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Ageing and the Tax Implied in Public Pension Schemes: Simulations for Selected OECD Countries

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AGEING AND THE TAX IMPLIED IN PUBLIC PENSION SCHEMES: SIMULATIONS FOR SELECTED OECD COUNTRIES

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AGEING AND THE TAX IMPLIED IN PUBLIC PENSION SCHEMES: SIMULATIONS FOR SELECTED OECD COUNTRIES

Abstract

A key figure which can be applied to measuring inter-generational imbalances involved in existing public pension schemes is given by the "implicit tax" that is levied on each generation's life-time income through participation in these systems. The implicit tax arises from the fact that, quite generally, pension benefits received fall short of actuarial returns to contributions (*i.e.*, "explicit" social security taxes) paid while actively working. If, in spite of large-scale demographic ageing, public pension schemes are continued to be run based on current rules, implicit tax rates will sharply increase for generations who are currently young when compared to those who are already approaching retirement. In the paper, this will be illustrated for the cases of France, Germany, Italy, Japan, Sweden, the UK, and the US. The results are based on simulations covering representative individuals in all age cohorts born from 1940 to 2000. At the same time, there are striking differences across countries regarding both the level of implicit taxes and their time paths over successive age cohorts, which can be attributed to different ageing processes as well as to different institutional features of national pension systems. In addition, we are studying the impact of pension reforms that were recently enacted or are currently under way, thus demonstrating how effective the measures taken are in terms of smoothing the inter-generational profile of implicit tax rates.

JEL Classification: H55, J11, D63.

Keywords: demographic ageing, public pensions, pension reform, inter-generational redistribution, international comparisons.

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1 Introduction*

The main goal pursued in this paper is to measure the impact of ageing on a number of existing public pension schemes. In doing so, we will try to highlight the consequences of several reform strategies pursued in different countries and the general role of institutional features for the way ageing affects public pensions. As a concept of measurement, we will refer to the notion of an "implicit tax" that is next to inevitably involved in any unfunded pension scheme (Fenge and Werding 2003). The set of countries we have chosen for our exercise focuses on a number of Western European economies – *viz.*, Germany, France, Italy, Sweden, and the United Kingdom – as well as the United States and Japan. In all these countries, public pensions are financed on a pay-as-you-go basis, either openly or implicitly.[1]

Our study follows up on earlier efforts like those undertaken by van den Noord and Herd (1993), Roseveare *et al*. (1996), Kotlikoff and Leibfritz (1999), or Holzmann *et al*. (2000). All of these papers suggest alternative approaches to measuring the impact of ageing on public pensions – in terms of future trends in "net pension liabilities", deficits in "general government fiscal balances", or differences in "generational accounts" – and apply them to different sub-sets of OECD countries given their current stance of pension policies. Here, we take into account further steps to reform that were enacted more recently or are currently under consideration, affecting the long-term perspectives for financing public pensions. Also, we employ a different concept of measurement, looking at the fiscal consequences of demographic ageing in a simple, but very illustrative, way from the perspective of individual members of the insured population. More specifically, we will estimate the financial burden imposed on representative agents belonging to the age cohorts born between 1940 and the year of 2000, including those who are currently approaching retirement as well as young and future workers, that is.

The pension systems to be considered in the following differ quite a lot in their actual scope (*i*) in terms of individuals covered (all citizens at working and pensionable age, all the labour force, or just employees of the private sector in the main branches of industry); (*ii*) in terms of risks that are insured (maximum coverage is for longevity,

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[1] Where public pensions are partially funded, funds being mostly invested in domestic government bonds, pensions are of an "implicit" pay-as-you-go variety. When ageing causes net investment in these funds to become negative, the fiscal consequences will not be fundamentally different from those in openly unfunded schemes, even though the timing of effects over successive age cohorts may differ. Here, these considerations apply to the cases of Japan and, to some extent, the US.

disability, and survivors); and (*iii*) in terms of the level of retirement income provided by public pensions when compared to earlier wages of pensioners or to current wages of those who are still in employment. Furthermore, old-age provision in different countries is based on very different attitudes towards compulsion *vs.* voluntary choices regarding membership, the level of cover *etc*. Finally, the differing arrangements bring about very different results in terms of redistribution *vs.* fairness, both on an intra- and inter-generational level. In any case, we concentrate on a pervasive type of "first-pillar" schemes that are administered by public authorities and provide at least some minimum level of retirement income for the vast majority of workers in each country. Not suprisingly, schemes of this type can be found in next to all industrialised economies.[2] Among the large number of potential examples, we want to include in our study some diversity with respect to the institutional features listed above. In addition, we are interested in demonstrating the effects of diverging strategies for coping with large-scale demographic ageing.[3]

Section 2 describes the methodology adopted for our simulations. Section 3 sums up the results obtained for the "baseline" or "current policy" scenarios for all the pension systems considered. In section 4, we look at individual countries, explaining some basic features of national pension schemes and spelling out in some more detail the consequences of ageing given current pension policies or alternative sets of rules derived from past policies or on-going reform discussions. Section 5 returns to a comparative perspective, trying to relate our findings to a number of institutional characteristics of national pension schemes. Section 6 concludes.

2 Ingredients for our projections

2.1 Demographic ageing: projections

Throughout the industrialised world, large-scale demographic ageing arises from two common trends. One is a typical swing in fertility rates – from a "baby boom" to a bust in child births – which took place some time between the late 1940s and the early 1970s and interfered with a more fundamental, secular trend towards having fewer children. The other is a long-term increase in life expectancy, implying that the number of individuals who survive until old age becomes higher and higher in proportion to those at

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[2] Within the OECD world, the only major exceptions are given by Australia and New Zealand.

[3] Of course, the final sub-set of countries covered here is also influenced by the availability of data that are needed for our calculations and by potential limitations to applying our basic simulation model to different countries.

young and middle age. Up to a point, net immigration can mitigate this shift in the population structure,[4] but only under extreme assumptions it could be expected to offset the trend (United Nations 2000). The strength and timing of demographic change differs considerably across countries, but the fundamental pattern it creates is the same everywhere.

Figure 1: Old-age dependency in selected OECD countries (1950–2050)

Sources: 1950: OECD (1988); 2000/50: U.S. Bureau of Census–online, Eurostat (2000), Statistical Office of Japan (2001).

In our simulations, we rely on most recent population projections prepared by official sources, taking as given assumptions regarding fertility, mortality, and migration that are used for "main" or "baseline" population scenarios. Following these projections, the old-age dependency ratio – defined to be the number of individuals aged 65 and older over individuals aged 15 to 64 – will roughly double in most of the countries considered here in the period from 2000 to 2050. In some cases, it will then have more than tripled if compared to the level of the early 1950s, when most existing public pension schemes were introduced or expanded in the aftermath of World War II. Figure 1 gives an overview of both actual numbers and projected ratios of old-age dependency for the countries selected for our exercise.

[4] Among our set of countries, this is true for the U.S. and, to a lesser extent, for Germany.

2.2 Implicit taxes: definition

The conclusion that there is a burden involved in any unfunded pension scheme once the system is matured is an obvious one. Certainly, no one should claim originality for defining this burden more precisely to be a tax which is implicitly levied on a given individual's life-time income. What may have been overlooked for quite some time, however, is that this notion of an implicit tax is extremely useful (*i*) for understanding the general effects of pay-as-you-go pensions for the inter-generational distribution (Sinn 1997; 2000; Fenge and Werding 2003),[5] and (*ii*) for demonstrating the particular impact of ageing on individuals who belong to different age-cohorts (Thum and Weizsäcker 2000; Sinn and Werding 2000).

The implicit tax involved in unfunded pensions is simply given by the difference of an individual's life-time contributions paid while working and pension benefits accruing later on, both discounted to net present values of some period t. Defining implicit taxes on absolute terms is not very instructive. Instead, one may consider the implicit tax *rate* τ_t which relates the amount of implicit taxes paid to life-time income earned by a typical individual belonging to a given generation. Assuming that the members of "generation *t*" (*i.e.*, those who take up work in period or "year" *t*) retire in period *T* and die in period Ω, the implicit (or "benefit-adjusted") tax rate is given by

$$\tau_t = \frac{\sum_{s=t}^{T-1} \frac{\vartheta_s w_s}{\prod_{i=t+1}^{s}(1+r_i)} - \sum_{s=T}^{\Omega-1} \frac{p_s}{\prod_{i=t+1}^{s}(1+r_i)}}{\sum_{s=t}^{T-1} \frac{w_s}{\prod_{i=t+1}^{s}(1+r_i)}},$$

where $\vartheta_{t\ldots T-1}$ are periodic contribution rates (or "explicit" social security tax rates), $w_{t\ldots T-1}$ are wages earned while actively working, $p_{T\ldots\Omega-1}$ are pension benefits received while in retirement, and $r_{t+1\ldots\Omega-1}$ are interest rates used for discounting all nominal amounts to period *t* values. If pension benefits fall short of the actuarial value of life-time contributions, τ_t will be larger than zero.

Taking into account that in unfunded pension schemes, benefits have to be paid out of current contributions, such that $p_T = p_T(\vartheta_T, w_T, N_{t+T-\Omega+1\ldots t}, N_{t+1\ldots T})$ *etc.*, *N* measur-

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[5] Fenge and Werding (2003) provide a thorough discussion of what the tax implied in unfunded pensions really is, how it can be interpreted, and how it relates to other measures for the fiscal burden involved in pay-as-you-go pension schemes, with or without population ageing, that are suggested in the literature.

ing the number of individuals in retirement and employment, respectively, and re-writing wages and cohort size based on periodic growth rates $g_{t+1\ldots\Omega-1}$ and $n_{t+T-\Omega+2\ldots T}$, we find that the implicit tax rate is a function

$$\tau_t = \tau_t(\underset{+}{\vartheta_{t\ldots T-1}}, \underset{-}{\vartheta_{T\ldots\Omega-1}}, \underset{-/(+)}{g_{t+1\ldots T-1}}, \underset{-}{g_{T\ldots\Omega-1}}, \underset{-/(+)}{n_{t+T-\Omega+2\ldots T-1}}, \underset{-}{n_{T\ldots\Omega-1}}, \underset{+/(-)}{r_{t+1\ldots T-1}}, \underset{+}{r_{T\ldots\Omega-1}}).$$

The main message of this decomposition is that contribution rates ϑ drive up the implicit tax rate as long as individuals are subjected to paying them themselves; they reduce the implicit tax rate as soon as they increase the budget from which individual pension benefits are financed. All other determinants of τ are just the ingredients of the well-known "Non-Aaron condition" (Aaron 1966) which states that in the regular case where in each period $(1+g)(1+n) < 1+r$, pay-as-you-go pensions involve a burden ($\tau > 0$) for those who participate over their entire life cycle. In the above formula, ambiguous signs arise from the fact that, within a multi-period overlapping-generations structure, wage growth, population growth and interest rates are relevant not only for the (net present value of the) amount of pension benefits that will be received, but also determine the amount of contributions to be paid.

