PUBLIC LIABILITIES UNDER UNCERTAINTY

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1. Introduction

The development of the Finnish economy has been the most fluctuating among the present EU countries in terms of real growth and employment during the last 15 years. Foreign and domestic demand and technological change have been the underlying driving forces. In the late 1980s inflation and real income expectations maintained domestic demand and private agents were running into debt. Due to, e.g., the policy of the Bank of Finland, the inflation expectations were never met, and the inconsistency of the plans turned out in the early 1990s. The debt crisis was strengthened by declining foreign demand. On the other hand, technological restructuring was rapid, and due to high unemployment, wages have risen slower than productivity since the mid 1990s.

The minimum of annual real economic growth rate was –6.3 per cent in 1991. The maximum, 6.3 per cent, was reached in 1997. The maximum of unemployment, 16 per cent, was reached in 1994, and the minimum of 3 per cent is from the year 1989. In a Nordic type welfare economy with high tax rates and large transfer schemes the high unemployment rate variation resulted in a roller coaster pattern also in public sector revenue and expenditure aggregates. The minimum of primary balance, –8 per cent of the GDP, was reached in 1993. The recent maximum was 6.7 per cent in 2000.

In addition to small open economy and Nordic welfare state properties, there are some other institutional features which complicate assessing the state of current policy and public economy in the long run in Finland. The Finnish public pension system includes also the so called second pillar of pension scheme categories. Thus, the main part of public pension benefits is earnings-related and there are no ceilings for the

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benefits. The national pension benefits are means-tested against the earnings-related pensions and the scheme is of the pay-as-you-go type.

The earnings-related pensions are partly pre-funded, the funding rate being approximately 25 per cent (Risku, 2001). The schemes for private sector employees and self-employed persons are run by private mutual pension insurance companies, industry-wide or company pension funds. The total value of their assets is above 50 per cent of the annual GDP. Domestic and foreign government bonds form 40 per cent and shares quoted on the exchange 30 per cent of the market value of the assets. The rest is invested in real estates, loans and money market instruments. All pension institutions as well as contributions and benefits are included in the general government sector in the national accounts.

The Finnish central government owns quoted stocks as well. However, the gross debt of the central government is approximately of the same size as the value of its financial assets, and the net financial wealth of the general government is almost equal to the wealth of pension institutions. Volatility of assets prices is another important point when assessing the state of the Finnish public economy.

The first generational accounts were presented in Auerbach *et al.* (1991). In an EU-wide project a research group produced generational accounts and related indicators for the EU member countries (EU, 1999 and Raffelhüschen, 1999a). The indicators showed a large intergenerational imbalance in Finland. The base-year of the report was 1995, and as the above stylized facts indicate, the Finnish economy has changed a lot since then. Policy changes have taken place as well. The former standard of national accounts has been replaced with the European System of Accounts (ESA95). Nowadays it is also a common view that continuously increasing longevity should be assumed.

In addition to the uncertainty of public net wealth and deficit based on business cycles and financial market, we could look at the future productivity uncertainty and the uncertainty of population forecasts as well. In the short and medium terms, population and its age-structure do not play any role, i.e. variables are constant or they are easy to forecast accurately. In the long term things are different, and population projections underlie every empirical intertemporal approach. The uncertainty of Finnish population projections is analysed in Alho (1998).

The first aim of this paper is to show how sensitive to business cycles intertemporal fiscal balance is, and discuss whether this could be catched by the sensitivity analysis typically presented in association with baseline generational accounts. Business cycle and other sensitivity results are based on Feist *et al.* (1999) and Vanne (2002).

The second aim is to describe, how risky the implicit net liabilities figures are in the Finnish case. We present results of intertemporal public budget simulations when population, productivity, interest rate and returns on stocks are stochastic. The results are presented in Alho and Vanne (2002).

In Chapter 2 we outline the rather well-known approach of generational accounts with an extension to stochastic population, productivity and interest rate paths. In Chapter 3 we present the data. The results are presented and discussed in Chapter 4. Conclusions are drawn in Chapter 5.

2. Generational accounting

2.1 Deterministic accounts

We follow generational accounting as presented in Raffelhüschen (1999b), and begin to determine generational accounts for current and future generations by calculating a set of figures as follows:

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

In equation (1) $N_{t,k}$ denotes the net present value (NPV) of all the future net taxes paid by the generation born in year *k* under the policy considered and discounted to the beginning of the base-year *t*. Net tax is defined as taxes paid minus transfers received and the value of public services consumed. *r* is the assumed annual discount rate. In equation (1) NPVs for the future generations, i.e. generations born after the year t, are also discounted to the year t, and not to the birth-year of the generation. NPVs are calculated separately for both genders, though this is not denoted in the equations. For generations born in year *t* or later, the result is the NPV of their lifetime net taxes, and for generations born before *t,* the result is the NPV of the net taxes of the remaining lifespan.

$P_{s,k}$ stands for the number of members of a generation born in year *k* who survive until the year *s*. *D* represents the assumed maximum length of lifetime, typically and also here 100 years. In practice, $P_{s,k}$ is drawn from population projections, which are typically produced by the so called cohort component method. We pass the explicit presentation and discussion of the method and assume increasing longevity until the year 2050. The assumption is implemented by decreasing mortality rates, i.e. increasing survival probabilities, for ages below 100 years, and assuming a certain death at the age of 100 years. Decreasing mortality has a significant impact on the length of retirement days, and thus on the NPV of the lifetime net taxes, *ceteris paribus*. In a more general case, we could also consider probability changes of “softer” transitions. We could, e.g., model transitions between labour market positions. One of the most remarkable cases is a rising effective retirement age. However, increasing longevity is the only type of transition we have assumed in this study.

