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Long-Term Fiscal Effects of Public Pension Reform in Norway – A Generational Accounting Analysis

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Abstract

"Generational accounts" measure the fiscal sustainability of the public sector. We ask whether contributions from the Government Pension Fund and remaining oil and gas wealth in the ground, together with the pension reform taking effect in 2011, are sufficiently large to secure generational balance in Norway. Our results show that the pension reform has a substantial effect, and contributes as much to generational balance as the total petroleum wealth. Structural characteristics of higher employment and lower transfer payments typical for cyclical upturns improve the GAs substantially. Optimistic assumptions regarding these structural characteristics do not remove the need for further reforms to obtain fiscal sustainability of the Norwegian public sector.

Keywords: *Generational Accounting, Norway, Fiscal Policy, Intergenerational Redistribution*

JEL classification: *H55, H68, J10*

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1. Introduction

In an almost twenty year old study, Auerbach et al. (1993) asked the question: "Norway: Is the nation over-consuming its petroleum wealth?" They analyzed this question with the method of Generational Accounting and their answer was: yes, Norway did over-consume. This result was partly confirmed in a later study by Steigum (1996). In this paper we first examine whether the Auerbach-conclusion still holds. There are indications that it does. Foremost, Norway has experienced a significant rise in life expectancy at birth from 77.3 to 80.7 years. In addition, the share of the younger part of the population that is not working has increased. However, net migration has also increased over the period. Many of the immigrants are relatively young and well educated, alleviating long-term fiscal challenges. Furthermore, since 2000 oil prices have risen sharply, and the petroleum wealth has increased accordingly.

Instead of consuming the petroleum wealth right away, the Norwegian Parliament has chosen a fiscal rule to inject the petroleum wealth into the economy along a moderate path. It has been a stated policy objective to pursue moderation in the sense that the petroleum wealth should be perpetuated to benefit all future generations. The newly enacted pension reform is a major political effort to bolster such a policy of intergenerational distribution of the petroleum wealth. The second purpose of this paper is to inquire whether this reform secures such an aim.

The pension reform takes effect from 2011 on. It seeks to neutralize the expenditure effect due to population ageing in general, and to the recently increased growth in life expectancy. The reform strengthens ties between former earnings, retirement decisions, and pension benefits, thus providing incentives to work particularly for elderly workers.

As in the Auerbach et al. (1993) paper, our evaluation tool is Generational Accounting. This method was introduced during the early nineties to estimate both explicit and implicit public debt in the long run. In Section 2 we describe the method of Generational Accounting and the calculation of the sustainability indicators used. The sources of data used for these calculations are reported in Section 3. Generational Accounting needs three kinds of data; a population projection, age- and sex-specific profiles and a general government budget of a certain base-year. Furthermore, we discuss in Section 3 our choice for global parameters (growth and discount rates) and the influence of the public oil-revenues on the general budget. In Section 4 we provide the results of the Generational Accounting analyses using different kinds of sustainability indicators. We find that Norway's sizeable petroleum wealth is not sufficient to prevent negative generational balances in all main scenarios in our analysis. In Section 5 the pension reform is analyzed. Our findings suggest that the reform succeeds in improving the generational balance at a level comparable with the total value of the Norwegian petroleum resources. However, on the one hand, the Generational Accounts for the base-year 2009 remain clearly unbalanced. On the other hand, the sensitivity analysis reveals

that more favorable base years and parameterizations may lead to the conclusion that the reform restores long term generational balance. Section 6 concludes.

2. Methodology of Generational Accounting

To measure the sustainability of a country's public sector we use the method of Generational Accounting developed by Auerbach, Gokhale and Kotlikoff (1991, 1992 and 1994). In contrast to traditional budget indicators which are based on annual cash flow budgets, Generational Accounting is founded on the intertemporal budget constraint and therefore the long-term implications of a current policy can be computed.[1] The intertemporal budget constraint of the public sector, expressed in present value terms of a base-year b is:

$$B_b = \sum_{k=b}^{b-D} N_{b,k} + \sum_{k=b+1}^{\infty} N_{b,k} . \qquad (1)$$

D denotes agents' maximum age and $N_{b,k}$ the present value of year b's net tax payments, i.e., taxes paid net of transfers received, made by all members of a generation born in year k over the remaining lifecycle. Then, the first right-hand term of equation (1) represents the aggregate net taxes of all generations alive in the base-year b. The second term aggregates the net tax payments made by future generations born in year $b+1$ or later. Together this is equal to the left-hand side of equation (1), B_b, which stands for the net debt in year b. That means if the sum of all living generations' net taxes, $\sum_{k=b}^{b-D} N_{b,k}$, is negative (i.e. if they receive a net transfer) and the net debt, B_b, is positive, the sum of future generations' net taxes has to be positive to balance the government's intertemporal budget; i.e. in a long-term perspective net transfers received by living generations plus the net debt of the base-year have to be financed by net taxes paid by future generations.

To calculate generations' aggregated lifecycle net tax payments, the net payment terms in equation (1) are decomposed into:

$$N_{b,k} = \sum_{s=\max\{b,k\}}^{k+D} T_{s,k} \; P_{s,k} \; (1+r)^{b-s} , \qquad (2)$$

[1] The further description of the methodology of Generational Accounting is mainly based on Raffelhüschen (1999) and Bonin (2001). For an analytical derivation of the intertemporal budget constraint see Benz and Fetzer (2006) or Fetzer (2006). Hagist (2008) gives an overview about the empirical studies with Generational Accounting along with a discussion concerning critical points in theoretical as well as empirical terms.

where $T_{s,k}$ denotes the average net tax paid in year s by a representative member of the generation born in year k, whereas $P_{s,k}$ stands for the number of members of a generation born in year k who survives until year s. To compute the remaining lifetime net payments of living generations, the future demographic structure is specified conducting long-term population forecasts.

Typically, Generational Accountants disaggregate equation (2) even further. To incorporate gender-specific differences in average tax payments and transfer receipts by age, separate aggregation of average net taxes paid by male and female cohort members is required. The products aggregated in equation (2) represent the net taxes paid by all members of generation k in year s. For generations born prior to the base-year the summation starts from year b, while for future born cohorts, the summation starts in year $k > b$. Irrespective of the year of birth, all payments are discounted back to the base-year b by application of a real interest rate r.

The age-specific net tax payment in year s of agents born in year k can be decomposed as

$$T_{s,k} = \sum_i h_{s,k,i} \quad . \tag{3}$$

$h_{s,k,i}$ stands for the average tax or transfer of type i paid or received in year s by agents born in year k, thus of age $s-k$.[2] In equation (3), $h > 0$ indicates a tax payment, whereas $h < 0$ defines a transfer.

Applying the method of Generational Accounting it is conventionally assumed that initial fiscal policy and economic behavior are constant over time. Under this condition it is possible to project future average tax payments and transfer receipts per capita from the base-year age profile of payments according to

$$h_{s,k,i} = h_{b,b-(s-k),i} \left(1+g\right)^{s-b}, \tag{4}$$

where g represents the annual rate of productivity growth. Equation (4) assigns to each agent of age s-k in year s the tax and transfer payment observed for agents of the same age in base-year b, uprated for gains in productivity. The base-year cross section of age-specific tax and transfer payments per capita is generally determined in two steps. First, the relative position of age cohorts between themselves in the tax and transfer system is estimated from micro-data profiles. In a second step the relative age profiles are re-evaluated proportionally to fit the expenditure and tax revenues of the base-year.

