

Will the Norwegian pension reform improve fiscal sustainability and raise employment without increased inequality?

Erling Holmøy and Kyrre Stensnes
Research Department, Statistics Norway

Abstract

The intention of the Norwegian pension reform agreed upon in 2006 is to (1) improve long run fiscal sustainability, (2) strengthen labour supply incentives, while (3) maintaining the main redistributive characteristics of the present system. This paper assesses to what extent the reform is likely to achieve these three goals using two large models iteratively: (1) A detailed dynamic micro simulation model simulates individual benefits and government pension expenditures; (2) a large CGE-model captures general equilibrium effects on employment and government revenues and expenditures. The simulations suggest that the pension reform is likely to improve fiscal sustainability significantly. The payroll tax rate can be about 10 percentage points lower in 2050 than in the no-reform scenario. Most of the improvement is caused by increased employment, rather than reduced annual benefits. This is to some extent obtained at the expense of increase income inequality among pensioners.

Keywords: Population ageing, Fiscal sustainability, Pension reforms, Income distribution, Computable general equilibrium model, Dynamic micro simulation

JEL classification: H30, H55, H62, H68, O15

Address: Research Departement, Statistics Norway, PO Box 8131 Dep., N-0033, Oslo, Norway

Email: erling.holmoy@ssb.no and kyrre.stensnes@ssb.no

1. Introduction¹

Due to increased longevity and lower fertility rates after 1970, Norway will experience a significant ageing of its population throughout this century. According to the most plausible demographic projections², the ratio of those of working age 20-66 to those 67 and older will decrease from 4.7 in 2006 to 2.7 in 2050. Although ageing in Norway is expected to be less pronounced than in most other OECD countries, Norway will experience one of the sharpest increases in public expenditures as a share of GDP after 2010 due to generous existing welfare state schemes (Antolin and Suyker, 2001). Three forces stand out as being the most important in driving this development. First, since there are no actuarial mechanisms in the public pension system, retirees receive their defined annual benefits over more years as they live longer. Second, public pension benefits are indexed to wage growth rather than to some average of wage and price growth.³ Third, the public pension system is still maturing, in the sense that the number of pensioners entitled to supplementary (earnings-related) pensions is still increasing.

The rapid growth in government pension expenditures when ageing sets in has made a reform of the public pension system high on the policy agenda, in Norway as in other countries. However, it is harder to create public support for cost saving welfare state reforms in Norway than in most other countries, since large petroleum revenues apparently makes the Norwegian state extremely wealthy. The value of the Government Pension Fund - Global (GPF), where petroleum revenue is accumulated, is likely to surpass one GDP during 2007. However, the current strong financial position of the Norwegian government gives a very misleading picture of the long run situation. Several long run projections⁴ have shown that ageing will eventually cause a fiscal sustainability problem in Norway as the growth in government expenditures is likely to exceed the growth in the tax base after 2020.

The Norwegian parliament approved the key principles for reform of the public old age pension system in April 2007. Its main intention is to (1) improve long run fiscal sustainability, (2) strengthen labour supply incentives, and yet (3) maintain the main redistributive characteristics of the present system. Although some questions remain unresolved, the key characteristics are clear. The system will still be financed on a pay-as-you-go basis, the replacement ratios continue to be quite high, and it will still include a first-tier redistributive minimum benefit combined with a second-tier insurance benefit based on previous incomes. The main changes include a stronger relationship between income and

¹ We thank Erling M. Kravik for valuable research assistance.

² See Statistics Norway (2005).

³ Wage indexation is the political intention, and this assumption underlies all Norwegian projections of government pension expenditures. Effectively, however, the historical indexation has been somewhat less generous.

entitlements, flexible retirement after the age of 62, an automatic quasi-actuarial mechanism that adjusts the annual individual benefit to changes in the expected number of years as pensioner, and a less generous indexation of benefits.

