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**GENERATIONAL ACCOUNTING IN NORWAY:
IS THE NATION OVERCONSUMING ITS PETROLEUM WEALTH?**

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Abstract

This paper uses generational accounting to assess Norway's fiscal position. Generational accounting measures the remaining lifetime net tax burdens facing different living generations. It can also be used to compute the percentage difference between the average net tax burden facing future generations and that facing current newborns under existing fiscal policies. Although the Norwegian government imposes sizable burdens on current generations, it also consumes a large share of total national output. Our calculations indicate that despite the government's positive net wealth, current policies imply net tax burdens on future Norwegians that are about twice as large as those facing current young generations.

I. Introduction

This paper uses a new method, called generational accounting, to assess Norway's long-term fiscal position.¹ Generational accounting determines whether a country's current fiscal policies can be sustained without requiring future generations to pay higher net taxes (taxes paid net of transfers received) over their lifetimes than current generations pay.

Understanding the sustainability of the current level of net taxation, though important for any country, is particularly interesting in the case of Norway. Unlike most countries, Norway has a large, positive stock of government wealth due mainly to its considerable petroleum resources. Based on conventional macroeconomic analysis, which emphasizes the amount of government debt, the fact that the Norwegian government has a net surplus would suggest that its fiscal house is fully in order. But this does not mean that it will have positive net wealth forever. Indeed, Norway's budget deficit, as conventionally measured, is expected to reach 6 percent of GDP in 1993. Even if the budget deficit were zero, projected demographic changes as well as projected increases in the scale of Social Security benefits raise the question of fiscal sustainability.² So too does the government's high and growing level of purchases of goods and services.

In short, then, this paper considers whether Norway is consuming its oil and other wealth too rapidly, with the consequence that future generations of Norwegians will not benefit from that wealth to the same extent that current generations have.³ Our main findings suggest that this concern is real, that current Norwegian fiscal policy is not sustainable, and that the continued failure to adjust government policy will leave future Norwegians facing

1 See Auerbach, Gokhale, and Kotlikoff (1991, 1992a, 1992b, 1993, 1994) and Kotlikoff (1992).

2 See Kotlikoff (1992) for a detailed critique of the deficit as a measure of an economy's fiscal position.

3 For an early study of this issue, see Steigum and Thogersen (1992).

lifetime net tax burdens that could well be twice as large as those confronting today's children based on current law. While the precise size of this generational imbalance depends on the assumed rate of return the government earns on its assets, the disparity is large even under quite high interest-rate assumptions.

The next section describes the Norwegian economy and provides an overview of its fiscal policies. Section III explains the method of generational accounting. Section IV summarizes the data used to construct the accounts, leaving a more detailed description for the appendix. Section V presents the accounts, discusses their implications and sensitivity to assumptions, and provides comparisons with generational accounts for the United States. Section VI summarizes our findings and draws conclusions.

II. The Norwegian Economy and Fiscal Policy — A Brief Description

Norway is a small country with 4.3 million inhabitants and a highly open economy. Exports accounted for 43 percent of GDP in 1992, almost one-third of which were petroleum products, primarily oil and natural gas. Living standards are quite high compared with those of most other OECD countries. In 1992, per capita GDP totaled \$24,600. As indicated in table 1, the nation's huge petroleum resources — estimated to equal about 41 percent of GDP, or \$34,640 per capita — are a prime source of this wealth.

About 86 percent of Norway's petroleum assets are directly or indirectly (through taxation) owned by the government. In addition, the government has a substantial stock of wealth resulting from its generation of hydroelectric power. It also has considerable financial reserves, with total government wealth exceeding Norwegian GDP by a factor of more than 2.5.

Norway's proven oil reserves amount to 17 years of production at the current rate. Starting from zero in 1971, production increased to 132 million tons oil equivalents (mtoe) in 1992, making the nation a larger producer than the United Kingdom. According to the government's recent Long Term Program 1994-1997, this trend will continue throughout the rest of the 1990s, with production expected to peak at 165 mtoe in 2000 and then to head downward to 137 mtoe in 2010 and 87 mtoe in 2030. Norway is also rich in natural gas reserves, which would last for 111 years at the current rate of production. Extraction, however, is expected to increase substantially over the next 10 to 15 years.

Like almost all OECD countries, Norway's population is getting older. Table 2 shows how this aging process will play out through the next century. The projections, which are taken from the Long Term Program 1994-1997 and Gjersem (1993), assume that the current fertility rate of 1.89 percent will prevail in future years and that life expectancy will continue to increase. The share of the population that is of working age (19 through 64) is projected to rise over the next 20 years and then to reverse course. The percentage of Norwegians over age 65 is now 0.163, but by 2050 that figure should hit 0.203. The dependency ratio of 0.702 (the ratio of those age 18 and below plus those age 65 and above to those age 19 to 64), already quite high, is expected to fall to 0.650 by 2015 and to begin increasing thereafter, reaching 0.731 by the year 2050.

By international standards, Norway has a massive public sector. Table 3 compares key fiscal ratios for Norway, the United States, Italy, Japan, Germany, and France in 1992. Of the six countries, Norway's 0.551 ratio of total government outlays to GDP is the largest. The U.S. ratio of 0.354 is the smallest. While Norway's transfer payments to GDP ratio of 0.226 is

somewhat below that of France, its 0.260 ratio of direct government consumption plus investment spending is the highest of the six. Not surprisingly, Norway also ranks first in the ratio of taxes to GDP. In fact, the only category in which Norway's fiscal policy compares favorably with those of the other five countries is the ratio of net debt to GDP. The government's net financial assets are a positive 17.2 percent of GDP. By way of comparison, Italy's net financial assets are a negative 105.3 percent.

Table 4 presents the principal components of the Norwegian government's expenditures and receipts in 1992.⁴ Transfers total 29 percent of GDP, of which 6.41 percent represents subsidies, primarily agricultural. The current universal Norwegian Social Security system was established in 1967, though old-age pensions will not be fully phased in until the middle of the next century. The system is fairly generous and is basically financed on a pay-as-you-go basis. In 1992, public expenditure on old-age pensions amounted to 6.8 percent of GDP, while disability pensions, sickness allowance, and unemployment benefits totaled 7.5 percent. Another important transfer is family allowance, which amounted to 2.4 percent of GDP in 1992. Old-age pensions are expected to grow rapidly in the years ahead, due both to demographics and to the phase-in of the new pension system.

Public consumption spending represented 22.43 percent of GDP in 1992, much of which was traceable to government workers' wages. About 30 percent of total employment is in the public sector. The second largest component of public consumption spending represents expenditures on health and education.

As table 4 shows, the government runs a considerable deficit (3.62 percent of GDP) despite its huge wealth. In part, this stems from the recent

4 Note that some of the figures in this table differ from those in table 3 due to differences in classifications.

recession, which triggered a shift to an expansionary fiscal policy stance in the beginning of the 1990s. It also reflects investment in the petroleum sector, which in 1992 accounted for 32 percent of the budget shortfall reported in table 4. Current projections show the deficit rising to 6 percent of GDP in 1993, of which 43 percent represents direct investment in the petroleum sector.

Table 4 also indicates the important role of indirect taxes and Social Security contributions to Norway's public finance. In addition to a large value-added tax (VAT), there are substantial consumption taxes (excise taxes) on cars, gasoline, alcohol, and tobacco. Excluding petroleum taxes, most direct taxes are on labor income. Capital taxes are low in Norway. Private households are heavily indebted due to the deductibility of nominal borrowing costs. In fact, aggregate capital taxes from private households are negative, i.e., the government is, on average, subsidizing capital income. Property taxes are also a minor item.

In 1992, the statutory tax rate for capital income was reduced to 28 percent and the maximum marginal tax rate on labor income was cut to about 50 percent. Overall, the effect of this reform has been to increase corporate income taxation and to reduce personal capital income taxation.

III. Methodology⁵

Generational accounting is based on the government's intertemporal budget constraint. This constraint, written as equation (1), requires that the future net tax payments of current and future generations be sufficient, in present value, to 1) cover the present value of future government consumption

⁵ This section provides a brief description of the method of generational accounting. For a more detailed explanation, see Auerbach, Gokhale, and Kotlikoff (1991).

and 2) pay off the government's initial net indebtedness.

$$(1) \quad \sum_{s=0}^D N_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} = \sum_{s=t}^{\infty} G_s (1+r)^{t-s} - W_t^g$$

The first summation on the left-hand side of (1) adds together the generational accounts (the present value of the remaining lifetime net payments) of existing generations. The term $N_{t,k}$ stands for the account of the generation born in year k . The index s in this summation runs from age 0 to age D , the maximum length of life.⁶

The second summation on the left-hand side of (1) adds together the present value of remaining net payments of future generations. The first term on the right-hand side expresses the present value of government consumption. In this summation, the values of government consumption in year s , given by G_s , are discounted by the pre-tax real interest rate, r . The remaining term on the left-hand side, W_t^g , denotes the government's net wealth in year t .