For living and future generations, division of the aggregate remaining lifetime net tax payments by the number of cohort members alive in year s defines the cohort's generational account in year s:

[2] In case of an isolated analysis of public subsystems like health care or public pension as conducted in the following chapters, *i* is just chosen so that all relevant payment streams are included in the analysis.

$$GA_{s,k} = \frac{N_{s,k}}{P_{s,k}} \quad . \tag{5}$$

Generational accounts are constructed in a purely forward-looking manner, only the taxes paid and the transfers received in or after the base-year are considered. As a consequence, generational accounts cannot be compared across living generations because they incorporate effects of differential remaining lifetime. One may compare, however, the generational accounts of base-year and future born agents, who are observed over their entire lifecycle.

To illustrate the fiscal burden of current fiscal policy, we use seven sustainability indicators:[3] The starting point for the first indicators are the intertemporal public liabilities which can be computed by the assumption that the intertemporal budget constraint of the public sector (1) is violated:

$$IPL_b = B_b - \sum_{k=b-D}^{\infty} N_{b,k} \, . \tag{6}$$

The amount of intertemporal public liabilities measures aggregate unfunded claims on future budgets, assuming that the present policy will hold for the future. The first sustainability indicator, the fiscal gap (FG_b), can be derived if the intertemporal public liabilities are set in relation to base-year's GDP (GDP_b). This indicator is akin to the debt quota well known since the Maastricht treaty but it addresses the total debt, i.e. the debt which will occur in the future added to the debt inherited from the past:

$$FG_b = \frac{IPL_b}{GDP_b} . \tag{7}$$

It is uncertain how the policy adjustment required to redeem intertemporal public liabilities will affect generations' fiscal burdens. For illustrative purposes, Generational Accounting typically assigns the entire adjustment to future generations which is equivalent to k > b. All tax payments made by members of future born cohorts are adjusted proportionally with the help of a uniform scaling factor θ. The factor θ is set to ensure balance of the intertemporal public budget defined in equation (1):

$$h_{s,k,i} = \theta \times h_{b,b-(s-k),i} \left(1+g\right)^{s-b} \tag{8}$$

for and instead of equation (4). Computing the average age-specific net taxes paid by representative future born agents, the burden for future generations can be illustrated as

[3] For a discussion of measuring fiscal sustainability and the development of sustainability indicators, see Raffelhüschen (1999) and Benz and Fetzer (2006).

an absolute difference between the generational account of the base-year agent and the generational account of the one year after base-year born agent. This is our second sustainability indicator, the future generations' burden:

$$FGB = GA_{b,b} - GA^{\theta}_{b,b+1} \tag{9}$$

The third indicator that illustrates the burden of current fiscal policy is the revenue gap. In this case the scaling factor $\theta = \theta_{rev}$ reflects the enhancement of age-specific revenues in per cent for all generations which is necessary to close the intertemporal public budget constraint. It can also be interpreted as the ratio of the intertemporal public liabilities to the present value of all age-specific revenues of the fiscal system :

$$\theta_{rev} = \frac{IPL_b}{\sum_{s=b}^{\infty} \mathrm{Re}v_s \cdot \frac{1}{(1+r)^{(s-b)}}} \tag{10}$$

with $\mathrm{Re}v_s$ referring to the sum of revenues in year s by all living generations in year s.

Analogous to the revenue gap, we also compute the so-called transfer gap. In this case the scaling factor $\theta = \theta_{trf}$ reflects the necessary decrement of age-specific public transfers (Trf) like health benefits in per cent for all generations that is necessary to close the intertemporal public budget constraint. Constructing the revenue and transfer gap, we implicitly assume that the government is able to enforce an immediate adjustment of all taxes and contributions or transfers respectively.

All indicators used are defined using an infinite time horizon. In the practical calculation all relevant variables like population or cohorts' tax payments are projected for 300 years from the base-year on. Afterwards a geometrical serial is used to determine the remaining net tax payments. The choice of 300 periods is nearly completely arbitrary and just reflects a good approximation point for our analysis.

Evaluating a policy measure like the Norwegian pension reform via the method of Generational Accounting has merits and – like every model – also disadvantages. The biggest caveat is that Generational Accounting by design disregards changes in labor supply. This is a serious shortcoming as the increment of the Norwegian labor supply is a stated argument for the pension reform by the Norwegian government. However, in our view, this disadvantage is compensated by two clear merits of the Generational Accounting approach. Firstly, Generational Accounting has the perspective of the complete budget of general government and an infinite time horizon. According to Kotlikoff (2003), this is the only way to evaluate properly the fiscal consequences of a pension reform properly as with all other approaches the labeling problem of public finances comes to light. Furthermore, in addition to other fiscal sustainability gauges or estimates about the fiscal consequences of a pension reform, generational accounts do not only tell by how much pension expenditures will decrease (the Norwegian government's

target is 20 percent by 2050) but also which generations have to bear the burden of such a reform.

3. Data and assumptions

To compute Generational Accounts and to calculate the described indicators, a population projection is needed. Furthermore the calculations require the expenditures and revenues of the Norwegian public sector in 2009, age-sex-profiles for the different expenditure and revenue types and a productivity growth rate as well as a discount rate. The population projection in the following is calculated with a demographic program developed by Bonin (2001).

3.1. Population projections

Generational Accounting requires detailed population projections, which distinguish between three possible scenarios titled medium variant, high variant and low variant. Based on different assumptions about the three parameters life expectancy, fertility and migration it is possible to derive a population projection for each of the demographic scenarios. Own calculations are necessary for the reason of Generational Accounting's assumed infinite time horizon: The official projections end in 2060 while we need a 300 years projection period. In these calculations we use the given data of Statistics Norway for the parameters of the year 2009. The projected parameters until year 2060 in the different scenarios originate from the assumptions made by Statistics Norway (2010a). Table 1 shows those central assumptions of the three scenarios.

Table 1: Central assumptions of Norwegian population projections

Parameter	Year	Scenario		
		Medium Variant	High Variant	Low Variant
Total Fertility Rate	2009	1.98	1.98	1.98
	2060	1.95	2.1	1.7
Life Expectancy at birth for females/males in years	2009	83.1/78.6	83.1/78.6	83.1/78.6
	2060	90.3/87.1	93.4/90.2	87.1/84.0
Net migration	2009	38,637	38,637	38,637
	2060	22,000	31,000	14,000

