

Generational Accounting in the UK

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Abstract

Generational Accounting measures the burden that current fiscal policies are likely to impose on future generations. It also identifies the set of policy reforms needed to achieve *generational balance* a situation in which future generations face the same lifetime net tax rates as current generations. This paper presents the first set of *generational accounts* for the United Kingdom and compares the UK generational imbalance with that in the U.S., Japan, Germany, France, Italy, and twelve other countries in Europe, Asia, and South America.

The preparation of this study was greatly aided by various departments of the government, particularly H.M. Treasury. In providing this assistance, the government has initiated an extremely important process of doing long-term fiscal planning for the nation on a systematic and comprehensive basis. That said, the particular findings and assessments presented in this paper are those of its authors and not those of Her Majesty's Government.

Compared with other leading industrial countries like the U.S., Japan, and Germany, the imbalance in U.K. generational policy is, under our assumed baseline policy, quite modest; i.e., there is not a major intergenerational problem. Moreover the imbalance would entirely disappear if labour productivity growth should turn out to be 1/4 per cent higher than our baseline assumption and government expenditures were not raised in line with the increase in the tax base. Should this not arise, some fiscal adjustment would be needed to achieve generational balance. This could take a variety of forms, such as the equivalent of either a £5 bn increase in tax revenue or a £5 bn reduction in government spending with proportionate tax increases or spending reductions thereafter.

Our baseline policy scenario, which represents our sense of current government policy, is marked by very considerable fiscal restraint and prudence. In particular, it assumes a) the price indexation of a variety of social benefits, including the Basic and SERPS pension benefits, and b) a slowdown in the growth of health care spending per beneficiary. In our baseline, pension and other social benefits payments decline by 2050 from 13 percent to 9 percent of GDP. Social security contributions also decline under the baseline, lowering total taxes relative to GDP after 2050. Due to population aging, health care spending rises in the baseline from 6 percent to 8 percent of GDP between now and 2050 notwithstanding the assumed slower growth of benefits per beneficiary.

Despite our fiscally responsible baseline, these assumptions still leave a generational imbalance. Without great restraint in future government purchases of goods and services or increases (relative to our baseline projection) over time in the net tax payments of current British adults, future British children could well face higher *lifetime net tax rates* (the present value of lifetime net taxes divided by the present value of lifetime labour earnings) than their parents now face.

Under an alternative policy scenario, that we label *Looser Policy*, pension and other social benefits are wage indexed and growth in health care spending per beneficiary remains at current levels through 2030. Since current generations pay less in net taxes under this alternative scenario, there is a larger fiscal bill left for future generations to pay. In this case, achieving generational balance would require much stronger medicine, either a substantial sustained cut in non education and non health government spending or an equally substantial increase in income tax revenues and a corresponding increase in social security contributions.

I. Introduction

Generational accounting is a relatively new method of long-term fiscal planning and analysis. It seeks to answer the following closely related questions. First, how large a fiscal burden does current policy imply for future generations? Second, is fiscal policy sustainable without major additional sacrifices on the part of current or future generations or major cutbacks in government purchases? Third, what alternative policies would suffice to produce *generational balance* – a situation in which future generations face the same fiscal burden as do current generations when adjusted for growth (when measured as a proportion of their lifetime earnings)? Fourth, how would different methods of achieving such balance affect the remaining lifetime fiscal burdens – the *generational accounts* -- of those now alive?

Generational accounts are specifically defined as the present value of *net taxes* (taxes paid minus transfer payments received) that individuals of different age cohorts are expected, under current policy, to pay over their remaining lifetimes. Adding up the generational accounts of all currently living generations gives the collective contribution of those now alive toward paying the government's bills. The government's bills refers to the present value of its current and future purchases of goods and services plus its net debt (its financial liabilities minus its financial and real assets, including the value its public-sector enterprises). Those bills left unpaid by current generations must be paid by future generations. This is the hard message of the *government's intertemporal budget constraint* – the basic building block of modern dynamic analyses of fiscal policy.

The constraint can be expressed in a simple equation: $A+B=C+D$, where D is the government's net debt, C is the sum of future government purchases, valued to the present, B is the sum of the generational accounts of those now alive, and A is the sum of the generational accounts of

future generations, valued to the present. Given the size of the government's bills, C+D, the choice of who will pay is a zero-sum game; the smaller is B, the net payments of those now alive, the larger is A, the net payments of those yet to be born.

The comparison of the generational accounts of current newborns and the growth-adjusted accounts of future newborns provides a precise measure of generational imbalance. The accounts of these two sets of parties are directly comparable because they involve net taxes over entire lifetimes. If future generations face, on a growth-adjusted basis, higher generational accounts than do current newborns, current policy is not only generationally imbalanced, it's also unsustainable. The government cannot continue, over time, to collect the same net taxes (measured as a share of lifetime income) from future generations as it would collect, under current policy, from current newborns without violating the intertemporal budget constraint. The same is true if future generations face a smaller growth-adjusted lifetime net tax burden than do current newborns. However, in this case, generational balance and fiscal sustainability can be achieved by reducing the fiscal burden facing current generations rather than the other way around.

The calculation of generational imbalance is an informative counterfactual, not a likely policy scenario, because it imposes all requisite fiscal adjustments on those born in the future. But it delivers a clear message about the need for policy adjustments. Once such a need is established, interest naturally turns to alternative means of achieving generational balance that do not involve foisting all the adjustment on future generations. A summary measure of the size of the adjustment needed to achieve generational balance is the *Generational Balance Gap*, which is defined as the ratio to GDP of the difference between the government's bills and the present value of net taxes it would collect from current and future generations assuming current policy were maintained indefinitely.

Generational accounting was originally developed by Auerbach, Gokhale, and Kotlikoff (1991) and Kotlikoff (1992). Less than a decade old, it has spread to over 25 countries around the globe, from New Zealand to Norway. Much of this accounting is being done at the governmental or multilateral institutional level. The U.S. Federal Reserve, the U.S. Congressional Budget Office, the U.S. Office of Management and Budget, the Bank of Japan, the Bundesbank, the Norwegian Ministry of Finance, the Bank of Italy, the New Zealand Treasury, the European Commission¹, the International Monetary Fund, and the World Bank have all done generational accounting. Generational accounting has also drawn considerable interest from academic and government economists. Haveman (1994), Congressional Budget Office (1995), Cutler (1993), Diamond (1996), Buiter (1997), Shaviro (1997), Auerbach, Gokhale, and Kotlikoff (1994), Kotlikoff (1997), Raffelhuschen (1998), and others have debated its merits.

This paper presents the first set of generational accounts for the United Kingdom. It also points out the alternative fiscal adjustments that are needed to achieve generational balance in the UK. Finally, it compares these adjustments with those needed in the U.S., Japan, Germany, France, Italy, and twelve other countries in Europe, Asia, and South America.

The findings reported here and opinions expressed here are unofficial and purely those of the authors. Nonetheless, the development of these accounts benefited enormously from the advice of officials at a number of UK government agencies including H.M. Treasury, The Bank of England, the Department of Social Services, the Department of Health, the Office of National Statistics, the Department of Education and Employment, and the Government Actuary Department. In addition, the data used in the analysis are a) published government data, b) unpublished government data, or c) data projections that appear to accord with the government's own forecasts and sense of baseline

¹ The European Commission has an ongoing project to do generational accounting for EU member nations under the

fiscal policy. In providing its assistance, the government has initiated an extremely important process of doing long-term fiscal planning for the nation on a systematic and comprehensive basis.

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could well face higher *lifetime net tax rates* (the present value of lifetime net taxes divided by the present value of lifetime labour earnings) than their parents now face.

Under an alternative policy scenario, that we label *Looser Policy*, pension and other social benefits are wage indexed and growth in health care spending per beneficiary remains at current levels through 2030. Since current generations pay less in net taxes under this alternative scenario, there is a larger fiscal bill left for future generations to pay. In this case, achieving generational balance would require much stronger medicine, such as a 26.3 percent sustained cut in non education and non health government spending or a 25.6 percent sustained increase in income tax revenues and a 43.1 percent increase in social security contributions.

The paper proceeds in Section II to describe generational accounting's methodology and the important role demographics play in the construction and analysis of generational accounts. Section III compares generational accounting with conventional deficit accounting, pointing out the complete sensitivity of the latter to the choice of fiscal vocabulary. From a theoretical perspective, deficit accounting is an exercise in linguistics, not economics. In contrast, the key economic questions that generational accounting seeks to answer are independent of fiscal nomenclature. Thus, substituting generational accounting for deficit accounting is a policy imperative.

The fact that, unlike deficit accounting, generational accounting provides meaningful answers to meaningful fiscal policy questions does not mean that generational accounting is perfect. Section IV raises some of the limitations of generational accounting – limitations that are important to bear in mind in reviewing the findings. Section V describes the extensive sources of data used in this study, all of which are laid out in the Appendix². With this as background, Section VI presents the UK generational accounting results and compares them with those of other countries. The final section, VII, summarizes and concludes the paper.

II. The Method of Generational Accounting³

Equation (1) is a formalization of the above statement that $A+B=C+D$; i.e., that the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of the government's future purchases plus its initial net debt.⁴

² The Appendix for this discussion paper is available on the web site <http://www.niesr.ac.uk/niesr/discuss.htm>.

³ This section draws heavily on Auerbach and Kotlikoff (1999).

⁴ The constraint does not assume that government debt is ever fully paid off, merely that the debt grows less quickly than the rate of discount -- that it does not explode. Thus, it is consistent with the long-run existence of government deficits, as long as these deficits are smaller than the amount needed simply to service the level of outstanding debt.

$$(1) \quad \sum_{s=0}^D N_{t,t-s} P_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} P_{t,t+s} (1+r)^{t-s} = \sum_{s=0}^{\infty} G_{t+s} (1+r)^{t-s} + D_t$$

All terms in (1) are real values i.e. they are measured at constant prices. The first summation on the left-hand side of (1) adds together the *generational accounts* of existing generations. The term $N_{t,k}$ stands for the present value of the average remaining lifetime net tax payment – the generational account measured on a per person basis -- at time t of the generation born in year k . The present value is formed as of year t for generations alive at time t and as of the year of birth for generations not yet born. For example, $N_{t,t}$ is the time- t present value of lifetime net tax payments of those born at time t , i.e., it is the generational account of time- t newborns; $N_{t,t-65}$ is the present value of the average remaining lifetime net tax payments – the generational account -- of those who are 65 years olds at time t , and $N_{t,t+30}$ is the present value to the year of birth ($t+30$) of the average lifetime net tax payments – the generational account -- of those who will be born 30 years from year t .

The term $P_{t,k}$ stands for the time- t population of the generation born in year k . The term r is the government's real, before-tax, discount rate. The index k in this summation runs from $t-D$ (those age D , the maximum length of life, in year 0) to t (those born in year 0). The second summation on the left side of (1) adds together the present values of the generational accounts of future generations, with k again representing the year of birth. As each of these generational accounts is expressed in dollars of the respective generation's birth year, they must be discounted back to year t in the summation using the government's real, before-tax return r .

The first term on the right-hand side of (1) expresses the present value of government purchases. In this summation the values of government purchases in year s , given by G_s , are also discounted to year t . The remaining term on the right-hand side, D_t^g , denotes the government's net

debt – its financial liabilities minus the sum of its financial assets and the market value of its public enterprises.

The generational account $N_{t,k}$ is defined by:

$$(2) \quad N_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k} \frac{P_{s,k}}{P_{t,k}} (1+r)^{-(s-t)}$$

where $\kappa=\max(t,k)$. In expression (2) $T_{s,k}$ stands for the projected average net tax payment to the government made in year s by a member of the generation born in year k . The term $P_{s,k}$ stands for the number of surviving members of the cohort in year s who were born in year k .⁵ In the case of generations who are born prior to year t , the summation begins in year t and is discounted to year t . For generations born in year $k>t$, the summation begins in year k and is discounted to that year.

The term $P_{s,k}/P_{t,k}$ indicates the proportion of members of cohort k alive at time t who will also be alive at time s . Hence, it represents the probability that a particular member of the year- k cohort who is alive in year t will survive to year s to pay the net taxes levied, on average, in that year on year- k cohort members. Hence, $N_{t,k}$ is an actuarial present value. It represents the average value in the present of the amount of net taxes that members of cohort k will pay in the future, where the averaging is over not just net tax payments, but also survivorship.