$T_{s,k}$ denotes the average net tax paid in the year *s* by a representative member of the generation born in the year *k*, and all types of taxes, transfers and services are taken into account. $T_{s,k}$ includes, among other variables, also the collective public services, and in this study the depreciation of the fixed capital as part of the value of public services. In the original version of generational accounting neither individual nor collective public services were included in generational accounts. Public services were taken into account as a stream which should only be financed intertemporally by taxes (Auerbach, Gokhale and Kotlikoff, 1991).

It is assumed that current policy is prevailing indefinitely. $T_{s,k}$ is a sum of various types of taxes, transfers and services:

$$T_{s,k} = \sum_i h_{s,k,i} \qquad (2)$$

where *i* denotes the type of tax, transfer of service. If $h_{s,k,i}$ >0, it is a tax, and if it is negative, it is a transfer of service. The difference *s–k* refers to the age of the generation in the year *s*. The future streams are first projected by age. Generally, projections based on sophisticated methods or expert knowledge may be available, but especially if that is not the case, projections are based on the assumed annual rate of productivity growth, *g:*

$$h_{s,k,i} = z_{s,k,i} h_{t,t-(s-k),i} (1+g)^{s-t} \tag{3}$$

Equation (3) assigns to each agent of age *s–k* in year s the same payment observed for agents of the same age in the year *t*, adjusted for productivity. The coefficients *z* are policy parameters to capture the changes that have taken place or are assumed to take place. Parameters may also be used as endogenous variables, which are solved in order to find an intertemporal balance.

The generational account in the year *t* of the cohort born in the year $k \leq t$, is:

$$A_{t,k} = \frac{N_{t,k}}{P_{t,k}} \tag{4}$$

The generational accounts for the future generations are defined as follows:

$$A_{k,k} = \frac{N_{k,k}}{P_{k,k}} \tag{5}$$

$P_{k,k}$ is the number of children born in the year *k* and who are alive at the end of the year. According to equation (5) the generational accounts for future generations are NPVs of lifetime net taxes in the birth-year.

If we compare the accounts of future generations to each other or to the account of the newly-born generation, we have to do the corresponding productivity adjustment, and when operating at the level of public economy, as in equation (1), we have to calculate the NPVs at the same moment.

We now define the basic indicator of generational imbalance or unsustainability of the policy. The uncovered intertemporal public liabilities (IPL) of the base-year *t*, L_t, are defined as:

$$L_t = B_t - \sum_{k=t-D}^{\infty} N_{t,k} \tag{6}$$

B_t is the net public debt at the beginning of the year t, and the N-values are defined in equation (1). Due to comparability across countries or the same country at different points of time, L_t should be related to, e.g., the GDP of the year t. If L_t is unequal to zero, the policy considered is not sustainable. In case L_t is positive, taxes should be raised or transfers and services cut. In case L_t is negative, taxes are allowed to be lowered or benefits raised. L_t is an indicator of the imbalance.

The variables $z_{i,t,,k}$ (equation (3)) are used to balance the intertemporal budget, i.e., to set L_t zero. The balancing could be done by choosing the values of z at any of its sub-index combination points. A typical solution is to choose net taxes of future generations to balance the budget (k>t). Another common solution is to adjust all gross taxes of current and future generations.

Balancing of the budget generates more indicators of imbalance, in addition to the fundamental indicator L_t. We could, e.g., compare the generational accounts (equations (4) and (5)) of the youngest current and the first future generation, if future generations balance the budget. If all generations balance the budget by a uniform proportional annual tax change, we are able to solve the sustainable tax rate.

The only indicators we consider here are L_t and a uniform annual tax change for all future periods.

2.2 *Stochastic accounts*

We handle explicitly the debt and the gross asset parts of the public portfolio in stochastic simulations. We rewrite the IPL definition of equation (6) in a form where the stochastic variables are denoted:

$$L_t(r,y,f,m,l,g) = B_{bond,t}(r) - B_{stock,t}(r,y) - \\ - \sum_{k=t-D}^{\infty} N_{t,k}(f,m,l,g,r) \qquad (7)$$

In definition (7) interest rate (*r*), return rate on risky assets (*y*), fertility rates (*f*), mortality rates (*m*), net migration (*l*) and growth rate of productivity (*g*) are stochastic processes. Fertility and mortality rates at every age are presented as stochastic time series, mortality rates also by gender. In the current application covariances between fertility rates at different ages as well as the corresponding covariances among mortality rates were also taken into account.

The stochastic properties of the variables are estimated from historical data. All the stochastic variables are assumed to be mutually independent, and in this particular case 1500 stochastic paths were drawn from the distributions. A value of L_t is calculated for and attached to every path. The properties of the distribution of L_t over paths are considered. The mean, median and deviation indicators are calculated. The deviation is an indicator for the risk embedded in the intertemporal fiscal stance.

In the empirical case, simulations were continued only until the year 2100. For deterministic generational accounts, assumptions are chosen so that the resulting series are converging and their sums are finite. In stochastic simulations nothing guarantees the convergence of the infinite series resulting from the random path.