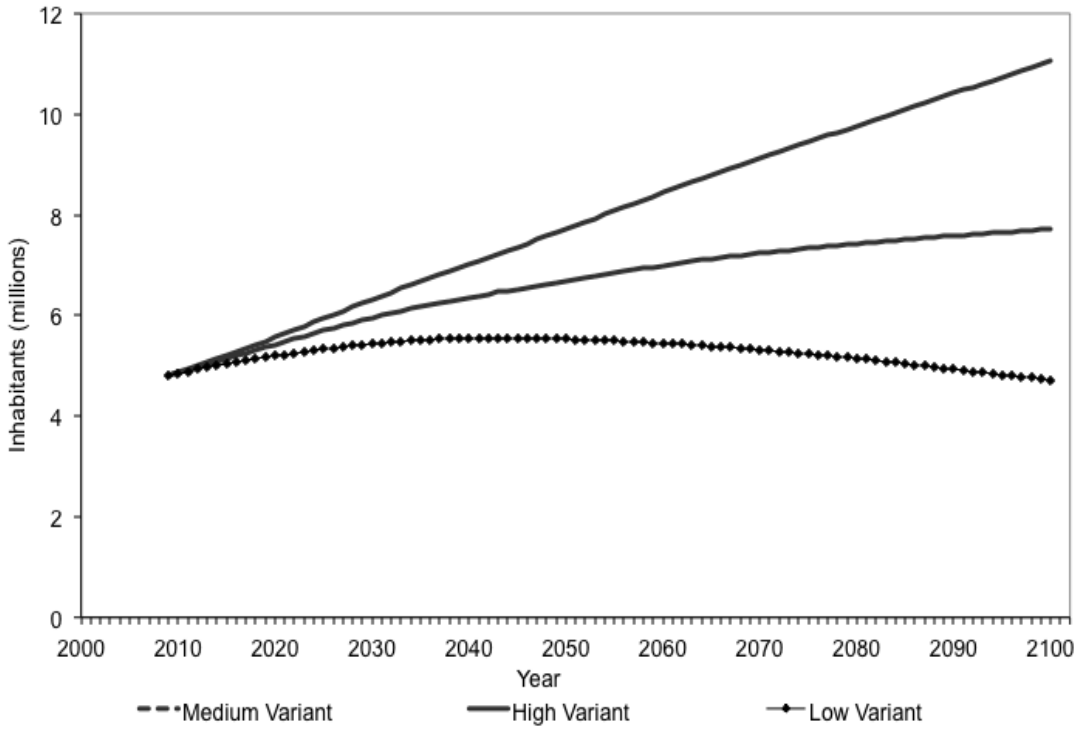
Source: Statistics Norway (2010a)

In the following the future size and structure of the Norwegian population can be anticipated for all three different demographic scenarios. The outcomes of these projections are shown in Figure 1. Compared to the official calculations of Statistics

Norway (2010a), we (nearly) exactly hit the Norwegian population in 2050 within our medium projection.

From Figure 1 we see that in the medium variant of the Norwegian population projection the population grows over the projection horizon. According to this scenario the population increases from 4.7 million in 2007 to 7.7 million in 2100. The high variant causes a constant increase in terms of population. The population rises to 6.7 million in 2050 and 9.5 million in 2100. Only the low variant contains a decrease of the population. Until it reaches the year 2036, the population also grows in this scenario due to the increasing life expectancy of both men and women, afterwards a shrinkage process begins which causes a population of 5 million in 2050 and 3.9 million in 2100. For the following analysis we take the medium variant as our standard scenario if not stated differently. Outcomes for the two other scenarios can be found in the appendix of this paper.

Figure 1: Different developments of the Norwegian population until 2100

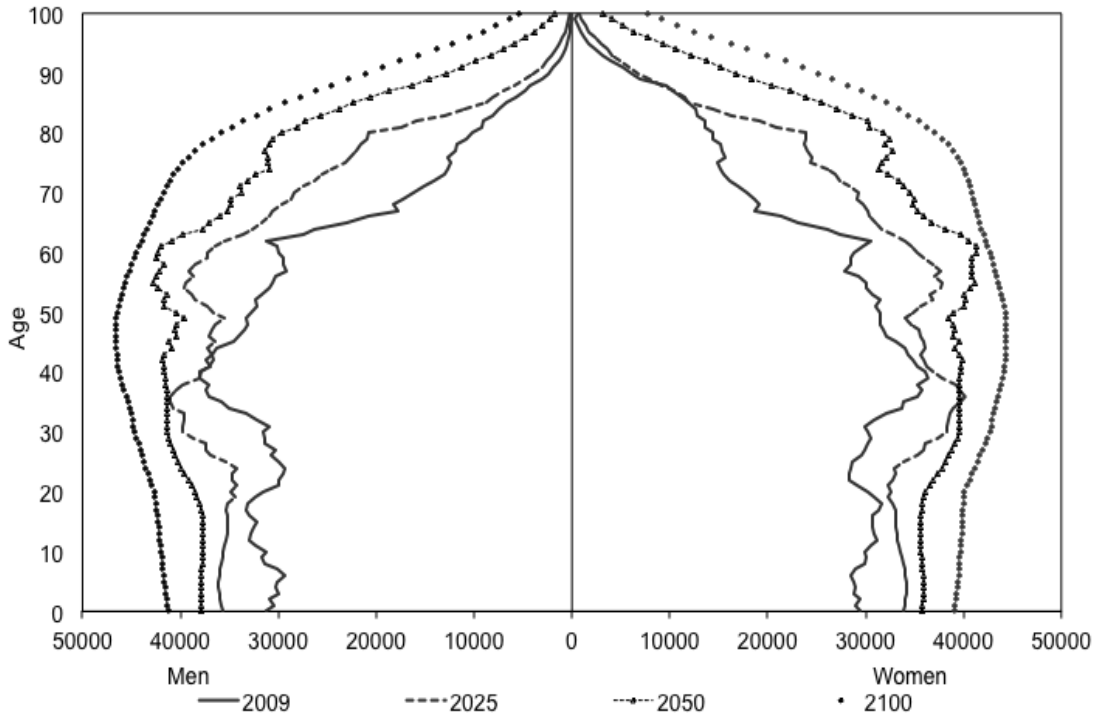


Source: Own calculations

Figure 2 presents the population projection based on the medium variant in the years 2009, 2025, 2050 and 2100 divided by age and sex. In the base-year the Norwegian population shows a few remarkable patterns. The first anomaly in the development of the Norwegian population occurred for the cohorts of the 86-year-olds to the 72-year-olds in 2009. This is caused by the Second World War. However, the impact of the war on the population structure in Norway is much lower than in most other Central-European

nations. The "baby-boom" led to birth-rates of almost three children per woman. At the end of the 1960s the so-called "pill kink" finished this boom with sharply lower fertility rates. Due to increasing fertility rates after 1985 the cohorts of 24-year-olds and younger grow. The reasons for this increase are difficult to pin down, because it did not happen in most other Central-European countries. However, the generous family benefits together with a sound economic development may be one cause (Rønsen (2004)).