A set of generational accounts is simply a set of values of $N_{t,k}$, one for each existing and future generation, with the property that their combined present value, when multiplied by the appropriate time- t , generation-specific population counts, adds up to the right-hand side of equation (1). Though

⁵ The population weights $P_{s,k}$ incorporate both mortality and immigration, implicitly treating immigration as if it were a “rebirth” and assigning the taxes paid by immigrants to the representative members of their respective cohorts. This

we distinguish male and female cohorts in the results presented below, we suppress sex subscripts in (1) and (2) to limit notation.

What Do Generational Accounts Include?

Note that generational accounts reflect only taxes paid less transfer payments received. With the exception of government expenditures on health care and education, which are treated as transfer payments, the accounts do not impute to particular generations the value of the government's purchases of goods and services. Why not? Because it is difficult to attribute the benefits of such purchases. Therefore, the accounts do not show the full net benefit or burden that any generation receives from government policy as a whole, although they can show a generation's net benefit or burden from a particular policy change that affects only taxes and transfers. Thus generational accounting tells us which generations will pay for the government spending not included in the accounts, rather than telling us which generations will benefit from that spending. This implies nothing about the value of government spending; i.e., there is no assumption, explicit or implicit, in the standard practice of generational accounting concerning the value to households of government purchases.

Assessing the degree of Generational Imbalance

Given the right-hand side of equation (1) and the first term on the left-hand-side of equation (1), we determine, as a residual, the value of the second term on the left-hand side of equation (1) -- the collective payment, measured as a time-t present value, required of future generations. Based on this amount, we determine the average present value lifetime net tax payment of each member of each future cohort under the assumption that these lifetime net tax payments rise for members of each

approach does not, therefore, separate the burdens of natives and immigrants. Such an extension is desirable, particularly

successive future cohorts at the economy's rate of labor productivity growth, g . Now, if labor productivity grows at g percent per year, so will real wages. Hence, the lifetime labor income of each new cohort will be g percent larger than that of its immediate predecessor. So, in assuming that each successive cohort pays lifetime net taxes that are g percent larger than those of its predecessor, we are assuming that each successive future cohort pays the same share of its lifetime labour income in net taxes; i.e. we are assuming that each future cohort faces the same lifetime net tax rate.

Let \bar{N} stand for the growth-adjusted generational account of future generations. \bar{N} is the amount each member of a future cohort would pay in lifetime net taxes if her lifetime labor income were the same as that of a current newborn. The actual amount the cohort born in year $t+1$ will pay is $\bar{N}(1+g)$. The actual amount the cohort born in year $t+2$ will pay is $\bar{N}(1+g)^2$. The actual amount the cohort born in year $t+3$ will pay is $\bar{N}(1+g)^3$, and so on.

We use equation (3) to solve for \bar{N} .

$$(3) \quad \sum_{s=0}^D N_{t,t-s} P_{t,t-s} + \sum_{s=1}^{\infty} \bar{N}(1+g)^s P_{t,t+s} (1+r)^{t-s} = \sum_{s=t}^{\infty} G_s (1+r)^{t-s} + D_t$$

Since \bar{N} is the lifetime net tax payment of future generations adjusted for growth, it is directly comparable to that of current newborns, $N_{t,t}$, since the generational accounts of both newborns and future generations take into account net tax payments over these generations' entire lifetimes and are

if one wishes to study the effects on generational accounts of changes in immigration patterns.

discounted back to their respective years of birth. If \bar{N} equals $N_{t,t}$, generational policy is balanced. If \bar{N} exceeds (is smaller than) $N_{t,t}$, future generations face larger (smaller) growth-adjusted lifetime net tax burdens than do current newborns.

Our assumption that the generational accounts of all future generations are equal, except for a growth adjustment, is just one of many assumptions one could make about the distribution across future generations of their collective net tax payments to the government. We could, for example, assume a phase-in of the additional fiscal burden (positive or negative) to be imposed on future generations, allocating a greater share of the burden to later future generations and a smaller share to earlier ones. Clearly, such a phase-in would mean that generations born after the phase-in period has elapsed would face larger values of lifetime burdens (the $N_{t,k}$ s) than we are calculating here.

Generation Balance Gap – A Summary Measure of the Requisite Fiscal Adjustment

As mentioned above, *Generation Balance Gap* (GBG) provides a summary measure of the extent of fiscal adjustment needed to achieve generational balance. The *Generation Balance Gap* is defined in equation (5) as the ratio to GDP of the difference between the government's bills and the present value of net taxes it would collect from current and future generations assuming current policy were maintained indefinitely. Note that in defining the *generation balance gap* in (5), we are assuming that, apart from growth, each member of all future generations pay $N_{t,t}$ in net taxes; i.e., except for the growth factor, they pay the same amount as a current newborn would pay under current policy.

(5)

$$GBG = [\sum_{s=t}^{\infty} G_s (1+r)^{t-s} + D_t - \sum_{s=0}^D N_{t,t-s} P_{t,t-s} - \sum_{s=1}^{\infty} N_{t,t} (1+g)^s P_{t,t+s} (1+r)^{t-s}] / GDP$$

Assessing the sustainability of current policy

For any set of government policies to be sustainable they must satisfy the government's intertemporal budget constraint. We therefore define the intertemporal budget gap (IBG) as the imbalance in the intertemporal budget constraint

(6)

$$IBG = \sum_{s=0}^{\infty} G_{t+s} (1+r)^{t-s} + D_t - \sum_{s=0}^D N_{t,t-s} P_{t,t-s} - \sum_{s=1}^{\infty} N_{t,t+s} P_{t,t+s} (1+r)^{t-s}$$

The intertemporal budget gap will be less than the generational balance gap, if current policy treats future newborns less favourably, in terms of their net lifetime taxes on a growth adjusted basis, than present newborns. Conversely if the reverse true then the intertemporal budget gap will be greater than the generational balance gap.

For example, government policy might be to phase out a particular transfer payment (such as mortgage interest tax relief or married person tax allowance) on a certain date. This might be enough of a reduction in payments to ensure that government policy is sustainable. However this is achieved by reducing their future liabilities or equivalently by reducing payments to future generations more than presently living ones. It is therefore unlikely to close the generational balance gap unless future generations were being treated more favourably than current living generations before the policy change.

Alternative Ways to Achieve Generational Balance

Another way of measuring the imbalance in fiscal policy (which we consider below) is to ask what immediate and permanent change in either a) government purchases or b) a specific tax (such as

the income tax) or transfer payment (such as old-age social security benefits) would be necessary to close either the *generational balance gap* or the *intertemporal budget gap*? Because all such policies satisfy the government's intertemporal budget constraint, they are also sustainable.

To be more precise about this type of calculation, suppose, for example, we want to find the immediate and permanent percentage reduction in government purchases needed to achieve generational balance. Denote this percentage reduction by d . We use equation (5) to solve for d under the assumption that \bar{N} equals $N_{t,t}$.

$$(7) \quad \sum_{s=0}^D N_{t,t-s} P_{t,t-s} + \sum_{s=1}^{\infty} \bar{N} (1+g)^s P_{t,t+s} (1+r)^{t-s} = \sum_{s=t}^{\infty} (1+d) G_s (1+r)^{t-s} + D_t$$

As a second example, consider the immediate and permanent percentage increase in income taxes needed to achieve generational balance. Call this percentage increase v . To determine the size of v , we try different immediate and permanent income tax increases until we find the one with the following property: given the new values of generational accounts (the values inclusive of the tax hike), the calculated value of \bar{N} equals $N_{t,t}$. In contrast to the calculation of d , in this calculation of v , $N_{t,t}$, the generational account of current newborns, is not held fixed. Like the accounts of all other existing generations, $N_{t,t}$ is higher because of the increase in the income tax. Consequently, so is \bar{N} .

\bar{N} Very similar calculations can be done to ascertain the size of an immediate and permanent percentage reduction in government purchases or increase in income tax required to achieve intertemporal budget balance. However in this case \bar{N} in equation (7) needs to be replaced $N_{t,t+s}$, the

generational account of future newborns under current policy.

The Role of Demographics

As can be seen in equation (3), demographics play a central role in determining the size of the imbalance in generational policy. Other things equal, the larger the population sizes of future generations, the smaller will be the size of \bar{N} , and, therefore, the smaller will be the imbalance of generational policy. Ceteris paribus, larger population sizes of current generations will raise or lower \bar{N} depending on the sign of the generational accounts these population totals are multiplying. For example, if the generational accounts of those over age 65 are negative, larger numbers of older people will make the calculated value of \bar{N} larger. A negative account means that the government will, under current policy, pay more to a generation in transfer payments than it receives in taxes. Negative generational accounts for older generations is the norm in industrialized countries because these generations receive more in state pension, health, and other benefits over the remainder of their lives than they pay in taxes.

What is the impact of the large number of baby boomers on generational or intertemporal budget imbalance? Since these generations typically still have positive generational accounts, they are contributing, on balance, to lowering the size of \bar{N} and, thus, the imbalance in generational policy. On the other hand, since these generations are close to receiving large net transfers from the government, the current values of their generational accounts are quite small. Hence, the contribution they are making toward lowering \bar{N} is small. This is the channel by which the very sizable benefits

that are due to be paid in retirement to the enormous baby boom generation in the UK and other industrialized countries constitute a fiscal burden on young and future generations.

Inputs to Generational Accounting

Producing generational accounts require projections of population, taxes, transfers, and government purchases, an initial value of government net debt, and a discount rate. Since generational accounting considers all levels of government -- local, state, and federal -- the measures of taxes, transfers, and government purchases must be comprehensive. Government infrastructure purchases are treated like other forms of purchases in the calculations. Although such purchases provide an ongoing stream, rather than a one-time amount, of services, they must still be paid for. Generational accounting clarifies which generation or generations will have to bear the burden of these and other purchases. As mentioned, government net debt is calculated net of the current market value of state enterprises. This value is determined by capitalizing the net profits of those businesses. In contrast to the treatment of the market value of state enterprises, government net debt does not net out the value of the government's existing infrastructure, such as parks, highways, and tanks. Including such assets would have no impact on the estimated fiscal burden facing future generations because including these assets would require adding to the projected flow of government purchases an exactly offsetting flow of imputed rent on the government's existing infrastructure.

Taxes and transfer payments are each broken down into several categories. Our general rule regarding tax incidence is to assume that taxes are borne by those paying the taxes, when the taxes are paid: income taxes on income, consumption taxes on consumers, and property taxes on property owners. There are two exceptions here, both of which involve capital income taxes. First, as detailed in Auerbach, Kotlikoff, and Gokhale (1991), one should, data permitting, distinguish between

marginal and infra-marginal capital income taxes. Specifically, infra-marginal capital income taxes should be distributed to existing wealth holders, whereas marginal capital income taxes should be based on future projected wealth holdings. Second, in the case of small open economies, like the UK, marginal corporate income taxes are assumed to be borne by (and are therefore allocated to) labor.

Our general rule for allocating transfer payments is to allocate them to those who directly receive them. As an example, consider income support. This is a means-tested benefit given to those who work less than 16 hours a week and have less money than the law says they need to live on. Even if the actual amount received depends on the number of children in the household, it is the working condition of the parents that ultimately explains the transfer. So we allocate the benefit only to the adults in the household. The same procedure holds for transfers that are arguably targeted to the children in the family, such as family credits and maternity benefits (the only exception being child benefits that are allocated directly to the children). Transfers to the disabled are another exception to the rule, as they are attributed to those who suffer from the disability condition, rather than to the claimant (when the two are not the same person).⁶

The typical method used to project the average values of particular taxes and transfer payments by age and sex starts with government forecasts of the aggregate amounts of each type of tax (e.g., payroll) and transfer payment (e.g., welfare benefits) in future years. These aggregate amounts are then distributed by age and sex based on relative age-tax and age-transfer profiles derived from cross-section micro data sets. For years beyond those for which government forecasts are available, age- and sex-specific average tax and transfer amounts are generally assumed to equal those for the latest year for which forecasts are available, with an adjustment for growth.

Equation (8) helps clarify the method of distributing annual tax or transfer aggregates in a

particular year to contemporaneous cohorts. Again, to simplify the presentation we abstract from the distinction between sexes that we consider in the actual calculations.

$$(8) \quad H_t = \sum_{s=0}^D T_t R_{t,t-s} P_{t,t-s}$$

In (8), H_t stands for an aggregate tax or transfer amount in year t . Let's assume it stands for total income tax payments to make the example concrete. The term T_t is the average amount of income tax paid in year t . $R_{t,t-s}$ is the relative distribution profile for income taxes in year t . Specifically, it stands for ratio of the average income tax payment of members of the cohort born in year $t-s$ to the average income tax payment in year t . Finally, $P_{t,t-s}$ stands for the number of people in year t who were born in year $t-s$, i.e., it is the population size of the age $t-s$ cohort. Given H_t and the values of the $R_{t,t-s}$ and $P_{t,t-s}$ terms, one can use equation (9) to solve for T_t . To form $T_{t,t-s}$, the terms that enter equation (2) that are used to calculate each current generation's account, note that

$$(9) \quad T_{t,t-s} = T_t R_{t,t-s}.$$

Discount Rates and Uncertainty

For base-case calculations, generational accountants typically use a real rate of discount in the neighborhood of 5 percent, a rate that exceeds the real government short-term borrowing rate in most developed countries. This rate seems justified given the riskiness of the flows being discounted. However, the “right” discount rate to use is in sufficient question to merit presenting results based on

⁶ Appendix 2 contains a detailed description of the incidence assumptions used for all the taxes and transfers considered.

a range of alternative discount rates – a practice routinely followed by generational accountants.