Equation (1) indicates the zero-sum nature of intergenerational fiscal policy. Holding the present value of government consumption fixed, a reduction in the present value of net taxes extracted from current generations (a decline in the first summation on the left side of [1]) necessitates an increase in the present value of future generations' net tax payments.

The term $N_{t,k}$ is defined by

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

⁶ Hence, the first element of this summation is $N_{t,t}$, which is the present value of net payments of the generation born in year t ; the last term is $N_{t,t-D}$, the present value of remaining net payments of the oldest generation alive in year t , namely, those born in year $t-D$.

Here, $\bar{T}_{s,k}$ 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 . For generations born prior to year t , the summation begins in year t . For generations born in year k , where $k > t$, the summation begins in year k . Regardless of the generation's year of birth, the discounting is always back to year t .

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 the combined present value adds up to the right-hand side of equation (1). Though we distinguish male and female cohorts in the results presented below, we suppress sex subscripts in (1) and (2) to ease notation.

Note that generational accounts reflect only taxes paid less transfers received. With the exception of government expenditures on 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. 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/burden from a particular policy change that affects only taxes and transfers. Thus, generational accounting tells us which generations will pay for government spending, not which will benefit from that spending.

Assessing the Fiscal Burden Facing Future Generations

Given the right-hand side 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 right-hand side, which is 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 generation under the assumption that the average lifetime tax payment of successive generations rises at the economy's rate of productivity growth. Without this growth adjustment, the lifetime net tax payments of future generations are directly comparable to those of current newborns, since the generational accounts of both newborns and future generations take into account net tax payments over these generations' entire lifetimes.

Note that our assumption that the generational accounts of all future generations are equal, except for a growth adjustment, is just one of many possible conjectures about the distribution across future generations of their collective net payment to the government. We could, for example, assume a phase-in of the additional fiscal burden (positive or negative) to be imposed on new young generations. Clearly, this would mean that generations born after the phase-in period has elapsed would face larger lifetime burdens (the $N_{t,k}$'s) than those calculated here.

IV. Constructing Generational Accounts

To form generational accounts for current and future generations, we need 1) projections of the population by age and sex, 2) projections of average net taxes for each generation in each year in which at least some of its members will be alive, 3) a discount rate to convert flows of net taxes into present values, 4) an estimate of the initial stock of government net wealth, and 5) projections of future government consumption. We describe the data sources and procedures for obtaining this information in general terms here, and provide a detailed description in the appendix.

Population Projections

The projection of population by age and sex from 1992 through 2050 is taken from The Long Term Program 1994-1997, a fiscal planning document issued by the Norwegian government. We have extended these projections through 2200 by assuming that fertility and mortality rates after 2050 equal those projected for that year.

Projection of Taxes and Transfers

Our projections of average future taxes and transfers by age and sex begin with the 1992 official totals for all levels of government (central and local). All taxes and transfers are considered in this analysis. Taxes are categorized as VATs, auto excise and gasoline taxes, alcohol and tobacco excise taxes, Social Security contributions, income taxes, and personal wealth taxes. Transfer payments are categorized as old-age support, health, education, old-age pensions, disability pensions, sickness allowance, family allowance, unemployment benefits, and other Social Security.

We distribute the 1992 totals of each of these taxes and transfers by age and sex based on corresponding distributions in cross-section survey data. The primary sources for these distributions are the 1990 Income and Wealth Survey and the 1990 Survey of Consumer Expenditure. The Income and Wealth Survey sample contains 8,287 households with 22,349 members. The Survey of Consumer Expenditure contains 1,201 households with 3,216 members. The appendix provides further details concerning the construction of the cross-section tax and transfer distributions.

The result of distributing the various aggregate taxes and transfers by age and sex is a 1992 distribution of benchmarked average payments by age and sex for each type of tax and transfer. We assume that, except for produc-

tivity growth, all distributions hold for future years. Thus, if we assume a 0.75 percent rate of productivity growth, the projected distribution of taxes and transfers by age and sex for, say, 2020 equals the 1992 distribution multiplied by 1.0075 raised to the twenty-eighth power.

The sole exception to this procedure arises in the case of old-age pensions. The Norwegian Social Security system is relatively young, and higher old-age pension benefits are to be phased in over time. To accommodate this fact, we used the MOSART model (a microsimulation model constructed by the Norwegian Central Bureau of Statistics) to project future distributions of old-age pensions by age and sex.

Discount Rates

The appropriate discount rate for calculating the present value of future amounts depends on whether or not they are known with certainty. Future government receipts and expenditures are risky, which suggests that they be discounted by a rate higher than the real rate of interest on government securities. On the other hand, government receipts and expenditures appear to be less volatile than the real return on capital, suggesting that they be discounted by a rate lower than that. Our baseline calculations assume a 4 percent real discount rate, which appears to be close to the current average real rate earned by the Norwegian government on its net financial wealth.

Government Consumption

The present value of government spending on goods and services is estimated based on the assumption that spending grows over time (from its 1992 level) to keep pace with population plus productivity growth. This amounts to assuming that spending per capita rises at the productivity growth rate.

Given the projected absolute stream of spending, forming its present value is a simple matter of discounting.

Our estimate of spending includes infrastructure investment rather than the imputed rent on the existing stock of infrastructure. Our failure to impute rent on Norwegian government infrastructure (other than the electricity-generating sector and the public telephone company) does not, however, appear to bias our calculations. The reason is that, to a first approximation, the present value of the future imputed rent on new infrastructure investment should equal the amount of the investment.

In the case of existing infrastructure, such as the Norwegian fjords, we ignore both the value of the stock (in calculating the government's net wealth) and the future imputed rent (in calculating the present value of government spending). To a first approximation, these adjustments would cancel from the right-hand side of equation (1) and therefore would leave unaltered our calculation of the net tax burden facing future generations.

Government Net Wealth

Our measure of government net wealth is the sum of five components: net financial assets, the market value of publicly owned stock, the present value of income from the sale of petroleum, the present value of the net cash flow from hydroelectric power plants, and revenue from the public telephone company. The appendix describes the data sources and calculation of each of these items.

V. Findings

Basic Results

Tables 5 and 6 present the basic generational accounts for Norwegian males and females for the base year of 1992. For cohorts ranging in age from 0 to 95 in 1992, each table includes nine sets of calculations, corresponding to three real, before-tax interest rates (2, 4, and 7 percent) and three rates of multifactor productivity growth (0.25, 0.75, and 1.25 percent). The center column corresponds to our base-case assumptions of a 4 percent rate of interest and a 0.75 percent rate of productivity growth.

For males in the base case (table 1), the generational account is \$129,900 for newborns, rising to a peak of \$295,200 for those who turned 25 in 1992. Thereafter the account falls, becoming negative at age 60 as individuals approach retirement and, with it, a reduced level of income taxes and public pension benefits. In interpreting this pattern, it is important to remember that a generation's account equals the present value of its *remaining* lifetime net tax payments. Thus, one cannot directly compare the accounts of different current generations to determine their relative *lifetime* burdens.

For women (table 6), the lifetime pattern is similar for the base case, but the accounts at each age are generally much lower. Newborns in 1992, for example, face a net lifetime fiscal burden of just \$5,600. This difference can be understood by looking at more detailed information presented in tables 7 through 10.

Tables 7 and 8 repeat the generational accounts for males and females for the base case, decomposing the results into the components of household payments and receipts. Comparing these two tables, we see that taxes on income and labor earnings explain most of the gender-related differences. As a result of their lower rate of labor force participation and their lower

earnings when employed, females born in 1992 will pay \$86,200 less in income and payroll taxes. In addition, women receive higher lifetime benefits. Their higher public pensions result from greater longevity, although a large share of general social welfare payments and most family benefits go to women.

Tables 7 and 8 also permit a number of other interesting observations regarding the Norwegian fiscal system. One is the importance of indirect taxes. For males, roughly one-third of all lifetime taxes are indirect (VATs plus specific excise taxes); for females, the share is one-half. On the receipts side, the largest program for both men and women is education. While pension benefits are larger in absolute terms, they are received much later in life and hence have a smaller present value than education benefits.