The expectation that, as a rule, implicit tax rates are positive is true even for a steady-state where ϑ is a constant. This follows from the inter-generational redistribution involved in unfunded pensions, where "inaugural gains" accrue to those who receive pensions without having paid contributions (over their full period of labour force participation), while subsequent generations have to pay the bill (Sinn 2000). Yet, if no shocks occur the implicit tax rate will be constant over all successive age cohorts. When demographic ageing enters the picture, the time series for $\tau_{t\ldots\infty}$ need no longer be balanced across generations. Instead, it is highly likely to go up following a systematic trend, mainly depending on how long those politically responsible are trying to keep up the level of pension benefits by increasing contribution rates. Once a new steady state is reached, τ will again become a constant, but on a higher level than before.

The focus of this paper is on real-world examples for the profile of implicit tax rates across different generations. Thus, what will matter most for our simulations is the "shock" created by demographic ageing, *i.e.* the change in the age structure of the insured population that is taking place in any of the countries considered, *plus* the type of policy reactions that are chosen *and* the timing of any pension reform. If, for instance, authorities respond to large-scale demographic ageing by cutting down the level of pension benefits they will increase the implicit tax rate for those who are currently old-aged. If, instead, contribution rates are driven up, the tax rate will rise for younger age-

cohorts. If both types of strategies are combined, the difference between pensions which would be actuarially fair and actual retirement benefits must be expected to rise for all the generations involved in the demographic transition.

2.3 Simulation tool and assumptions

As was already stated, we will be looking at τ_t for the age cohorts born between 1940 and the year of 2000 for all the countries which we selected. It should be clear that our work involves a good deal of projections regarding population, labour force participation, and the legal framework for current pension schemes. At the same time, we can rely on long time-series of existing data for the past development of earnings, contribution rates and, where appropriate, current pension benefits.

Our simulations have been run using the CESifo Pension Model which was developed for the Advisory Board of the German Federal Ministry of Economics (*Wissenschaftlicher Beirat* 1998). The model is based on a simple accounting approach suited to forecast pension budgets that are operated on a pay-as-you-go basis. Originally, the tool was modelled on the rules entailed in the German Statutory Pension Scheme. For the present study, it has been extended to capture all other European pension systems included here in their basic form, even if some loss in details turned out to be inevitable.

It should be emphasised from the very beginning that, unlike projections based on general equilibrium models, our simulations do not take into account in a systematic fashion individual responses to changes in institutions or economic parameters. The major justification for our simplified approach is that, when the focus is on international comparisons, general equilibrium models which entail a substantially higher portion of economic theory turn out to be next to unmanageable. If many of the assumptions that are made effectively have to be set to meet endogenous restrictions in each country, it is hard to see what drives the final results in a comparative perspective. Against this background, taking most aspects of individual behaviour to be exogenous and using assumptions that are deliberately made comparable across countries offers a much more flexible framework for the kind of exercise we have in mind.

Regarding the European countries covered here, our simulations are based on the most recent population projections published by Eurostat (2000). Scenarios for labour force participation (differentiated by gender and 5-year age groups) and employment (or unemployment rates) have been adopted from forecasts that were made on a national level because we did not feel in a position to make assumptions regarding these trends

that are rather country-specific by ourselves.[6] Basically, our assumptions are those agreed upon for parallel projects run by the OECD (2001a) and the Economic Policy Committee of the EU (2001), aiming at comparable projections for the impact of ageing on public finances in all their member countries.[7] All in all, we did not allow for too much variation across countries with respect to these economic variables.

For the future development of productivity and wages, we invariably assumed real annual increases by 1.75 per cent a year. Another important variable for our calculations is given by the real interest rate which we set to be 4 per cent *p. a.* for the future in our simulations.[8] Regarding past and present developments of all relevant variables, we of course used historical data. Last but not least, we took as given the current legal framework of the public pension systems under scrutiny, in most cases adding earlier regulations or current reform proposals as a variant in order to highlight the effects of different types of policy changes. Thus, we are primarily attempting to arrive at meaningful "baseline" or "current policy" projections for existing pension schemes where movements are mainly due to changes in the population structure, *plus* some alternative "(pre-)reform" scenarios based on policy choices that directly affect the pension system.[9] Appendix A summarises the main sources of information used for our projections.

In the case of the US and Japan, we refrained from doing full-scale projections on our own. Instead, we took as given official forecasts as to the development of all relevant parameters.[10] However, we have been "translating" assumptions regarding wage growth and real interest rates into our common set of assumptions where necessary in order to establish cross-country comparability of the results. In addition, we checked with some care whether the projected developments of benefit levels, contribution rates and pension funds – which offer some degrees of freedom for managing public pension schemes – appear to be feasible over the full projection horizon.

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[6] In this regard, we also did not think it sensible to use identical assumptions for all countries. Some fundamental trends, like increasing female participation, attempts to halt early retirement, or structural reforms aiming at lower unemployment, may be common across (European) countries. Still, the current levels of relevant parameters and the timing of these trends can be rather different.

[7] In these projects, the impact of ageing was measured in the tradition of "general government fiscal balances" as suggested by the OECD (Roseveare *et al.* 1996). Again, see Fenge and Werding (2003) for a comparison of measurement concepts.

[8] Both these number have been determined based on long-term average rates for the major industrialised countries. Note that our results are clearly sensitive to the difference of $r - g$ regarding both the level of implicit tax rates and the increases of τ as ageing progresses. The fundamental trends are unchanged, however, given a reasonable range of variations.

[9] For the ease of presenting our results in a comprehensive manner, we also refrained from reporting on a large set of sensitivity analyses, although work of this type would be clearly useful if our primary interest were in forecasting national pension budgets.

[10] See Board of Trustees (2000) and Ministry of Health and Welfare (2000).

As a representative agent in each age cohort, we constructed an individual with a stylised biography and working-career (see Appendix B for the precise pattern assumed for the case of Germany) which we did not alter over time, *i. e.* across generations.[11] Basically, we consider a male (blue or white-collar) worker who enters his active period of life at age 20 and then earns just the average wage of all workers throughout his career. He is fully active until some year in his 50s when he is expected to become disabled with some positive probability.[12] With what is left of his earnings capacity, he goes on working until age 65. Upon retirement, he is entitled to receive old-age pension benefits for himself and, where appropriate, for his spouse. When he dies, his widow will receive survivor benefits for some more years if these are contained in the respective pension scheme.[13]

As a result, the three main types of pension benefits – disability pensions, old-age pensions, and survivor benefits – are included in our model. Owing to our national expertise, the standardised individual is based on a number of assumptions which may appear to be natural by German standards. However, we were very reluctant in adapting them in the cases of other countries. The chief purpose of our calculations is to compare the effects of different institutions – over time and across countries – and not the impact of differences in behaviour.[14] We therefore made a number of adjustments with respect to disability rates and life-expectancy, the latter being particularly important for our results (*e.g.*, in the case of Japan). But as a matter of fact we stayed as close as possible with the original design.

For the sake of briefness, we will not go into too many details of the pension systems that are considered in the following. Comprehensive descriptions, including broad-based international comparisons of existing pension systems, can be found in various sources which are regularly up-dated (again, see Appendix A). Information on current discussions regarding pension reform which are going on in many countries is included in many readers which have been published recently for the purposes of both policy-makers and the research community.[15]

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[11] Among other things, this implies that some of the effects of changes in early retirement over time are hidden in our calculations.

[12] Basically, this probability is given by the ratio of people at working age receiving disability benefits over the population aged 53–64.

[13] Mortality assumptions are based on conditional life-expectancy for males and females at relevant ages. For more details, see Thum and Weizsäcker (2000) who did earlier calculations for the case of Germany.

[14] Of course, this distinction is not a sharp one: in each country, institutional design and individual behaviour must be expected to be somehow inter-related.

[15] See, for instance, the books edited by Bosworth and Burtless (1998), Siebert (1998), Gruber and Wise (1999), Renaud (2000), or Feldstein and Siebert (2002).

3 The results at a glance

Before looking at individual countries, it may be useful to summarise our main results in a cross-country perspective. Among other things, this may give a flavour of what our results based on the time profile of implicit taxes over successive age cohorts look like. At the same time, it may create a feeling for what is specific in each country, deserving closer scrutiny. Figure 2 displays the results obtained for all the"current policy" scenarios considered.

Figure 2: Current policy scenarios – all countries

Source: CESifo Pension Model.

It is easy to see that, for the (unweighted) average of all countries, there is a clear upward trend in implicit tax rates imposed on life-time income of individuals born between 1940 and 2000. For the initial cohorts, τ_t ranges between around –8 and +8 per cent, while it increases to the 4 to 24 per cent range as we move to the youngest age cohorts.[16] The upward trend is most visible in the cases of Germany, France, and Japan. Due to tighter pension policies pursued throughout or to reforms that were recently enacted, increases are less pronounced for the UK, Sweden, and Italy. In the US, the level of τ_t is remarkably low over the full projection horizon.

[16] For the European countries taken in isolation, we also find that variation increases over time, *viz.* from the 4–9 to the 10–22 per cent range.

These observations imply that there is also some rank reversal across countries going on during the simulation period. In Germany, the burden implied in public pensions is the highest at both ends of the period covered, while France moves from a modal position to the top and Japan catches up from a very modest level of burdens to the (lower) middle. The UK, having imposed strong checks on public pensions for many years, defend a position in the middle of the scale, in spite of recent policy changes that potentially drive up pension expenditure over the long term. Sweden and Italy, both running pension schemes that were rather generous from the very beginning or were seemingly over-drawn during the 1970s to 1990s, respectively, successfully restrict the burden involved in their systems for younger age cohorts. Thus, both countries give examples of remarkable reforms that have taken place in continental Europe, although the level of burdens to be controlled and the speed of adjustments may differ.

4 Results for single countries: the impact of policy responses

4.1 Germany

In Germany, the Statutory Pension Scheme (*Gesetzliche Rentenversicherung*) provides the dominant form of retirement income, covering more than 75 per cent of the current labour force. The scheme does not include civil servants. Also, a large fraction of the self-employed is covered outside the public pension system. Initially, the scheme was conceived to be the public branch of a conventional multi-pillar system. But so far neither employer-based pension plans nor private provisions (other than owner-occupied housing) have ever played a significant role in the overall structure of old-age provision in Germany.

The Statutory Pension Scheme is a prototypical "social insurance", being organised as a separate public budget, financed on a pay-as-you-go basis with ear-marked contributions, and entailing no major elements of redistribution from the rich to the poor.[17] Contributions are linear in the insured workers' earnings, subject to an upper limit which is uniform for both employees and employers.[18] Obligations are shared between these two parties on a 50:50 base. The system is rather ambitious in granting benefits which currently amount to about 70 per cent of an uprated average of life-time net

[17] It should be mentioned that in Germany old-age poverty is taken care of outside the public pension system. However, the proportion of elderly people living on social assistance is much lower than their share in total population.

[18] The limit has been next to constant for many years at about 180 per cent of average wages.

earnings. Pensions are basically indexed to wages, such that their level keeps pace with the growth rate of net earnings.