The appropriate discount rate for calculating the present value of future government revenues and expenditures depends on their uncertainty. If all such flows were certain and riskless, it would clearly be appropriate to discount them using the prevailing term-structure of risk-free interest rates. However, even in this simple and unrealistic case, such discounting could be problematic since it would require knowing the values of this term structure. To discern these values, one might examine the real yields paid on short-term, medium-term, and long-term inflation-indexed government bonds. But this presupposes the existence of such bonds. Many countries do not issue indexed bonds, and those that do don't necessarily issue indexed bonds of all maturities.

In the realistic case in which countries' tax revenues and expenditures are uncertain, discerning the correct discount rate is even more difficult. In this case, discounting based on the term structure of risk-free rates (even if it is observable) is no longer theoretically justified. Instead, the appropriate discount rates would be those that adjust for the riskiness of the stream in question. Since the riskiness of taxes, spending, and transfer payments presumably differ, the theoretically appropriate risk-adjusted rates at which to discount taxes, spending, and transfer payments would also differ. Moreover, if there were incomplete insurance arrangements, the appropriate risk adjustments would likely be generation-specific. Unfortunately, the size of these risk adjustments remains largely unresearched. In the meantime and in the practice followed here, generational accountants have simply chosen to estimate generational accounts for a range of discount rates.

Although we also present results using 3 and 7 percent discount rates, our central calculation of generational accounts for the UK incorporates a 5 percent real discount rate. This rate is roughly 200 basis points above the rate of return currently being paid by the British Government on its

this study.

inflation-indexed bonds. Using a 5 percent rate in this analysis, rather than the government's 3 percent borrowing rate, means that were we to accumulate the government's official net debt through time, taking into account each year's projected aggregate net taxes, government debt would accumulate more rapidly than the government would likely project in their own forecasts. This does not make invalidate generational accounting. Rather generational accounting should be viewed as answering a different question. A conventional government projection of future levels of debts and deficits (based on whatever fiscal taxonomy the government has arbitrarily adopted) is a projection\scenario that assumes that projected future taxes, transfers, and spending arise with certainty. In contrast, the generational accounting calculation of the growth-adjusted lifetime net tax burden facing future generations is asking what sacrifices are we going to be demanding of those generations when we take into account not just that we are going to impose potentially higher net taxes on them, but also that we are going to impose more uncertainty on them because the degree to which their future net taxes will be higher is itself uncertain. This point is critically important in viewing our results based on 5 and 7 percent real discount rates. These results are measuring not just the burden on future generations (if we don't change policy) as well as on current ones (if we do change policy) of paying more net taxes; they are also measuring the fact that these potentially higher net taxes are raising the risks facing those generations.

III. Generational Accounting versus Deficit Accounting

A critically important feature of generational accounting is that the size of the fiscal burden confronting future generations (the second summation on the left-hand side of (1)), the generational accounts of newborn generations, and the imbalance in generational policy (the difference between

$N_{t,t}$ and \bar{N}) are all invariant to the government's fiscal labelling. This is the way in which it describes its receipts and payments.

The same, unfortunately, is not true of the government's official debt. As described in Kotlikoff (1992), from the perspective of neoclassical economic theory, neither the government's official debt nor its change over time -- the deficit -- is a well-defined economic concept. Rather these are accounting constructs whose values are entirely dependent on the choice of fiscal vocabulary. Stated differently, a government's reported debt and deficit bear no intrinsic relationship to any aspect of its fiscal policy, including its generational policy.

To see the arbitrary nature of fiscal labels, consider a government policy of taking 100 pounds more measured in present value in net taxes from Nigel, a typical British subject. Here are just six examples of the different ways the government could label this policy. In each of these examples, r stands for the interest rate, Nigel's remaining lifetime net-tax payments increase by £100, and there is an additional net flow of £100 to the government from Nigel this year and no additional net flows from Nigel to the government in future years.

- 1) "a £100 tax levied this year on Nigel"
- 2) "a £100 loan made this year by Nigel to the government, plus a £100(1+r) tax paid to the government next year by Nigel, plus a repayment next year to Nigel by the government of £100(1+r) in principal plus interest"
- 3) "an £800 loan made this year by Nigel to the government less a £700 transfer payment to Nigel, plus a tax levied next year on Nigel of £800(1+r), plus a repayment next year to Nigel of £800(1+r) in principal plus interest."

- 4) “a £200 tax paid this year by Nigel, less a £100 loan to Nigel this year by the government, plus a £100(1+r) transfer payment next year to Nigel, plus a repayment next year by Nigel of principal and interest of £100(1+r)”
- 5) “a £5,000,000,000 tax paid this year by Nigel, less a £4,000,000,900 loan to Nigel this year by the government, plus a £4,000,000,900(1+r) transfer payment next year to Nigel, plus a repayment next year by Nigel of principal and interest of £4,000,000,900(1+r)”.

Compared to case 1’s language, using the language in the other cases will generate the following: case 2: a £100 larger deficit, case 3: a £800 larger deficit, case 4: a £100 smaller deficit, and case 5: a £4,000,000,900 smaller deficit.

Although the government’s reported deficit is dramatically different depending on how it labels the additional £100 pounds it gets this year from Nigel, Nigel’s economic circumstances are unchanged. Regardless of which language the government uses, it’s still getting £100 more in present value from Nigel in net taxes, and Nigel’s own economic resources are, in each case, depressed by £100. Since Nigel’s annual cash flows are the same, alternative choices of language have no impact on the degree to which he is liquidity constrained in choosing how much to consume and save.

Moreover, the same set of economic incentives Nigel faces for saving or working is provided in all four cases. For example, suppose the government imposes an additional marginal tax rate of t on Nigel’s current labor income in order to generate the additional £100 pounds in revenue measured in present value. In case 1, this would be described as “a tax at rate t on this year’s labor earnings.” In case 2, it would be described as “a tax at rate $t(1+r)$ on this year’s labor supply where the payment is due next year.” In case 3, it would be described as “a marginal subsidy at rate $7t$ to this year’s labor supply plus a marginal tax on this year’s labor supply at rate $8t(1+r)$ where the payment is due

next year.” In case 4, it would be described as “a marginal tax of $2t$ plus a marginal subsidy at rate $t(1+r)$ to be paid next year.” And in case 5, it would be described as “a marginal tax of $50t$ plus a marginal subsidy at rate $49t$ to be paid next year.” In each case, the net marginal income from Nigel’s earning an additional pound this year is reduced by t times one pound.

To make the point about government labeling more salient, suppose H.M. Treasury were to begin this year calling each worker’s social contributions a “loan” and the additional Basic and SERPS pension benefits paid to the worker in old age in recognition of their post-1997 contributions “the payment of interest plus principal” on these loans less an “old age tax” which would differ from zero if the additional benefits did not equal principal plus interest on the loan. This alternative choice of language would make the official government deficit roughly £45 billion larger than is currently being reported and transform the government’s projected surplus into a projected deficit. If the government went back in time to the initiation of these programs and relabeled them in this manner, its official debt would quadruple.

In addition to a higher value of official debt, this alternative, but equally legitimate choice of language would translate into higher values of the generational accounts of all existing generations, apart from newborns. The larger value of the debt term on the right-hand side of the equation (1) would, in this case, be exactly matched by a higher value of the first summation on the left-hand side of the equation. Consequently, the size of the second summation on the left-hand side of the equation -- the collective net tax burden facing future generations -- is unchanged. Since both $N_{t,t}$ and \bar{N} are unaffected the choice of fiscal language, their percentage difference – the generational imbalance – is invariant to fiscal labeling. So too are policy-induced changes in the generational accounts of current as well as future generations.

Each choice of fiscal language raises or lowers the first summation on the left-hand side of (1) and the official net debt term on the left-hand side by exactly the same amount. Since there is an infinite number of ways to label each dollar given to the government by the private sector or given to the private sector by the government, there is an infinite set of alternative time series of the government's official debt that can be constructed simply by describing past and future economic policy with different words. But none of these time series of debts and deficits, in and of themselves, tells us anything about how the government is treating alternative generations.

IV. Limitations of Generational Accounting

As mentioned above, generational accounting seeks to measure the fiscal burden current policy portends for future generations and how changes in policy would affect current as well as future generations. Both of these questions involve what economists call *fiscal incidence*. Fiscal incidence refers to the changes in economic wellbeing of individual economic agents as a result of policy changes. Economists refer to economic wellbeing with the term *utility*. Formal incidence analysis describes mathematically how agent's utility levels are altered in response to new policy initiatives. These utility changes are then described in terms of monetary equivalents; e.g., economists produce statements like the following: "the welfare impact of this policy on these agents is equivalent to their being forced to give the government an extra £1,000 under the initial policy regime." The changes in the generational accounts of current generations arising from a change in policy are meant to measure, as monetary equivalents, the utility changes experienced by those now alive. The imbalance in generational policy – the difference in the generational account of newborns and future generations – is also meant to measure, as a monetary equivalent, a change in utility. In this case, it is the reduction in utility that future generations would experience were their lifetime net

tax rates raised from the rate facing newborns under current policy to the rate needed, under current policy, to cover all the bills left unpaid by those now alive.

The theory of fiscal incidence is very well developed. Its primary message is that those who mail tax payments to the government or receive transfer payments from the government may be neither the true victims of the government's tribute nor the true beneficiaries of its largesse. The discrepancy between whom the government says it is trying to hurt and help and whom it actually hurts and helps arises from potential policy-induced changes in factor and product prices. Take, as an example, a government subsidy to milk producers. If the supply of milk is sufficiently responsive (*elastic*) to the subsidy, the price of milk may fall so much that milk producers end up no better off despite receiving a subsidy check each month in the mail. The real beneficiaries in this case would be consumers who would be able to buy milk at a lower price.

Generational accounting incorporates a set of incidence assumptions in allocating taxes and transfers. For example, in the current study, corporate profit taxes are treated like taxes on labor income and are allocated to workers. Why? Because taxing corporate profits will lead to a reduction in the share of the world's capital stock that is invested in the UK. Indeed, capital will flow out of the UK until the relative scarcity of capital in the UK increases its pre-tax return and makes its after-tax return equal to that available from investing abroad. As capital becomes relatively scarce, labor becomes relatively abundant. This drives down the return to labor – the real wages firms pay their workers. For a small open economy like the UK, one would expect workers to bear the full cost of the tax in the form of lower real wages.

Although generational accounting incorporates a basic set of incidence assumptions, it does not rely on a computable general equilibrium model to modify these assumptions on a policy-specific basis. In so doing it misses, as Buitier (1997) stresses, certain general equilibrium repercussions of

policy changes. Although Buiters' concern is on target, as a practical matter, a recent study by Fehr and Kotlikoff (1996-1997) that uses the Auerbach and Kotlikoff (1987) dynamic life-cycle general equilibrium model to study this issue, suggests that generational accounting's incidence assumptions are reasonably accurate for a wide range of policies that don't involve very sizable changes in economic incentives. This said, there is nothing to preclude economists from formulating adjustments to the changes in generational accounts that more accurately reflect policy-induced changes in factor and product prices and, for that matter, pure efficiency changes that arise from providing a less distortionary set of fiscal incentives.

Making proper incidence adjustments to policy-induced changes in generational accounts requires having the right model of the economy. As Buiters (1997) also points out, the intergenerational incidence of policy changes will differ, and potentially dramatically, depending on whether the economy's agents are a) life-cyclers, meaning they are concerned with their own well being over their life cycles and do not use private intergenerational transfers to offset government ones, b) *Ricardian*, meaning they are altruistically linked to their descendents and use private gifts and bequests to offset any government attempt to redistribute among themselves and their descendents, or c) *liquidity constrained*, meaning they cannot borrow against their future income.