3. Data

3.1 Population

The deterministic population projection starting from the base-year 1995 was reported in Feist *et al.* (1999). The deterministic population forecast starting from the year 2000 is here basically that of Eurostat published in 1997. We have slightly modified the Eurostat baseline projection, and also continued the projections until the year 2100. Eurostat has published a new revision in 2000 (EU, 2000), but the differences between the new and old versions are not remarkable. We assumed a total fertility rate of 1.75, net immigration of 5000 persons annually and an increasing life expectancy until the year 2050, and constant mortality thereafter. The increase of life expectancy was approximately one year in a decade. The assumed annual net immigration figure is relatively small compared to the original population, only 0.1 per cent, which has been a typical figure for Finland during the last 20 years. We didn't apply any separate immigrant population modelling (Bonin, Raffelhüschen and Walliser, 1999).

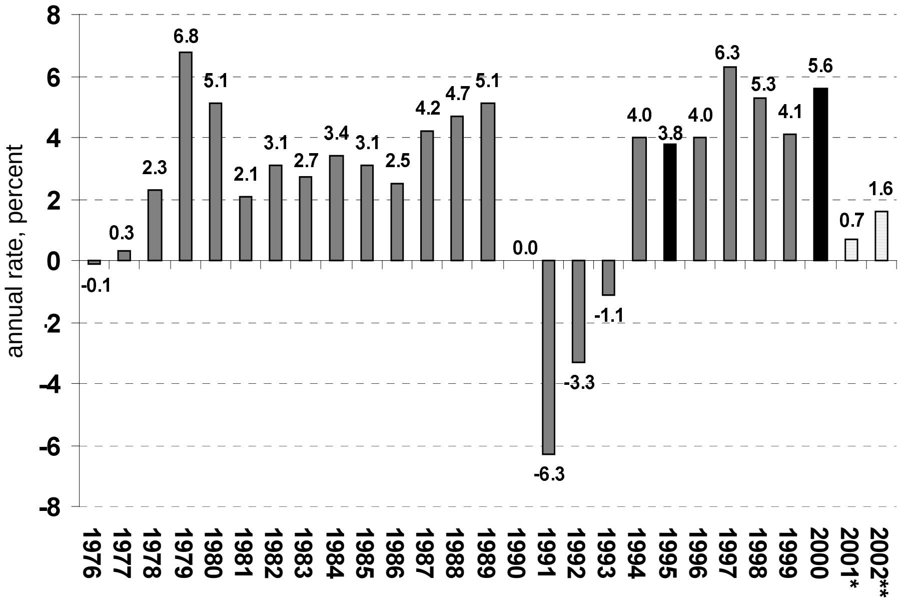
The stochastic population projections are reported in Alho (1998). The method is based on a baseline projection and error distributions. The error distributions of age-specific fertility and mortality rates were estimated by first simulating past baseline (naïve) forecasts. The total fertility rate data was from the period 1776-1996, and age specific figures from the period 1955-1995. Age-specific mortality rates by 5-year age-groups were available from the period 1900-1994. Total migration data was from the years 1945-1995.

3.2 Growth and primary balances

The growth rate of the Finnish economy has varied a lot during the last 25 years, as is shown in Figure 1.

Fig. 1

Annual real growth rates of GDP in 1976-2002 in Finland**
(percent)



Sources: Statistics Finland, Ministry of Finance.

The real output was contracting for three years, in 1991-1993, and the record decline was 6.3 per cent in 1991. On the other hand, the growth rates observed since 1994 have also been exceptionally high. The nominal value of GDP was 95 billion euro in 1995 and 132 billion euro in 2000. The preliminary statistics in Figure 1 indicates that after the year 2000 the Finnish economy is again driven into a slow growth regime.

One of the key parameters of generational accounting is the rate of productivity change. For the stochastic simulations we defined it as a relative change of real GDP per capita. The variable includes both the effects of input and total factor productivity changes. Input changes are due to, e.g., the changes of population age-structure and the changes of employment rates as well as investment development. The estimation of the time series properties of the variable was based on the data from the period 1860-2000 (Alho and Vanne, 2002).

Growth fluctuations reflect in fluctuations of unemployment rates and returns on assets and further in fluctuations of tax revenues and social transfers.

Unemployment rates were rising rapidly in 1991-1994, but the decline was rather slow since then, despite the rapid real growth. This is due to both rising participation rates and high productivity growth. The unemployment rate was 15.4 per cent in 1995, in the base-year of the EU study, and in 2000 the rate was 9.8 per cent of the labour force. In 2001 the average unemployment rate was 9.1, and it is supposed to rise in 2002.

High variations of the real growth and unemployment rates have resulted in high variation of primary surpluses and deficits as shown in Figure 2. In a Nordic type welfare state the automatic stabilizer effects are rather strong. Primary balance is calculated here without taking into account either the returns on public financial capital or public interest expenditures. Depreciation of the public fixed capital is included in the expenditure, and thus net formation of fixed capital is not taken into account.

Mainly due to the partially pre-funded public pension system, Finland has a tradition of positive primary balances. The recession years of the 1990s and a few years after them were a dramatic exception to this. The final primary balance surplus was 6.7 per cent of GDP in 2000. In Vanne (2002) the preliminary figure of 6.4 per cent was used.