Comprehensive quantitative assessments of the effects of the approved pension reform have so far been missing.⁵ More generally, the huge international literature on pension reforms offers, to our knowledge, very few empirical assessments of the complete macroeconomic and fiscal effects of actual pension reforms. Rather, the academic literature has studied stylized reforms, emphasizing particular effects. As opposed to this, the ambition of this paper is to provide as accurate as possible empirical assessments on to what extent the reform is likely to achieve its three main goals:

1. Improve the future fiscal stance compared to a scenario in which the present system is maintained. Specifically, will the reform reduce the gap between the growth rates of, respectively government expenditures and tax bases?
2. To what extent will improved fiscal sustainability be a result of the expansion of tax bases caused by stronger labour supply incentives, rather than reduced average benefits?
3. To what extent are reduced government pension expenditures and stronger labour supply incentives traded for a less egalitarian distribution of benefits between individual old-age pensioners?

To shed light on these questions, we choose a comprehensive and integrated approach, based on the widest possible background material and most relevant modelling tools available for the Norwegian economy. Empirical studies of an important political decision such as a major pension reform, should not ignore relevant and substantial knowledge. We feel that this apparently obvious ambition has a more controversial and perhaps non-fashionable implication: accuracy, gained by including a disaggregated classification of e.g. tax bases, exact descriptions of the tax- and pension systems, detailed modelling of population heterogeneity and market structures affecting the real time dynamics of policy reforms, should be given priority over analytical tractability and transparency. We therefore base our projections on the combined use of a detailed dynamic microsimulation model and a large scale dynamic Computable General Equilibrium (CGE) model.

⁴ The most important are the Pension Commission (NOU 2004:1), Ministry of Finance (2004, 2006), and Heide, Holmøy, Solli and Strøm (2006).

⁵ Fredriksen, Heide, Holmøy and Solli (FHHS) (2007) estimate macroeconomic effects of an earlier reform proposal. In addition to updating reform content, we change a large number of key assumptions. First, we utilise the latest population projections from Statistics Norway (2005). Second, recent developments on global energy markets make it relevant to increase the oil price we apply in our calculations. Third, we exploit updates and technical improvements in the modelling framework.

The microsimulation provides a detailed description of the demographic dynamics, including the development of the labour force and the number of various kinds of pensioners, as well as an accurate calculation of individual pension benefits. We can therefore exploit relevant population heterogeneity in work histories and earning profiles to assess how incomes are affected by changes in the pension system. The resulting estimates measure what Coile and Gruber (2003) refer to as “mechanical” effects on these variables, i.e. effects for given behaviour and given wage rates and prices. In the following, we will include these effects in what we refer to as “direct” effects, i.e. effects calculated outside the CGE model. The CGE model accounts for the equilibrium adjustments of the price components of government expenditures and all tax bases.

The paper is organised as follows: Section 2 presents our methodology and briefly describes the microsimulation model and the CGE model. Section 3 presents a reference scenario, emphasizing the fiscal prospects when the existing pension system is maintained. Section 4 discusses the reform effects on the fiscal stance and employment by comparing the reform scenario with the reference scenario, whereas Section 5 discusses the distributional consequences. Section 6 provides examines the robustness of the reform effects with respect to the uncertain labour supply stimulus as well as the demographic development. Section 7 concludes.

2. Methodology

Models used to provide realistic estimates of the effects of a fully specified pension reform should meet five fundamental requirements: First, to be operational the model must describe accurately all elements in the existing and the proposed pension system. Specifically, it must account for the complex interplay between minimum guarantees and income dependent pensions. Second, a detailed description of the population heterogeneity with respect to age and income is necessary for accurate calculations of individual and aggregate pension entitlements and benefits. Specifically, changes in female labour market participation and increasing education levels must be accounted for. Third, a detailed description of all tax bases, as well as of their determinants, is required for a full assessment of the total fiscal effects of the pension systems compared. The labour supply responses to pension reform and changes in the tax rates are particularly important in this respect. Fourth, the model should take into account that changes in relative prices affect the prices of government consumption and transfers indexed to wages and/or prices. Fifth, analyses of fiscal sustainability and pension reform require a long run perspective that captures both the long run reform effects as well as the capacity effects of investments and productivity growth.