Generational accounting as conventionally applied proceeds from the assumption that agents are life-cyclers, and for good reason. There is now a wealth of very strong cohort and micro evidence ruling out Ricardian behavior. These studies include Boskin and Kotlikoff (1985), Abel and Kotlikoff (1994), Altonji, Hayashi, and Kotlikoff (1992, 1997), and Hayashi, Altonji, and Kotlikoff (1996). Moreover, studies by Hayashi (1987) and others suggest that at most a small minority of households is liquidity constrained with respect to their consumption behavior. Other studies, including the particularly impressive one by Altonji and Siow (1987), find no evidence whatsoever of

liquidity constrained or other Keynesian-type consumption behavior.

Although the assumption of life-cycle behavior is the one adopted here, nothing precludes economists from adjusting generational account changes to accommodate the behavior of those segments of the population that they view to be non life-cyclers. In the case of liquidity-constrained agents, the appropriate method of discounting the change in the future net taxes of such agents would depend on the precise nature of the liquidity constraints they face and the degree to which these constraints would adjust to the new policy environment.

The treatment of fiscal incidence is but one of three main valid concerns that have been raised with respect to the calculation of generational accounts. The other two have already been mentioned; a) the changes in net taxes arising from policy changes should, in principle, be discounted using appropriate risk-adjusted discount rates and b) that government purchases that are not allocated to cohort members by age and sex may, nonetheless, benefit current as well as future generations.

In addition to these valid concerns, some economists have suggested that generational accounting is too dangerous to be used in the public arena because it is too easy for politicians to manipulate the projections entering the analysis and, therefore, the outcome of the analysis. Whether or not politicians engage in such behavior remains to be seen. Up to now, however, such manipulation has not occurred. In any case, economists have a professional obligation to provide policymakers with the best set of tools available to help answer their fiscal policy questions. If the policymakers misuse these tools, that misuse will rest on their shoulders and will, most likely, be quickly uncovered.

V. Assumptions, Data Sources, and Projections

In forming generational accounts for the UK, we start from the 1997 National Accounts data on the receipts – *Resources* -- and expenditures – *Uses* -- of the general government (central government and local authorities). These amounts are classified according to the European System of Accounts, which was introduced in the UK for the first time in the 1998 edition of the National Accounts (The Blue Book). Table 1 reports all (current and capital) Uses and Resources. The difference between the sum of Resources and the sum of Uses reported in the table is the general government net lending(+)/net borrowing(-).

We derive this table by a) starting from the summary indication of Uses and Resources as contained in the Tables 5.1.1-7, and then b) disaggregating the main aggregates by using other National Accounts tables and, in the case of government expenditure, departmental statistics⁷. As far as the receipts are concerned, the main source of information used in the disaggregation process is Table 1.7S in the Blue Book (1998), reporting the classification of taxes paid by UK residents to general government and the European Union. As for Expenditure, we start from Table 5.4 (General Government: Total Outlays by Classification of Function of Government). This table allows us to disaggregate total government consumption by different types of public services (education, health, etc.) and different types of expenditure. In particular, a distinction is reported between the expenditure on goods and services (“net intermediate consumption”) and the compensation of employees. This latter consists of wages and salaries and employers' contributions⁸.

⁷ In particular we use: “Social Security Statistics, 1998” (Department of Social Security, DSS); “Education and Training Statistics for the UK, 1998” (Department for Education and Employment, DfEE); “Health and Personal Social Services Statistics for England, 1997” (Department of Health, DoH); “Inland Revenue Statistics, 1997”, (Inland Revenue).

⁸ These are social security contributions paid by the government to its employees. We identify them with the sum of the “imputed contributions” and “contributions to notionally funded and unfunded pension schemes” in the Resource side (Tables 5.24S and 5.34S of the Blue Book, 1998). These are contributions paid to a series of unfunded pension schemes run by the government, such as those for NHS staff, teachers, and Armed Forces.

The amounts in Table 5.4 do not exactly coincide with the ones reported in the departmental statistics, as the expenditure of the departments are only one component of the total expenditure. As an example, total outlay on Health includes the expenditure of various bodies, such as the Department of Health, the Health and Safety Commission and Local government public health departments⁹. Therefore, if we want to disaggregate further among different types of public services we need to use some assumptions. For example, in order to disaggregate the National Account current expenditure on Health among four different types of services: hospital and community health services, general medical services, pharmaceutical services and personal social services, we estimate the share of the total departmental expenditure absorbed by each of these categories as reported in the “Health and Personal Social Services Statistics for England, 1997”. We then apply these proportions to the net intermediate consumption and to the compensation of employees (in its wage component¹⁰) for Health, as reported in the Blue Book.

We also disaggregate the expenditure on Education among five different types of education services: school, higher education and further education (both full time and part time). The net intermediate consumption and the expenditure on wages on Education reported by the National Accounts are allocated among these types of education services by using their share of the total departmental expenditure (estimated from the “Education and Training Statistics for the UK”, 1997).

Further, to disaggregate the total expenditure on social benefits we use Table 5.24S (Central Government: Social Contributions and Benefits) and Table 5.34S (Local Government: Social Contributions and Benefits) of the Blue Book 1998, and several tables contained in “Social Security

⁹ The difference, however, is generally quite small. Taking Health as an example, the Blue Book figures for total expenditure on Health are £40,524 mn in 1995 and £42,859 mn in 1996, while the equivalent amount reported in the “Health and Personal Social Services Statistics for England, 1997” for 1995/96 is £41,866 mn.

¹⁰ For each function of government (health, education, etc...) we assume that the “compensation of employees” is divided between wages and contributions according to the same proportion.

Statistics, 1998". The same sources also allow us to identify the revenues from National Insurance contributions. Appendix 1¹¹ describes how we have derived each of the taxes and transfers contained in Table 1.

The second stage of our study has been to obtain an age and sex distribution of as many of these taxes and transfers as possible. This required us building age and sex relative profiles from household or individual micro-data. However, some of the fiscal variables included in the general government budget of Table 1 can not be distributed among the 1997 population by age and sex (for example, the expenditure on public order, or on international cooperation). We thus build an artificial profile, that allocate these taxes or transfers uniformly among all age groups (the relative profiles values are 1/101). In doing so, we let demographic changes affect the growth of these aggregates. As we pointed out above, we treat these taxes and transfers as "government consumption" (negative consumption if taxes), and thus as the components of G_t in equation 1. This implies that they are not considered in the construction of generational accounts for currently living generations. Table 2 presents a list of all age-specific and non-age specific taxes and transfers considered in this study.

A special treatment is also reserved to the revenues from government assets, and therefore to the following sources of fiscal revenues: Petroleum tax revenues, Rents, and Gross Operating Surplus. These revenues are capitalized at 1997, that is to say, we let their future flows grow in line with labor productivity and discount them to the base year. The sum of the present value of these revenues is then subtracted from the government debt (taken as the net financial liabilities of general government, Table 5.1.9 of the Blue Book, 1998). This amount represents the government's net debt in equation 1.

¹¹ The Appendix for this discussion paper is available on the web site <http://www.niesr.ac.uk/niesr/discuss.htm>.

Profiles and Demographic Projections

We construct the age and sex profiles for the taxes and transfers in Table 2 by using data contained in the following sources:

- **The Family Expenditure Survey (FES) (ONS, 1995-96)** contains information on expenditure and incomes of about 7,000 private households in the UK.
- **The Family Resource Survey (FRS), (ONS, 1995-96)**, used by the Department of Social Security and based on a sample of around 26,000 households, contains detailed information on incomes, social security benefits, tenure and housing costs, assets and savings.
- **The General Household Survey (GHS), (ONS, 1995-96)**, based on information on 15,000 households, is especially relevant as it contains information on the use of health care facilities.

In addition to these surveys we will make use of a variety of other sources of data, particularly those produced by certain government departments. For most of the social security benefits we make use of administrative data received from the Department of Social Security. To disaggregate health expenditure we use data provided by the Department of Health, and, in particular, by the NHS Executive, while the age-sex breakdown for education expenditure is based on the “Education and Training Statistics for the UK” (DfEE). Another source of data is the Inland Revenue Statistics, which we use to construct the profile of the inheritance tax.

As an example of how we constructed these profiles, let’s consider the one for the Income tax. We use the information contained in the Financial Resource Survey about the amount of income tax deducted from the payslip of the interviewed who are employed or paid by those who are self-employed. We obtain the amounts paid by men and women aged from 0 to 101 and divide them by the number of men and women of that age who have been interviewed, in order to get the per capita

amounts. We then normalize these amounts, as they are divided by the average income tax paid by the men population (for men) and by women population (for women). We thereby obtain relative profiles (whose sum over the age range 0-101 is 1), indicating the relative per capita payment of a certain tax (or receipt of a certain transfer) separately for the male and female population (the $R_{t,t-s}$ in equation 8). In order to get the aggregates of the base year (or of successive years, if we have official projections) we calibrate the relative profiles by solving for the average receipt or payment in year t , T_t (see equation 9). In Appendix 2¹² we explain in detail the data sources and the assumptions used to build the relative profiles.

As for the demographics projections we use the 1996-based national population projections of the Government Actuary's Department. Their main assumptions are as follows:

- the fertility rate, equal to 1.72 in 1997/1998, increases and reaches 1,8 children per woman in 2006/2007, remaining constant thereafter.
- life expectancy at birth, which is 74,7 for men and 79,7 for women in 1997, rise to 76.1 for men and 80.1 for women by 2005/2006 and increase thereafter (converging to 79.2 for men and 84 for women in 2066/2067).
- annual net migration amounts to 66.000 people from 1998 onward.

Using these assumptions, together with the ones on mortality rates, GAD obtains projections on the UK population by individual age for the period 1998-2010, and for the years 2026, 2031 and 2036. We obtain the projections for the remaining years before 2036 by interpolating the official figures, and extrapolate the 2036 numbers to get projections until the year 2101 (we assume a constant population structure thereafter). One implication of these projections is that the “old age dependency ratio” (population aged 65 and older divided by population aged 25-64) which is 29.7 per

¹² The Appendix for this discussion paper is available on the web site <http://www.niesr.ac.uk/niesr/discuss.htm>.

cent in 1997, decreases slightly in the next 6 years and will then increase rapidly reaching 50 per cent by 2036. If compared to other country figures, however, these results do not look so alarming. Among the G10 countries only the USA will have a lower dependency ratio by 2050 (44.2 against 49.4 in the UK).

The Quality of Survey Data

Any use of survey data must take into account the fact that, despite the effort and care spent in collecting and checking information, the survey's results may be affected by sampling errors, non response biases, and incorrect reporting of certain items. Comparison with National Account data show that both the FES and FRS perform quite well, even if there are some areas where there are known problems with the surveys. These are due to the fact that these are voluntary household surveys relying on the knowledge of their respondents and to the fact that characteristics of respondents may differ from those of non-respondents.

Our use of DSS administrative records in the construction of relative profiles for most social security transfers implies that these profiles are immune from the problems associated with multiple benefits receipt. We did have to confront, however, the problem represented by the under-representation of the very old in the population (perhaps because they focus on households). This resulted in limited availability of data for respondents who are very old and thus in a larger variance of the surveys' observations at the high tail of the age distribution. To deal with this problem, when the per-capita data show a high degree of noise at the very old age we sum the observations for these ages (i.e., for the range 80-101) and split it equally among the single age groups belonging to that band. This generally results in a flat upper tail of the profile. Moreover, when the observations are

very scarce for all ages (as for some social security transfer in the FRS), we group them in 5-year-age bands and split the sums equally among the age groups within the ranges.

As a general rule, to avoid constructing profiles that are excessively dependent on the sample's biases and outliers we always smooth the original (row or grouped data) profiles by applying a Hodrik-Prescott filter. The graphs at the end of the paper show both the original (row or grouped data) and the smoothed relative profiles.

Projections

The main sources of projections are the HM Treasury and the Government Actuary's Department (GAD). The HM Treasury provides projections on government revenues and expenditures until the fiscal year 2003/2004. The GAD produces estimates until 2060/2061 on the benefits financed from the National Insurance Fund (pensions, incapacity benefits, widow's benefits, jobseeker's allowances, maternity allowances, redundancy fund benefits) and thus on the social security contributions needed to finance this expenditure.

We use these sources of information to derive future values of as many types of taxes and transfers of Table 2 as possible, for as many years ahead as possible. When we have no official projections, we assume that taxes and transfers grow in line with per capita labor productivity. The only exception to this rule is represented by social security transfers (and thus social security contributions) for which we impose a zero growth in real terms, as these benefits have been indexed to prices rather than to earnings since 1980.

In particular, we use the following source of projections:

Table 292a, "Public sector current receipts", HM Treasury: contains the detailed projections on tax revenues until 2003/2004. We use the amounts reported in this table (converted in 1997 prices) for most of the tax revenues.