The system has expanded in the 1960s and the early 1970s. Since then, the level of pensions has been roughly kept constant. In order to do so, contribution rates had to be increased by a considerable margin, due to the slow down in economic activity which took place during the 1980s and early 1990s and, more prominently, to the increasing demographic pressure. Based on a defined-(level-of-) benefits policy legally defined in the "Pension reform act 1992", the contribution rate cut through the 20 per cent line in 1997 – a level which had always been regarded as some sort of natural ceiling. At that time, projections indicated that under unfavourable conditions contributions would even go up to 28 per cent or more by 2035 (*i. e.*, when the peak load of the "baby boomers" is expected to enter retirement).[19] As a consequence, a long debate arose on how to stabilise the system on a more sustainable footing.

Effectively, it has taken two full-scale attempts at deciding over a new pension reform. Backed by a majority in parliament, the pre-1998 government enacted what was then called the "Pension reform act 1999". It would have produced a reduction in replacement rates by around 10 per cent, also adding more severe checks on early retirement and disability pensions. The law was suspended by the new government elected in late 1998 because it was said to be too extreme. Later on, the new majority came out with another reform proposal ("Govt. reform proposal 2000") which, at least during the first round of discussions, was expected to be even more restrictive in terms of cutting down future pension benefits (now by about 15 per cent, though with a different timing). In subsequent discussions, it became apparent that trade unions were not willing to support the proposal in its original form. Consisting of social democrats and the (left-wing) "green" party, the new government was not able to resist these pressures and revised the proposal. The reform that was finally accepted in summer 2001 and became effective immediately ("Current policy scenario") is again very close to the 1999 plans, although the precise mechanism used for reducing the benefit level is different.

In 1998, the old government also started to change the way in which the pension budget is financed. More specifically, it increased the federal subsidy, financed from general taxation, beyond the level of non-contributory benefits included in the Statutory Pension Scheme. The new authorities immediately decided to follow this policy of making future burdens less visible. In our projections, we therefore corrected contribution rates for the time path of future subsidies that result from these adjustments in law,

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[19] See *Wissenschaftlicher Beirat* (1998). Werding (1999) as well as Sinn and Thum (2000) provide surveys on existing projections.

calculating "pure" pay-as-you-go equilibrium rates which would be needed to finance for total benefits.[20]

The 2001 reform differs from all earlier approaches in that the reduction of public pension benefits shall be made up for by increased pre-cautionary savings. Starting from 2002, individuals are expected to save up to 4 per cent of their gross earnings using a newly defined set of certified products. Savings are subsided at rates that are contingent on income and family status (in particular, the number of children), but so far have not been made mandatory. As in many other cases, it is an open question whether this will really increase private savings, instead of just re-directing flows that would otherwise have gone into a larger class of assets. Abstracting from the subsidies, which are hard to quantify in terms of the representative agent's net gains (and partly just replace other forms of savings-related transfers that existed before), these auxiliary savings can be expected to earn a market rate of interest and, therefore, do not affect our calculations.

The combined effect of all these adjustments in single policy variables can be measured in a comprehensive way by calculating the "implicit tax rate" falling on individuals belonging to successive age-cohorts born between 1940 and the year of 2000. Figure 3 shows our results for the different policy scenarios explained before.

Figure 3: The tax implied in the German Statutory Pension Scheme

Source: CESifo Pension Model.

[20] Absent the federal subsidy contribution rates have to be higher by about 0.8 percentage points in the year of 2000, but by around 5 percentage points at the end of our projection horizon.

For those who were born in 1940 (and entered the labour market after the 1957 pension reform which laid out the overall design of the German pension system for the post-war period), the implicit tax rate has been around 9 per cent of life-time earnings. Irrespective of the legal framework which is assumed, this tax rate must be expected to rise for all subsequent age cohorts. Implicit taxes stay roughly constant at a level of about 11 per cent for those born between 1950 and 1965 (the "baby boomers"). For individuals born 1970 and later on, the tax rate will again continue to increase. In any of the policy scenarios considered, it will more than double for those who are born currently if compared to the initial value.

If, like in the 1992 legal framework, responses to demographic ageing mainly consist of adjustments in contribution rates, the burden of financing for old-age pensions is largely passed on to subsequent generations. For instance, it is not the "baby boomers" themselves who will have to bear the highest tax rate but, roughly speaking, their children who are much fewer in numbers. This is a typical result for the way in which pay-as-you-go schemes with defined benefits distribute the burdens associated with ageing across generations. In a sense, a policy of increasing contribution rates can be interpreted like the introduction of a new pay-as-you-go system on top of the old one: new "inaugural gains" accrue to those who are already in retirement – here, these gains are just enough to reduce the rising burden inherited from earlier generations – and younger age cohorts have to pay the bill (see section 2.2).

Against this background, what different approaches to pension reform can achieve is essentially the following: the particular timing of how they affect contributions and benefits carries through to a different timing of implicit tax rates, shifting some of the burden projected for young and future age-cohorts to older generations. For the implicit taxes falling on older generations, the reduction in pension benefits is more important, while the contribution rates they are facing are mostly given from past history. On the other hand, younger generations benefit from lower contribution rates before they will be receiving lower old-age pensions. The net effect for younger cohorts must be an advantage by the mere existence of τ_t. Theoretically, mutual changes in overall burdens for old and younger individuals should be expected to cancel out (Sinn 2000). This is not immediate from figure 3 for two important reasons. First, some of the additional burden created by pension reform is falling on those who were born before 1940, but are still in retirement. Second, there is an effect of cohort size to be taken into account when we are looking at individuals, not at full age cohorts. On a *per-capita* basis, the reduction in burdens associated with pension reform can be much higher for cohorts who are relatively small in size than the additional burden placed on larger generations.

These interpretations clearly fit to our results regarding the two different reform scenarios considered in figure 3. The government proposal, which did not pass the parliamentary process in its original form, would have put higher burdens on current "old" and "middle-aged" generations than the reform that has finally been taken. At the same time, it would have reduced the tax rate for future generations based on a deeper cut in the long-term level of pension benefits. If looked at from outside, however, neither of the reforms considered in Germany so far has substantially altered the fundamental trend in implicit tax rates.

4.2 France

The French system of old-age provision is much more fragmented than the system that is in place in Germany. For about 70 per cent of the labour force, retirement income is mainly provided by the *Régime Général*, plus two complementary second-pillar schemes (ARRCO and AGIRC). Employees working in the public sector or with large national firms are covered by specific schemes with respect to their second-pillar claims. As in many other countries, people in self-employment are insured by other specific schemes. The *Régime Général* and many of the second-pillar schemes are co-managed by social partners (*i. e.*, by trade unions and representatives of firms), with strong control over social affairs awarded to these groups of stake-holders. As a result, reforming the system has turned out to be very difficult at several attempts during past years, in spite of growing concern about future sustainability of the current system.[21]

Taking together the two pillars of old-age protection for typical employees, the replacement rate in France ranges from almost 100 per cent for very low wages to around 60 per cent for high earnings (Charpin 1999). If the public *Régime Général* is considered in isolation, average workers receive a cover of around 50 per cent of their wages earned during the best 10 to 25 years in employment. The range of years which are relevant for accruals has been extended by the latest reform which was enacted in 1993. The major step to reform taken at that time was to replace prior wage indexation of pensions after award by CPI indexation. As another important element of reform, the 1993 law extended the number of years needed in order to qualify for full pension entitlements from 37.5 to 40 years. Still, what is particular in France is a very low median age at retirement (Blanchet and Pelé 1999), which is not at least due to the fact that the *Régime Général* still allows for regular retirement at age 60. While the statutory retirement age is subject to intense discussions, no further decisions have been taken to increase it.

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[21] As an early example, see the *Livre blanc* by the *Commissariat Général du Plan* (1991).

As a consequence of the 1993 reform, the French *Régime Général* now follows a mixed strategy with regard to defining the level of current pensions. At award, pension benefits are calculated to meet the replacement rate of 50 per cent mentioned before. Subsequently, pension claims are only adjusted in order to keep their purchasing power constant until the retiree dies. An erosion of the overall level of old-age provision provided by the general regime is thus avoided. On an individual level, however, retirement income will fall short of current living standards of workers at an increasing rate as pensioners are growing older.[22]

All in all, the authorities have made some steps towards tightening the public pension system 1993. But so far, they did not lay hands on the level of pensions at award. As a matter of fact, they did not arrive at enacting any further reforms at all, although the public debate has continued. Currently, the social partners involved in the process have postponed discussions until late in the year of 2002. Our calculations for the case of France (see figure 4) are therefore based on the two types of legal systems that can be observed from the past.[23]

Since the level of pensions provided by, and of contributions made to, the general regime is basically not excessive, the graphs shown in figure 4 start at relatively low levels of implicit taxes.[24] For the "current policy scenario", the tax that is implicitly placed on those born in 1940 is estimated to be at about 3.65 per cent of life-time income. Based on the earlier law, it even would have been as low as 2.5 per cent. Due to large changes in the population structure, implicit tax rates are constantly rising for subsequent generations as they are in the case of Germany. If no further checks are placed on the level of benefits, contribution rates will sharply increase and implicit net taxes must be expected to approach 16 per cent as their end-of-projection level, taking into account the effects of the latest pension reform.

Figure 4 also indicates that the changes enacted in 1993 have already been powerful in reducing the burden passed on to young and future generations.[25] If the current-

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[22] This is true under usual conditions – *i.e.*, if the growth rate of nominal wages exceeds the inflation rate over the long term.

[23] In the case of France, we dropped disability benefits from our calculations because they are financed from a separate budget (FSI) which is heavily subsidised from the general government budget. Omitting disability pensions on both the revenue and benefit side leaves our results undistorted, although we may underestimate the full burden involved in the usual package of old-age security benefits as defined at the outset of section 2.2.

[24] In 1960, the amount of contributions payable to the *Régime Général* was 8.5 per cent of current earnings. Today, the contribution rate has reached a current 16.35 per cent.

[25] For the representative agent with a standardised work-biography, the most important element of these reforms is the change in indexation rules. The other elements of tightening the earlier system also contribute to decreasing the amount of future pension expenditure and, hence, of revenues needed, whereas full-time employees with a complete work-record will not be affected too much in terms of receiving lower benefits.

law scenario is compared to the pre-1993 law projection, a substantial shift in the inter-generational burden sharing is visible. Since the system which is in place today reduces current and future contribution rates, all generations who are now middle-aged or younger clearly benefit from the reform. Again, this result goes through in spite of the reduction in future real benefits that will accrue to the same individuals once they are in retirement. Nonetheless, considering the final level of taxes implied in the *Régime Général*, our estimates show that there is significant scope for further reform if the goal is to balance the system more than has been achieved so far.

Figure 4: Implicit tax rates – the French *Régime Général*

Source: CESifo Pension Model.

4.3 United Kingdom

The U.K. system of old-age provision has gone through many changes during the last 25 years. Basically, the public pension system is a two-tier system providing a flat-rate benefit, the "State Basic Pension", and an additional earnings-related component which, until early 2002, was called the "State Earnings Related Pension Scheme", SERPS. (Following the latest reform to which we will return later on it has been redefined as the "State Second Pension", or "S2P"). Both types of benefits are based on pay-as-you-go financing and are administered as a separate public budget, the so-called National Insurance. SERPS has been introduced in 1978, replacing an older system of "Graduated Retirement Pensions" based on contributions prior to 1975 which is now quickly fading

out. In the early 1980s, a "contracting out" clause was introduced allowing to opt out of SERPS for a voluntary membership in other, employer-based or fully private pension plans. In return, a rebate on National Insurance contribution is granted. The precise rules governing opportunities to quit the system of publicly provided supplementary pensions have been redefined several times and are subject to constant debate.