This difference in timing is exhibited in tables 9 and 10, which present the annual-flow components of the base-case accounts for a single generation — 1992 newborns — over 10-year intervals. Each row in the table gives the actual payments and receipts that a representative member of the cohort will receive as he or she ages. The present values of these flows are presented in the rows of tables 7 and 8. As one would expect, the tables indicate a smoother lifetime pattern of consumption taxes than of income taxes. Because income taxes include taxes on capital income, they occur, on average, later in life than payroll taxes. On the receipts side, again as expected, education benefits occur very early in life and pension benefits quite late. This explains why the lower annual flows for education result in much larger age-0 present values. As a comparison of the tables for males and females shows, men's pension benefits are actually greater than women's in each year. Thus, the higher present value for women is entirely attributable to their greater longevity.

The Fiscal Burden on Future Norwegians

Having considered the accounts for existing generations in some detail, what can we say about future generations? Let us return to tables 5 and 6, which present at the bottom the fiscal burdens that must be borne by future generations in order to satisfy the government's intertemporal budget constraint. For the base case, we estimate that future generations face net payment burdens that, adjusted for growth, are 133 percent higher than those faced by 1992 newborns. This indicates a severe imbalance in generational policy. However, it is important to consider how dependent this finding is on a variety of assumptions.

As discussed above, there are wide ranges of interest rates and economic growth rates that could plausibly be used in calculating generational accounts. How much do our conclusions hinge on the particular base-case combination used thus far? Tables 5 and 6 provide the answer, giving current and future generational accounts for nine different interest-rate/growth-rate combinations. The results indicate that the finding of a severe generational imbalance does indeed depend on our parameter assumptions.

The net-payment burden of a given generation is the sum of the present values of different streams of taxes and transfers, some of which occur earlier and others later during the generation's remaining lifespan. Hence, the relationship between the net-payment burden and the rate of interest may not be monotonic. Tables 5 and 6 show that the percentage difference between the accounts of newborn and future generations is smaller the higher is r .⁷ This difference is quite sensitive to the values of r and g used in the

⁷ Note that the percentage difference is adjusted for growth and is calculated as $\{[N_f/((1+g)*N_n)] - 1\} \times 100$, where N_f is the net-payment burden on future generations and N_n is that on current newborns.

calculations, and it is large and positive for a range of plausible values of these parameters.

For a given value of r , a higher value of g implies larger payments and receipts the further in the future that these occur. Again, however, because the timing of taxes and transfers is generally different over the lifespan, values of g and of the net payment need not be related in a monotonic way for particular generations. Table 5 shows that higher values of g produce larger present-value net-payment burdens for future as compared to current generations and result in a larger percentage difference between the accounts of future and newborn generations.

The Impact of Petroleum Wealth

As mentioned above, one of the distinctive features of the Norwegian economy is its considerable government wealth, due primarily to its energy resources. Because of its prominence, petroleum wealth is often used as a benchmark for questions about Norway's fiscal status. For example, we might relate the size of Norway's current generational imbalance to its stock of petroleum wealth, or ask how changes in the value of the nation's energy resources affect its fiscal position.

One way of addressing the first question is to ask to what extent government spending out of its petroleum wealth would have to be reduced to restore generational balance. For the base case, in which there is initially a generational imbalance of 133 percent, we find that a permanent reduction in spending of 22.0 percent would be required. In 1992, this would mean a reduction of \$1,329 per person in government spending, which equals about two-thirds of Norway's estimated 1992 income from its petroleum wealth.

Of course, the nation's actual petroleum wealth might change over time. Because the value of energy resources is highly sensitive to the volatile prices of oil and natural gas, significant unexpected increases or decreases are quite plausible. Our calculations indicate that a decline in petroleum wealth could have a severe impact on the well-being of future generations. For the base-case assumptions about interest and growth rates, halving the value of petroleum wealth raises the generational accounts of the unborn by 62.6 percent — an absolute amount of \$82,000 for males and \$3,500 for females. Thus, declines in petroleum wealth due to world oil price changes could have an important impact on Norway's generational balance.

Comparing Norwegian and U.S. Generational Accounts

How do our findings for Norway compare to those for the United States? Table 11 presents comparative generational accounts for the two countries according to our base-case interest- and growth-rate assumptions. The accounts for the United States correspond to those presented in earlier work (see Auerbach, Gokhale, and Kotlikoff [1993]), except that an interest rate of 6 percent was used previously. The Norwegian accounts are those given above for the base case in tables 1 and 2, except that educational spending is included in other government spending rather than treated as a transfer payment. We treat educational spending in this manner for the sake of comparison, because this significant component of government purchases has not been allocated by age and sex for the United States. As can be seen by comparing the accounts for Norway in table 11 to those in the center columns of tables 1 and 2, including educational spending with other government purchases of goods and services raises the accounts for future generations and

for those current generations young enough to have benefited from such spending.

In addition to the overall accounts for each generation, table 11 presents breakdowns of payments and receipts similar to those given for Norway in tables 7 and 8; but aggregated somewhat to permit a standard categorization for the two countries. As table 11 indicates, Norway has significantly higher levels of generational accounts for almost all current male generations. Some young female generations, however, bear slightly lower net-payment burdens compared to current younger female generations in the United States. For a given level of government purchases per capita, this may translate, via the government budget constraint, into a much lower burden on future generations in Norway. However, while the percentage increase in the burden on future generations is somewhat lower in Norway, the absolute burden on future Norwegians still exceeds that faced by future Americans. The reason for this is that Norway not only is raising more revenue from its current citizens, but is also spending more on government consumption. While the two countries have similar values of GDP per capita, government purchases represent 26 percent of Norway's GDP, compared to 19 percent for the United States (see table 3).

Achieving Generational Balance — Three Illustrative Policies

What changes in taxes and transfers would be required to restore the generational accounts of newborn and future Norwegians to fiscal balance? By fiscal balance, we mean that the ratio of the net-payment burden on future generations to that on newborns should be no higher than the rate of multi-factor productivity growth. Table 12 shows the effects on the accounts of current and future generations of three alternative ways of achieving fiscal balance. The first column shows that the average VAT rate would have to be

raised by 48 percent. This would involve substantial increases in the burdens on young and middle-aged generations: For example, 30-year-old males and females would be required to pay more than \$30,000 in additional VATs. The net-payment burden on future male generations would fall by about \$144,000, while for future female generations it would rise by \$23,000.

As shown in column two of table 12, the effect of raising payroll (SST) taxes by about 37 percent would be similar, except that current older generations would pay somewhat less, and middle-aged and younger male generations somewhat more, than under the first policy. All current female generations would, however, pay lower additional amounts under the second policy. The net gain to future male generations would be \$143,000, while the loss to future female generations would be about \$9,000 — substantially lower than under the first policy.

Alternatively, as column three in table 12 indicates, pension (PEN) benefits could be reduced by about 52 percent to achieve fiscal balance. In this case, those under age 40 would lose less while older living generations would lose significantly more in present value as compared to the first policy. Under the third policy, the burdens on future male generations would fall by \$166,000, while those on future females would increase by about \$5,000.

VI. Summary and Conclusion

This paper uses generational accounting, a new tool for fiscal analysis and planning, to study Norway's long-term fiscal position. The findings are quite unsettling. Despite having one of the highest rates of taxation in the OECD and a sizable amount of public wealth, Norway's fiscal policy appears to be unsustainable. Unless adjustments are made and made soon, future genera-

tions of Norwegians are likely to face a much higher fiscal burden than that now in place.

There are many different ways to restore generational balance to Norwegian fiscal policy. One is to reduce government spending by roughly one-fifth. Another is to set aside (*not spend*) about two-thirds of the country's petroleum income.⁸ A third option is to limit any further growth in the generosity of Norwegian old-age pensions. Finally, the government could raise taxes. While Norway's leaders will ultimately have to decide how and when to make the necessary adjustments, they can use generational accounting to ensure that whatever increased fiscal burden they impose on current generations is distributed fairly. They can also use it to check, on an ongoing basis, that their largess to current Norwegians does not come at the price of higher fiscal burdens on future citizens.

8 Steigum (1993) provides an analysis of such a policy.

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Table 1

Norway's National Wealth Per Capita, 1992

Physical capital	\$88,456
Natural resources	24,060
Human capital	224,326
Net financial assets	- 2,476
National wealth	<u>\$334,366</u>

Assumptions: Exchange rate: 6.65 kroner per dollar
Real rate of return: 7 percent per year
Productivity growth: 1 percent per year
Source: Central Bureau of Statistics.

Table 2

Norway's Demographic Transition

	<u>1990</u>	<u>2015</u>	<u>2050</u>	<u>2100</u>
Population (millions)	4.25	4.60	4.66	4.42
Working age (percent)	58.8	60.6	57.8	57.2
Dependency ratio	.702	.650	.731	.749
Share of population				
over age 65	.163	.164	.203	.208
over age 75	.070	.068	.106	.103

Source: Gjersem (1993).