Table 290c, “Public sector transactions by sub-sector and economic category: details for general government on a financial year basis”, HM Treasury: contains forecasts for both taxes and expenditure aggregates until 2003/2004. We apply the (real) growth rates implied by this table to the 1997 values of those taxes that are not individually forecasted in Table 292a, and to most of the expenditure and transfers.

For the expenditure on Health and Education we use the information contained in the Comprehensive Spending Review (CSR) published in July 1998 by the HM Treasury. In particular, we use the projected “Total spending in Education” (Table A1) and “Total Health plus Personal Social Services” (Table 7.1). For the expenditure on Health and Education between 2001 and 2003 we use the growth rates forecasted by the Treasury in Table 290c for “Current expenditure on goods and services”.

Table 290c is also used to make sure that our projections match with the Treasury ones. In particular, we use the amounts of fiscal revenues projected by the Treasury and rescale all the expenditure projected for the period 1998-2003 in order to have them matching the aggregates contained in Table 290c. In order to do so we calculate the proportion of each different projected payment over the correspondent aggregate, and then apply these proportions to the Treasury values. We thereby obtain projections of the general government net borrowing requirement that match almost exactly the ones projected by the Pre-budget report for the next 6 years.

Every five years the GAD publishes a review assessing the likely costs of the benefits under the NI scheme, and the amount of contributions needed to cover this outflow. We use data which will be published in the next report and that cover the period 2000-2061. To get the values from 1998 to 2000 we interpolate our 1997 ESA value and the first GAD projection. Appendix 3¹³ describes the assumptions followed to project forward each of the taxes and transfers considered in this study.

VI. Findings

Our baseline policy scenario, which represents our sense of current government policy, is marked by very considerable fiscal restraint and prudence. Despite this fiscal prudence, these assumptions still leave a generational imbalance. Without great restraint in future government purchases of goods and services or increases (relative to our baseline projection) over time in the net tax payments of current British adults, future British children could well face higher *lifetime net tax rates* (the present

¹³ The Appendix for this discussion paper is available on the web site <http://www.niesr.ac.uk/niesr/discuss.htm>.

value of lifetime net taxes divided by the present value of lifetime labour earnings) than their parents now face.

Under an alternative policy scenario, that we label *Looser Policy*, pensions and other social benefits are wage indexed and growth in health care spending per beneficiary remains at current levels through to 2030. Since current generations pay less in net taxes under this alternative scenario, there is a larger fiscal bill left for future generations to pay. In this case, achieving generational balance would require either a substantial sustained cut in non-education and non-health government spending or an equally substantial increase in income tax revenues and a corresponding increase in social security contributions.

Details of the Alternative Policy assumptions

In our baseline policy scenario we extrapolate our sense of future current government policy. All the assumptions used in its construction reflect considerable fiscal restraint and prudence. For the period 1998-2003 we have based our estimate of both tax receipts and government personal transfers and expenditures on current government projections (the details are in Appendix III). For the period 2004-2060 the projections of aggregate government spending on contributory benefits and their corresponding social security receipts are based on the current Government Actuary' Departments projections under the assumption that the benefits are all price indexed. All other government transfer payments after 2004, except rent rebates, and all contributory benefits and social security receipts after 2060 are assumed to rise in line with prices. Therefore, in real terms the only increase or decrease in aggregate spending on these categories is due to demographic changes. Finally, all other receipts and expenditures *per beneficiary* are assumed to grow in line with productivity, which we have set at 1.75%. However the *aggregate* spending or receipts in these categories may increase or decrease at a rate greater than 1.75% per annum in real terms because of demographic changes. In Chart I we show the implications of these

assumptions in terms of the spending on all personal transfers (all social security benefits), education and health care expressed as a share of Gross Domestic Product (GDP). For our forecast of GDP, we use government's projections until 2003 and thereafter we assume that GDP grows in line with total income tax revenues.

Under the baseline scenario government spending on personal transfers falls dramatically as a percentage of GDP, despite the ageing of the population. This is a direct consequence of the government policy of price indexation. Aggregate health spending under these assumptions grows slightly slower than it has done historically until 2050 before stabilizing at around 8% of GDP.

Under an alternative policy scenario, that we have labeled *Looser Policy*, we relax some of the fiscal restraints embedded within our baseline policy. In this scenario pensions and other social benefits are wage indexed after 2004 and, therefore, on a per-beneficiary basis grow in line with all other government transfers and receipts. In addition to this, we also increase the growth in health care spending per beneficiary from 1.75% to 2.8% through to 2030 before letting it return to 1.75%. We have chosen a growth rate of 2.8 percent per beneficiary as this is close to the average historical rate of growth in per capita health care spending in the UK since 1950. Chart I also shows the implications of these assumptions on personal transfer and health care spending as a ratio of GDP. If only non-contributory social security transfers rise in line with wages, then total social security transfers as a percentage of GDP remain fairly constant until 2030 before starting to fall. This is because the rise in social security transfers arising from the maturation of SERPS programme and the ageing of the population approximately offset the decline due to price indexation until 2030. If, however, *all* social security transfers rise in line wages, then social security transfers as a share of GDP rise to nearly 18% before stabilizing in 2050. Moreover, in this scenario health care spending rises roughly at the same rate as it has done historically until 2020. It then increases at a faster rate from 2020-2040, the period when the

“baby boomers” retire and the old age dependency ratio rises by almost 30%, before stabilizing at around 11% of GDP.

Generational Accounts in the UK

The generational accounts are the set of values (in present value terms) of the average total net lifetime tax payments of a male and a female member from each of the living and future generations. These are the values $N_{t,k}$, in equation (1). By “total net lifetime tax payments” we understand total taxes paid less total transfer payments received over an individual’s lifetime, where future payments and receipts have been discounted back to the present at an annual discount rate of 5%. The averaging is done not just over net tax payments, but also over survivorship. The government expenditure which we were unable to allocate (such as government expenditure on law and order and defense) are not included in the generational accounts, but are included in equation (1) as the unallocated government expenditures G_t .

It is necessary to calculate values for both male and females as some transfers treat the sexes differently, and also as the life expectancies for males and females are very different. However the accounts should be used with great caution in inferring anything about gender redistribution, as they do not take into account the *intra-household* distribution of incomes and benefits.

Tables 3 and 4 present the generational accounts under our baseline policy for a male and a female member of each of the living generations respectively. The average total value of net transfers has been disaggregated into 11 different components. Thus from Table 3, a current living male newborn will expect to make a net payment of £52,355 in 1997 present value prices to the government. The payments will be made up predominantly of £46,523, £42,950 and £22,497 of income tax, indirect tax and social security contributions respectively; and the receipts predominantly

of £19,175, £30,102 and £14,170 of health care, education and social benefits respectively.

In the first few years of his life, a male newborn expects the government to spend a significant amount on both his health care and education. Thus, if we look at a male member of the generation aged 15, we see that his expected receipts of health care and education have fallen with respect to the newborn, as he has now received these benefits. Also the present value of his tax payments has risen, because his working life (when he pays his taxes) is now only between 1-10 years off and so is discounted far less heavily than a newborn's, whose working life is 16-25 years off. Therefore, the net tax payments of a currently living 15-year-old male is considerably higher than the equivalent for a current male newborn (£136,615 against £52,335). Current living 25-year-old males have the largest net tax payment to the government (£174,946). At 25, most people have the majority of the working life ahead of them, a period during which they will pay taxes and will receive very little from the government in terms of health care and pension payments for nearly forty years. By 65, though, the situation is reversed. Most people will have paid the majority of their lifetime taxes and will be in receipt of a state pension and/or expecting a significant expenditure on health services by the government in the next few years. Consequently, a current living 65-year-old male will be expecting a net receipt from the government of £92,328.

The primary difference between the male and female accounts is on the tax side. Females on average pay less taxes, as their participation rate in the labour market (taking into account part time work) and their average wage are both lower. On the converse, they receive less in terms of both health care and pensions during retirement.

Table 7 shows the growth adjusted generational account of future generations under the baseline policy scenario. The generational account remains relatively constant over time, suggesting that current policy is generationally equitable. However, the composition of the account changes,

with social security transfers becoming less significant and health care more. This explains the slight trend in the female generational account, as they receive on average less health care than males.

Tables 5 and 6 show the generational account of male and female living generations under looser policy, and Table 7 gives the account for future generations. The only difference between these tables and the earlier ones is on the transfer side, and then they are dramatically different only for the younger generations. The impact of indexing social security benefits to prices only slowly reduces the value of these benefits relative to average incomes. Therefore, the relaxation of this fiscal constraint does not greatly affect the entitlement of those already receiving these transfer payments. However, it dramatically affects the entitlement of the newborns, who will be receiving their pension after 65 years. The lifetime net taxes of current male newborns under this looser policy is £36,871, and for females is -£14,368 (a fall of nearly £20,000 from the baseline). Table 7 shows that these changes become even greater over time in the looser policy scenario, as both the health care programme and the welfare system grow significantly larger.

Assessing the Imbalance in UK Generational Policy

The generational accounts enable us to assess both generational equity and the sustainability of current government policy. In Table 10 we record both the generational balance gap and the intertemporal budget gap under the different policy assumptions. These gaps are significant at around 2/3 of the value of present government debt (which is about 40% of GDP). The intertemporal budget balance is slightly smaller than the generational balance because, as Table 7 showed, under baseline policy future females have to make larger net tax payments than current generations. Therefore, even under the tight fiscal restraint of our baseline policy, these assumptions still leave both a generational and intertemporal budget imbalances. The generational implications of this budget imbalance can be

assessed in terms of the rise in lifetime net tax payments that future generations will have to sustain in order to close this gap. The last row of Table 3 and 4, labeled FUT, shows the net tax payments that every future generation has to sustain (on a growth adjusted basis) to ensure fiscal sustainability (this is \bar{N} in equation 3). We have made the additional assumption here that the ratio of male and female net tax payments for current newborns equals the same ratio for all future newborns. To ensure fiscal sustainability the average of the male and female net tax payments needs to rise from around £26,000 to just above £39,000.

Relaxing the fiscal restraint of the baseline policy, by allowing both non-contributory and contributory benefits to rise in line with wages and introducing higher growth in health care spending per beneficiary, has substantial fiscal implications. Both the generational balance and intertemporal budget gap rise to nearly twice GDP. Under this policy, the fiscal bill left for each member of every future generation on a growth-adjusted basis would be £75,000 as compared to £11,000 paid by current newborns.

Achieving a Sustainable and Generationally Balanced Fiscal Policy

Another way of measuring the imbalance in fiscal policy is to ask what immediate and permanent change in income tax is necessary to close either the *generational balance gap* or the *intertemporal budget gap*. An income tax increase that achieves generational balance is the income tax increase needed to satisfy the intertemporal budget constraint under the assumption that the lifetime net tax payments of all future generations are equal (on a growth adjusted basis) to current newborns. An income tax increase that restores the intertemporal budget balance is the income tax increase required to satisfy the intertemporal budget constraint under the assumption that otherwise

policy remains the same. These two results would be identical if all tax payments and transfer receipts grew at the same rate and the age profile of the population did not vary with time.

In Table 10 we have recorded the different tax increases required to achieve generational and intertemporal balance under different policy alternatives. Where contributory benefits are assumed to rise in line with wages, we also assume a commensurate increase in social security contributions and then let the income tax increase to close the gap.

Under baseline policy a rise of 7-9% in income tax revenues is required to restore both generational and intertemporal balance. This is equivalent to a increase of about £5bn in the income tax revenues and a permanent and proportionate increase thereafter, or to about a 2% increase in all income tax rates. An alternative scenario is investigated in Table 11: productivity is assumed to rise at 2% rather than 1.75%, with a similar rise in VAT payments and no commensurate rise in any other tax payments, transfer receipts or government expenditures. Our calculations suggest that if government were able to raise productivity by this ¼% and stick otherwise to the tight fiscal targets demanded by our baseline scenario, then this policy would be sustainable.

Table 10 also highlights the fiscal implications of relaxing these tight fiscal constraints. Under the scenario labelled looser policy, income tax would have to rise to about 34%, around 22% to cover the increase in non-contributory benefits and 12% to cover the increase in health care spending. Social security contributions would also have to rise by 43% to cover the cost of the increase in contributory benefits.

Chart II plots the implications of these results in terms of increases in the total tax revenue expressed as a percentage of GDP, where the total tax revenue is defined as the sum of all government receipts excluding only imputed social security contributions. Under looser policy the tax revenue would need to rise to historically unsurpassed rates of 40-45 per cent of GDP. In contrast,

the tax rises needed to ensure sustainability under the baseline scenario only return the total tax revenue to about its post second world war average.