Currently, around one third of the U.K. labour force still participates in SERPS (or S2P). Almost two thirds are covered by different forms of contracting-out arrangements,[26] while a minority of less than 5 per cent have no cover apart from State Basic Pensions (Blake 2002). On the other hand, around 44 (64) per cent of retirement income accruing to married couples (in brackets: singles) is provided by public benefits,[27] 30 (22) per cent comes from occupational pensions, and another 16 (9) per cent are income derived from individual investment (Department of Social Security 2000).

The observation of frequent change is also true for the overall structure of the public pension system that remains in operation for those who are still contracted in and, to a lesser extent, for those who opted out. In 1975, the way in which revenues for National Insurance were raised has switched from lump-sum contributions to earnings-related contributions, with a complicated structure of differing contribution rates applying to both employees and employers across several wage brackets. Since then, the structure has changed several times. Currently, there is a uniform lower threshold for contributions to become payable for employees and employers (£ 87 per week of gross wages in the fiscal year of 2001/02).[28] Employees have to pay a fraction of 10 per cent of contributions when contracted in, while employers have to pay 11.9 per cent of contributions.[29] In the case of employees, an upper earnings limit (£ 575 per week) is defined, while for employers no such limit is in place. Current contracted-out rebates are 1.6 and 3 per cent of earnings for employees and employers, respectively. In the following, we will first concentrate on the case of contracted-in employment.

Until early 2002, individuals who had not opted out from SERPS received a flat-rate benefit (in 2001/02: £ 115.90 a week, including a "spouse benefit" allocated to

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[26] The dominant form of contracting out is based on "contracted-out salary-related schemes" which were introduced from the very beginning. More recently, so-called "money purchase" schemes and "appropriate personal pensions" are growing more and more important, but still are much smaller in size than the salary-related plans (Government Actuary's Department 2000).

[27] This includes a number of non-(old-age pension and incapacity) benefits, like housing benefits, council tax benefits, *etc.*

[28] Note that this lower threshold is not fully identical with the "lower earnings limit" (£ 72 a week) defining the minimum amount of income insured.

[29] National Insurance contributions are partly used to finance for other than pension benefits (including, among other things, an allocation to the British National Health Service since a number of years). In our calculations, effective contributions have been corrected in order to make the results comparable to those obtained for other countries.

partners who do not qualify for a State Basic Pension), plus the earnings-related supplementary pension, covering 25 to 20 per cent of an uprated average of life-time wages falling in the range between lower and upper earnings limits. (The maximum of 25 per cent has been reached for those retiring in the year of 1999/2000, while for subsequent cohorts of pensioners, accrual rates were to be gradually reduced, so that a replacement rate of 20 per cent was scheduled to be fully effective for those retiring after 2015.) As a result of contributions that are largely linear in earnings between lower and upper limits and benefits that are composed by a lump-sum amount and an earnings-related component, the British public pension scheme must be expected to redistribute across earnings brackets in a conventional manner, *i. e.* from those with higher earnings to those who earn low wages. In order to capture this feature in our calculations, we consider three main types of workers. Those with "high earnings" are receiving wages that are 50 per cent higher than those with "average earnings" throughout their working-life. Conversely, those regarded as receiving "low earnings" are on wages that are 50 per cent below the average. These relations apply to both past and projected wages, and we will see how this affects the level and time-path of implicit tax rates for the income groups defined here.[30]

A very important issue for both the financial prospects of the U.K. pension system and the level of implicit taxation of current and future generations turns out to be the following. If earnings limits and flat-rate Basic Pensions are assumed to be indexed to prices over the next 50 years, as they have been during the 1980s and 1990s, the system would become less and less expensive on relative terms – if compared to current GDP, for example. At the same time, the system effectively changes its nature: By 2050, those with high earnings would pay contributions only for less than one third of their wages, those with average earnings would pay contributions on half of their wages, while for those with low earnings, contributions were payable on 90 per cent of their wages.[31] In

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[30] In the case of other pension systems considered here – in particular, that of France – redistribution is effected more indirectly through limits on the number of years that are relevant for calculating individual pension claims. In these cases, the direction of redistribution is not as obvious as in the present case. For instance, those may benefit from these rules who have spent a long time qualifying for high-skill jobs and are earning rather high wages during a shorter period of time, thus being entitled to receive high pension benefits. Therefore, we did not see a straightforward method of how to capture these institutional features for a comprehensive comparison across countries and stayed with the design based on full-time working-careers for individuals with average earnings.

[31] Currently, the upper earnings limit is in the range of 125 per cent of average wages. It has been up to 160 per cent in the early 1980s but, due to increases that fell short of wage growth, it has substantially eroded since then. Conversely, the lower earnings limit defining the fraction of earnings that is exempted from contributions in the case of low-wage earners has declined from more than 20 per cent to about 16 per cent over the last two decades. Continuing with price indexation of earnings limits would extend these trends into the future. Up to a point, the recent introduction of higher thresholds for contributions to become payable can be seen as a side-step meant to avoid part of these problems.

the State Basic Pension scheme, all of these individuals would be entitled to receive pensions that have gone down to about 11 per cent of average earnings, whereas the current replacement rate is around 25 per cent. The impact in terms of implicit tax rates imposed on individuals in different age cohorts with differing earnings profiles is shown in figure 5, panel a).

The main alternative that has been considered by the current Labour government for several years is given by earnings upratings of both earnings limits and flat-rate benefits (see Government Actuary's Department 1999). In this case, the public pension scheme would expand with old-age dependency *and* with economic growth. As a consequence, future contribution rates would be much higher than in the price-uprating scenario. Also, the pension system would retain its character regarding replacement rates and intra-generational redistribution. It is easy to understand that decisions regarding any of these policy options that are binding over the long term are not feasible. For the fiscal year of 2002/03, however, the government has adopted a mixed indexation regime that comes close to the case of full earnings upratings: old-age pensions, survivor benefits (but no other benefits included in the National Insurance scheme like, *e.g.*, incapacity benefits) and lower earnings thresholds have been increased in line with wage growth, while the upper earnings limit is still indexed to prices (Government Actuary's Department 2002). If we take this as indicating a new type of policy to be pursued until 2050, we obtain the alternative set of results presented in figure 5, panel b).

Another element of the current reform package that is captured in figure 5 b) is the switch from SERPS to the new S2P regime which is based on the Child Support, Pensions and Social Security Act 2000. Here, the main adjustment is that accruals are no longer linear in earnings between lower and upper earnings limits. Instead, the range of covered earnings is divided into three bands, with marginal accrual factors varying from 40 per cent over 10 per cent to 20 per cent as one moves from the lower earnings limit to higher wages. As a consequence, the S2P benefit formula has also become more redistributive across different earnings brackets, thus reinforcing the effect of current changes related to the State Basic Pensions. Redistribution from high-wage earners to those with low wages effected through the S2P scheme may still be limited by the fact that the upper earnings limit might be constantly indexed to prices only.[32]

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[32] On the other hand, if this particular policy were followed until 2050, the lower earnings limit would eventually approach the upper earnings limit. We therefore assumed that the upper earnings limit will effectively be replaced by the new threshold between "bands" 2 and 3 of covered earnings (slightly more than 100 per cent of average earnings) once this threshold, when indexed to wages, exceeds the current upper limit.

Figure 5: Implicit tax rates – U.K. National Insurance (Contracted-in employment)

a) Pre-2002 law (price indexation of earnings limits and flat-rate benefits + SERPS)

b) 2002 reform (wage indexation of earnings limits and flat-rate benefits + S2P)

Source: CESifo Pension Model.

Comparing the two scenarios considered in figures 5 a) and b), we shun any predictions as to which path of policy will be followed in future upratings of all the relevant parameters. In spite of labelling the panels as the "pre-2002 law" and the current "2002 reform", it may be reasonable to assume that actual developments may be located somewhere between the two limiting cases simulated here, if only because political majorities responsible for current short-term adjustments may continue to change.

In any case, given the low level of public old-age protection in the U.K., all curves shown in figure 5 start at relatively low tax rates. For those born in 1940, implicit taxes are lower in the case of earnings upratings than in the alternative case since, given their past record of contributions, they will receive higher benefits in the future if this is the option chosen. This is true across all classes of earnings who are generally ordered, as should be expected, according to a positive correlation between their level of earnings and the size of implicit tax rates they are facing.[33] As the system has expanded with the introduction and maturing of SERPS, tax rates for the age cohorts born between 1940 and 1960 are increasing, the ranking of income groups being unchanged. For younger age cohorts, their full life-time burden incurred through contracted-in participation in the National Insurance system of old-age provision will be highly dependent on the choice of future upratings.

In the case of price upratings of the relevant parameters, tax rates imposed on young and future generations will go down for those with (higher than) average earnings. The fact that they will have to pay lower contribution rates on decreasing portions of current earnings will more than compensate these individuals for their lower pension entitlements. On the other hand, for individuals with low earnings, implicit tax rates must be expected to increase over time in a process by which they might eventually converge towards those for individuals with higher earnings. As a matter of fact, the redistributive features of the U.K. system of public old-age provision would gradually fade out if the policy of price-oriented indexation of all the relevant parameters were pursued throughout the long-term horizon of our projections.[34] In the alternative scenario based on earnings-oriented upratings, tax rates will continue to increase as in the

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[33] It should not come as a surprise that the implicit tax rate can be next to zero or even negative for "low wage" earners who benefit from redistribution between the rich and the poor. If we were looking at individuals with wages in the range of the lower earnings limits, the net subsidy received through the flat-rate basic pension would turn out to be even higher.

[34] It is sometimes argued that the intra-generational redistribution that is built into the British (and, to some extent, the US) public pension scheme is partly off-set by the fact that individual life-expectancies and, hence, net present values of pension benefits are positively correlated with the level of earnings. At the same time, our main finding is not that there *is* intra-generational redistribution involved in the UK pension scheme but that, given it exists, there will be a strong tendency to *revert* it in the case of continuous price upratings. In this case, the diverging trends in implicit tax rates for different earnings brackets would go through even if the claim discussed here is correct.

other countries considered before. They are lower than in the earlier cases because the British public pension system is less ambitious than those in other European countries and because the process of ageing is not as extreme in the U.K. as in most of continental Europe. Furthermore, in this scenario the redistribution of income involved in the British pension system will remain roughly intact, the burden imposed on high wage earners being limited through the ceiling on their contributions.

Arguably, none of the scenarios looked at so far should be called the "current policy scenario", demonstrating how public pensions affect life-time income of an average British worker. As a matter of fact, the variant included in our initial survey of major results (*i.e.*, in figure 2) is the one related to individuals with average earnings who left the public supplementary pension scheme altogether (under the "reform 2002" framework). Considering that effective life-time tax rates for current workers are largely positive, in particular for those earning high or average wages, there may be a strong incentive to opt out of the National Insurance system to the largest possible extent. Since contracting out is limited to SERPS or S2P, the effect of doing so is not as large as one may suspect (see figure 6).

