "The Pay-as-you-go Pension System as a Fertility Insurance and Enforcement Device", *Journal of Public Economics* 88, 1335–1357.

Sinn, H.-W. (2005), "Europe's Demographic Deficit: A Plea For a Child Pension System", *De Economist* 153, 1–45.

Sinn, H.-W. and M. Werding (2000), "Rentenniveausenkung und Teilkapitaldeckung: ifo Empfehlungen für eine Konsolidierung des Rentensystems", *ifo Schnelldienst* 53, Issue 18/2000, 12–25.

Sinn, H.-W. and M. Werding (2005), "Kinderrente und Vorsorgepflicht: Der ifo Vorschlag zur Lösung der demographischen Krise des Rentensystems", *ifo Schnelldienst* 58 (in preparation).

Settergren, O. (2005), "New Use of an Old Italian Invention: The double-entry bookkeeping used to monitor and secure financial stability of the new Swedish pay-as-you-go pension plan", in: N. Takayama (ed.), *The Balance Sheet of Social Security Pensions*, PIE Proceedings No. 6, Institute of Economic Research, Hitotsubashi University: Tokyo, 18–28.

Statistisches Bundesamt (2003), *Bevölkerung Deutschlands bis 2050: 10. koordinierte Bevölkerungsvorausberechnung*, Statistisches Bundesamt: Wiesbaden.

Van den Noord, P. and R. Herd (1993), "Pension Liabilities in the Seven Major Economies", *OECD Economics Department Working paper* No. 142.

Van den Noord, P. and R. Herd (1994), "Estimating pension liabilities: a methodological framework", *OECD Economic Studies* No. 23.

Werding, M. (1998), *Zur Rekonstruktion des Generationenvertrages*, Tübingen: Mohr-Siebeck.

Werding, M. and H. Blau (2002), *Auswirkungen des demographischen Wandels auf die staatlichen Alterssicherungssysteme: Modellrechnungen bis 2050*, ifo Beiträge zur Wirtschaftsforschung, Vol. 8, Munich: Ifo Institute.

Werding, M. and H. Hofmann (2005), *Die fiskalische Bilanz eines Kindes im deutschen Steuer- und Sozialsystem*, ifo Forschungsberichte, Vol. 27, Munic: Ifo Institute.

Werding M. and A. Kaltschütz (2005), *Modellrechnungen zur langfristigen Tragfähigkeit der öffentlichen Finanzen*, ifo Beiträge zur Wirtschaftsforschung, Vol. 17, Munich: Ifo Institute.

Wigger, B. (1999), "Pay-as-you-go financed pensions in a model of endogenous growth and fertility", *Journal of Population Economics* 12, 625–640.

Willis, R.J. (1973), "A New Approach to the Economic Analysis of Fertility Behavior", *Journal of Political Economy* 81, S14–S64.