Table 3
Comparative Fiscal Ratios in 1992

	<u>Norway</u>	<u>U.S.</u>	<u>Italy</u>	<u>Japan</u>	<u>Germany</u>	<u>France</u>
Taxes/GDP ^a	46.9	30.7	40.7	30.6	43.7	43.6
Total Outlays/GDP ^b	55.1	35.4	51.3	25.7	45.7	48.5
Direct Spending/GDP ^c	26.0	18.7	20.7	15.0	22.9	22.3
Transfers/GDP ^d	22.6	14.4	20.3	11.5	n.a.	24.8
Interest Payments/GDP	3.7	2.2	11.4	3.9	3.3	3.4
Deficit/GDP	2.8	4.7	9.5	-1.8	2.8	3.9
Net Debt/GDP	-17.2	38.0	105.3	4.2	24.4	30.1

a. Direct taxes, indirect taxes, and social insurance contributions.

b. Purchases on current account.

c. Government consumption plus investment.

d. Includes Social Security benefits, but excludes subsidies.

Source: OECD.

Table 4

Public Expenditures and Receipts, 1992

Receipts (percent of GDP)

Direct and indirect petroleum taxes	3.84
Other direct taxes	15.35
Social Security contributions	11.69
Other indirect taxes	16.06
Income from government wealth	7.86
Total receipts	<u>54.80</u>

Expenditures (percent of GDP)

Public consumption	22.43
Net investment in fixed capital	2.40
Transfers	29.03
- private households	21.47
- subsidies	6.41
- abroad	1.15
Interest	3.70
Increase in capital deposits in state enterprises (net)	0.86
Total expenditures	<u>58.42</u>
Deficit	3.62

Source: Revised National Budget 1993 St.meld. nr.2 (1992-93), Ministry of Finance (May 1993).

Table 7

The Composition of Male Generational Accounts (r=.04, g=.0075)

Present Values of Receipts and Payments

(thousands of dollars)

Generation's Age in 1992	Net Payment	Payments						Receipts								
		VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH
0	129.9	62.4	15.6	8.2	84.1	85.2	2.6	0.5	5.3	59.8	17.1	11.9	12.0	0.4	15.5	5.7
5	149.0	65.8	16.6	9.8	100.8	102.2	3.1	0.6	5.1	68.7	20.6	14.3	14.4	0.5	18.4	6.8
10	184.5	69.0	17.6	11.5	118.4	120.2	3.7	0.7	5.5	61.5	24.2	16.8	16.9	0.6	21.6	8.0
15	231.4	71.8	18.6	13.2	136.3	138.3	4.2	0.8	6.1	42.4	28.3	19.3	19.5	0.7	24.9	9.1
20	274.5	71.1	18.6	13.8	149.0	152.0	4.7	0.8	6.3	18.2	31.0	21.4	21.2	0.7	25.7	9.5
25	295.2	69.1	17.4	13.4	156.6	162.4	5.3	0.9	6.2	8.7	36.8	23.8	21.6	0.8	21.1	9.1
30	289.0	64.0	15.4	12.6	154.2	165.3	6.0	1.0	5.9	3.9	43.5	26.4	21.4	0.9	17.0	8.6
35	260.7	58.7	14.0	11.7	142.2	161.1	6.7	1.1	5.8	1.9	50.5	29.6	20.7	0.8	15.0	8.2
40	218.3	53.7	13.2	10.8	126.7	152.2	7.1	1.3	6.1	1.0	63.1	32.7	20.1	0.5	13.1	7.4
45	162.2	47.8	12.3	9.5	106.7	136.4	7.4	1.5	6.3	0.4	77.5	36.1	19.0	0.2	10.8	6.2
50	99.8	41.8	10.7	8.6	84.6	116.3	7.5	1.7	6.7	0.0	90.2	39.8	17.4	0.1	8.5	5.1
55	34.8	35.0	8.6	7.7	60.5	91.9	7.2	2.0	6.9	0.0	102.5	39.8	14.5	0.1	7.2	3.1
60	-29.6	28.6	6.8	6.2	37.3	69.2	6.9	2.4	7.0	0.0	124.6	33.4	10.1	0.0	5.3	1.9
65	-71.5	22.2	4.9	4.6	17.7	47.8	6.0	3.0	6.8	0.0	144.5	15.4	2.3	0.0	1.8	0.9
70	-70.2	16.8	2.9	3.4	7.4	31.8	4.7	3.5	6.6	0.0	125.4	1.5	0.0	0.0	0.0	0.2
75	-75.8	12.3	1.6	2.8	4.5	18.8	2.8	4.1	5.8	0.0	108.6	0.3	0.0	0.0	0.0	0.0
80	-54.6	9.1	1.0	2.9	3.0	9.6	1.6	5.3	4.7	0.0	71.8	0.0	0.0	0.0	0.0	0.0
85	-38.2	6.8	0.7	3.0	2.0	5.0	1.0	6.1	3.8	0.0	46.9	0.0	0.0	0.0	0.0	0.0
90	-27.3	5.0	0.6	2.4	1.4	3.4	0.9	6.4	2.6	0.0	31.9	0.0	0.0	0.0	0.0	0.0
95	-21.7	3.7	0.3	2.3	1.0	2.2	0.8	5.5	1.9	0.0	24.6	0.0	0.0	0.0	0.0	0.0
Future Generations	305.4															
Percentage Change	133.3															

Source: Authors' calculations.

Table 8

The Composition of Female Generational Accounts (r=.04, g=.0075)

Present Values of Receipts and Payments

(thousands of dollars)

Generation's Age in 1992	Net Payment	Payments						Receipts									
		VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
0	5.6	62.9	15.7	8.4	43.7	39.4	1.0	0.7	5.6	62.2	23.2	13.7	11.8	19.2	15.4	13.7	
5	-0.2	66.4	16.7	10.0	52.3	47.2	1.2	0.9	5.5	71.6	27.8	16.4	14.1	23.0	18.4	16.3	
10	9.0	69.4	17.6	11.7	61.1	55.1	1.4	1.0	5.9	64.7	32.5	19.2	16.4	26.9	21.4	19.1	
15	30.9	72.5	18.7	13.4	70.6	63.7	1.6	1.2	6.5	46.2	36.5	22.2	19.0	31.1	24.8	22.0	
20	53.6	72.0	18.7	14.1	76.8	69.8	1.7	1.3	6.8	21.3	40.6	24.6	20.9	34.7	25.5	23.6	
25	61.6	71.0	17.8	13.9	78.6	72.9	2.0	1.5	6.9	9.9	46.2	28.0	20.8	37.4	21.2	22.5	
30	54.8	66.6	15.9	13.2	74.1	71.4	2.1	1.7	6.8	5.9	53.5	31.2	18.9	34.3	17.2	19.1	
35	50.2	61.9	14.6	12.4	68.3	69.0	2.2	1.9	6.9	3.6	59.4	34.2	17.0	24.1	15.4	15.9	
40	38.9	57.5	14.0	11.7	61.6	65.1	2.4	2.2	7.3	2.4	70.0	36.8	15.5	12.7	13.5	13.0	
45	15.4	52.1	13.1	10.5	51.4	57.0	2.7	2.5	7.8	1.3	79.4	38.5	13.7	5.5	11.1	11.6	
50	-14.3	46.3	11.5	9.7	39.4	46.8	2.9	3.0	8.3	0.2	87.8	39.6	11.3	1.9	8.8	10.0	
55	-45.7	39.8	9.4	8.9	27.1	35.5	2.8	3.5	8.8	0.0	96.5	35.4	8.3	0.5	7.5	9.0	
60	-81.8	33.4	7.5	7.5	17.1	25.8	2.6	4.1	9.0	0.0	118.6	26.3	5.1	0.1	5.5	7.0	
65	-87.6	26.6	5.5	5.8	9.3	17.6	2.4	4.9	8.9	0.0	125.1	10.0	1.8	0.0	1.8	2.3	
70	-82.3	20.7	3.3	4.4	5.2	11.5	2.1	5.4	8.5	0.0	114.6	0.9	0.0	0.0	0.0	0.2	
75	-74.9	15.2	1.9	3.8	4.0	8.0	1.8	6.0	7.3	0.0	95.7	0.4	0.0	0.0	0.0	0.2	
80	-59.0	10.9	1.1	3.6	3.0	5.9	1.6	6.9	5.7	0.0	72.3	0.1	0.0	0.0	0.0	0.2	
85	-46.1	7.8	0.8	3.5	2.2	4.2	1.2	7.2	4.4	0.0	54.3	0.0	0.0	0.0	0.0	0.0	
90	-36.4	5.3	0.6	2.6	1.7	2.7	0.9	6.9	2.8	0.0	40.4	0.0	0.0	0.0	0.0	0.0	
95	-27.3	3.4	0.3	2.2	1.2	1.6	0.8	5.2	1.8	0.0	29.9	0.0	0.0	0.0	0.0	0.0	
Future Generations	13.1																

Source: Authors' calculations.