In Tables 8 and 9 we show how the tax rises needed to ensure generational balance under looser policy affect the generational accounts of the currently living generations (recorded in Tables 5 and 6 before these tax increases). The huge tax rises are recorded in the columns labeled “income tax and social security contributions”. The net lifetime tax payments of newborn males has nearly doubled and those of newborn females has risen by over £14,000. However, generational equity has now been restored.

The Cost of delay the tax rises and the savings of delaying wage indexation

Table 12 aims to illustrate the cost of delaying the income tax rises needed to restore either generational or intertemporal balance by 5, 15 or 25 years. These costs are expressed in terms of the tax rise that would be then required. It is evident that, even under the baseline policy, the cost of delaying these income tax increases soon becomes substantial. Delaying by five years implies that the income tax rise would need to be more than 1.5 percentage points larger than the one adopted immediately. Under a slightly looser policy scenario (wage indexation of non-contributory benefits) the costs of the delay soon spiral out of control.

Table 13 looks at the converse situation, the savings in terms of reduced income tax increases arising from delaying the return to the wage indexation of non-contributory benefits until 2010, 2020 or even 2030. The necessary tax rise drops quite rapidly, as the value of these benefits fall relative to average

Sensitivity of Findings to Interest and Growth Rate and Other Policy Assumptions

In this study we have assumed an interest rate of 5%, and a growth rate in productivity of 1.75% for the majority of payments and transfers. To demonstrate that our findings are not particularly sensitive to these assumptions we report in Table 14 the results of a number of experiments where we have varied these assumptions. We show the generational imbalance and intertemporal budget gap and the income tax rises needed to restore the balance when a) the interest rate is 3% and 7%, and b) when the rate of growth of all payments and transfers rises $\frac{1}{4}$ % and $\frac{1}{2}$ % in real terms faster than the baseline. The results only vary slightly, because the interest rate and the productivity rate are applied to both government receipts and payments. Thus, if the baseline assumptions are changed, then both receipts and payments change broadly in the same proportion, leaving the gap roughly the same and the required tax increases to restore the balance very similar.

International Comparisons of GAs

Table 15 compares alternative adjustments needed to achieve generational balance in the UK with those in the U.S., Japan, Germany, France, Italy, and 12 other European, Asian, and South American countries. The source for the non UK numbers reported in the table is Kotlikoff, and Leibfritz (1999) and Raffelhueschen (1998).

VII. Summary and Conclusion

With the critical assistance of various agencies of Her Majesty's Government, particularly H.M. Treasury, this study has developed the first set of generational accounts for the UK. Unlike the U.S., Japan, Germany, and Italy, the UK does not, under our assumed baseline policy, exhibit a large imbalance in its generational policy that seriously threatens the economic wellbeing of future generations. On the other hand, baseline policy, while entailing significant fiscal restraint, does not achieve generational balance. This suggests that additional fiscal measures will be needed to prevent

Britain's children from paying higher lifetime net tax rates than those now being paid by their parents. Moreover, if the fiscal responsibility embedded in current policy is neither enhanced nor maintained, Britain's children could face significantly higher lifetime net tax rates than their parents now face.

The preparation of this study was greatly aided by various departments of the government, particularly H.M. Treasury. In providing this assistance, the government has initiated an extremely important process of doing long-term fiscal planning for the nation on a systematic and comprehensive basis. It is our hope that Office of National Statistics will continue this process by publishing regularly updated sets of generational accounts. And, further, that H.M. Treasury will adopt the measures of fiscal sustainability and generational equity used in this study as their primary measures of the sustainability and generational impact of government policy.

References

- Abel, Andrew and Laurence J. Kotlikoff, "Intergenerational Altruism and the Effectiveness of Fiscal Policy: New Tests Based on Cohort Data," in *Savings and Bequests*, Toshi Tachibinachi, ed., Ann Arbor, MI.: Michigan University Press, 1994.
- Altonji, Joseph, Fumio Hayashi, and Laurence J. Kotlikoff, "Is the Extended Family Altruistically Linked?" *American Economic Review*, vol. 82, no. 5 (December 1992), pp. 1177–98.
- Altonji, Joseph, Fumio Hayashi, and Laurence J. Kotlikoff, "Parental Altruism and Inter-Vivos Transfers: Theory and Evidence," *Journal of Political Economy*, vol. 105, no. 6 (December 1997), pp. 1121–66.
- Auerbach, Alan J., Laurence J. Kotlikoff, and Willi Leibfritz, eds., *Generational Accounting Around the World*, Chicago, Illinois: The Chicago University Press, forthcoming 1999.
- Auerbach, Alan J. and Laurence J. Kotlikoff, "The Methodology of Generational Accounting," forthcoming in *Generational Accounting Around the World*, in Alan J. Auerbach, Laurence J. Kotlikoff, and Willi Leibfritz, eds., Chicago, Illinois: Chicago University Press, forthcoming, 1999.
- Auerbach, Alan J., Jagadeesh Gokhale, and Laurence J. Kotlikoff, "Generational Accounts: A Meaningful Alternative to Deficit Accounting," in D. Bradford, ed., *Tax Policy and the Economy* 5, Cambridge, MA: MIT Press, 1991, 55-110.
- Auerbach, Alan J., Jagadeesh Gokhale, and Laurence J. Kotlikoff, "Generational Accounting: A Meaningful Way to Assess Generational Policy," *The Journal of Economic Perspectives*, Winter 1994.
- Boskin, Michael and Laurence J. Kotlikoff, "Public Debt and U.S. Saving: A New Test of the Neutrality Hypothesis," *Carnegie-Rochester Conference Series on Public Policy*, Autumn 1985.
- Buiter, Willhelm H., "Generational Accounts, Aggregate Saving and Intergenerational Distribution," *Economica*, vol. 64, 1997, 605-26.
- Congressional Budget Office, 1995, *Who Pays and When: An Assessment of Generational Accounting*, Washington, D.C.: U.S. Government Printing Office, November.
- Gokhale, Jagadeesh, Benjamin R. Page, and John R. Sturrock, "Generational Accounts for the U.S.: An Update," in *Generational Accounting Around the World*, Alan J. Auerbach, Laurence J. Kotlikoff, and Willi Leibfritz, eds., Chicago, Illinois: Chicago University Press, forthcoming 1999.
- Cutler, David, "Review of Generational Accounting: Knowing Who Pays, and When, for What We Spend," *National Tax Journal*, vol. 46, no. 1, March 1993, 61-76.

- Diamond, Peter, "Generational Accounts and Generational Balance: An Assessment," *National Tax Journal*, vol. 49, no. 4, December 1996, 597-607.
- Fehr, Hans and Laurence J. Kotlikoff, "Generational Accounting in General Equilibrium," *FinanzArchiv*, vol. 53, no. 4, 1996-1997, 1-27.
- Hayashi, Fumio, Joseph Altonji, and Laurence J. Kotlikoff, "Risk-Sharing Between and Within Families," *Econometrica*, March 1996.
- Haveman, Robert, "Should Generational Accounts Replace Public Budgets and Deficits?" *Journal of Economic Perspectives*, vol. 8, no. 1 (Winter 1994), pp. 95-111.
- Kotlikoff, Laurence J., 1992, *Generational Accounting: Knowing Who Pays, and When, for What We Spend*, New York, N.Y.: The Free Press.
- Kotlikoff, Laurence J. and Willi Leibfritz, "An International Comparison of Generational Accounts," in *Generational Accounting Around the World*, Alan J. Auerbach, Laurence J. Kotlikoff, and Willi Leibfritz, eds., Chicago, Illinois: Chicago University Press, forthcoming 1999.
- Kotlikoff, Laurence J., "From Deficit Delusion to the Fiscal Balance Rule: Looking for a Sensible Way to Describe Fiscal Policy," *The Journal of Economics*, Seventh Supplement, 1993.
- Kotlikoff, Laurence J., "Reply to Diamond's and Cutler's Reviews of Generational Accounting," in *The National Tax Journal*, Vol. L, No. 2, June 1997.
- OECD, "Ageing in OECD Countries -- A Critical Policy Challenge", *Social Policy Studies* No.20, 1966.
- Raffelhüschen, Bernd, "Aging, Fiscal Policy and Social Insurances: A European Perspective," mimeo, Albert-Ludwigs-University of Freiburg, Germany and University of Bergen, Norway, 1998.
- Shavior, Daniel N, *Do Deficits Matter?* Chicago, Ill.: University of Chicago Press, 1997.

Table 1

RESOURCES	£ million	USES	£ million
Operating surplus	12,434	Net intermediate consumption	
Taxes on production		Education	
VAT	52,289	School	2,541
Alcohol	5,793	Higher Education FT	1,239
Tobacco	8,234	Higher Education PT	703
Hydrocarbon oil	18,059	Further Education: FT	438
Stamp duties	3,113	Further Education: PT	1,078
Betting, gaming and lottery	1,522	Health	
Insurance premium tax	1,043	Hospital and community health services	23,448
Payment to the National Lottery Distribution Fund	1,512	General medical services	4,176
Other customs and excise duties	1,393	Pharmaceutical services	3,718
Other taxes on production		Personal Social Services	8,605
National non domestic rates	14,598	Social protection	
Vehicle excise duty paid by businesses	1,362	Other (non-attributable)	27,762
Other	875	Compensation of employees: wages	
Property income		Education	
Interest received	4,136	School	12,204
Distributed income of corporations	1,616	Higher Education FT	1,348
Property income attributed to insurance policy holders	33	Higher Education PT	765
Rent	717	Further Education: FT	353
Taxes on Income		Further Education: PT	870
Income Tax	72,202	Health	
Corporation Tax	29,533	Hospital and community health services	1,295
Petroleum revenue tax	1,523	General medical services	231
Taxes on capital gains	1,522	Pharmaceutical services	205
Windfall tax	2,610	Personal Social Services	475
Other current taxes		Social protection	
Council Tax	10,570	Other (non-attributable)	25,696
Vehicle excise paid by households	2,972	Compensation of employees: contributions	
Other current transfers	154	Education	5,750
Social contributions		Health	816
Employers NIC's	24,281	Social protection	748
Employees NIC's	17,819	Other (non-attributable)	2,862
Self-employed and non-employed NIC's	1,098	Non-market capital consumption	6,703
Other social contributions	7,106	Subsidies paid	
Notionally funded and unfunded pension schemes: emplc	2,033	Health	226
Notionally funded and unfunded pension schemes: emplc	2,557	Housing	1,210
Imputed social contributions	5,587	Other (non-attributable)	3,425
Other current transfers		Interests paid	30,132
Current international cooperation	1,739	Social security benefits in cash	
Miscellaneous current transfers	496	Retirement Pensions: basic	30,371
Taxes on capital (inheritance tax)	1,687	Retirement Pensions: SERPS	3,118
Other Capital Transfers	329	Widow's and guardian's allowances	988
		Jobseeker's allowance	624
		Incapacity benefits	7,580
		Maternity Benefits	35
		Statutory sick pay	28
		Statutory maternity pay	505
		Social fund benefits	177
		Benefits paid to overseas residents	1,069
		Redundancy Fund benefits	132

Table 1

RESOURCES	USES
	Social assistance benefits in cash: local authorities
	Students grants 2,594
	Rent rebates/allowances 11,187
	Unfunded employees social benefits 14,163
	Other current transfers
	Current international cooperation 1,544
	GNP fourth resource contributions to EU 2,458
	Grants to higher 4,741
	Grants to further education 3,703
	Grants to non-profit institutions 2,864
	Grants to fund NHS pension increases 581
	Capital transfers payable
	Education 369
	Health 163
	Housing 2,696
	Other (non-attributable) 3,089
	Gross Fixed Capital formation
	Education 1,121
	Health 97
	Social protection 361
	Housing 718
	Other (non-attributable) 7,960
	Net borrowing -16,109