Figure 2: Norwegian population in 2009, 2025, 2050 and 2100

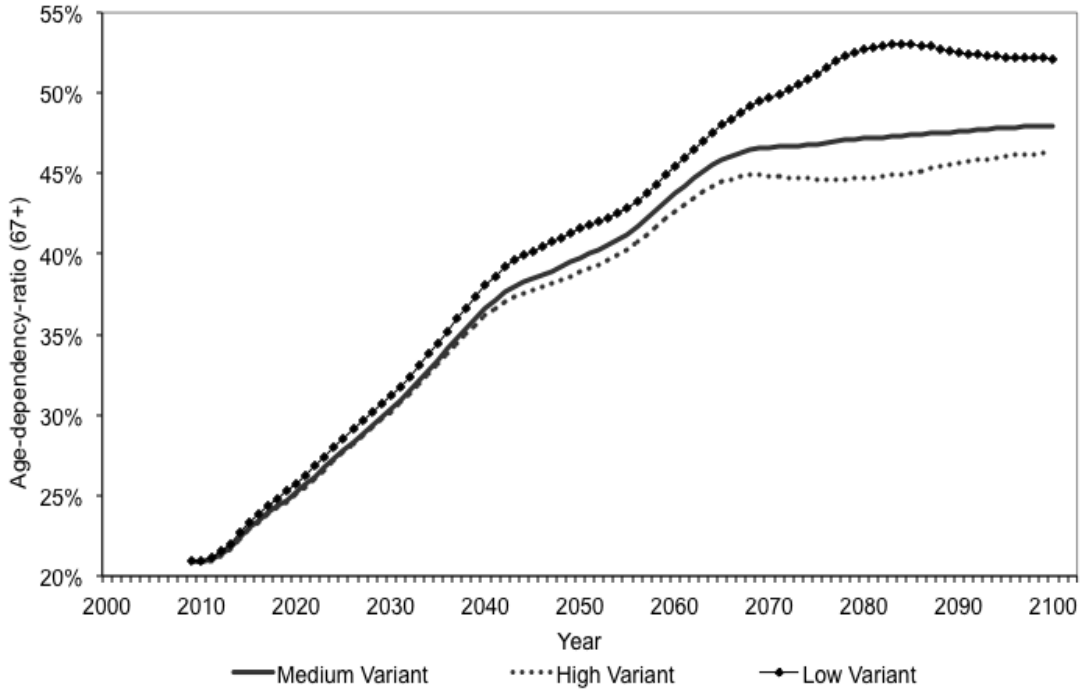


Source: Own calculations

Figure 2 shows an increase in the absolute size of the Norwegian population in the future. Especially there will be more and more Norwegians above the age of 60 years, while the size of the younger cohorts will remain more stable. This is mainly caused by the augmentation of the life expectancy in Norway combined with fertility rates near reproduction levels.

Figure 3 shows the development of the old-age-dependency-ratio (67+), defined as the ratio between members of cohorts older than 66 years to the sum of all generations between 20 and 66 years. This ratio measures how future changes in the population structure affect the relative size of cohorts, i.e. this ratio shows the proportion between the old part of the society and the younger working part. The development of the old-age-dependency-ratio gives a first hint of potential social security imbalances in the future.

Figure 3: Development of the old-age-dependency-ratio until 2100 in Norway



Source: Own calculations

3.2. Public sector finances and petroleum revenues

The budget of the Norwegian general government, which is shown in Table 2 based on Statistics Norway (2010b) is characterized by a few remarkable patterns. Revenues include taxes on labor and capital incomes, value added tax, property tax and social insurance contributions. A large part on the revenue-side of the Norwegian budget is given by earnings out of the oil resources of the country. Public expenditures contain expenses for general public services, defense, public order and safety, economic affairs, and environmental protection, housing and cultural activities which are aggregated in the budget item "Governmental Consumption". The aggregate health expenditures is divided into four different subcategories according to Statistics Norway (2010c) i.e. outpatient medical care, inpatient medical care, pharmaceuticals and health administration. The entry disability and sickness (in the original budget of Statistics Norway (2010b)) is divided into again four subcategories after Ministry of Finance (2008) , i.e. disability benefits, sickness benefits, vocational training and the early retirement scheme AFP.

Table 2: Public expenditures and revenues of the Norwegian general government in 2009

Public expenditure (Billion NOK)		Public revenues (Billion NOK)	
Government consumption[4]	297.7	Non-petroleum property income	101.7
Petroleum related expenditures	16.2	Dividend GPF	74.9
Interest payments	34.0	Property income from petroleum	98.3
Outpatient medical care	40.7	VAT	187.0
Inpatient medical care	64.4	Customs duties	2.4
Pharmaceuticals	22.6	Indirect taxes on petroleum	3.7
Health administration	5.3	Alcohol tax	11.3
Long-term care	49.4	Tobacco tax	8.1
Primary education	59.7	Gas and pollution tax	53.9
Secondary education	29.6	Real estate tax	6.5
Tertiary education	36.3	Other indirect taxes	12.3
General education expenditures	16.7	Social security contributions	234.6
Old age pension	131.6	Income tax without petrol	305.3
Survivor benefits	6.1	Income tax on petrol activities	149.0
Early retirement scheme (AFP)	12.7	Motorvehicle tax	6.9
Disability benefits	92.3	Other income	75.7
Sickness benefits	23.7		
Vocational training	30.2		
Family benefits	84.9		
Unemployment benefits	10.8		
Housing	2.7		
Social welfare	31.1		
Total expenditures	1098.6		
Surplus	232.9		
SUM	1331.5	SUM	1331.5

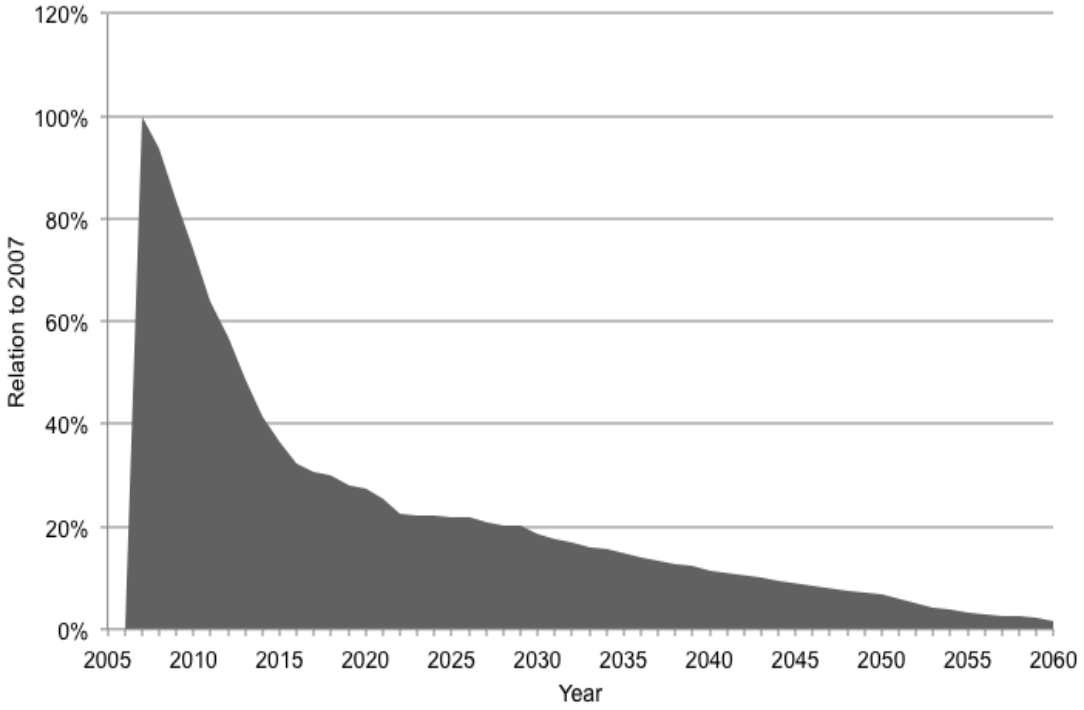
Source: Own calculations based on Statistics Norway (2010b,c)