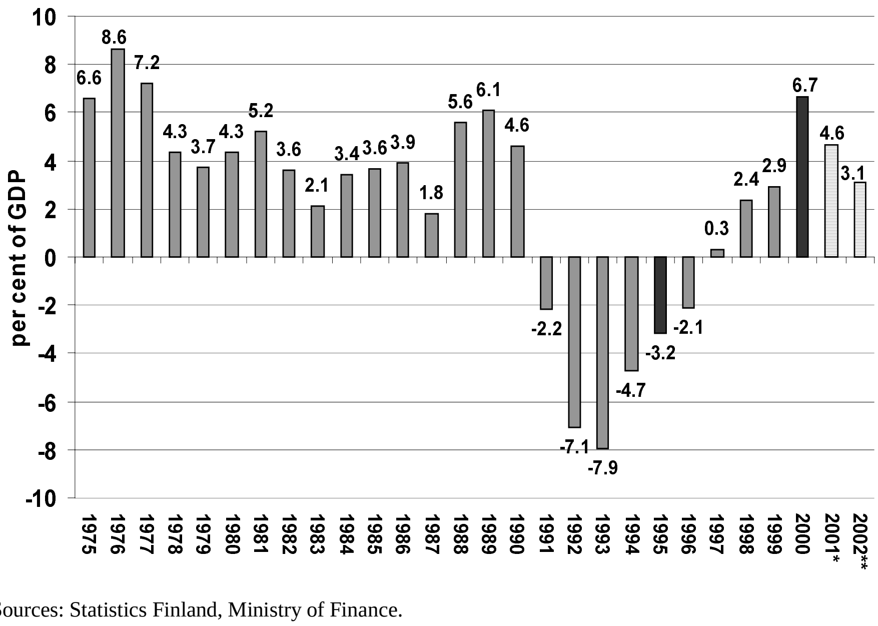
3.3 *Public wealth*

Public net financial wealth is one of the key variables when calculating the IPLs in equations (6) and (7). Primary balances accumulate or decrease net wealth, but as can be seen by comparing Figures 2 and 3, the primary balance has not been the key variable underlying the changes of public net wealth in Finland during recent years.

There are two exceptional features in the Finnish public economy compared to the majority of the European countries. The pension institutions running the statutory earnings-related pension schemes own stocks and other financial assets. Also the central government owns a remarkably high amount of financial assets in addition to gross debt. The volatility of stock prices strengthens the business cycle effects on the IPLs.

Fig. 2

Primary balances in 1975-2002 in Finland**
(percent of GDP)

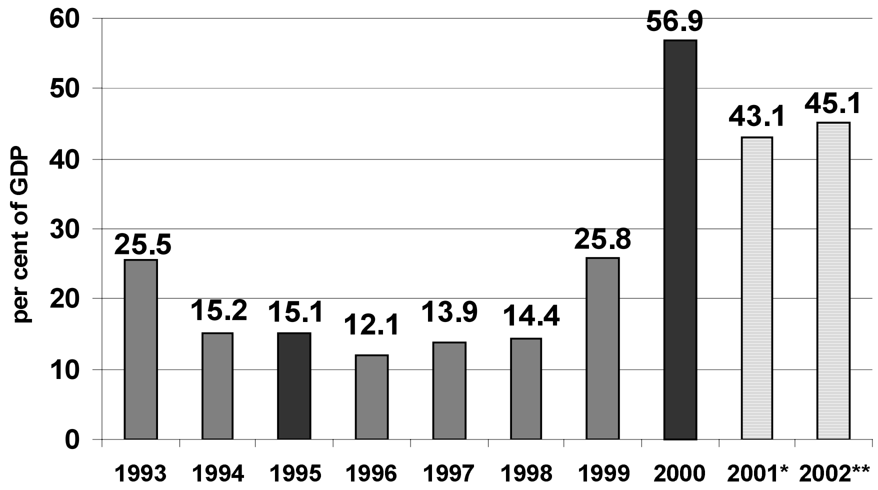


Sources: Statistics Finland, Ministry of Finance.

Fig. 3

Net financial wealth of the general government in 1993-2002 (1 Jan) in Finland**

(percent of GDP)



Sources: Statistics Finland, Ministry of Finance, Finnish Pension Alliance.

In the beginning of 1995 the net wealth was 15 per cent of GDP according to the present financial statistics standard. The share was 8 per cent in the end of the year according to the former standard, and that value was used in the EU study. The preliminary ratio of net assets to the GDP of the year 2000 was 59 per cent, which figure was used as the initial net wealth in Vanne (2002). The updated statistics is 57 per cent. We notice that the market value of public net assets has decreased again since the beginning of 2000 according to preliminary statistics, despite primary balance surpluses.

The main part of public assets is covering the liabilities of the statutory earnings-related pension schemes, which are mainly run by private mutual insurance companies. The portfolios are managed as private investors manage their portfolios, but there are rather sophisticated rules for the part of total liabilities, which should be covered, as well as for a proper risk management. The pension funds ran surpluses also during the recession, and the gross debt was accumulated with the central government.