Table 3

Male Generational Accounts Under Baseline Policy

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	52,355	46,523	14,387	42,950	22,497	7,580	-2,225	-19,175	-30,102	-7,547	-14,170	-8,363
5	72,911	54,224	16,772	49,995	27,095	8,567	-2,806	-17,762	-31,645	-6,199	-16,632	-8,699
10	103,070	63,748	19,723	58,550	32,668	9,791	-3,533	-17,839	-26,970	-4,429	-19,529	-9,111
15	136,615	74,791	23,138	68,133	39,164	11,181	-4,420	-18,615	-21,963	-2,207	-23,045	-9,541
20	166,615	85,453	26,380	74,337	45,216	12,046	-5,478	-19,473	-15,115	-863	-25,986	-9,899
25	174,946	88,269	26,993	72,711	45,849	12,009	-6,741	-20,142	-6,896	-958	-25,851	-10,296
30	162,971	85,753	25,978	69,377	43,044	11,826	-8,517	-21,414	-5,127	-943	-25,706	-11,298
35	139,711	78,847	23,426	64,283	38,008	11,377	-10,828	-22,837	-3,423	-792	-25,665	-12,687
40	108,312	68,430	19,867	58,568	31,799	10,775	-13,848	-24,350	-2,467	-533	-25,583	-14,347
45	67,376	54,131	15,536	51,572	24,807	10,195	-18,088	-26,413	-1,514	-282	-25,786	-16,782
50	23,000	35,472	10,569	42,802	17,021	9,101	-21,531	-25,866	-933	-124	-25,326	-18,185
55	-25,397	20,038	6,068	35,536	9,629	8,527	-29,219	-28,927	-544	-46	-24,732	-21,727
60	-65,277	8,950	2,732	27,897	3,864	7,779	-38,262	-31,224	-79	-13	-22,305	-24,615
65	-93,328	3,410	920	20,758	689	6,975	-48,874	-33,404	0	-2	-16,346	-27,454
70	-92,409	1,974	371	14,397	2	6,284	-42,398	-35,853	0	0	-13,296	-23,889
75	-86,658	987	252	9,966	3	5,945	-32,987	-39,703	0	0	-12,406	-18,715
80	-79,883	446	174	6,575	6	5,976	-23,500	-44,338	0	0	-11,252	-13,970
85	-80,810	546	135	4,218	0	6,567	-18,521	-50,960	0	0	-11,231	-11,565
90	-72,600	257	99	2,446	0	5,711	-15,082	-45,966	0	0	-10,673	-9,391
95	-57,719	1	71	1,403	0	4,195	-11,822	-34,743	0	0	-9,547	-7,277
100	-37,433	0	47	423	0	2,796	-7,159	-23,192	0	0	-5,884	-4,464
FUT	76,480											

Table 4
Generational Accounts for Females Under Baseline Policy

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	1,463	19,976	8,738	41,644	12,395	7,019	-1,919	-20,536	-29,658	-8,744	-16,293	-11,160
5	13,427	23,464	10,266	48,800	14,996	7,977	-2,430	-19,109	-31,361	-7,756	-19,373	-12,046
10	32,669	27,480	12,008	57,010	17,978	9,072	-3,054	-19,012	-26,493	-6,358	-22,955	-13,006
15	53,856	32,323	14,133	66,584	21,622	10,386	-3,861	-19,725	-21,447	-4,615	-27,395	-14,149
20	70,308	36,046	15,672	71,521	24,433	11,089	-4,761	-20,053	-15,178	-3,481	-30,131	-14,850
25	73,141	34,676	15,003	69,105	22,914	10,828	-5,809	-19,884	-6,513	-3,163	-28,955	-15,061
30	63,355	31,518	13,516	66,429	19,952	10,681	-7,407	-20,581	-4,759	-2,615	-27,309	-16,069
35	50,766	27,235	12,292	61,888	17,664	10,287	-9,394	-21,335	-3,748	-1,865	-25,248	-17,009
40	34,502	23,187	10,834	56,062	15,060	9,830	-11,966	-22,296	-2,995	-967	-23,799	-18,446
45	6,976	17,635	8,430	48,224	11,120	9,334	-17,928	-23,626	-1,841	-354	-23,238	-20,782
50	-20,603	11,820	5,823	39,042	6,881	8,361	-23,773	-23,030	-1,083	-94	-22,439	-22,112
55	-53,496	6,590	3,487	31,747	3,040	7,845	-32,096	-25,335	-419	-14	-22,481	-25,861
60	-79,783	2,647	1,701	25,011	404	7,106	-40,679	-26,526	-218	0	-20,604	-28,624
65	-83,250	1,184	1,095	18,996	18	6,220	-38,624	-26,966	-57	0	-18,986	-26,129
70	-81,283	849	884	14,441	19	5,365	-34,594	-26,906	0	0	-18,515	-22,826
75	-76,801	546	710	11,032	15	4,716	-29,303	-26,721	0	0	-18,475	-19,319
80	-69,126	372	554	7,794	0	4,149	-23,311	-25,379	0	0	-17,769	-15,535
85	-63,064	146	439	5,564	0	3,821	-19,281	-23,578	0	0	-17,340	-12,835
90	-54,542	119	336	2,975	0	3,143	-15,730	-19,098	0	0	-15,925	-10,362
95	-44,700	4	256	1,405	0	2,397	-12,605	-14,543	0	0	-13,418	-8,195
100	-22,036	0	130	655	0	1,237	-6,280	-7,424	0	0	-6,286	-4,068
FUT	2,137											

Table 5
Generational Accounts for Males Under Looser Policy

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	36,871	46,523	14,387	42,950	22,497	7,580	-7,244	-22,584	-30,546	-8,168	-20,161	-8,363
5	56,807	54,224	16,772	49,995	27,095	8,567	-8,380	-21,350	-32,026	-6,567	-22,825	-8,699
10	86,246	63,748	19,723	58,550	32,668	9,791	-9,688	-21,676	-27,243	-4,655	-25,860	-9,111
15	119,145	74,791	23,138	68,133	39,164	11,181	-11,127	-22,729	-22,103	-2,399	-29,364	-9,541
20	148,617	85,453	26,380	74,337	45,216	12,046	-12,650	-23,859	-15,197	-1,019	-32,189	-9,899
25	156,911	88,269	26,993	72,711	45,849	12,009	-14,269	-24,709	-6,943	-1,067	-31,636	-10,296
30	144,507	85,753	25,978	69,377	43,044	11,826	-16,494	-26,289	-5,152	-1,009	-31,228	-11,298
35	121,082	78,847	23,426	64,283	38,008	11,377	-19,194	-27,996	-3,434	-825	-30,723	-12,687
40	89,827	68,430	19,867	58,568	31,799	10,775	-22,471	-29,738	-2,471	-547	-30,039	-14,347
45	49,104	54,131	15,536	51,572	24,807	10,195	-26,932	-32,075	-1,516	-287	-29,545	-16,782
50	7,588	35,472	10,569	42,802	17,021	9,101	-29,205	-30,863	-934	-125	-28,065	-18,185
55	-39,671	20,038	6,068	35,536	9,629	8,527	-36,443	-33,925	-544	-46	-26,784	-21,727
60	-76,621	8,950	2,732	27,897	3,864	7,779	-43,775	-35,567	-79	-13	-23,794	-24,615
65	-101,239	3,410	920	20,758	689	6,975	-52,393	-36,769	0	-2	-17,373	-27,454
70	-97,307	1,974	371	14,397	2	6,284	-44,288	-38,194	0	0	-13,963	-23,889
75	-89,390	987	252	9,966	3	5,945	-33,889	-41,134	0	0	-12,805	-18,715
80	-81,177	446	174	6,575	6	5,976	-23,870	-45,048	0	0	-11,466	-13,970
85	-81,529	546	135	4,218	0	6,567	-18,712	-51,349	0	0	-11,370	-11,565
90	-72,801	257	99	2,446	0	5,711	-15,134	-46,075	0	0	-10,713	-9,391
95	-57,719	1	71	1,403	0	4,195	-11,822	-34,743	0	0	-9,547	-7,277
100	-37,433	0	47	423	0	2,796	-7,159	-23,192	0	0	-5,884	-4,464
FUT	250,480											

Table 6
Generational Accounts for Females Under Looser Policy

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	-14,368	19,976	8,738	41,644	12,395	7,019	-6,296	-24,040	-30,109	-9,915	-22,622	-11,160
5	-2,909	23,464	10,266	48,800	14,996	7,977	-7,318	-22,749	-31,752	-8,647	-25,901	-12,046
10	15,973	27,480	12,008	57,010	17,978	9,072	-8,447	-22,798	-26,773	-7,038	-29,513	-13,006
15	36,802	32,323	14,133	66,584	21,622	10,386	-9,803	-23,700	-21,589	-5,154	-33,851	-14,149
20	53,320	36,046	15,672	71,521	24,433	11,089	-11,085	-24,136	-15,263	-3,858	-36,250	-14,850
25	56,667	34,676	15,003	69,105	22,914	10,828	-12,398	-23,953	-6,570	-3,387	-34,490	-15,061
30	46,698	31,518	13,516	66,429	19,952	10,681	-14,457	-24,822	-4,794	-2,725	-32,531	-16,069
35	34,155	27,235	12,292	61,888	17,664	10,287	-16,787	-25,684	-3,766	-1,905	-30,059	-17,009
40	18,099	23,187	10,834	56,062	15,060	9,830	-19,580	-26,706	-3,002	-978	-28,160	-18,446
45	-9,808	17,635	8,430	48,224	11,120	9,334	-26,283	-28,118	-1,843	-356	-27,170	-20,782
50	-35,060	11,820	5,823	39,042	6,881	8,361	-31,184	-26,927	-1,083	-94	-25,588	-22,112
55	-67,046	6,590	3,487	31,747	3,040	7,845	-38,851	-29,219	-419	-14	-25,391	-25,861
60	-90,853	2,647	1,701	25,011	404	7,106	-45,941	-29,817	-218	0	-23,120	-28,624
65	-91,232	1,184	1,095	18,996	18	6,220	-42,216	-29,402	-57	0	-20,940	-26,129
70	-86,489	849	884	14,441	19	5,365	-36,787	-28,521	0	0	-19,912	-22,826
75	-79,883	546	710	11,032	15	4,716	-30,509	-27,679	0	0	-19,394	-19,319
80	-70,675	372	554	7,794	0	4,149	-23,882	-25,847	0	0	-18,280	-15,535
85	-63,853	146	439	5,564	0	3,821	-19,565	-23,805	0	0	-17,618	-12,835
90	-54,803	119	336	2,975	0	3,143	-15,825	-19,173	0	0	-16,017	-10,362
95	-44,700	4	256	1,405	0	2,397	-12,605	-14,543	0	0	-13,418	-8,195
100	-22,036	0	130	655	0	1,237	-6,280	-7,424	0	0	-6,286	-4,068
FUT	-97,610											

Table 7

Growth Adjusted Net Lifetime Tax Payments of Present and Future Newborns under Baseline and Looser Policy Assumptions.

	<i>Baseline Policy</i>		<i>Looser Policy Scenario</i>	
	Male GA	Female GA	Male GA	Female GA
Newborns in 1997	52,355	1,463	36,871	-14,368
Newborns in 2007	53,850	3,777	34,306	-16,635
Newborns in 2017	53,991	5,433	30,687	-19,159
Newborns in 2027	53,461	6,228	27,258	-21,493
Newborns in 2047	52,968	7,786	23,097	-23,872
Newborns in 2097	52,548	9,914	16,548	-28,260

Table 8

**Male Generational Accounts Under Looser Policy,
but with Income and Social Security Tax Increases to Achieve Generational Balance**

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	68,227	62,237	14,387	42,950	38,139	7,580	-7,244	-22,584	-30,546	-8,168	-20,161	-8,363
5	90,346	72,540	16,772	49,995	42,319	8,567	-8,380	-21,350	-32,026	-6,567	-22,825	-8,699
10	122,099	85,281	19,723	58,550	46,988	9,791	-9,688	-21,676	-27,243	-4,655	-25,860	-9,111
15	157,113	100,054	23,138	68,133	51,870	11,181	-11,127	-22,729	-22,103	-2,399	-29,364	-9,541
20	188,017	114,317	26,380	74,337	55,752	12,046	-12,650	-23,859	-15,197	-1,019	-32,189	-9,899
25	194,550	118,085	26,993	72,711	53,673	12,009	-14,269	-24,709	-6,943	-1,067	-31,636	-10,296
30	179,151	114,719	25,978	69,377	48,722	11,826	-16,494	-26,289	-5,152	-1,009	-31,228	-11,298
35	151,457	105,480	23,426	64,283	41,750	11,377	-19,194	-27,996	-3,434	-825	-30,723	-12,687
40	115,117	91,545	19,867	58,568	33,974	10,775	-22,471	-29,738	-2,471	-547	-30,039	-14,347
45	68,445	72,416	15,536	51,572	25,863	10,195	-26,932	-32,075	-1,516	-287	-29,545	-16,782
50	19,950	47,454	10,569	42,802	17,400	9,101	-29,205	-30,863	-934	-125	-28,065	-18,185
55	-32,825	26,807	6,068	35,536	9,706	8,527	-36,443	-33,925	-544	-46	-26,784	-21,727
60	-73,594	11,973	2,732	27,897	3,868	7,779	-43,775	-35,567	-79	-13	-23,794	-24,615
65	-100,087	4,561	920	20,758	689	6,975	-52,393	-36,769	0	-2	-17,373	-27,454
70	-96,639	2,641	371	14,397	3	6,284	-44,288	-38,194	0	0	-13,963	-23,889
75	-89,057	1,320	252	9,966	3	5,945	-33,889	-41,134	0	0	-12,805	-18,715
80	-81,026	597	174	6,575	6	5,976	-23,870	-45,048	0	0	-11,466	-13,970
85	-81,344	731	135	4,218	0	6,567	-18,712	-51,349	0	0	-11,370	-11,565
90	-72,714	343	99	2,446	0	5,711	-15,134	-46,075	0	0	-10,713	-9,391
95	-57,719	2	71	1,403	0	4,195	-11,822	-34,743	0	0	-9,547	-7,277
100	-37,432	1	47	423	0	2,796	-7,159	-23,192	0	0	-5,884	-4,464
FUT	68,227											