Figure 6: Implicit tax rates in the U.K. – Contracted-out employment (2002 reform)

* (Current policy scenario)

Source: CESifo Pension Model.

In figure 6, we concentrate on the most conventional case of contracting out for "salary-related schemes" at the earliest possible stage, thus disregarding higher rebate

rates that have been introduced more recently with respect of other forms of contracting-out arrangements. In addition, we assume that future rebates will have to correspond to the development of S2P claims foregone. This implies that in the case of earnings upratings, rebate rates will have to be roughly constant over time (while, in the alternative case of price upratings, they would have to be reduced over the next two decades because the fraction of income insured in the S2P scheme would considerably decrease; see Government Actuary's Department 1999).

All in all, our results for the case of "contracted-out" employment indicate that evading part of the public pension system creates an advantage for average earners who are born since the late 1940s. Similar things are true for those with high earnings, while low-wage earners are always better off staying with public supplementary pensions. At least, this is a clear-cut result following the most recent adjustments made in 2002.

4.4 Italy

In Italy, the old-age dependency ratio is expected to exceed 61 per cent by 2050 (see figure 1). Thus, Italy will be hit by demographic ageing more than most other European country. At the same time, pension spending per GDP in Italy is the highest among a larger number of OECD countries today, at the outset of these imminent changes. This is due to a public pension system which has been very generous for several decades in terms of granting relatively high benefits to employees who retire rather early (Baldini *et al.* 2001; Franco 2002). Before any reforms were started, the level of fully-fledged pension claims accruing to an average Italian worker with a full work-record was about 79 per cent if compared to current wages earned by active individuals. Reductions in the case of early retirement were virtually absent.

As a consequence, those who are insured in the *Fondo Pensione Lavoratori Dipendenti* (FPLD) – the central pillar of the Italian public pension system – are faced with extreme contribution rates. In 1995, contributions amounted to 27.12 per cent of gross wages, shared between employers and employees. On top of that, the system has received substantial subsidies from general tax revenues until the mid-1990s, contributing to large public deficits. As a consequence, reforming public pensions was one of the major tasks to be accomplished when Italy started to go for a more balanced situation of public finances in the course of preparing for the European Monetary Union.

Recent pension reforms in Italy have been enacted in two steps: the so-called "Amato reform" introduced in 1992, and a more radical step taken through the "Dini reform" in 1995.[35] The revisions affect all branches of the Italian public pension

[35] For relevant surveys, see Hamann (1997), Ferraresi and Fornero (2000) or, again, Franco (2002).

scheme, although our calculations concentrate on the FPLD which covers around 70 per cent of the Italian labour force.[36] The 1992 reform was primarily aimed at limiting the share of pension expenditure to its 1992 level (equal to 14.9 per cent of GDP) by means of a switch from wage indexation to CPI indexation of benefits and an extension of the reference period for pensionable earnings from no more than five years to virtually the whole working life. Other measures taken in 1992, like the increase in the statutory retirement age (from 55 to 60 for females and from 60 to 65 for males), were partly rolled back by the subsequent reform which followed a new approach to strengthening the principles of actuarial fairness inside public pension schemes.

The new philosophy established in 1995 is that the definition of individual pension claims should rest on "notional individual accounts". In the post-1995 system, old-age pensions are strongly related to contributions paid over the whole working life, based on an age-related conversion coefficient which uses GDP growth as the internal rate of return to life-time contributions and implies actuarial reductions of benefits in the case of early retirement. Given these changes, workers are relatively free in choosing their retirement age between 57 and 65 years.

Following these reforms, the long-term prospects for financing public pensions in Italy have clearly improved. Prior to the 1992 reform, the ratio of pension expenditure over GDP was expected to approach 25 per cent by 2030, while the latest official projections state that it may be close to 16 per cent in 2030 and could then decline to about 13 per cent until 2050 (*Ministero del Tesoro / Ragioneria Generale dello Stato* 1999). Similarly, the contribution rate was formerly expected to exceed 55 per cent at some point in the mid-term future. It has been set to a current 33 per cent in the aftermath of the latest reform, but is now expected to stay roughly constant over the next three decades.[37] Still, pension benefits and the corresponding contribution rates will be rather high over the next two decades, as is observed by many national experts (Hamann 1997; Ferraresi and Fornero 2000; or Franco 2002). The main reason is that the phase-in of the reform is extremely gradual, with transition periods implying that the 1995 reform – taking into account and extending transition periods related to the 1992 reform package – will not become fully effective before 2050. In other words, older workers are largely protected against the extra-burden involved in pension reform, while younger workers still have to pay for relatively high pensions for quite some time.

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[36] In the Italian public pension system, other categorical schemes are operating for farmers and agricultural workers, artisans, shopkeepers, and other groups of mainly self-employed professionals.

[37] These predictions are largely confirmed by our own projections. In the case of the pre-1992 legal framework, contribution rates would climb up to 55.7 per cent in 2040, then declining to slightly less than 50 per cent until 2050. Based on the 1995 reform, they may now peak at 35.6 per cent during the late 2020s, then returning to about 26 per cent by 2050.

How do these trends and observations translate into patterns of implicit tax rates imposed on individuals born between 1940 and 2000? As in the case of other countries, we compare three variants of legal arrangements which have been effective in the past decade: the pre-1992 framework, the 1992 ("Amato") reform, and a current policy scenario based on the latest 1995 ("Dini") reform. If compared to the results obtained for other countries, two aspects are immediate from figure 7. First, the overall level of taxes implied in the Italian public pension scheme is rather high. This comes as no surprise taking into account the current high levels of both contribution rates and pension benefits. Second, we observe that it takes quite some time in the Italian case until individuals are faced with lower life-time tax rates as a result of pension reform.

Figure 7: Implicit tax rates – the Italian *Fondo Pensione Lavoratori Dipendenti*

Source: CESifo Pension Model.

For the (baseline) case of retirement at age 65, our calculations indicate that individuals born 1980 and later would have benefited from the 1992 reform. Taking into account the subsequent changes enacted in 1995, this threshold moves down to age cohorts born around 1975. Surprisingly, all generations covered in our projections have a lower implicit tax rate in the 1995 scenario than in the 1992 variant, provided that they go on working until the statutory retirement age. This reflects the fact that the 1992 reform was mainly about cutting the overall volume of future pension expenditure, while the 1995 package moved on to addressing "structural" reforms in some more detail.

Among other things, disincentives regarding prolonged activity were targeted at more precisely by the measures applied in 1995. In other words, a majority of individuals who would have retired early under the 1992 rules effectively have to pay part of the bill.

Apart from these details, the overall picture obtained in figure 7 is similar to our earlier results. In the pre-1992 case, implicit tax rates are extremely low for those born 1940 through 1945, while τ_t is continuously rising for subsequent generations. Against this background, the major effect of pension reform is that higher burdens are placed on old and middle-aged workers, while the increase for young and future age cohorts is reduced or, in the case of the 1995 reform, even reverted. The latter aspect highlights that, given the substantial pressure in terms of projected future pension expenditure, the reforms adopted in Italy during the 1990s are really remarkable.

4.5 Sweden

By European standards, Sweden offers another example of fundamental pension reform, in spite of the fact that the country is not as severely affected by demographic ageing as many other OECD countries are. Prior to changes enacted in 1998, the Swedish public pension scheme was operated as a two-tier system, comprising both a universal flat-rate pension (*Folkpension*) dating back to 1947 and an important earnings-related, or "supplementary", pension (*Allmän tilläggspension*, ATP) which was introduced in 1960.[38] *Folkpensions* were granted to everyone who had lived in Sweden for more than three years or had at least had three years of employment in the country. In order to qualify for a fully-fledged basic pension, however, 40 years of residence or employment were needed, and the pension was reduced proportionally for each year effectively lacking. Originally, basic pensions were completely financed from general government revenues. Since 1974, they were partly covered by contributions imposed on employers and the self-employed only. In 1998, the level of basic pensions (payable per retiree in the household) was approximately 14.5 per cent of current average wages.

Over time, the ATP system turned out to be the dominant form of public pensions, backed by participation rates of both males and females that are relatively high if compared on an international level. The amount of ATP benefits was contingent on years worked and wages earned. For individuals who worked for 30 years or more, ATP pensions amounted to around 60 per cent of their average pensionable earnings, calculated from the "best" 15 years in employment. As the combined effect of basic pensions and ATP claims, pensions for a married single-earner with a full life-time working-career were at a level of about 72 per cent of current average earnings. Until 1994, ATP pen-

[38] For many years, the Swedish system of public pensions has been augmented by employer-based pensions which were not affected by the recent reforms.

sions were exclusively financed by contributions raised from employers and self-employed. In 1995, employees' contributions were introduced at a rate of 1 per cent, total contributions then being 19.86 per cent of gross wages.[39] Since 1998, contribution rates are next to equally shared between employers and employees.

It should be mentioned that, over the years, the ATP system has built up a considerable amount of buffer funds which are now equal to total pension expenditure of about three and a half years. During the 1990s, however, net injections into these funds have become negative. Given constant contribution rates, the funds would have expired in 2012, contribution rates then jumping up to around 23 per cent and further increasing to around 30 per cent until the late 2030s. Following several years of fiddling around with some parameters of the old system, these unfavourable prospects triggered a reform enacted in 1998 which established an entirely new set of rules (Palmer 2000; 2002).

The new Swedish pension system again has two branches, one (the "income", or "income-related", pension) being a comprehensive pay-as-you-go scheme, the other (the "premium" pension) being based on mandatory savings. Starting from 2001, social security contributions are set to18.5 per cent of gross wages, subject to an upper limit, of which 16 percentage points are used for financing current pensions, while 2.5 percentage points are channelled into pension funds with individual accounts. Individuals who have extremely low income or no income at all are protected by a guarantee pension which is financed from the general budget and, net of taxes, is in the range of earlier *Folkpension* claims.

Like the Italian post-1995 public pension scheme, the new pay-as-you-go scheme is operated based on "notional individual accounts". *I.e.*, pension benefits are strictly related to earlier contributions, using both an imputed real rate of return of 1.6 per cent (adjusted if actual growth rates exceed this limit) and all the information that is available regarding future ("unisex") life-expectancies of new cohorts of pensioners.[40] In other words, the system is close to a conventional "defined contribution" plan based on actual individual accounts, and principles of actuarial fairness are introduced into the domain of public pensions. The new system is expected to go along with constant contribution rates. The cost is that, over the long term, the replacement rate of pay-as-you-

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[39] The portion of contributions that is attributable to old-age pensions was 16.0 per cent. As in the case of France, we have to omit disability pensions here, because they were financed from various sources during the simulation period. In periods where they were financed from social security contributions, we adjust contribution rates based on the share of pension expenditure related to disability.

[40] It should be mentioned that, apart from *Folkpensions* or guarantee pensions for spouses without any work-record of their own, survivor pensions have been largely absent from the Swedish pension system even in the past. In the new system, additional cover can be bought for survivors, or a single-earner's pension can be annuitised taking into account benefits accruing to survivant spouses.

go pensions will decrease by 50 per cent or more if measured by earnings of those who are currently active.