Table 9

The Components of Male Generational Accounts (r=.06, g=.015)

Average Annual Values of Receipts and Payments

		Payments							Receipts								
Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 0 in 1992	Payment																
Age	Year																
0	1992	1428.8	1463.6	330.6	0.0	0.0	0.0	-0.3	-257.9	-107.3	0.0	0.0	0.0	0.0	0.0	0.0	
10	2002	-4033.0	1505.5	329.2	0.0	0.0	0.0	-0.3	-61.8	-5801.8	0.0	0.0	0.0	0.0	0.0	-3.7	
20	2012	2600.1	2466.3	724.5	456.2	2045.4	1658.3	11.4	-9.6	-164.3	-2141.6	0.0	-57.7	-479.8	-7.6	-1577.5	-323.7
30	2022	15941.6	3723.3	1009.3	652.6	7877.5	6385.3	52.2	-10.4	-277.2	-689.7	0.0	-216.6	-936.9	-12.5	-1244.9	-370.5
40	2032	21892.4	3795.5	814.6	782.5	10269.9	9937.4	252.4	-11.2	-190.2	-226.9	0.0	-559.4	-1108.4	-116.6	-1147.6	-599.6
50	2042	25452.6	4174.9	1193.1	699.6	11270.1	12894.5	483.5	-12.1	-273.4	-57.9	0.0	-1648.9	-1568.3	-16.6	-918.5	-767.4
60	2052	16219.1	3925.4	1016.0	907.3	9191.1	11604.9	729.1	-13.0	-495.1	0.0	-653.1	-5870.7	-2575.0	-15.1	-1188.9	-343.8
70	2062	-12237.5	3357.7	832.6	633.6	2250.3	7820.2	1036.3	-266.0	-894.7	0.0	-25913.2	-925.3	0.0	0.0	0.0	-169.1
80	2072	-18001.1	2829.8	391.6	607.7	1062.3	4463.4	697.7	-804.4	-1336.0	0.0	-25913.2	0.0	0.0	0.0	0.0	0.0
90	2082	-22933.8	2725.2	295.7	1220.1	776.5	2070.4	489.6	-3075.0	-1523.1	0.0	-25913.2	0.0	0.0	0.0	0.0	0.0
Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 10 in 1992	Payment																
Age	Year																
10	1992	-3742.6	1397.1	305.5	0.0	0.0	0.0	0.0	-0.3	-57.3	-5384.1	0.0	0.0	0.0	0.0	0.0	-3.4
20	2002	2412.9	2288.7	672.3	423.3	1898.1	1538.9	10.5	-8.9	-152.5	-1987.4	0.0	-53.6	-445.3	-7.0	-1463.9	-300.4
30	2012	14793.8	3455.2	936.7	605.6	7310.4	5925.6	48.5	-9.6	-257.2	-640.1	0.0	-201.0	-869.4	-11.6	-1155.3	-343.8
40	2022	20316.2	3522.2	756.0	726.2	9530.5	9221.9	234.2	-10.4	-176.5	-210.6	0.0	-519.1	-1028.6	-108.2	-1065.0	-556.5
50	2032	23620.1	3874.4	1107.2	649.3	10458.7	11966.1	448.7	-11.2	-253.7	-53.7	0.0	-1530.2	-1455.4	-15.4	-852.4	-712.2
60	2042	15051.4	3642.7	942.9	842.0	8529.4	10769.4	676.6	-12.1	-459.5	0.0	-606.1	-5448.1	-2389.6	-14.0	-1103.3	-319.0
70	2052	-11356.4	3116.0	772.7	588.0	2088.3	7257.2	961.7	-246.8	-830.2	0.0	-24047.6	-858.7	0.0	0.0	0.0	-156.9
80	2062	-16705.1	2626.0	363.4	564.0	985.9	4142.1	647.5	-746.5	-1239.8	0.0	-24047.6	0.0	0.0	0.0	0.0	0.0
90	2072	-21282.6	2529.0	274.4	1132.3	720.6	1921.3	454.4	-2853.6	-1413.4	0.0	-24047.6	0.0	0.0	0.0	0.0	0.0

Table 9 (Continued)

Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 20 in 1992 Payment																	
Age	Year																
20	1992	2239.2	2123.9	623.9	392.9	1761.4	1428.1	9.8	-8.3	-141.5	-1844.3	0.0	-49.7	-413.2	-6.5	-1358.5	-278.7
30	2002	13728.7	3206.5	869.2	562.0	6784.0	5498.9	45.0	-8.9	-238.7	-594.0	0.0	-186.5	-806.8	-10.8	-1072.1	-319.1
40	2012	18853.5	3268.6	701.6	673.9	8844.3	8558.0	217.4	-9.6	-163.8	-195.4	0.0	-481.7	-954.5	-100.4	-988.3	-516.4
50	2022	21919.5	3595.4	1027.5	602.5	9705.7	11104.6	416.4	-10.4	-235.5	-49.9	0.0	-1420.0	-1350.6	-14.3	-791.0	-660.9
60	2032	13965.0	3380.5	875.0	781.3	7915.3	9994.1	627.9	-11.2	-426.4	0.0	-565.1	-5055.8	-2217.5	-13.0	-1023.9	-296.1
70	2042	-10646.5	2891.7	717.0	545.7	1938.0	6734.7	892.4	-229.0	-770.5	0.0	-22424.0	-796.8	0.0	0.0	0.0	-145.6
80	2052	-15610.1	2437.0	337.2	523.4	914.9	3843.9	600.9	-692.7	-1150.6	0.0	-22424.0	0.0	0.0	0.0	0.0	0.0
90	2062	-19858.0	2346.9	254.6	1050.7	668.7	1783.0	421.7	-2648.2	-1311.7	0.0	-22424.0	0.0	0.0	0.0	0.0	0.0
Age 30 in 1992 Payment																	
Age	Year																
30	1992	12740.3	2975.6	806.6	521.5	6295.6	5103.0	41.7	-8.3	-221.5	-551.2	0.0	-173.1	-748.7	-10.0	-994.9	-296.1
40	2002	17496.1	3033.3	651.1	625.4	8207.5	7941.8	201.7	-8.9	-152.0	-181.3	0.0	-447.1	-885.8	-93.2	-917.2	-479.2
50	2012	20341.4	3336.6	953.5	559.1	9006.9	10305.1	386.4	-9.6	-218.5	-46.3	0.0	-1317.7	-1253.4	-13.3	-734.1	-613.3
60	2022	12929.9	3137.1	812.0	725.1	7345.4	9274.5	582.7	-10.4	-395.7	0.0	-554.1	-4691.8	-2057.9	-12.0	-950.2	-274.8
70	2032	-11056.6	2683.5	665.4	506.4	1798.4	6249.8	828.2	-212.6	-715.0	0.0	-21986.1	-739.5	0.0	0.0	0.0	-135.1
80	2042	-15662.8	2261.5	312.9	485.7	849.0	3567.1	557.6	-642.8	-1067.7	0.0	-21986.1	0.0	0.0	0.0	0.0	0.0
90	2052	-19604.9	2178.0	236.3	975.1	620.6	1654.6	391.3	-2457.5	-1217.2	0.0	-21986.1	0.0	0.0	0.0	0.0	0.0
Age 40 in 1992 Payment																	
Age	Year																
40	1992	16236.4	2814.9	604.2	580.4	7616.6	7370.1	187.2	-8.3	-141.1	-168.3	0.0	-414.9	-822.0	-86.5	-851.2	-444.7
50	2002	18876.9	3096.3	884.9	518.9	8358.4	9563.2	358.6	-8.9	-202.8	-42.9	0.0	-1222.9	-1163.1	-12.3	-681.2	-569.2
60	2012	11968.8	2911.2	753.5	672.9	6816.5	8606.8	540.7	-9.6	-367.2	0.0	-544.4	-4354.0	-1909.7	-11.2	-881.8	-255.0
70	2022	-11459.5	2490.3	617.5	469.9	1669.0	5799.8	768.6	-197.2	-663.5	0.0	-21602.1	-686.2	0.0	0.0	0.0	-125.4
80	2032	-15734.1	2098.7	290.4	450.7	787.9	3310.3	517.4	-596.6	-990.9	0.0	-21602.1	0.0	0.0	0.0	0.0	0.0
90	2042	-19392.4	2021.2	219.3	904.9	575.9	1535.5	363.1	-2280.6	-1129.6	0.0	-21602.1	0.0	0.0	0.0	0.0	0.0