Public coffers in Norway are remarkable compared to other OECD countries. In 2009 Norway was blessed with a primary surplus of 232.9 billion NOK, nearly one fourth of what the public sector spends. Four budget items should be highlighted concerning this number. Norway pays 34.0 billion NOK on interest for its public debt of 59.2 percent of GDP in 2009 while receiving 74.9 billion NOK in interest and dividends from the Government Pension Fund (GPF). These figures show that the Norwegian governmental

[4] Government consumption catches all non-age-specific spending including government investment. The only exceptions are oil-related expenditures and interest payments which appear as own items.

sector has a booking net wealth. Furthermore, oil revenues either from taxes or dividends contributed a total of 251.0 billion NOK (98.3+3.7+149.0) to the budget. However, petroleum revenues will not be sustainable in the future. According to official prognoses of the OECD (2007) revenues will shrink to 0.4 percent of their 2005 level until 2060, taking into account price as well as output effects. Figure 4 shows the assumed development of oil revenues in relation to GDP in 2005 which will be used in the forthcoming calculations.

Figure 4: Development of Norway's petroleum revenues



Source: Own calculations based on OECD (2007)

3.3. Micro profiles

Beyond the population projection and the base-year budget of the public sector, age- and sex-specific micro-profiles are necessary to define the intertemporal budget constraint of the public sector. These profiles are needed to distribute the different aggregates of public revenues and expenditures among the cohorts which live in the base-year and hence to determine the future public revenues and expenditures. Clearly, these are dependent on the demographic development. Entries like government consumption which are not paid or consumed in an age-specific way are distributed with a flat per capita profile. The age- and sex-specific profiles used stem primarily from Statistics Norway.[5] Health expenditures profiles for in-and outpatient treatments, pharmaceuticals and long-term care are taken

[5] These profiles were given to us by request.

from Fetzer et al. (2005). All profiles together with an overview of how the different budget items are distributed are presented in the appendix.

3.4. Interest and growth assumptions

Because of the infinite time-horizon it is not straightforward to define the constant interest and growth rates, which are needed to predict future revenues and expenditures of the public sector and to analyze the sustainability of this system. Norway's government assumes for its calculation of the present value of the GPF a standardized growth rate (g) of 1.5 percent and a discount rate (r) of 3.0 percent which we apply in our standard scenario with one exception, i.e. oil revenues (see above).

4. The sustainability of Norway's fiscal system

As described above, the Norwegian state is in the comfortable situation to have an explicit budget surplus at present. But this is mainly caused by high oil revenues of the public sector and it is unrealistic to assume that these will be constant in the future. Furthermore, an expanding number of retirees is expected. These are entitled to benefits in the public pension system and they will receive a major part of public health care transfers. Public pensions as well as public health care transfers are therefore expected to increase. The financial consequences of the described revenue-effect and the ageing-effect can be calculated by the method of Generational Accounting. The results are shown in the following.

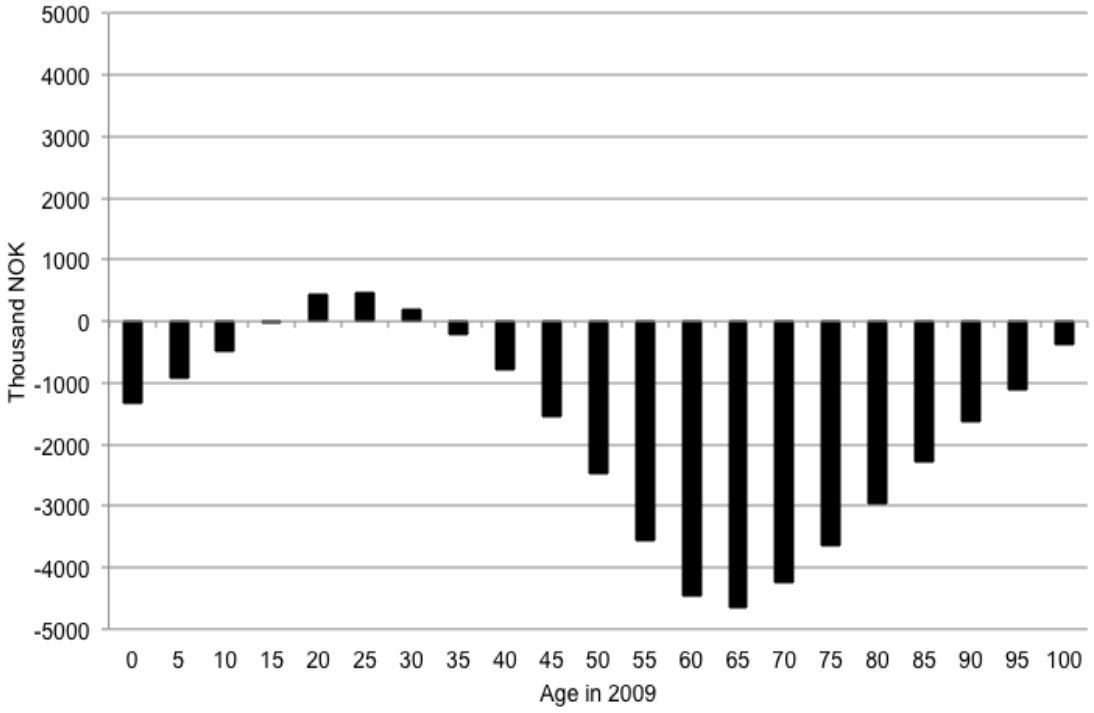
4.1. Generational accounts

Figure 5 presents the Generational Accounts of Norwegians in our base year, 2009, according to our standard scenario (medium variant, g=1.5 percent, r=3 percent).[6] The sinus-shaped pattern is very common in OECD countries with strong pay-as-you-go systems. The young between 16 and 33 years finance the elderly generations from 34 years and older. Generational Accounts on average begin with minus 1,318,920 NOK for the present newborn and are at a maximum of 538,389 NOK paid by the representative 22 year old. This means that a 22 year old Norwegian (nearly half male/female) pays 538,389 NOK more in taxes and contributions over his/her remaining life-cycle than he/she will receive in transfers and subsidies from the Norwegian general government. This includes assigned oil revenues which are distributed evenly by (living) capita each year. The generation of 34 years is the first one which receives more than he/she pays in taxes over his/her remaining life-cycle. However, one should keep in mind that Generational

[6] For the further analysis we assume that migrants are treated as Norwegians i.e. a 50 years old immigrant receives the same transfers and pays the same amount of taxes as his 50 years old Norwegian counterpart.

Accounting is strictly forward looking, so living generations' accounts are not comparable. The major receiver is the generation of 65 year olds because after 65 years discounting lowers the Generational Accounts significantly. This pattern can generally be observed in many developed countries.