For the stochastic simulations, we processed bonds and public assets separately (equation (7)). From a sophisticated portfolio point of view, a more detailed partition would be necessary. Bonds are a rather homogenous category, but in the Finnish case it should be remembered that the value of bonds is a net variable. Part of the bonds issued by the Finnish central government is in the possession of the Finnish pension funds. The pension funds hold also bonds of foreign central governments and companies, and their share is increasing. Naturally, risk properties of company bonds are different from those of governments, but we didn't take this into account.

On 1 January the net value of bonds was –32.3 per cent of GDP in 2000. The properties of the real interest rate time series were estimated from the German government bond observations in 1955-2000 (Alho and Vanne, 2002). The surpluses or deficits of primary balances generated by the corresponding paths were not explicitly cumulated to the debt stock, in order to consider their stochastic properties separately.

The value of assets, excluding bonds, was 91.3 per cent of GDP on 1 January 2000 (Statistics Finland, 2001). Assets include very heterogeneous investments, namely stocks, loans, shares of real estate companies, money market instruments and cash. The stocks owned by the pension funds are mainly foreign. Stocks owned by the central government are Finnish, though they are quoted on the market, part of them also in foreign stock exchanges and many of the companies operate internationally. We decided to base the estimation on the Dow-Jones index series from 1950-2000 (Alho and Vanne, 2002).

We didn't try to find any results related to optimal portfolio management. The modest target was to include the stochastic properties of the asset term in the intertemporal budget. Having this in mind, we assumed that the value of assets would be kept constant over time by selling and buying. The risk premium (over the bond rate) streams formed on average an additional part of positive wealth.

3.4 Revenues, expenditures and age-profiles

In Table 1 we disaggregate public revenues and expenditures in 1995 and in 2000. The statistics standard has changed also here. We follow the new standard also as to the year 1995, and the aggregates are slightly

Table 1

Public revenue and expenditure aggregates in 1995 and 2000 in Finland
(percent of GDP)

	1995	2000
Revenues		
Income taxes	17.4	21.0
VAT and other indirect taxes	13.7	13.3
Employers' social insurance contributions	10.1	8.8
Insured persons' social insurance contributions	4.5	3.3
Total = tax rate	45.7	46.4
Expenditures		
Pensions	13.1	10.8
Unemployment benefits	3.7	2.0
Family policy (transfers related to children)	2.6	1.7
Other social transfers	2.8	2.0
Subsidies	2.8	1.5
Individual public services	14.5	12.9
Collective public services	8.3	7.6
Other expenditures minus other revenues	1.1	1.5
Total	48.9	40.0
Primary surplus (+) or deficit (–)	**–3.2**	**6.4**

Source: Statistics Finland, National Accounts.

different from those used in the EU study. The main statistical improvement from the point of generational accounting is that collective public services are separated from the individual public services.

Revenues and expenditures are here organized so that the revenue side includes only taxes, and the rest of income is deducted from the residual of expenditures. The tax-rate rose slightly from 1995 to 2000, due to higher employment, higher profits and thus higher income taxes. The preliminary statistics was the above mentioned 46.4 per cent for 2000. The final statistics was even higher, 47.1 per cent.

In fact, the nominal tax rates have been lowered. Lowering of taxes is also the expressed policy of the present cabinet which took office in spring in 1999. Social insurance contributions have declined, because the unemployment benefits can be financed by lower rates.

The policy of the present government is that the expenditure of the central government, including interest payments, should be kept constant in nominal terms. The policy has not completely succeeded, but it is reflected in the above expenditure figures. It should be noted that only one fifth of the total pension expenditure is in the books of the central government. On the other hand, unemployment benefit expenditure has declined remarkably since 1995, and has made the cutting job easier for the government. The total pension expenditure was 10.9 per cent of GDP in 2000, compared to 13.1 per cent in 1995.

We use the profiles of the EU study as age-profiles of the base-year taxes, transfers and services. However, for pensions we use a profile from the year 1999 (Central Pension Security Institute, 2000), as well as for health insurance benefits (Social Insurance Institution, 2000). For social and health services we use a profile from the year 1998 (Ministry of Social Affairs and Health, 2001). All the profiles are adjusted for the year 2000 so that the corresponding aggregates of national accounts are fulfilled. In Figures 4 and 5 we present the age-profiles of net taxes in 1995 and in 2000 for both genders.

The profiles in Figures 4 and 5 are non-deflated. Increasing prices, wages and indexed transfers have a positive impact on the net taxes, if they are originally positive and a negative impact if net taxes are originally negative. However, the higher age where net taxes are equal to zero, has shifted 3 years forward for both genders. The crucial age was 59 years for