Table 9 (Continued)

Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 50 in 1992 Payment																	
Age	Year																
50	1992	17517.8	2873.4	821.2	481.5	7756.7	8874.6	332.8	-8.3	-188.2	-39.8	0.0	-1134.8	-1079.4	-11.5	-632.2	-528.2
60	2002	11105.2	2701.6	699.3	624.4	6325.8	7987.1	501.8	-8.9	-340.8	0.0	-507.1	-4040.5	-1772.2	-10.4	-818.3	-236.6
70	2012	-10707.3	2311.0	573.0	436.1	1548.8	5382.3	713.2	-183.0	-615.8	0.0	-20119.7	-636.8	0.0	0.0	0.0	-116.4
80	2022	-14674.1	1947.6	269.5	418.3	731.2	3072.0	480.2	-553.6	-919.5	0.0	-20119.7	0.0	0.0	0.0	0.0	0.0
90	2032	-18069.0	1875.6	203.5	839.7	534.4	1425.0	337.0	-2116.4	-1048.3	0.0	-20119.7	0.0	0.0	0.0	0.0	0.0
Age 60 in 1992 Payment																	
Age	Year																
60	1992	10402.4	2507.1	648.9	579.5	5870.3	7412.1	465.7	-8.3	-316.2	0.0	-373.9	-3749.6	-1644.6	-9.6	-759.4	-219.6
70	2002	-8848.6	2144.6	531.8	404.7	1437.3	4994.8	661.9	-169.9	-571.4	0.0	-17583.3	-591.0	0.0	0.0	0.0	-108.0
80	2012	-12529.8	1807.4	250.1	388.2	678.5	2850.8	445.6	-513.8	-853.3	0.0	-17583.3	0.0	0.0	0.0	0.0	0.0
90	2022	-15680.3	1740.6	188.9	779.3	496.0	1322.4	312.7	-1964.0	-972.8	0.0	-17583.3	0.0	0.0	0.0	0.0	0.0
Age 70 in 1992 Payment																	
Age	Year																
70	1992	-5662.1	1990.2	493.5	375.6	1333.8	4635.1	614.2	-157.6	-530.3	0.0	-13767.9	-548.4	0.0	0.0	0.0	-100.2
80	2002	-9078.3	1677.2	232.1	360.2	629.7	2645.5	413.5	-476.8	-791.9	0.0	-13767.9	0.0	0.0	0.0	0.0	0.0
90	2012	-12002.0	1615.3	175.3	723.2	460.2	1227.2	290.2	-1822.6	-902.8	0.0	-13767.9	0.0	0.0	0.0	0.0	0.0
Age 80 in 1992 Payment																	
Age	Year																
80	1992	-7720.1	1556.5	215.4	334.3	584.3	2455.1	383.8	-442.4	-734.9	0.0	-12072.1	0.0	0.0	0.0	0.0	0.0
90	2002	-10433.3	1499.0	162.6	671.1	427.1	1138.8	269.3	-1691.4	-837.8	0.0	-12072.1	0.0	0.0	0.0	0.0	0.0
Age 90 in 1992 Payment																	
Age	Year																
90	1992	-7368.5	1391.1	150.9	622.8	396.4	1056.8	249.9	-1569.6	-777.4	0.0	-8889.4	0.0	0.0	0.0	0.0	0.0

Table 10

The Components of Female Generational Accounts (r=.06, g=.015)

Average Annual Values of Receipts and Payments

		Payments							Receipts								
Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 0 in 1992		Payment															
Age	Year																
0	1992	1428.8	1463.6	330.6	0.0	0.0	0.0	-0.3	-257.9	-107.3	0.0	0.0	0.0	0.0	0.0	0.0	
10	2002	-3958.5	1505.5	329.2	0.0	0.0	0.0	-0.3	-61.8	-5731.1	0.0	0.0	0.0	0.0	0.0	0.0	
20	2012	-409.6	2466.3	724.5	456.2	1484.5	1085.6	15.9	-9.6	-164.3	-3394.3	0.0	-30.5	-461.4	-250.9	-1577.5	-754.0
30	2022	4236.4	3723.3	1009.3	652.6	4229.6	3285.6	56.3	-10.4	-277.2	-832.4	0.0	-428.2	-1228.2	-3173.0	-1244.9	-1526.0
40	2032	7028.3	3795.5	814.6	782.5	4957.8	4474.0	44.8	-11.2	-190.2	-396.7	0.0	-1044.7	-1092.6	-2916.0	-1147.6	-1041.8
50	2042	10323.3	4174.9	1193.1	699.6	5553.5	5560.7	117.7	-12.1	-273.4	-320.2	-21.7	-2422.9	-1347.4	-650.3	-918.5	-1009.8
60	2052	2823.9	3925.4	1016.0	907.3	3562.1	3989.9	178.7	-13.0	-495.1	0.0	-633.1	-5677.1	-1261.9	-37.8	-1188.9	-1448.5
70	2062	-18645.7	3357.7	832.6	633.6	964.2	2291.4	269.6	-266.0	-894.7	0.0	-25460.5	-361.1	0.0	-12.6	0.0	0.0
80	2072	-21425.6	2829.8	391.6	607.7	751.7	1470.4	302.1	-804.4	-1336.0	0.0	-25460.5	-86.8	0.0	0.0	0.0	-91.2
90	2082	-23199.5	2725.2	295.7	1220.1	835.7	1447.6	334.8	-3075.0	-1523.1	0.0	-25460.5	0.0	0.0	0.0	0.0	0.0
Age 10 in 1992		Payment															
Age	Year																
10	1992	-3673.5	1397.1	305.5	0.0	0.0	0.0	0.0	-0.3	-57.3	-5318.5	0.0	0.0	0.0	0.0	0.0	0.0
20	2002	-380.1	2288.7	672.3	423.3	1377.6	1007.4	14.8	-8.9	-152.5	-3149.9	0.0	-28.3	-428.1	-232.8	-1463.9	-699.7
30	2012	3931.4	3455.2	936.7	605.6	3925.1	3049.0	52.3	-9.6	-257.2	-772.5	0.0	-397.4	-1139.8	-2944.6	-1155.3	-1416.1
40	2022	6522.3	3522.2	756.0	726.2	4600.9	4151.9	41.6	-10.4	-176.5	-368.1	0.0	-969.5	-1013.9	-2706.1	-1065.0	-966.8
50	2032	9580.0	3874.4	1107.2	649.3	5153.7	5160.3	109.2	-11.2	-253.7	-297.2	-20.2	-2248.4	-1250.3	-603.5	-852.4	-937.1
60	2042	2620.6	3642.7	942.9	842.0	3305.7	3702.6	165.9	-12.1	-459.5	0.0	-587.5	-5268.3	-1171.1	-35.1	-1103.3	-1344.2
70	2052	-17303.2	3116.0	772.7	588.0	894.8	2126.4	250.2	-246.8	-830.2	0.0	-23627.4	-335.1	0.0	-11.7	0.0	0.0
80	2062	-19883.0	2626.0	363.4	564.0	697.6	1364.5	280.4	-746.5	-1239.8	0.0	-23627.4	-80.6	0.0	0.0	0.0	-84.6
90	2072	-21529.2	2529.0	274.4	1132.3	775.5	1343.4	310.7	-2853.6	-1413.4	0.0	-23627.4	0.0	0.0	0.0	0.0	0.0

Table 10 (Continued)

Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 20 in 1992 Payment																	
Age	Year																
20	1992	-352.7	2123.9	623.9	392.9	1278.4	934.9	13.7	-8.3	-141.5	-2923.1	0.0	-26.3	-397.3	-216.1	-1358.5	-649.3
30	2002	3648.4	3206.5	869.2	562.0	3642.5	2829.5	48.5	-8.9	-238.7	-716.9	0.0	-368.8	-1057.7	-2732.6	-1072.1	-1314.2
40	2012	6052.7	3268.6	701.6	673.9	4269.6	3853.0	38.6	-9.6	-163.8	-341.6	0.0	-899.7	-940.9	-2511.3	-988.3	-897.2
50	2022	8890.8	3595.4	1027.5	602.5	4782.6	4788.8	101.3	-10.4	-235.5	-275.8	-18.2	-2086.5	-1160.3	-560.1	-791.0	-869.6
60	2032	2445.8	3380.5	875.0	781.3	3067.7	3436.0	153.9	-11.2	-426.4	0.0	-531.4	-4889.0	-1086.8	-32.6	-1023.9	-1247.4
70	2042	-15500.0	2891.7	717.0	545.7	830.3	1973.3	232.2	-229.0	-770.5	0.0	-21368.8	-311.0	0.0	-10.8	0.0	0.0
80	2052	-17894.1	2437.0	337.2	523.4	647.4	1266.3	260.2	-692.7	-1150.6	0.0	-21368.8	-74.8	0.0	0.0	0.0	-78.5
90	2062	-19421.7	2346.9	254.6	1050.7	719.7	1246.7	288.3	-2648.2	-1311.7	0.0	-21368.8	0.0	0.0	0.0	0.0	0.0
Age 30 in 1992 Payment																	
Age	Year																
30	1992	3385.7	2975.6	806.6	521.5	3380.2	2625.8	45.0	-8.3	-221.5	-665.2	0.0	-342.2	-981.6	-2535.8	-994.9	-1219.5
40	2002	5616.9	3033.3	651.1	625.4	3962.2	3575.6	35.8	-8.9	-152.0	-317.0	0.0	-834.9	-873.2	-2330.5	-917.2	-832.6
50	2012	8251.2	3336.6	953.5	559.1	4438.3	4444.0	94.0	-9.6	-218.5	-255.9	-16.4	-1936.3	-1076.8	-519.7	-734.1	-807.0
60	2022	2284.5	3137.1	812.0	725.1	2846.8	3188.6	142.8	-10.4	-395.7	0.0	-478.3	-4537.0	-1008.5	-30.2	-950.2	-1157.6
70	2032	-13788.4	2683.5	665.4	506.4	770.6	1831.2	215.4	-212.6	-715.0	0.0	-19234.7	-288.6	0.0	-10.1	0.0	0.0
80	2042	-16010.0	2261.5	312.9	485.7	600.8	1175.1	241.4	-642.8	-1067.7	0.0	-19234.7	-69.4	0.0	0.0	0.0	-72.9
90	2052	-17427.7	2178.0	236.3	975.1	667.8	1156.9	267.5	-2457.5	-1217.2	0.0	-19234.7	0.0	0.0	0.0	0.0	0.0
Age 40 in 1992 Payment																	
Age	Year																
40	1992	5212.5	2814.9	604.2	580.4	3676.9	3318.1	33.2	-8.3	-141.1	-294.2	0.0	-774.8	-810.3	-2162.7	-851.2	-772.6
50	2002	7657.8	3096.3	884.9	518.9	4118.8	4124.1	87.3	-8.9	-202.8	-237.5	-14.5	-1796.9	-999.3	-482.3	-681.2	-748.9
60	2012	2140.5	2911.2	753.5	672.9	2641.8	2959.1	132.5	-9.6	-367.2	0.0	-423.4	-4210.4	-935.9	-28.1	-881.8	-1074.3
70	2022	-11973.7	2490.3	617.5	469.9	715.1	1699.4	199.9	-197.2	-663.5	0.0	-17027.9	-267.8	0.0	-9.3	0.0	0.0
80	2032	-14035.4	2098.7	290.4	450.7	557.5	1090.5	224.1	-596.6	-990.9	0.0	-17027.9	-64.4	0.0	0.0	0.0	-67.6
90	2042	-15351.1	2021.2	219.3	904.9	619.8	1073.6	248.3	-2280.6	-1129.6	0.0	-17027.9	0.0	0.0	0.0	0.0	0.0

Table 10 (Continued)

Generations	Net	VAT	EX1	EX2	SST	YTX	WTX	OLD	HOS	EDU	PEN	DIS	SIK	FAM	UNM	OTH	
Age 50 in 1992																	
Age	Year																
50	1992	7110.0	2873.4	821.2	481.5	3822.2	3827.1	81.0	-8.3	-188.2	-220.4	-10.0	-1667.5	-927.3	-447.6	-632.2	-695.0
60	2002	2028.0	2701.6	699.3	624.4	2451.6	2746.0	123.0	-8.9	-340.8	0.0	-351.3	-3907.2	-868.5	-26.0	-818.3	-996.9
70	2012	-9437.6	2311.0	573.0	436.1	663.6	1577.0	185.5	-183.0	-615.8	0.0	-14127.9	-248.5	0.0	-8.7	0.0	0.0
80	2022	-11350.9	1947.6	269.5	418.3	517.4	1012.0	207.9	-553.6	-919.5	0.0	-14127.9	-59.8	0.0	0.0	0.0	-62.7
90	2032	-12571.8	1875.6	203.5	839.7	575.1	996.3	230.4	-2116.4	-1048.3	0.0	-14127.9	0.0	0.0	0.0	0.0	0.0
Age 60 in 1992																	
Age	Year																
60	1992	1937.6	2507.1	648.9	579.5	2275.1	2548.3	114.1	-8.3	-316.2	0.0	-270.4	-3625.9	-806.0	-24.2	-759.4	-925.2
70	2002	-8200.6	2144.6	531.8	404.7	615.8	1463.5	172.2	-169.9	-571.4	0.0	-12553.2	-230.6	0.0	-8.0	0.0	0.0
80	2012	-9976.2	1807.4	250.1	388.2	480.1	939.1	193.0	-513.8	-853.3	0.0	-12553.2	-55.5	0.0	0.0	0.0	-58.2
90	2022	-11109.2	1740.6	188.9	779.3	533.7	924.6	213.8	-1964.0	-972.8	0.0	-12553.2	0.0	0.0	0.0	0.0	0.0
Age 70 in 1992																	
Age	Year																
70	1992	-6052.3	1990.2	493.5	375.6	571.5	1358.1	159.8	-157.6	-530.3	0.0	-10091.5	-214.0	0.0	-7.5	0.0	0.0
80	2002	-7700.0	1677.2	232.1	360.2	445.6	871.5	179.1	-476.8	-791.9	0.0	-10091.5	-51.5	0.0	0.0	0.0	-54.0
90	2012	-8751.4	1615.3	175.3	723.2	495.3	858.0	198.4	-1822.6	-902.8	0.0	-10091.5	0.0	0.0	0.0	0.0	0.0
Age 80 in 1992																	
Age	Year																
80	1992	-7917.8	1556.5	215.4	334.3	413.5	808.8	166.2	-442.4	-734.9	0.0	-10137.1	-47.8	0.0	0.0	0.0	-50.1
90	2002	-8893.5	1499.0	162.6	671.1	459.6	796.2	184.1	-1691.4	-837.8	0.0	-10137.1	0.0	0.0	0.0	0.0	0.0
Age 90 in 1992																	
Age	Year																
90	1992	-9293.2	1391.1	150.9	622.8	426.6	738.9	170.9	-1569.6	-777.4	0.0	-10447.3	0.0	0.0	0.0	0.0	0.0

Source: Authors' calculations.

Table 11

The Composition of Norwegian and U.S. Generational Accounts ($r=0.04$, $g=0.0075$)

Present Values of Receipts and Payments (thousands of dollars)

Age in 1992	United States							Norway						
	Net Payment	Income Taxes	Payroll Taxes	Excise & Other Taxes	Social Security Benefits	Health Benefits	Other Welfare Benefits	Net Payment	Income Taxes	Payroll Taxes	Excise & Other Taxes	Social Security Benefits	Health Benefits	Other Welfare Benefits
MALES														
0	146.7	85.5	65.3	51.1	18.5	29.9	6.8	189.8	85.2	84.1	88.8	17.6	29.2	21.6
10	196.1	115.9	88.8	62.3	24.2	37.6	9.2	246.0	120.2	118.4	101.8	24.9	39.2	30.2
20	248.4	150.2	115.2	70.0	29.1	46.0	11.9	292.7	152.0	149.0	108.2	31.8	48.9	35.9
30	242.8	161.0	114.6	66.1	36.9	50.7	11.3	292.9	165.3	154.2	98.0	44.5	53.7	26.5
40	189.5	152.2	95.0	60.4	49.3	59.4	9.3	219.3	152.2	126.7	84.8	64.4	58.9	21.0
50	82.2	117.3	58.2	49.9	66.5	69.5	7.3	99.9	116.3	84.6	68.6	91.9	63.9	13.7
60	-46.9	69.6	19.9	36.0	90.2	76.9	5.3	-29.6	69.2	37.3	48.5	127.0	50.5	7.2
70	-95.7	36.0	2.9	22.8	85.2	68.4	3.8	-70.2	31.8	7.4	27.8	128.9	8.1	0.2
80	-66.9	19.6	.7	11.8	51.5	45.4	2.0	-54.6	9.6	3.0	14.6	77.1	4.7	0.0
90	-3.5	7.1	.0	1.7	6.5	5.8	.0	-27.3	3.4	1.4	8.9	38.3	2.6	0.0
Future Generations	281.4							339.0						
FEMALES														
0	59.2	40.0	32.3	49.3	18.0	30.4	14.0	67.7	39.4	43.7	88.0	23.9	31.1	48.3
10	76.0	54.2	43.9	59.6	23.7	39.2	18.9	73.8	55.1	61.1	100.1	33.5	41.5	67.4
20	91.1	69.4	56.2	66.3	28.6	48.9	23.2	74.9	69.8	76.8	106.5	41.9	52.3	83.8
30	73.6	69.9	50.8	63.8	36.5	58.0	16.4	60.7	71.4	74.1	97.8	55.2	56.9	70.6
40	31.2	64.3	38.5	59.0	48.6	72.1	9.9	41.2	65.1	61.6	85.6	72.2	59.6	39.2
50	-39.0	50.8	21.3	49.1	66.2	88.4	5.7	-14.1	46.8	39.4	70.4	90.8	59.2	20.7
60	-117.9	34.0	6.9	36.0	91.0	100.1	3.7	-81.8	25.8	17.1	51.0	122.7	40.4	12.6
70	-133.4	20.5	1.0	23.5	85.6	89.9	2.8	-82.3	11.5	5.2	30.5	120.0	9.4	0.2
80	-92.3	9.8	.2	12.7	53.9	59.1	1.9	-59.0	5.9	3.0	17.2	79.2	5.8	0.2
90	-9.8	.5	.0	1.6	5.6	6.0	.2	-36.4	2.7	1.7	9.4	47.3	2.8	0.0
Future Generations	113.4							121.0						
Percentage Difference	90.3							77.3						