Figure 5: Generational accounts of Norway 2009



Source: Own calculations

4.2. The fiscal gap and other sustainability indicators

Our first sustainability indicator is the fiscal gap as defined in equation (7). It measures the sum of the Generational Accounts for living and future generations weighted with their (expected) cohort size, set in relation to base-year's GDP. As shown in Table 3 the value of the fiscal gap for the whole Norwegian public sector in our standard scenario (medium variant, g=1.5 percent, r=3.0 percent) is 685 percent.[7] This means that the Norwegian fiscal policy in 2009 is not sustainable. The Norwegian fiscal gap can be derived as follows: The implicit debt of Norwegian fiscal policy (taxes not related to oil, social security contributions, expenditures for health and public pension, etc.) is 860 percent of GDP. Adding the explicit public debt with 43 percent of GDP in 2009 results in a gross debt of

[7] In the literature, the fiscal gap is normally positive if a government is in debt, i.e. if the demographic development puts a burden on public coffers. Hence, a negative algebraic sign imputes a net wealth over the long-term of the country's fiscal policy. Accordingly, in our other reported indicators we maintain this terminology.

903 percent of GDP. One has to subtract from this amount the assets of the GPF worth 96 percent of GDP in 2009 and the present value of petroleum related future revenues which amount to 122 percent.

Table 3: Overview of components of the fiscal gap and other sustainability indicators 2009
(Population scenario medium variant, g=1.5 percent, r=3.0 percent)

	Sustainability Indicators	*Public Sector*
in percent of GDP of 2009	Implicit Debt	860
	Explicit Debt in 2009	43
	Petroleum Wealth	-122
	Fund Assets in 2009	-96
	Fiscal Gap	685
	Future Generations' Burden (in NOK)	2,763,600
in %	Revenue Gap	16.6
	Transfer Gap	14.1

Source: Own calculations

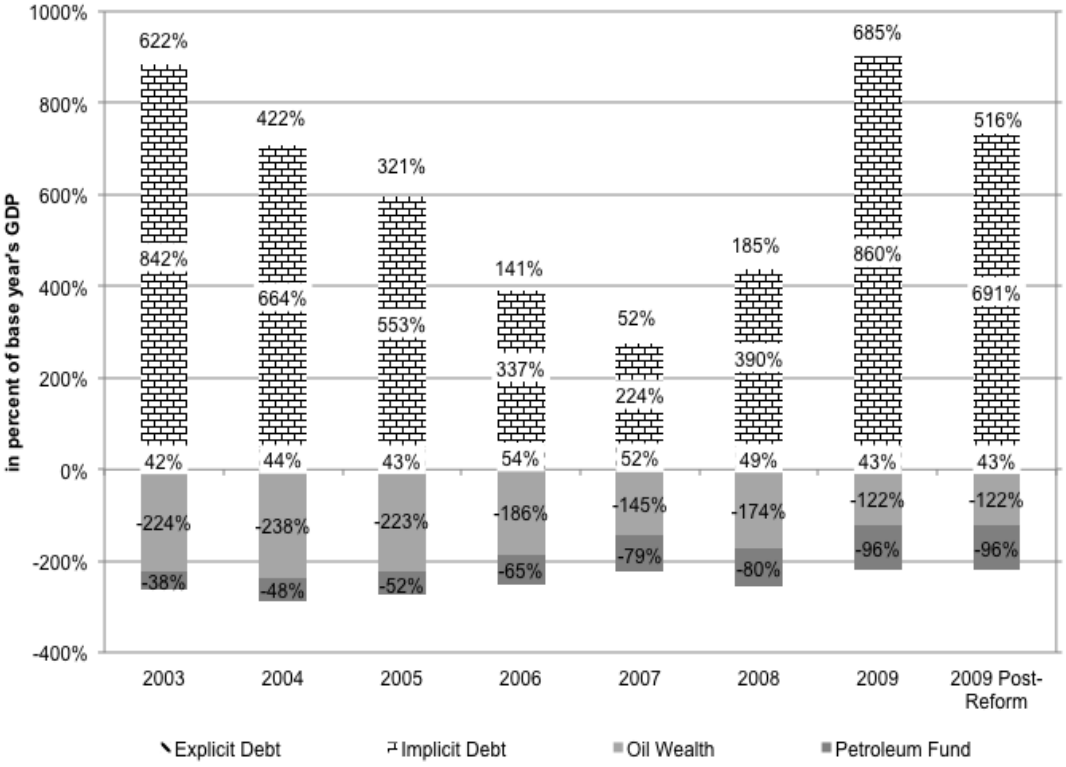
Our second indicator is the future generations' burden. To calculate this indicator, the intertemporal public liabilities and the number of people in future generations are set in proportion to each other (equation 9). This indicator implies that the entire adjustment is borne by future generations. The burden for future generations can be illustrated as an absolute difference between the generational account of the base-year and the generational account of the one year after base-year born agent. The future born generation in Norway would have to pay about 1,500,000 NOK per person more in taxes over their entire lifecycle than they would receive in transfers (a tax increase of 29.3 percent). On the other hand, the base-year born agent gets a net-transfer over his/her remaining lifecycle of about 1,300,000 NOK, yielding a future generations' burden of 2,800,000 NOK. This burden is also reflected in our last two sustainability indicators, the revenue and transfer gap. Norway's government would have to raise all taxes (except those on petroleum activities) by 16.6 percent or alternatively could decrease all transfers by 14.1 percent, to have a long-term balanced budget.

4.3. The fiscal gap and the budget cycle

It is natural that the burden on future generations will be lower if all future years are boom years like 2007, and that it is higher if all future years are financial crisis years, like

2009. This is exactly what Figure 6 shows. The Norwegian fiscal gap moves with the business cycle over time.

Figure 6: Fiscal gaps 2003 – 2009



Source: Own calculations

Sensitivity analyses comparing the more stable year 2005 with 2009 are also illustrated in Table A-3 and Figure A-1 in the appendix. From Table A.3 we see that the future generations' burden, as defined in equation (9), remains substantial but decreases from 2.8 mill. NOK in 2009, to 1.1 mill. NOK in 2005.

5. The Norwegian pension reform

The Norwegian pension reform is to take effect from 2011 on. It seeks to dampen the expenditure effect due to growth in life expectancy, and to strengthen ties between former earnings, retirement decisions, and pension benefits, thus providing work incentives in particular for elderly workers. The reform comprises two major elements.[8] First, one tries to control for growth in expenditures by applying the following set of indexing rules:

[8] For a comprehensive overview of all reform details see Risku and Vidlund (2008) and Ministry of Labour and Social Inclusion (2009).

Indexing Rule 1: Income dependent pension entitlements will be indexed by wage growth until retirement. The pension benefits, however, will only be adjusted by wage growth minus 0.75 percentage points. Pensions will thus not be increased completely in step with national wage increase rates. In other words, the purchasing power of a standard pension will be lower over time.

Indexing Rule 2: Pension payments will be adjusted via life expectancy of the population at large. If life expectancy increases, a quasi-actuarial mechanism kicks in and reduces annual benefits as the expected length of the retirement period increases.[9] The indexation of pension benefits to changes in national life expectancy cuts pension generosity.[10]

The next element is to stimulate labor supply. This will be done by lowering the implicit tax, i.e. making the supplementary (income based) pension more actuarially fair with benefits calibrated to the entire working life. Furthermore, the new flexible retirement age (starting from 62 years) will be based on an actuarial adjustment of the yearly benefits. As it is not clear how individuals will behave to this new policy instruments,[11] we will follow the standard procedure of Generational Accounting and abstract from these reform elements in our calculations of fiscal sustainability.