As was mentioned before, income pensions provided by the new pay-as-you-go scheme are augmented by so-called premium pensions which arise from mandatory savings which have to be made at a rate of 2.5 per cent of annual gross earnings. This fraction is collected along with all other social security contributions at next to no administrative costs, making sure that everyone complies with the compulsory rules. Funds can be invested in a very broad array of certified assets, including shares, bonds and other securities that are available through financial markets. Also, savers can flexibly adjust their portfolio, bearing the full financial risk of all their transactions. In order to keep transaction costs low, all investment is channelled through a public "premium pension authority" (*Premiepensionsmyndigheten*, PPM). This body acts as a meta-fund manager and as a clearing-house, carrying out all net-transactions that arise from individual (re-)investment decisions.[41] All in all, the framework invented for premium pensions appears to be a flexible, low-cost combination of public administration and private-sector arrangements which deserves a lot of attention from other countries that are trying to move their overall system of old-age provision in the direction of higher prefunding through investment in financial markets. Since, by definition, contributions made to the premium pension system earn a market rate of interest (disregarding risk and transaction cost, if any), they do not involve an implicit tax. Therefore, this branch of the new Swedish pension system will be ignored in our simulations.

Again, transition from the old to the new system is only gradual, with cohorts born between 1938 and 1953 being subject to a mixed regime. However, the speed of transition is high.[42] As a consequence, the shift in net life-time taxes from young age cohorts to those who are already approaching retirement turns out to be a huge one (see figure 8). Cohorts born up until the mid-1970s effectively face higher implicit tax rates in the new regime than they would have in the old one. At the same time, the Swedish have apparently halted further increases in implicit tax rates for younger individuals before they would have climbed up to levels projected for many other European countries.

In the old system implicit tax rates would have continuously increased from less than 3 per cent of life-time earnings of those born in 1940 to more than 20 per cent for those born today. Following the 1998 reform, tax burdens almost perfectly level off at about 12 per cent for individuals born 1954 and later, *i.e.* for those who are fully subject

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[41] The PPM also provides a low-risk unit portfolio, the "Premium saving fund", for those who do not report any particular choices of funds.

[42] Pensioners born 1938 will receive 80 per cent of their pension benefits calculated according the rules of the old system, 20 per cent based on the new rules. For each subsequent cohort, this mixture will be shifted by ± 5 per cent, respectively.

to the new pension system. Essentially, this is a result of two effects. On the one hand, future pay-as-you-go pensions accruing to life-time contributors have been adjusted to a level which, after the transition period, is next to constant in terms of life-time present values. On the other hand, given current demographic projections, the level of benefits also allows for constant contribution rates.

Figure 8: Implicit tax rates – the case of Sweden

Source: CESifo Pension Model.

4.6 United States

If compared to European countries, demographic ageing is by far less significant in the US. Nonetheless, discussions about the consequences of ageing for US Social Security started at an early stage in the 1980s and, with some variation in intensity, have been going on ever since. The Social Security scheme has been established in 1935, comprising all branches of old-age, disability and survivors insurance and, at that time, covering most employed individuals. Over time, coverage became almost universal, now including also the self-employed and most public-sector employees. Old-age pensions are based on a career average of (wage-)indexed earnings, based on the "best" 35 years in employment. The formula used for calculating benefits is progressive, since individual amounts of average indexed earnings are divided into several brackets which are then converted into pension entitlements subject to ratios of 90, 32, and 15 per cent in

ascending order.[43] This implies that a higher replacement rate applies to retirees who had lower life-time earnings, such that US Social Security is situated half way between an almost entirely "linear" system like the German one and a system providing flat-rate benefits like the U.K. State Basic Pension scheme. After award, benefits are regularly adjusted to cost-of-living inflation.

Currently, the statutory retirement age is 65 for individuals born 1937 or earlier, while early retirement benefits are available starting from age 62 with next-to-actuarially-fair reductions. A reform enacted as early as 1983 gradually raises the normal retirement age to 67 for individuals born after 1960, early retirement still being possible starting from age 62 with a permanent reduction of benefits by up to 30 per cent. Since 1990, all components of social security benefits, *i.e.* old-age pensions, disability benefits and survivors' benefits, are financed from contributions raised on gross earnings at a rate of 12.4 per cent, the tax base as well as covered earnings being subject to an upper limit of about 2.5 times average earnings.

An important feature of the US Social Security system is that it is currently building up a buffer fund intended as a pre-requisite to cope with demographic ageing. In the course of the 1983 reform, the decision was taken to increase contribution rates beyond current cost rates, such that annual revenues now regularly exceed annual pension expenditure. The idea was to expand the Social Security Trust Funds which existed before on a much smaller scale, thus collecting reserves in order to finance for old-age provision in future periods when the "baby boomers" would enter retirement.[44] This is a general strategy of dealing with the financial pressure arising from projected ageing – at the same time reshuffling burdens across generations – which has been considered in several other countries.[45] However, the US are one of the few examples where this option has been chosen in good time and has now been followed for almost two decades. The drawback is that the funds, which are publicly managed and not attributable to insured individuals, are mainly invested in government bonds. As mentioned earlier, the consequence is that fund depreciation will affect the general government budget.

In the public as well as among economists, the reform taken in 1983 has not removed concerns about the future of Social Security. During recent years, discussions have focused on issues like the feasibility of a transition to a fully-fledged capital-

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[43] On top of a retired worker's pension claim, another 50 per cent of the benefit are granted to his or her spouse, unless the additional amount is not exceeded by the spouse's own pension claim.

[44] Not only the extent, but also the timing of demographic ageing in the US is different from that envisaged for most European countries. In this country, the "baby boom" started immediately after World War II, such that "baby boomers" will enter retirement age starting before 2010.

[45] In the case of Germany, a similar proposal has been made by the Advisory Board of the Federal Ministry of Economics (*Wissenschaftlicher Beirat* 1998).

reserve system based on individual accounts or, which amounts to virtually the same, on privatising the current system of public old-age provision (Feldstein 1995; Kotlikoff *et al.* 1998). In any of these cases, first-pillar pensions and the most important forms of employer-based, second-pillar pensions would tend to converge.[46] The debate on social security reform gained momentum following the change from the Clinton administration to the presidency of George Bush Jr.[47] In May 2001, the latter established a new "President's Commission to Strengthen Social Security" which, in their interim and (draft) final reports (President's Commission 2001a; 2001b), showed much concern about expected depreciation of the Social Security Trust Funds. The alternatives suggested by the commission, all involving a (partial) transition to an individual account system, are not undisputed. Currently, there are no final conclusions regarding the future design of US Social Security.

Financial prospects for maintaining Social Security based on the current legal framework are explored on a regular basis by official forecasts which, covering a time horizon of 75 years into the future, are extremely long-term in their nature (see, for instance, Board of Trustees 2000). For our calculations, we decided to build on these projections, adapting them to our set of assumptions where needed for cross-country comparability. In addition, we had to check for the robustness of results regarding the points in time when net investment in the Social Security Trust Funds would turn negative, when it would finally be exhausted, *etc*. Also, we effectively consider two scenarios. Building on the current legal framework, we constructed a "Social Security Trust Funds" scenario, encompassing all changes enacted in 1983 (plus some further corrections which have been added subsequently). As a counter-factual, we also look at a pure "pay-as-you-go" scenario, using the time series of full "cost rates" applying to annual Social Security expenditure instead of actual contribution rates throughout the projection period. Figure 9 illustrates our results obtained for the case of US Social Security.

The low level of implicit tax rates estimated for the case of the US is a consequence of the fact that public involvement in the overall system of old-age provision is relatively low in this country. In addition, part of the "inaugural gains" arising from the introduction or expansion of unfunded pension schemes may be reflected in very low

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[46] In the US, occupational pensions are very important. Within this pillar, there has been a notable move from "defined benefit" (DB) plans to "defined contributions" (DC) plans over the last two decades. A wide-spread sub-category of pensions of the latter type is represented by so-called "401(k) plans" – named after the relevant section of the Internal Revenue Code.

[47] President Clinton, when announcing the prospects for a longer period of budgetary surpluses in Congress, had suggested to "Save Social Security First". In contrast, President Bush Jr. decided to "spend" these surpluses on major tax reductions and, more recently, on higher government expenditure meant to stimulate the economic development in the aftermath of the September 2001 terrorist attacks on New York City and Washington D.C.

implicit tax rates falling on the first age cohorts covered by our calculations. For individuals born between 1955 and 1980, the extensive use made of the Social Security Trust Funds – as a buffer fund against the impact of demographic ageing on social security contributions – implies that implicit tax burdens are next to constant at a level of about 3.5 per cent. Those born 1980 or later are affected by ageing at an increasing rate, implicit taxes approaching 5.5 per cent of life-time earnings for individuals born today.

Figure 9: Implicit tax rates – US Social Security

Source: CESifo Pension Model.

A result implied in current official projections run by the Social Security Board of Trustees (2000) is that, for the entire old-age, survivors and disability insurance scheme, cost rates will exceed contributions rates starting from 2014. According to our calculations, the reserves collected in the Social Security Trust Funds will effectively start decreasing in 2022/23, due to continuing accumulation of returns on existing funds. Social Security will finally run out of funds around 2043. Instead of paying contribution rates that are constant at their current level (12.4 per cent), young and future generations will then be faced with the full amount of higher cost rates, climbing up from about 17.8 per cent to close to 20 per cent during the following three to four decades.

Nonetheless, a comparison with the pure pay-as-you-go scenario reveals that the "trust fund" strategy chosen in 1983 removes much of the inter-generational redistribution which would have been involved in population ageing in the absence of any pre-

cautionary reforms. Increasing social security taxes beyond current cost rates in the period from 1983 to 2013 (and raising the statutory age of retirement) has increased implicit tax rates for the age cohorts born until 1970. At the same time, taking these measures at an early stage has helped in averting a situation where implicit taxes would have gone up to about 8.5 per cent for individuals born in the year of 2000.

4.7 Japan

From a European perspective, the Japanese system of old-age provision shares some common features with the U.K. system.[48] The overall system of old-age protection in Japan has many branches, with employer-based schemes playing an important role. Within the public pension system, two schemes provide the standard form of public pensions awarded to the typical employee, one being a flat-rate scheme with rather low benefits which is open to all the long-term residents, the other usually granting a larger fraction of retirement income in the form of earnings-related benefits. In the following, we will concentrate on these two schemes, providing a "universal pension benefit" (*kokumin nenkin*) and a compulsory supplementary pension for private sector employees (*kôsei nenkin hoken*).

The universal, or National, pension system has been set up in 1959 for people who did not receive cover from any company pension plan. It has become universal in 1986. Basically, the contribution is a monthly flat-rate of 13,300 ¥ (since 1998). For wage earners, this contribution is included in those made to the earnings-related system. For their spouses, contributions to the universal systems are free. A fully-fledged pension claim is acquired after 40 years of membership and is then given by a monthly benefit of 66,625 ¥. Universal pensions are financed on a pure pay-as-you-go basis, part of the revenues being taken from general taxation.