Fig. 4

Age profiles of net taxes of males in 1995 and 2000 in Finland

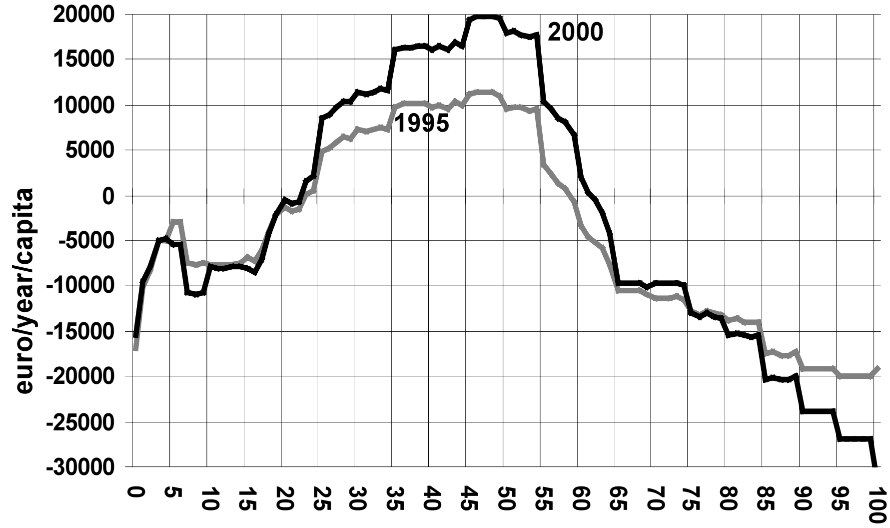


Fig. 5

Age profiles of net taxes of females in 1995 and 2000 in Finland

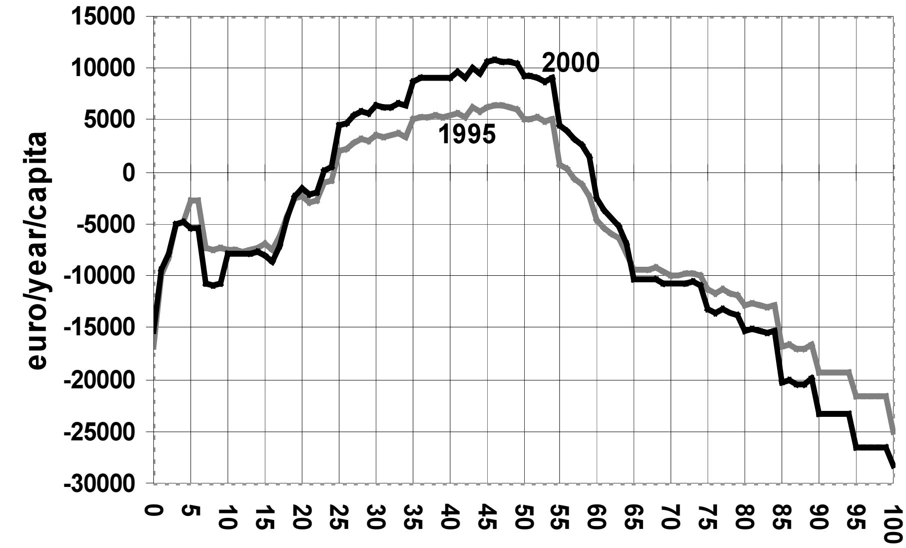
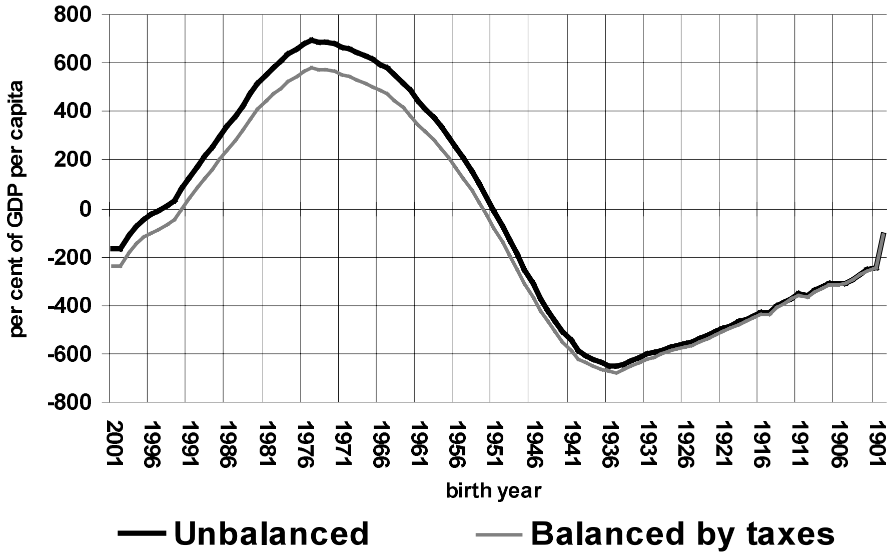


Fig. 6

Generational accounts of the year 2000 for the generations born in 1900-2001
(percent of GDP per capita)



women and 61 years for men. Also positive net taxes have changed more than negative net taxes, especially at the prime ages from 30 to 55 years. Rising employment rates are the underlying reason. Naturally, these changes are no surprise given the aggregate changes reported in Table 1. Rising employment rates are observed also at higher ages of labour force, and in fact, the effective retirement age has risen since 1995.

4. Results

4.1 Deterministic accounting

The generational accounts of current generations defined in equation (4) are presented in Figure 6. Also the account for the generation to be born in 2001 is presented as defined in equation (5). The other curve in the figure describes the accounts given that the IPLs are reset to zero by a sustainable tax rate change assumed to have come in force in 2001.

The two ages where the value of the generational account is zero, are 6 and 49 years in the unbalanced current policy path. Positive accounts, denoting positive NPVs of net taxes, appear in a 12 year wider age range than in 1995. The lower age has declined and the higher age has risen by 6 years since 1995.

In Table 2 we present the IPLs and the respective required aggregate tax rate change to reset the IPL to zero at the baseline of this study and a comparison to the EU study baseline.