Figure 7 shows the sustainability and redistribution effects resulting from indexing rules 1 and 2. Our simulations are carried out using the average gains in life expectancy with reference to the 56-year-old cohort in 2010. The reason for this choice is that the reform is going to be initiated from the generation born in 1954, i.e. for people that are 56 in 2010.[12]

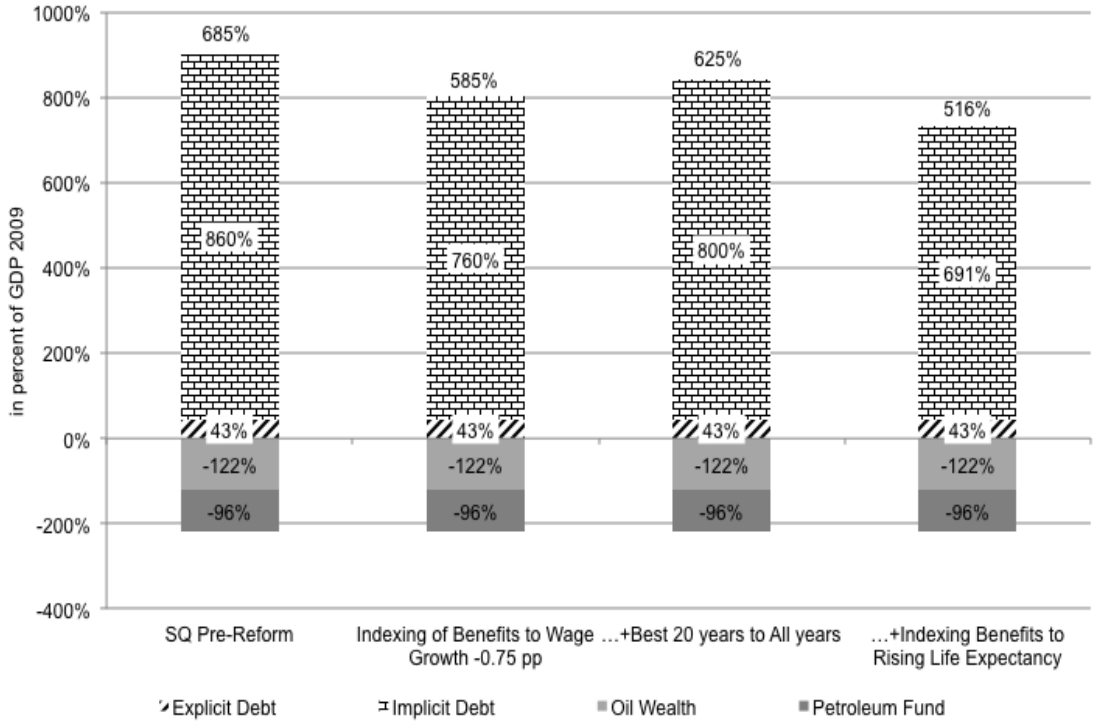
[9] The mechanism implemented is only quasi-actuarially fair, as the indexing of benefits does not include an actuarial consideration of life expectancy but only a consideration of average gains in life expectancy.

[10] If the average life expectancy rate increases, employees will have to stay longer in employment to be entitled to the same present value of total pension, or accept lower annual pension payments and thus a lower present value of total pension benefits. An increase in the expected number of retirement years reduces the annual benefit such that the present value of total pension benefits is nearly invariant to changes in current remaining life expectancy and retirement age.

[11] See Holmøy and Stensnes (2008) for a further discussion.

[12] Concerning the reference point, i.e. the 56 year olds in 2010 for indexing pension payments with average gains in life expectancy, we want to remark that in the original pension reform plan the group of 67 year olds was earmarked as reference. The effects of taking a younger reference group are smaller cuts in pension generosity but as a direct consequence also less sustainability. The reason for lesser cuts in generosity due to an indexing with average gains in life expectancy is straightforward as the gains in years of life are bigger when comparing the cohort passing into retirement with the group of 67 year olds compared to the 56 year olds.

Figure 7: Fiscal gaps after pension reform



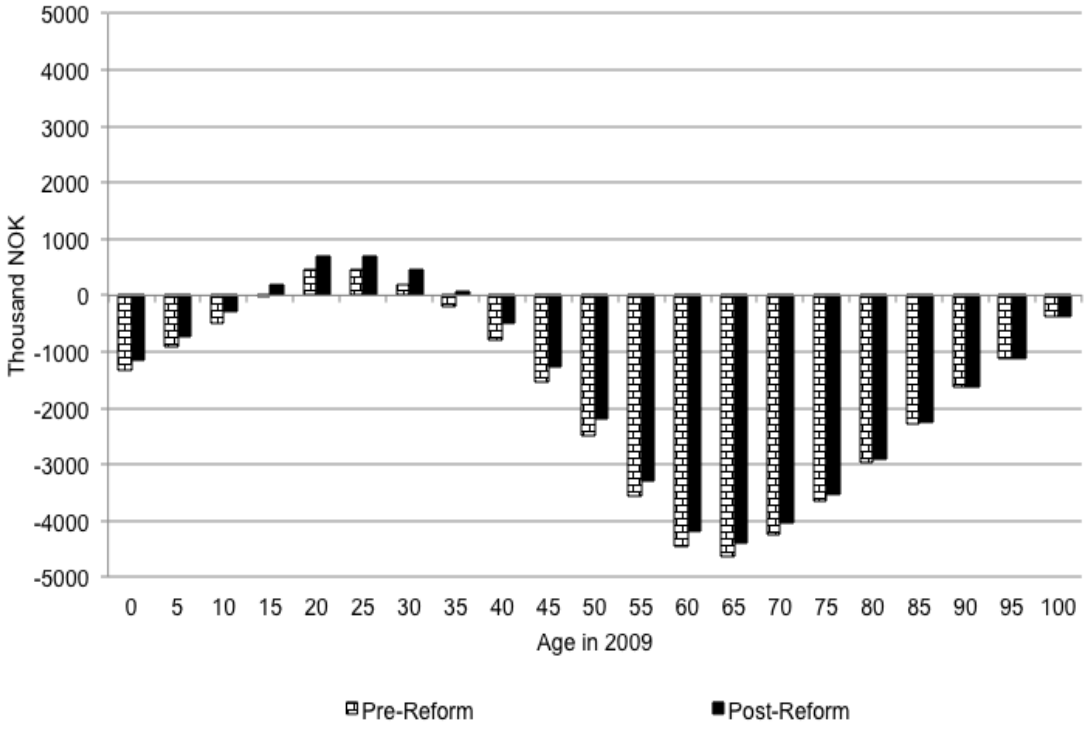
Source: Own calculations

We see that the fiscal gap in 2009 is substantially reduced from 685 percent of GDP to 516 percent of GDP after the pension reform. Note that reduced indexing of pensions with 0.75 percentage points reduces the fiscal gap by 100 percentage points of GDP (685 percent-585 percent), which is more than the value of the Government Pension Fund. This shows that seemingly small technical adjustments can have a great impact. The powerful impact in this case, follows from breaking the link between automatic growth in transfers when income and taxes grow. Counter-intuitively, the change in the calculations of the endowments from the best 20 years to all years increases the fiscal gap. However, this is due to the setup of this reform measure which protects most participants from losses via a beneficiary change of the pension formula. Holmøy and Stensnes (2008) confirm these findings. The indexing of benefits to the rising average life expectancy with savings worth over one GDP of 2009 has the biggest impact.