The current system of supplementary, earnings-related pensions has been installed in 1954, replacing older arrangements of a similar type. In contrast to public pension schemes in most other industrialised countries, the system is based on pay-as-you-go financing *with* a substantial stock of capital reserves. If compared to the cases of Sweden and the US, capital reserves in the Japanese system are supposed to be more than just a "buffer fund", intended to depreciate entirely as the "baby boomers" retire. But again, funds are mainly invested in government bonds, thus allowing for much more flexibility in determining current benefits and contribution rates than with a binding pay-as-you-go constraint, while for the public budget as a whole the system is not too

[48] For relevant surveys, see Clark (1998), Estienne and Murakami (2000), or Conrad (2001).

different from explicit non-funding with respect to the problems involved in demographic ageing.

In the early years covered by our simulations, contributions to the public pension system have been rather low. In 1960, contribution rates were no higher than 3.335 per cent of monthly earnings, subject to an upper limit and excluding annual bonuses which generally amount to between three and four months' earnings. Contribution rates exceeded 10 per cent of monthly earnings in the early 1980s and have climbed up to the current rate of 17.35 per cent in 1997. Since 1994, annual bonuses are included in financing the pension system through a special deduction of 1 per cent.

The replacement rate for a wage earner with a full life-time working career, jointly determined for his universal pension claim and the earnings-related component of public pensions, is now in the range of 50 per cent of gross earnings excluding bonus payments. In terms of net pension levels, this amounts to roughly 65 per cent of net earnings, now including average bonuses. In addition, a married couple will receive a second flat-rate benefit for a spouse who has not participated in the labour force. As in the cases of France and the US, individual pensions at award are adjusted to meet the aforementioned replacement levels. Following the latest reform enacted in 2000, they are then indexed to consumer prices in order to keep up their purchasing power.

One of the most important problems of the Japanese pension system is that the country is among those most heavily affected by demographic ageing. Total fertility rates in Japan have gone down from more than 3.5 births per woman in her fertile age in the early 1950s to a current 1.3. In most other OECD countries, the peak of the "baby boom" has been at lower fertility rates which rarely exceeded 2.5, while the current birth rate in Japan falls in the same range as in some European "low fertility" countries. At the same time, life expectancy of elderly Japanese people ranges considerably ahead of that in other industrialised countries, the median length of life being 80.2 years for male persons and 86.8 years for females.

Recent discussions regarding pension reform started some years ago.[49] In 1997, the government officially constituted a consultative committee. A "White paper on pensions" was drafted for the first time, which has been up-dated several times during the discussions. In its original form, the paper laid out different policy scenarios ranging from an unchanged level of benefits over several options of reducing benefits by 10 to 40 per cent to a radical abolition of supplementary pensions provided by the state. Officially, none of these proposals was favoured over the others by the public authorities involved. In a subsequent version of the White paper (Ministry for Health and Welfare

[49] See Estienne and Murakami (2000) who explain the anatomy of the reform process, discuss the proposals that have been made so far and add an annex on earlier reforms.

2000), only three scenarios were left: For the "status-quo" variant with constant benefit levels, contribution rates were projected to climb up to 34.5 per cent of monthly earnings (excluding bonuses) by the year of 2025; then, they were assumed to stay constant until 2060. In the two alternative scenarios, the level of benefits was reduced by about 15 per cent until the year of 2025. Depending on the fraction of universal flat-rate benefits which were to be financed from the general government budget – one third or one half – contribution rates were expected to go up to 27.6 or 25.2 per cent.[50]

The year 2000 reform mainly followed the paths suggested in the revised White paper (Conrad 2001; Clark and Mitchell 2001). The benefit level was immediately curtailed by about 5 per cent, reducing the coefficients applied to converting indexed reference earnings into pension benefits from 0.75 to 0.7125 per year of contributions. The mechanism for indexing benefits after award was switched from wage indexation to (French or US style) CPI indexation – so far, however, authorities appear to be reluctant to actually practise this new rule. With respect to the branch for universal pension benefits, the share of general tax revenues was expanded to cover approximately one third of annual pension expenditure.

Regarding implicit tax rates involved in the Japanese public pension system, we will therefore effectively compare the "1999 legal framework" (with a constant level of benefits) to a "current policy" scenario related to the year 2000 reform (where benefits are decreased by –15 per cent and nominal contributions will reach the 27.6 per cent level).[51] The results displayed in figure 10 first of all indicate that the Japanese public pension scheme is still on its way to maturing in the sense that (*i*) the system has notably expanded in terms of replacement rates and contribution rates until the 1980s and that (*ii*) the current shift away from a system which was nominally funded and could draw on substantial capital reserves to a system which is largely, and openly, unfunded is still well on its way. Those who were born in the 1940s and entered the system in the 1960s had to pay for a very low fraction of current pensions. Upon retirement, they will receive pensions at a considerable level. As a consequence, they end up with implicit tax rates that are strongly negative. Over all subsequent generations, implicit taxes go

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[50] In a sense, the revised reform proposals compromise between reform scenarios "B" and "C" of the first draft of the White paper mentioned in Estienne and Murakami (2000): There, the reduction in benefit levels would have been 10 or 20 per cent. Absent any changes in state subsidies, the corresponding contribution rates would have been 30 or 26 per cent in the long run, respectively.

[51] Here, as in the case of US Social Security, we mostly rely on official projections published in the White paper on pensions. With some care, we have been checking whether the developments of benefit levels, contribution rates and pension funds projected there would appear to be feasible or whether, according to our calculations, the system could entirely run out of funds within the projection horizon. The latter turned out to be wrong.

up by a substantial portion of life-time earnings. For age cohorts who are currently young, they will eventually reach "European style" levels.

Figure 10: Implicit tax rates – the case of Japan

Source: CESifo Pension Model.

This general tendency is true for the 1999 scenario as well as for the 2000 reform variant. In the latter case, however, the reduction in benefit levels and a much more modest increase in contribution rates visibly affect the inter-generational distribution of implicit tax burdens. The reform turns out to be beneficial for age cohorts born around 1980 and afterwards, at the expense of higher implicit tax rates for older generations. More precisely, the reform increases implicit tax rates falling on those born in 1940 from –9.4 per cent in the 1999 variant to –7.1 per cent in the reform scenario, while decreasing the end-of-projection level from close to 13 per cent to about 10.7 per cent.

In Japan as well as in many other cases, the situation of public pensions appears to be more balanced after the reforms analysed here than before – provided that smoothing life-time tax profiles across generations is a meaningful task in itself. At the same time, the calculations we have made are lacking any interior measure for what type of reforms, or what degree of burden-smoothing, would be appropriate from a normative point of view.

5 The role of institutional characteristics

We have now studied in some detail how typical policy responses affect individuals who belong to different age cohorts during the process of demographic transition. We looked at minor adjustments in benefit levels (in the cases of Germany and Japan); switches between wage indexation and CPI indexation, plus other measures intended to tighten existing public pension schemes (France and the U.K.); partial pre-funding (the US); and fundamental pension reforms (Italy and Sweden). As the last step to take, we will now try to understand the role of basic institutional features of public pension schemes for the trends in implicit tax rates observed in different countries.

In order to do so, we will first of all plot the changes projected for implicit tax rates (falling on those born between 1950 and 2000) against changes in old-age dependency ratios (for the period from 2000 to 2050) for all our "current policy scenarios" and some of the major variants of our simulations (see figure 11). By its construction, this is not a strong empirical test.[52] But it can illustrate, at least in a basic fashion, to what extent observed increases in τ_t are due to demographic change and to what extent they may be attributed to other, mainly institutional characteristics of national pension systems.

Apart from individual results, figure 11 also displays a linear trend line indicating that, for the average of the countries and scenarios considered, an increase in old-age dependency by 1 percentage point leads to an increase in τ_t by about 0.4 percentage points. Taken in itself, this number is hard to interpret. Considering national pension policies explained in the previous section, we may however conclude that this is a less than "natural" increase since all the countries we looked at are actively engaging in policies meant to control the future burden of pension financing. In any case, we may take the trend line as representing the average proportion between population ageing and financial burdens involved in public pensions (given average efforts to combat fiscal pressures, that is). Abstracting from many other potential determinants, deviations from the trend line (upward or downward) can then be seen as a rough indicator for how successful diverging institutional arrangements are in terms of coping with a given trend in the population structure. In order to exploit this idea more fully, we plug in several aspects of institutional design that may affect the observed heterogeneity in figure 12.

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[52] We look at absolute changes (measured in percentage points) rather than relative changes because, given the cross-country differences in (initial) levels of τ, the latter turned out to be less telling. We omit results for cohorts born 1940 through 1949 in order to abstract from effects that are mainly due to the phase-in of public pension schemes. We confront estimates for implicit taxes falling on those born 1950 and 2000 with population structures related to 2000 and 2050, respectively, following the simple idea that, in each case, the cohort considered is in the midst of their "pension career", half way between taking up work at some point in their 20s and passing away in their 70s.

Figure 11: Implicit tax rates and demographic ageing

Sources: Implicit taxes: CESifo Pension Model; Population: U.S. Bureau of Census–online, Eurostat (2000), Statistical Office of Japan (2001).

Taking into account the complexity of pension arrangements and the determinants of their financial viability, we cannot expect to obtain a very clear-cut picture from our exercise. Nonetheless, going through panels a) to d) in figure 12, we feel in a position to sum up the following observations.[53]

– *Financing method:* High increases in implicit tax rates (exceeding the trend line) are most likely to occur in pay-as-you-go systems with revenues coming from both ear-marked contributions and general taxation. In cases where benefits are financed from one of these sources alone, limits to the pension budget appear to be more binding. Also, systems with partial pre-funding are likely to fare better than the trend line would predict.[54, 55]

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[53] Of course, our sample is small and, for many reasons, may be subject to a selection bias. However, the conclusions reached are qualitatively the same as in Werding and Blau (2002) where 17 OECD countries are looked at using the change in pension expenditure per GDP (taken from OECD 2001a) as a measure of the fiscal consequences of ageing.

[54] This may not be surprising because, in theory, pre-funding draws on interest income to reduce the implicit wage tax involved in pay-as-you-go schemes. In practice, however, publicly managed funds can be invested in low yield bonds, and funds can be diverted from old-age provision for many other reasons. In our calculations, we do not account for this type of "political" risk.

[55] The outlier is the old Swedish system which has collected a substantial amount of buffer funds over-time without a clear perspective of how to use these funds in order to manage future challenges.

Figure 12: Implicit tax rates and institutional characteristics

(*a*) *Unfunded vs. funded systems*

(*b*) *Earnings-related vs. flat-rate systems*

(*c*) *Indexation mechanisms*

(*d*) *Median age at withdrawal (males)*

Sources: CESifo Pension Model; U.S. Bureau of Census, Eurostat (2000), Statistical Office of Japan (2001); OECD (2001b); DICE (CESifo Database for Institutional Comparisons in Europe).

– *Type of benefits:* The type of benefits paid – earnings-related, with or without a flat-rate component, or mainly flat-rate – does not seem to have much significance for the way demographic ageing affects the pension budget. Systems with mainly earnings-related benefits are among those hit the most and the least with respect to

projected increases in implicit taxes. The U.K. system where flat-rate benefits dominate may be in a relatively favourable position mainly because the system is not very generous in general (and because demographic pressure is rather low).