Table 9

**Female Generational Accounts Under Looser Policy,
but with Income and Social Security Tax Increases to Achieve Generational Balance**

(in 1997 pounds)

		Taxes					Transfers					
Age	GA	Income Tax	Capital Taxes	Taxes on Prod.	Social Security Contrib.	Other Revenues	Pensions	Health	Education	Youth/ Maternity	Social Insur.	Other Expend.
0	344	26,723	8,738	41,644	20,360	7,019	-6,296	-24,040	-30,109	-9,915	-22,622	-11,160
5	12,710	31,390	10,266	48,800	22,690	7,977	-7,318	-22,749	-31,752	-8,647	-25,901	-12,046
10	32,318	36,763	12,008	57,010	25,040	9,072	-8,447	-22,798	-26,773	-7,038	-29,513	-13,006
15	53,827	43,241	14,133	66,584	27,729	10,386	-9,803	-23,700	-21,589	-5,154	-33,851	-14,149
20	70,339	48,222	15,672	71,521	29,276	11,089	-11,085	-24,136	-15,263	-3,858	-36,250	-14,850
25	71,839	46,389	15,003	69,105	26,373	10,828	-12,398	-23,953	-6,570	-3,387	-34,490	-15,061
30	59,768	42,165	13,516	66,429	22,376	10,681	-14,457	-24,822	-4,794	-2,725	-32,531	-16,069
35	44,845	36,434	12,292	61,888	19,154	10,287	-16,787	-25,684	-3,766	-1,905	-30,059	-17,009
40	26,703	31,019	10,834	56,062	15,831	9,830	-19,580	-26,706	-3,002	-978	-28,160	-18,446
45	-3,554	23,592	8,430	48,224	11,417	9,334	-26,283	-28,118	-1,843	-356	-27,170	-20,782
50	-31,009	15,812	5,823	39,042	6,940	8,361	-31,184	-26,927	-1,083	-94	-25,588	-22,112
55	-64,816	8,816	3,487	31,747	3,044	7,845	-38,851	-29,219	-419	-14	-25,391	-25,861
60	-89,956	3,541	1,701	25,011	406	7,106	-45,941	-29,817	-218	0	-23,120	-28,624
65	-90,831	1,583	1,095	18,996	19	6,220	-42,216	-29,402	-57	0	-20,940	-26,129
70	-86,202	1,135	884	14,441	19	5,365	-36,787	-28,521	0	0	-19,912	-22,826
75	-79,699	730	710	11,032	15	4,716	-30,509	-27,679	0	0	-19,394	-19,319
80	-70,549	497	554	7,794	0	4,149	-23,882	-25,847	0	0	-18,280	-15,535
85	-63,803	195	439	5,564	0	3,821	-19,565	-23,805	0	0	-17,618	-12,835
90	-54,763	159	336	2,975	0	3,143	-15,825	-19,173	0	0	-16,017	-10,362
95	-44,699	5	256	1,405	0	2,397	-12,605	-14,543	0	0	-13,418	-8,195
100	-22,036	0	130	655	0	1,237	-6,280	-7,424	0	0	-6,286	-4,068
FUT	344											

Table 10

Achieving Generational and Intertemporal Balance Under Alternative Policy Scenarios

	<i>Generational Balance Gap as a Share of GDP</i>	<i>Intertemporal Budget Gap as a Share of GDP</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Assumed Increase in Social Security Contributions Relative to Baseline</i>
Baseline Policy	33.1%	26.3%	9.5%	7.76%	0%
Non Contributory Benefits Grow with Wages	76.5%	85.2%	21.9%	25.2%	0%
All Benefits Grow With Wages	142%	153%	23.2%	21.1%	43%
Looser Policy¹	179%	196%	34.0%	33.8%	43%

¹ All benefits grow with wages and there is faster growth in health care per beneficiary.

Table 11

Achieving Generational and Intertemporal Budget Balance Assuming Higher Labour Productivity Growth and No Commensurate Higher Growth in Expenditures¹

	<i>Generational Balance Gap as a Share of GDP</i>	<i>Intertemporal Budget Gap as a Share of GDP</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>
Baseline Policy	33.1%	26.3%	9.5%	7.76%
Rise in Labour Productivity	2.1%	-8.0%	0.5%	-2.5%

¹ In this scenario, income tax and VAT tax payments per taxpayer rise at 2% per annum as compared to 1.75% in the baseline scenario, with all other receipts, transfers and expenditures remaining unchanged relative to the baseline.

Table12

**Alternative Permanent Income Tax Increases Needed to Achieve Generational Balance and Intertemporal Budget Balance
Assuming Immediate and Delayed Adjustments**

		<i>Immediate</i>		<i>5 years delay</i>		<i>15 years delay</i>		<i>25 years delay</i>	
	<i>Generational Balance Gap as a Share of GDP</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemp. Balance</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemp. Balance</i>
Baseline Policy	33.1%	9.5%	7.76%	11.1%	9.1%	15.2%	12.8%	21.0%	18.5%
Non Contributory Benefits Grow with Wages	76.5%	21.9%	25.2%	25.7%	29.3%	35.2%	41.1%	48.5%	59.7%

Table13

The Savings from Delaying Wage Indexation of Non-Contributory Benefits in terms of future required Tax Increases

	<i>Wage Indexing of Non-Contributory Benefits Starting in 2004</i>			<i>Wage Indexing of Non-Contributory Benefits Starting in 2010</i>		<i>Wage Indexing of Non-Contributory Benefits Starting in 2020</i>		<i>Wage Indexing of Non-Contributory Benefits Starting in 2030</i>	
	<i>Generational Balance Gap as a Share of GDP</i>	<i>Immediate Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Immediate Income Tax Increase Needed to Achieve Intertemporal Budget Balance</i>
Non Contributory Benefits Grow with Wages	76.5%	21.9%	25.2%	17.6%	20.2%	13.02%	14.7%	10.6%	11.3%

Table14
Sensitivity of Findings to Assumed Interest and Growth Rates

	<i>Generational Balance Gap as a Share of GDP</i>	<i>Intertemporal Budget Gap as a Share of GDP</i>	<i>Income Tax Increase Needed to Achieve Generational Balance</i>	<i>Income Tax Increase Needed to Achieve Intertemporal Balance</i>
Baseline Policy	33.1%	26.3%	9.5%	7.8%
Interest Rate Fall to 3%	69.6%	32.7%	8.4%	5.2%
Interest Rate Increase to 7%	27.9%	25.3%	12.4%	11.3%
Increase in growth of all receipts and transfers by 0.25%	36.3%	28.9%	9.7%	8.0%
Increase in growth of all receipts and transfers by 0.5%	40.2%	31.7%	10.11%	8.3%

Table 15
International Comparisons of Generational Accounting
Alternative Ways to Achieve Generational Balance

Country	Cut in government purchases		Cut in government transfers		Increase in All taxes		Increase in income tax	
	A	B	A	B	A	B	A	B
United Kingdom	6.6	9.7	9.6	9.5	2.6	2.7	9.4	9.5
United States	18.7	27.0	19.8	20.3	10.5	10.8	23.8	24.4
Japan	26.0	29.5	28.6	25.3	15.5	15.5	53.6	53.6
Germany	21.1	25.9	17.6	14.1	9.5	9.5	29.5	29.5
Italy	52.7	87.9	41.0	40.0	66.7	61.4	198.4	188.8
Canada	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.2
Thailand	-38.1	-47.7	-185.1	-114.2	-25.0	-25.0	-81.7	-81.8
Australia	8.8	10.2	12.1	9.1	5.1	4.8	8.5	8.1
Denmark	9.9	29.0	4.7	4.5	3.4	4.0	5.8	6.7
Netherlands	21.0	28.7	21.4	22.3	8.5	8.9	14.9	15.6
New Zealand	-1.0	-1.6	-0.8	-0.6	-0.4	-0.4	-0.8	-0.8
France	17.2	22.2	11.5	9.8	7.1	6.9	66.0	64.0
Norway	11.5	9.9	9.4	8.1	7.4	6.3	11.3	9.7
Portugal	7.6	9.8	9.6	7.5	4.2	4.2	13.3	13.3
Sweden ¹	34.6	48.8	21.2	18.0	14.8	14.8	40.3	40.3
Sweden ²	-7.6	-8.7	-7.7	-6.0	-3.4	-3.1	-9.3	-8.6
Argentina	24.6	29.1	16.8	11.0	10.7	8.4	97.1	75.7
Belgium	11.2	12.4	6.0	4.6	3.7	3.1	11.7	10.0
Brazil	23.8	26.2	21.3	17.9	12.4	11.7	78.9	74.0

na – not available

A. Education expenditure treated as government consumption.

B. Education expenditure treated as government transfers and distributed by age groups.

Sources: Kotlikoff and Leibfritz (1999) and Raffelheuschen (1998)

1. The source of these numbers is the study for the E.C. described in Raffelheuschen (1998)

2. The source of these numbers is the IMF study by Haggerman and John reported in Kotlikoff and Leibfritz (1999).

Chart I

Projected Transfer Payments as a Share of GDP under Alternative Scenarios

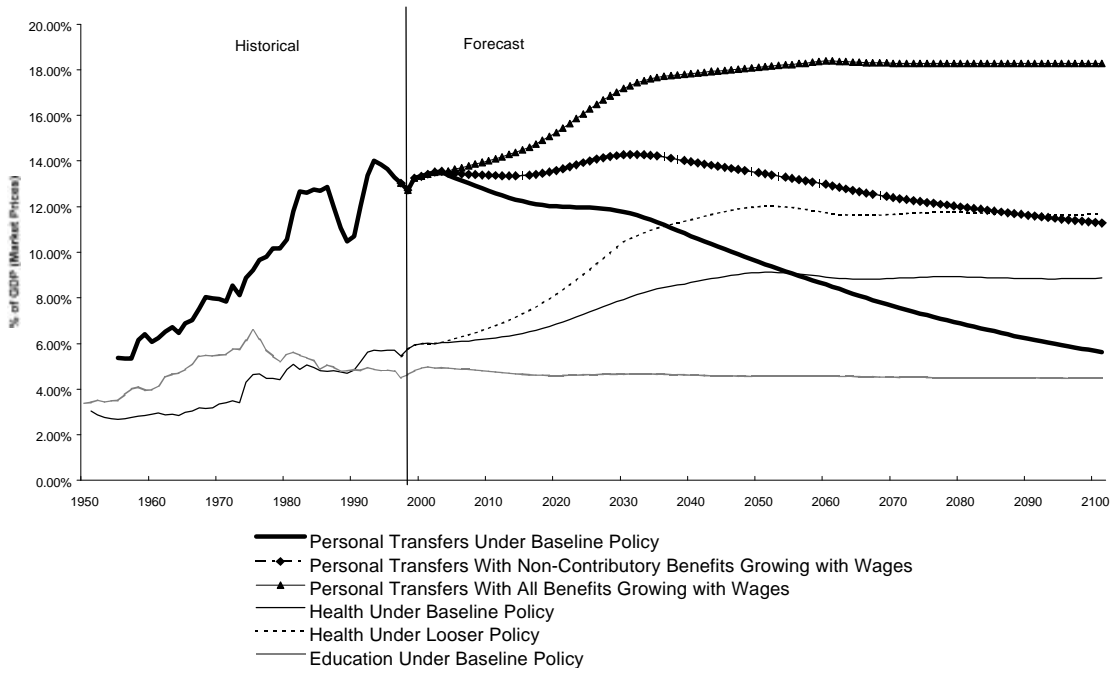


Chart II

Projected Taxes as a Share of GDP under Alternative Scenarios