Table 2

Intertemporal public liabilities (IPLs) with its components and balanced tax rate changes required at the baseline in 1995 and 2000 in Finland
(percent of GDP)

Item	1995 g=0.015 r=0.05	2000 g=0.015 r=0.05
Intertemporal public liabilities, total	253	–90
Ageing	114	159
Explicit net debt	–8	–59
Macroeconomy and fiscal policy	147	–191
Balancing change of tax rate	8.8	–3.2

The generational balance has improved dramatically from 1995 to 2000. The IPL-indicator was 253 per cent of GDP in 1995 and with the same productivity growth and interest rate assumptions it is –90 per cent of GDP in 2000. In terms of sustainable tax rates, instead of a requirement of raising the tax rate path 8.8 percentages of GDP above the current policy path, the sustainable tax rate path is now 3.2 percentages below the current policy path.

It should be noticed that the overall tax rate (ratio of all taxes collected to GDP) is not constant in time, though all tax rates that agents meet are kept constant in time. Especially, when pensions are taxable income, the overall tax rate rises when population is ageing. Pension expenditures as well as taxes paid by pensioners are rising in relation to GDP, though all the tax rates are kept constant. Current policy should not be regarded as maintaining the current overall tax rate.

Following the approach of the EU study (growth of 1.5 per cent, interest rate at 5 per cent), we have separated the effect of population ageing on the IPLs. In 1995 it appeared to be 114 per cent of GDP, and until the year 2000 it has increased to 159 per cent of GDP. One reason is that the main part of the burden of ageing will materialise in the future also in 2000, but the burden will be met in a nearer future. Another reason is that life-expectancy was assumed to stop in 2010 and in 2050 when the base-years were 1995 and 2000 respectively.

Table 3

Sensitivity of intertemporal public liabilities and balanced tax rate changes to productivity growth rate and interest rate, base-year 2000
(percent of GDP)

	g=0.015 r=0.03	g=0.02 r=0.03	g=0.01 r=0.03	g=0.02 r=0.05	g=0.01 r=0.05
Intertemporal public liabilities	–19	49	–53	–83	–95
Balanced change of tax rate	–0.3	0.6	–1.2	–2.5	–3.9

However, in terms of primary surplus or deficit, population ageing started in 1995 in Finland. In order to find this out, we calculated the resulting primary deficit year by year in the 1990s using the 1995 age-profiles and the age structures of the particular years. It appeared that the pure ageing effect on the annual deficit started to rise in 1995. The difference between the 2000 and 1995 deficits was approximately 0.5 per cent of GDP.

Table 3 includes a sensitivity analysis with respect to productivity growth and interest rate. The sensitivity results are organised in a rising order by the difference between the interest rate and productivity growth rate.

The IPLs are in the range of +49 and –95 per cent of GDP. The sustainable tax rate changes vary between 0.6 and –3.9 percentages of GDP. In Finnish long-run projections the annual productivity growth rate is typically assumed to be 1.5 and the real interest rate is assumed to be 3 per cent (Klaavo *et al.*, 1999). If this turns out to be the case, the IPLs are currently –19 per cent of GDP, and the sustainable tax rate change would be –0.3 per cent of GDP. If productivity would grow 2 per cent annually, taxes should be increased by 0.6 percentages of GDP for the balance. The conclusion is that the public economy is now quite near an intertemporal and intergenerational balance in Finland.

In the following we discuss whether the current situation was captured by the sensitivity analysis scenarios of the EU study. A combined macroeconomic and fiscal policy scenario was presented in the EU study where IPLs appeared to be slightly negative as seems to be the case in the light of the 2000 data. The combined policy included the following elements: 1) halving the unemployment rate from the 1995 level until the year 2005, 2) raising the effective retirement age by five years until 2015, 3) raising the social insurance contribution rates as high as 1.5 times the current value until 2035, and 4) cutting all the public services by 20 per cent until 2010.

The unemployment rate has not yet been halved from the 1995 level, but it has declined more rapidly than in the halving path. The effective retirement age has probably not increased at sufficiently high rate in the passed five years according to preliminary data. In practice, a five-year increase in twenty years is a very ambitious target, and it cannot be reached by current policy. Ceteris paribus, the assumed rise of contribution rates would result in a 6 percentage rise of tax rate in 40 years, i.e. a 0.15

percentage rise annually. In table 1 we find that the tax rate has risen at the required pace in the passed five years. The final statistics indicate that the tax rate has risen more rapidly. We find as well that public services have been cut approximately by 10 per cent compared to the 1995 level in terms of GDP percentages.

Broadly speaking, the Finnish economy and fiscal policy have followed the best path from the point of view of intergenerational balance outlined in the EU study. However, the assumed phasing-in periods of the policy have not finished yet, and the assumed target values of the policy parameters have not yet been reached either, but it seems that intergenerational balance has already been achieved.

In fact, in addition to the policy outlined in the EU study, two other instruments have been used. First, social transfers and production subsidies have been cut. The decrease of social transfers is partly due to diminished unemployment, but especially transfers related to children or family policy have been decreased in relative terms. They are typically non-indexed, and adjustment decisions have not been made. Pension cuts have also been made, but combined with earlier decisions and long transition periods, the overall result is that average pension benefits follow the productivity growth rate (Klaavo *et al.*, 1999) as was assumed in the EU study. Another issue is that the GDP share of the pension expenditure has decreased due to the fact that factor income distribution has changed in favour of capital income.