As we have shown in the last paragraphs, the Norwegian pension reform reduces the burden for future generations significantly. However, this implies that living generations have to take some of the burden i.e. lower pension benefits. This result can also be seen in a comparison of the generational accounts pre and post the pension reform as presented in Figure 8. A comparable reform effect imposed on Figure A1 shows that the generational account of a newborn in 2005 would have been reduced to around minus 100,000 NOK if 2005 were the base year. This shows that a more favorable

base year and more favorable assumptions regarding central parameters may yield the conclusion that the pension reform restores long term generational balance in optimistic scenarios. However, it is doubtful that optimism is a prudent guiding principle for fiscal policies.

Figure 8: Generational accounts pre- vs. post-reform

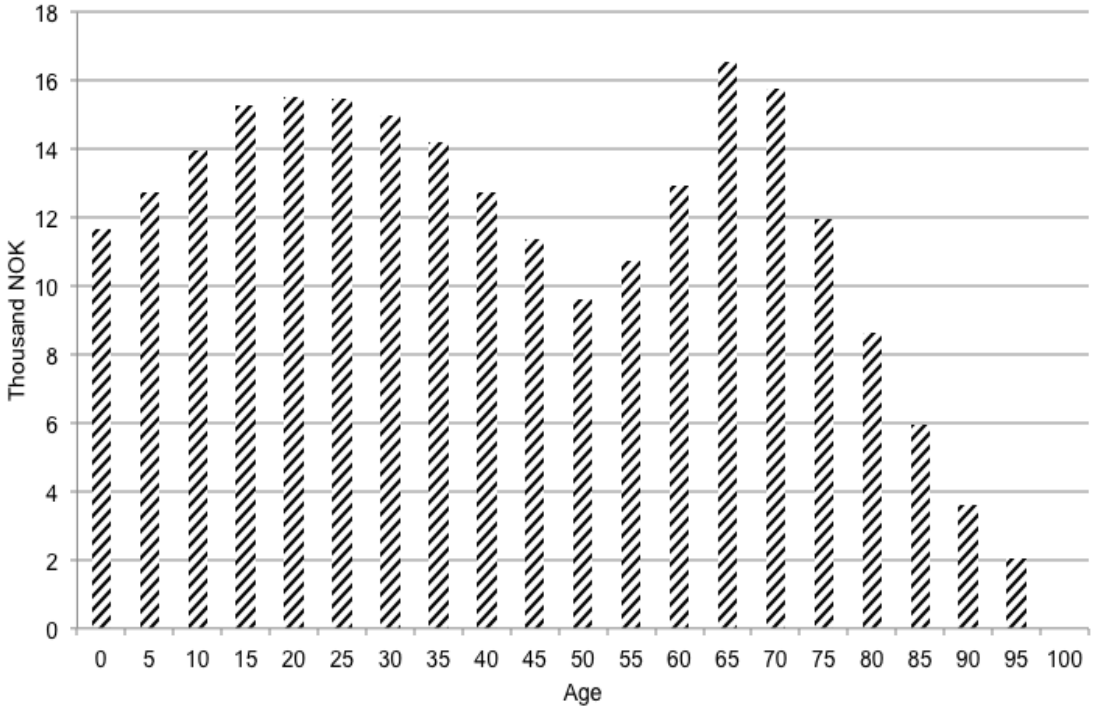


Source: Own calculations

To compare the generational accounts not only from the viewpoint of one cohort but between cohorts, we have to compare the differences of the generational accounts in annuities per cohorts as it is shown in Figure 9. Interestingly, the picture is not clear cut. Laymen's intuition concerning the burden of the pension reform may be that the pensioners are hit the hardest by a pension reform but they are not. In fact pensioners over 80 years are the ones hit the least. Another surprising result is that next to the younger cohorts between 15 and 35 years the cohorts around 65 years face a relatively high burden. This can be explained by the different reform measures. The first new index rule is hitting the generations just before entering the benefit phase particularly because they face the longest benefit period while their entitlements do not increase much more. Secondly the generous change from the 20 best to all years in the benefit formula is not reducing the burden for those who are just entering the benefit phase. Thirdly the postponement of the second index rule is especially favorable for the cohorts between 55 and 60 years while the 65 years olds are not benefiting that much. The postponed

indexing of expected longevity for the between 50 and 60 year olds came as a result of a political process during the implementation face. The government accepted the argument that individuals close to retirement should get a more lenient treatment since adaption to new rules at short notice is difficult. It still appears that this group has been particularly favored, given that both older and younger cohorts face a greater reform burden. The largest burden, however, is still borne by even younger cohorts.

Figure 9: Induced burden of the pension reform per cohort in annuities



Source: Own calculations

6. Summary and conclusion

Norway is expected to face relatively strong pressure on its public finances due to an ageing population and the resulting increase in age-related public expenditure. A continuation of the current policy (as of 2009) will end in a long run gap between government incomes and expenses. To close the gap, a nearly 17 percent increase in taxes would be needed. However, this estimate is sensitive to the underlying assumptions. In particular, the estimate is changing for the choice of the base year. For example, if 2005 is chosen instead of 2009, the computed gap would be an eight percentage point increase in taxes. With the pension reform enacted in 2011, Norway takes a step towards long-term

fiscal sustainability. Due to life expectancy adjustment in benefits, pension scheme expenditure will in practice remain unaffected by increased longevity. This is undoubtedly an effective way to retain fiscal sustainability. According to our results, the needed 17 percent increase in taxes (2009) is decreased to 12 percent. If 2005 is chosen as base year the eight percent increase needed is diminished to five percent.

All our calculations are sensitive to assumptions regarding population projections. In our calculations we assume a fertility rate of 1.9. In the appendix we show that increasing this birth rate worsens the fiscal balance. The same holds for increasing the assumed GDP-growth rate. As discussed earlier, our analysis abstracts from behavioral and general equilibrium adjustments to the reform. Thus, the burden of future generations may be alleviated by favorable labor supply responses and exacerbated by increased future medical and nursing costs.

We started by asking whether Norway is overconsuming its petroleum wealth. This is a reasonable question to ask also in the light of the broad political consensus of trying to perpetuate the Government Pension Fund (GPF) to make the transitory petroleum income also available to future generations. In all our sensitivity analyses, there are not any scenarios in which the GPF is not depleted. On the other hand, the recent pension reform shows that substantial improvements in the long term fiscal balance are possible. During some decades Norway has experienced a lucky streak with improving terms of trade in the new world economy, typically influenced by Chinese demand for inputs and strong competition in manufactured goods. Being an exporter of natural resources like oil, gas and fish, and a beneficiary of lower prices on manufactured goods, Norway has enjoyed a very favorable position. Our analyses suggest that Norway may be close to intergenerational fiscal balance provided that the luckiest of circumstances continue in the decades to come. Even under such favorable conditions, both the petroleum wealth and the pension reform are necessary to secure sustainability. However, it is reasonable to believe that the lucky streak will come to an end also in the case of Norway. In that case it is necessary to adhere on a continuous reform process to promote efficient markets, and to align expenditures and revenues to short- and long term constraints.

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