Table 12

The Changes in Generational Accounts Required to
Equalize Burdens on Newborns and Future Generations

Present Values of Receipts and Payments (thousands of dollars)

	Increasing VAT by 48.0 percent	Increasing SST by 36.8 percent	Reducing PEN by 51.7 percent
Generation's			
Age in 1992			
MALES:			
0	30.0	31.0	8.8
10	33.1	43.6	12.5
20	34.2	54.9	16.0
30	30.8	56.8	22.5
40	25.8	46.7	32.7
50	20.1	31.1	46.7
60	13.7	13.8	64.5
70	8.1	2.7	64.9
80	4.4	1.1	37.1
Future Generations	-144.3	-143.3	-165.6
FEMALES:			
0	30.2	16.1	12.0
10	33.3	22.5	16.8
20	34.6	28.3	21.0
30	32.0	27.3	27.7
40	27.6	22.7	36.2
50	22.2	14.5	45.4
60	16.1	6.3	61.4
70	9.9	1.9	59.3
80	5.2	1.1	37.4
Future Generations	23.0	8.8	4.6

Source: Authors' calculations.

Appendix: Data Sources

Population

The projection of the Norwegian population through 2200 is taken from Gjersem (1993). It is based on estimates to 2050 made by the Central Bureau of Statistics and used in the Long Term Program 1994-1997. We assume a constant fertility rate of 1.89 (observed in 1990) and a net inflow of immigrants of 5,000 persons a year. Mortality rates are projected to decline gradually through 2010, leading to an expected lifespan of 75 years for males and 81.6 years for females.

Wealth

Our calculations of generational accounts are not based on the conventional definition of wealth in the national accounts, primarily because we include natural resource wealth. Since Norway's petroleum reserves are not marked to market, the petroleum wealth estimate is calculated as the present value of expected net future cash flow, assuming a given time path of oil prices and field-specific natural gas prices, investment outlays and production costs, as well as a projection of the future speed of reserve depletion.⁹ Given that future oil prices, production costs, reserves, and other factors are highly uncertain, estimates of petroleum wealth are very sensitive to assumptions. As illustrated in appendix table 1, they are also sensitive to the interest rate used to discount future streams of government income from oil and gas.

Existing data on public wealth are incomplete and generally are not based on market values. Our estimates, reported in appendix table 2, must therefore be viewed cautiously. Hydroelectric power wealth is the present value of the government's net cash flow from its hydroelectric power plants. It is calculated as the sum of the replacement value of the fixed capital invested in this sector and the present value of supernormal rents on that capital. The Long Term Program 1994-1997 estimates the latter to be 90 billion kroner, or \$3,153 per capita, in 1992.

The estimated value of shares and equity capital has been provided by the Ministry of Finance. The government owns about 20 percent of the total stock of the Oslo Stock exchange. Another important asset is the public telephone company. Its value is estimated simply on the basis of a crude cash flow projection. We have not attempted to estimate the values of other public enterprises.

Transfers

Age and sex profiles for family allowance, disability pensions, old-age pensions, and other Social Security benefits are constructed on the basis of the 1990 Income and Wealth Survey, which contains information on 22,349 individuals (0.53 percent of the population), 17,676 of whom are over age 12. Individual tax returns are linked to the data collected by the survey. The various tax and transfer age-sex profiles were smoothed using a seven-period moving average, with weights reflecting the number of observations in each age group.

To account for the expected average growth in per capita old-age pensions, we use estimates provided by the Central Bureau of Statistics'

⁹ The underlying cash flow data were provided by the Ministry of Finance and are the same as those used in the Long Term Program 1994-1997.

microsimulation model MOSART. Appendix figure 1 shows the projected value of the average pensions of 70-year-old males and females relative to the minimum pension G. The latter is the pension that each Norwegian receives starting in the year he or she reaches age 67, assuming no past labor market participation. The Norwegian parliament chooses each year's value of G. While the general intent is that G will rise over time to keep pace with inflation and long-run productivity growth, during recent years the growth in G has fallen short.

Age-sex profiles for sickness allowance are estimated on the basis of individual 1989 data from the KIRUT data base. In 1992, sickness allowance transfers totaled 2.15 percent of GDP. The estimate of the age profile of unemployment benefits is based on recent cross-section unemployment data (which were aggregated into age intervals of five years) from the Labor Market Directorate.

Education and Health Expenditures

In 1992, public expenditures on education and health amounted to 6.8 and 8.0 percent of GDP, respectively. For education, we have adopted coverage rates and costs per student of various educational institutions based on public education statistics. While the age and sex profiles for primary and secondary education are very accurate, we had to resort to a subjective estimate of the age and sex profiles for college education.

Due to incomplete and missing data, most public health expenditures are not distributed by age and sex. Those expenditures that have been distributed (partly on a subjective basis) are for old-age homes, old-age wards and dwellings, home nursing and assistance, and other home help. We also estimate an age profile of expenditures on hospitals based on data from a single large hospital in Bergen.

Indirect Taxes and Social Security Contributions

Our age-sex profile for VATs is estimated from the 1990 Survey of Consumer Expenditures. This is a survey of 1,201 households containing 3,216 individuals. In distributing household consumption, we assumed that each child under age 17 consumed 70 percent of what adults consume. The 1992 total VAT receipts are adjusted upward to take into account the recent increase in the VAT tax rate from 20 to 22 percent.

Various excise taxes and import duties on gasoline and cars are aggregated into one single age profile based on the 1990 Survey of Consumer Expenditures. Also, excises on tobacco, beer, and other alcoholic drinks are combined into a single age profile based on the same survey.

Age and sex profiles for Social Security contributions are calculated using the 1990 Income and Wealth Survey. Total 1992 Social Security contributions were reduced to take account of the reduction in the payroll tax rate, which offset the 1993 increase in the VAT tax rate.

Income and Wealth Taxation

The 1990 Income and Wealth Survey permits a fairly good estimate of the age-sex profiles of income and wealth taxes. The totals are, however, based on preliminary data. Final tax data for 1992 will not be available until September 1993. Another complication is that the 1992 tax reform makes it difficult to extrapolate from 1991 tax data.

Appendix Table 1

Petroleum Wealth and Permanent Income
Based on Alternative Interest-Rate Assumptions

	Interest rate (percent)						
	7	6	5	4	3	2	1
Petroleum wealth (\$ per capita)	26,813	30,199	34,367	39,890	46,171	54,680	65,808
Permanent in- come (\$ per capita)	1,877	1,811	1,718	1,584	1,385	1,094	658

Note: Calculations assume an exchange rate of 6.65 kroner per dollar.
Source: Ministry of Finance.

Appendix Table 2

Public wealth

	Per capita	Percent of GDP
Petroleum wealth	\$ 34,640	140.9
Hydroelectric power wealth	12,561	51.1
Shares and equity capital	5,378	21.9
Other financial assets (net)	10,261	41.3
	_____	_____
Total public wealth	\$ 62,840	255.6

Note: The calculations are based on a 4 percent discount rate and an exchange rate of 6.65 kroner per dollar.

Source: Ministry of Finance.