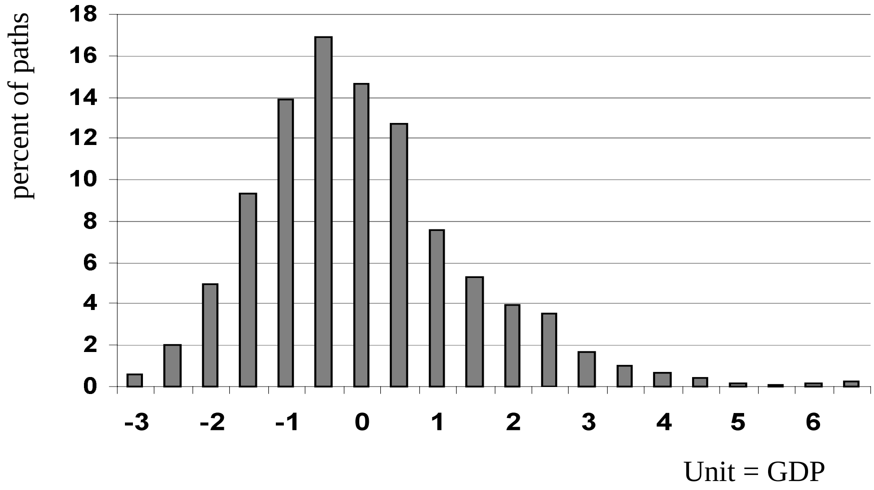
The development of capital income leads us to the other reason underlying the favourable intertemporal public debt position of the Finnish economy compared to the most favourable scenario of the EU study. Both capital income tax revenues and the value of public wealth react to changes in the market values of stocks and real estates. Capital income tax revenues are partly dependent on capital gains and partly on profits. Both are heavily dependent on business cycles, and the assumption of productivity growth rate cannot capture these effects, even though a variable rate was assumed.

4.2 Stochastic accounting

The observed rapid change of intertemporal fiscal stance during a short period and the rather obvious factors behind the change were the reasons for applying a stochastic approach. The deviation of the IPL

Fig. 7

Distribution of IPLs in 1500 simulations
(IPLs as shares of GDP in 2000)



outcomes provides a good base to assess how certainly we are able to talk about the fiscal stance. In Figure 7 we describe the distribution of public net liabilities based on the net wealth on 1 January 2000 and the first 101 (2000-2100) future primary balances.

Approximately 16 per cent of the outcomes are between –75 and –25 percentages of GDP, nearly 15 per cent of outcomes are in the range (–25.25) and 13 per cent in the range (25.75). The median is –18 percentages and the quartile range from –95 to 75 percentages (last column of table 4). The probability that the "true" value of uncovered public liabilities is in this range is 50 per cent. The distribution is skew to the right, indicating that large net liabilities are relatively more likely than corresponding levels of positive implicit wealth.

The four first columns of Table 4 also demonstrate the movement of the distribution of discounted net benefits, when the time horizon is lengthened. The movement indicates that the population is ageing on the median path. Though the median of IPL is still negative (–18) after including 101 primary balances (years 2000-2100), we could expect that

Table 4

Distribution of intertemporal public liabilities (IPL) and components
(percent of GDP)

	Time horizon, years					
	25	50	75	100	100	100
	Net benefits (net of taxes)				Net debt	IPL
Lower quartile	–80	–51	–19	8	–136	–95
Median	–69	–22	28	70	–95	–18
Higher quartile	–59	12	93	159	53	75

it would become positive when including, let's say, 10-15 additional years. Sustainability would prevail, if the median of IPLs would stabilise at zero (or nearly zero), when time horizon is lengthened. As discussed in Alho and Vanne (2002), we are not yet able to say a lot about the convergence or divergence of the median.

5. Conclusions

The intergenerational balance has improved dramatically in five years from 1995 to 2000 in Finland. The economy has grown rapidly due to reallocated resources and product innovations as well as the favourable international economic development. Fiscal policy has aimed at decreasing public gross debt, and the pension institutions have taken measures in order to raise the actual funding rate of the earnings-related pension schemes. The mainstream has been to improve the return on the investments of the funds.

In 1995 the Finnish public economy showed a severe unsustainability and intergenerational imbalance. In 2000 it is near balance, and probably, depending on the assumptions about the future, on the positive side.

When comparing the generational accounting results of the year 2000 to the results in the EU study 1995 as the base-year, we find that the development has been even better than the most favourable scenario presented in the 1995 study. The comparisons also raise the methodological question of dealing with the variables that are the most dependent on business cycles, capital income tax revenues being a good example. There is a large public financial wealth in Finland. The wealth includes also risky assets, whose value is determined on the financial markets and the value is highly dependent on the business cycles.

Stochastic simulations with the year 2000 as a starting point show that the median of net liabilities is not as favourable as the deterministic baseline path. The median of intertemporal net liabilities starts at a negative value and gets positive when the time horizon of the simulations is shifted forward. The median path is not sustainable, but it takes over 100 years before the additional primary balances convert the median positive.

Stochastic simulations presented here are based on very simple assumptions. In the future the interdependence of the stochastic economic variables should be investigated and taken into account. The model of the public portfolio should also be more realistic and include more categories of assets than the present first version includes. Putting effort on these issues would develop the approach into the direction of asset-liability management applied in the insurance industry.

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