– *Indexation mechanism:* Regarding the mechanisms applied to indexing benefits, the result appears to be clear. Wherever a clear-cut rule is followed, increases in implicit taxes are lower and more likely to be below the trend line. Not surprisingly, CPI indexation appears to produce the smallest changes. Pure wage indexation is more, but not excessively "expensive". Mixed regimes, where indexation are largely *ad hoc* (and can be heavily influenced by politically powerful lobbies) implies the highest upward deviations from the trend line.[56]

– *Age at withdrawal:* It seems plausible to assume that fighting early retirement plays an important role in the reduction of future burdens involved in public pensions, at least in (continental) Europe. In all countries, except France, adjustments are under way that are meant to increase the effective age at withdrawal, postponing pension take-up and barring other ways out of the labour force. Whether these policies will be successful is largely open.[57] Still, what we can observe based on our projections is that countries in which the need for pension reform is, or has been, most urgent (with τ_t going up a lot in at least one of the scenarios considered) are mainly those with very low ages at retirement today.[58]

Finally, we should add that one potentially very important aspect is absent from our cross-country comparisons: the level of benefits or, speaking more generally, the generosity of national pension systems. The most important reason for this omission is that meaningful assessments with respect to this point are largely lacking. Accounting for the average level of benefits in each country is clearly not enough because it ignores the many dimensions of redistribution that can be entailed in actual pension systems: by earnings brackets, non-employment spells, household structure both during activity and retirement age, *etc*.

Perhaps, the most reliable source that is currently available comparing retirees' income on an international level is OECD (2001b). The study reports on six of the countries included here – *viz*., all except France – representing the situation for current (but not future) pensioners. The remarkable result is that "total (quasi-)replacement rates",

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[56] Here, Sweden is not really a counter-example. In the new Swedish system, indexation is based on an explicit rule (GDP growth). Note that, with ageing and declining populations, GDP growth can be substantially lower than productivity and wage growth.

[57] From a normative point of view, this may not matter too much provided that third-party payments are abolished which presently distort individual retirement decisions in many existing pension schemes.

[58] Information regarding median ages at withdrawal is taken from Scherer (2002), an auxiliary paper to the OECD (2001b) study.

relating all types of retirement income *per-capita* to current income of average workers, are very homogenous across countries, falling in the 80 to 90 per cent range in each case. Yet, shares of public benefits in typical retirees' budgets differ considerably, Sweden and Germany (70 to 80 per cent) ranking clearly ahead of Italy (around 65 per cent) and way ahead of the U.K., the US, and Japan (30 to 40 per cent). Inasmuch as these differences are not affected by pension reforms that have already been taken, but just need some time to become fully effective, they clearly contribute to explaining the different levels and trends in implicit tax rates illustrated in figures 11 and 12.

6 Conclusions

The overall picture obtained in this paper is that, on average, demographic ageing must be expected to drive up the burden involved in public pension schemes for young and future age cohorts. Also, our projections tell us a lot about what *can* be done to deal with these imminent trends, while they are next to silent on what *should* be done. We have seen that the major effect of pension reform is given by a reduction in burdens imposed on younger generations, at the expense of older generations who have to pay higher life-time taxes. In other words, the primary impact of reform appears to be a reversal of the current inter-generational redistribution from future to living generations. In order to establish clear-cut policy recommendations in this area, one would therefore need criteria by which the inter-generational pattern of implicit tax rates involved in unfunded pensions can be assessed more rigorously. Neither a pure welfarist approach nor public choice considerations would easily lend support to the conclusion that embarking on this prevailing type of pension reform is useful.

In the relevant literature, it has taken an extended discussion to establish that the pay-as-you-go mechanism as such is inter-generationally efficient (Breyer 1989; Fenge 1995; for a brief survey, see Sinn 2000). Unless there are additional distortions created by the way contributions are levied or benefits are defined, converting unfunded pensions into fully-funded schemes will never lead to a Pareto-improvement. (At the same time, all improvements that are feasible could also be had when just removing distortions, without any change in the basic financing mechanism.) Up to a point, these theoretical results are confirmed by our calculations for the case of real-word pension schemes. Given that unfunded pension schemes are basically efficient, why should present governments care about increasing life-time tax rates for younger age cohorts?

First of all, individuals belonging to different age groups may themselves be interested in a more balanced distribution of life-time burdens. More specifically, older gen-

erations may care for the well-being of their children and grand children based on some sort of (intra-family, inter-generational, "forward looking") altruism, feeling uneasy about the burden unfunded pensions place on income and consumption of their off-spring. As an alternative, governments could have an independent view on inter-generational redistribution, maximising an aggregate welfare function in which some weight is attributed to the well-being of young (and future) age cohorts. In the case of altruism, increasing life-time taxes would turn out be a problem in terms of efficiency in a sense which is not captured in standard reflections on this issue. In the alternative case, considerations regarding efficiency and distributional issues are no longer a distinct matter because some notion of inter-generational fairness is incorporated in the relevant welfare function.

Net life-time taxes that are constantly increasing over time imply that the "excess burden" of this kind of taxation – as perceived by altruistic individuals or by an inter-generationally benevolent government – will grow more than proportional to the increase in tax rates. Given that, a particular type of welfare loss may be caused by distortions of the consumption pattern across generations. The costs of this inefficiency can be minimised by smoothing the profile of implicit tax rates (see Barro 1974; 1979). Of course, this policy recommendation is valid only if there is some kind of inter-generational link that can be used to compare welfare losses falling on different generations.

Two further aspects are important in this context. First, while the two justifications for tax smoothing mentioned here converge with regard to optimal policy recommendations, they turn out to be very different in terms of public choice considerations. If older people behave altruistically towards younger generations they may be willing to accept reductions in their pension claims and increases in the life-time taxes they are facing. As long as the median voter has children, majority votes will induce politicians to share this view. Absent altruism, however, an inter-generationally benevolent government pursuing paternalistic policies that are in line with its welfare function will find it difficult to convince self-interested individuals to vote for a tax-smoothing pension reform.

Second, for the case without altruism, one should spell out in some more detail the precise nature of equity norms a given society would have to accept in order to arrive at the conclusion that the intergenerational distribution of burdens needs to be corrected. For instance, under the premise that "equitable" taxation is taken to say that each generation should be burdened according to an "equal relative sacrifice" rule, the increase of implicit tax rates for younger generations would be regarded a problem in terms of justice. Nevertheless, other criteria for intergenerational redistribution can be conceived

of,[59] and the criteria by which actual pension reforms will be guided are largely open. In fact, they will be strongly influenced by the political process. In many cases, the true nature of the equity considerations behind any decisions taken will remain unclear.

Apart from considerations in terms of equity and efficiency, one of the most prominent (and at the same time most pressing) problems of pay-as-you-go pension schemes is their political instability. As we have seen, large-scale demographic ageing implies an increasing burden on future generations. As a consequence, it is uncertain whether future generations will go on to co-operate and finance for current benefits, or whether they will resist the entire system. As Hayek (1960, p. 297) put it:

> *"With the age distribution we are approaching, there is no reason why the majority over forty should not soon attempt to make those of a lower age toil for them. It may be only at that point that the physically stronger will rebel and deprive the old of both their political rights and their legal claims to be maintained."*

From an economist's perspective, it is difficult to say what consequences, both political and legal, younger generations will draw from their perception of the burden involved in ageing, and even declining, population. Their options range from voting for pension reform to working less, evading into the shadow economy, or emigrating into countries with lower implicit tax rates. Smoothing the time profile of implicit taxes may be part of a defensive policy by which potential conflicts are reduced in good time in order to improve, if nothing else, on the long-run sustainability of existing public pension schemes.

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[59] For instance, higher life-time taxes can be regarded a progressive tax on increasing wealth that younger age cohorts receive, rather than produce, just in the course of real economic growth (Burtless 2001). Or, one could argue that welfare judgements based on the burden involved in old-age pensions alone are incomplete: what really matters might be the full set of inter-generational transactions, including expenditure on children and their education (Sinn and Werding 2000; Werding 2002).

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Appendix A:
Sources of data and information regarding national pension schemes

A.1 Population projections

Population projections for EU countries are taken from Eurostat (2000). For the US and Japan, we use official forecasts provided by the U.S. Bureau of Census–online and the Statistical Office of Japan (2001), respectively, in sections 2.1 and 5 for illustrative purposes; we rely on population projections entailed in Board of Trustees (2000) and Ministry of Health and Welfare (2000) for our simulations in section 4.

A.2 Economic variables

Historical data regarding labour force participation, employment, wage growth, and interest rates are taken from the OECD database regularly published in the "Economic Outlook". In some cases, we used data provided by national pension administrations instead (see A.3). Regarding future developments of participation rates and unemployment rates, we basically relied on assumptions agreed upon for the parallel projects run by the OECD (2001a) and the Economic Policy Committee of the EU (2001). Regarding future real wage growth and real interest rates, we used the assumptions reported in section 2.3 (1.75 per cent and 4 per cent *p.a.*, respectively).

A.3 Pension schemes

Specific information regarding national pension schemes has been collected from the following sources:[60]

- Germany: *Verband Deutscher Rentenversicherungsträger* (http:\\www.vdr.de).
- France: *Caisse Nationale d'Assurance Vieillesse* (http://www.retraite.cnav.fr and http://www.legislation.cnav.fr).
- UK: Department of Employment and Pensions (http://www.pensionguide.gov.uk and http://www.dss.gov.uk).
- Italy: *Istituto Nazionale della Previdenza Sociale* (http://www.inps.it).[61]

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[60] In addition, those particularly interested in institutional comparisons are referred to the survey on more than 150 "Social Security Programs Throughout the World" provided by the U.S. Social Security Administration (http://www.ssa.gov). For a smaller set of countries, similar information is available from the Japanese Ministry of Health, Labour and Welfare (http://www.mhw.go.jp/english/wp_5/) or, for a European context, from the web site of the German Ministry of Labour and Social Affairs (http://www.bma.de). Another source of growing importance is the CESifo Database on Institutional Comparisons in Europe (http:\\www.cesifo.de).

- Sweden: *Försäkringskassan* and *Försäkringskasseförbundet* (http://www.fk.se, http://www.fkf.se, and http://www.pension.nu).
- USA: Social Security Administration (http://www.ssa.gov).[62]
- Japan: Ministry of Health, Labor and Welfare (http://www.mhlw.go.jp).

Appendix B: Stylised biography

Table B.1: The standardised agent considered in the model: basic assumptions for the case of Germany

Age 20–52	Full-time labour force participation with average earnings → Contributions paid to the pension scheme on a full-time basis	33 years
Age 53–64	Reduced probability of full-time participation → Reduced contributions based on 83.4 %* of full-time earnings → 16.6 %* of (full) disability benefits received	12 years
Age 65–74*	Period of retirement → old-age pension benefits payable based on prior work-record and earnings	10 years
Age 75(–86*)	Individual dies at age 75* → survivor benefits payable to the survivant spouse	11 years

* (Country-specific assumptions).

[61] For a thorough description of the new benefit formula introduced in 1995 and for all the transitional arrangements involved in the 1992 and 1995 reforms, see the appendix to *Ministero del Tesoro / Ragioneria Generale dello Stato* (1998).

[62] Regarding past developments, we also used the host of relevant data published in Social Security Administration (2000).

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