The integrated micro-macro model framework used in this paper is designed to meet these five requirements. Admittedly, it is complex and not easily accessible. However, obtaining a more stylised and transparent model by neglecting relevant existing knowledge, would necessarily produce less realistic estimates.

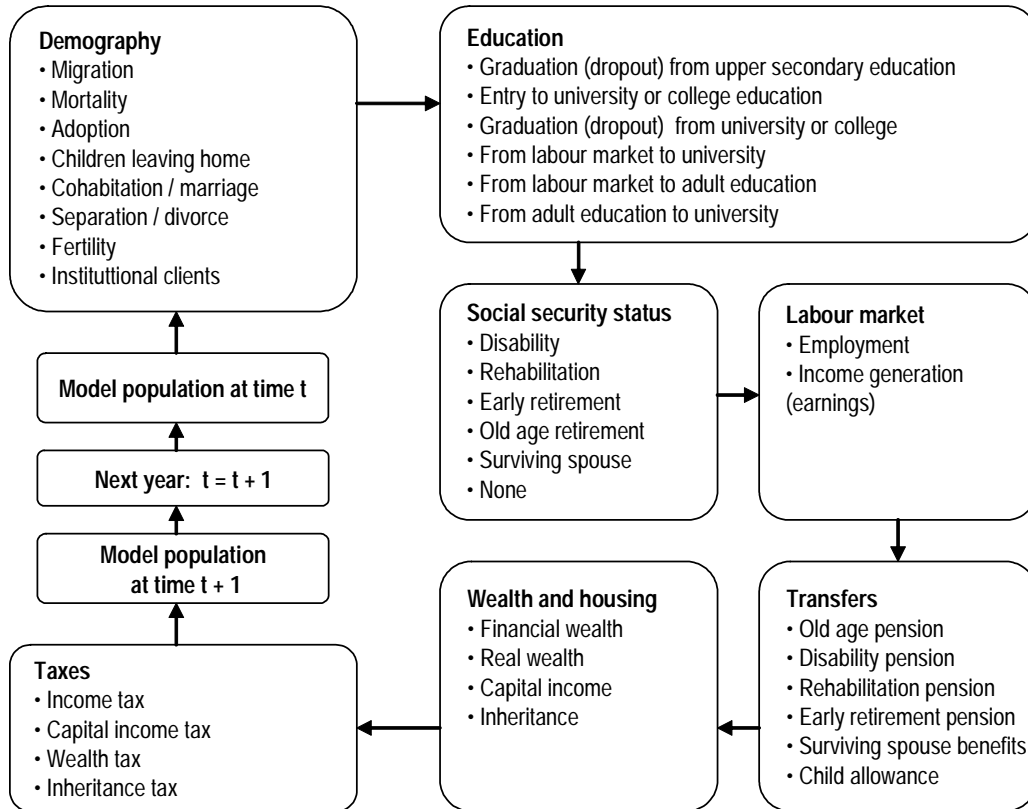
2.1 The dynamic microsimulation model

Tax and benefit rules are typically detailed and complex. Different parts of the population may face different rules, and there may be substantial problems of aggregation in calculating the total effect on government budgets of changes in tax or pension systems. To overcome these problems microsimulation models, as advocated among others by Orcutt *et al.* (1986), have become increasingly used in the last few decades to support governments with analyses regarding the effects of different social and financial policies. The basic idea in microsimulation modelling is to represent a socio-economic system by a sample of decision units (e.g. persons), and then model the behaviour of these primary units. Contrary to what is possible in a macroeconomic approach, the detailed and complicated tax and benefit rules may be exactly reproduced.

When analysing the National Insurance System in Norway, information about heterogeneity in the population is important, because the building up of pension entitlements depends on former labour incomes in a non-linear way. The dynamic microsimulation model, MOSART, is especially designed to analyse the *direct* effects on individual pension entitlements, benefits and government pension expenditures of changes in the pension system. By direct effects we mean effects ignoring behavioural responses and general equilibrium effects. The model simulates the life courses of a representative cross-section of the Norwegian population, emphasizing what is relevant for individuals' accumulation of public pension entitlements. It captures the following events: migration, deaths, births, marriages, divorces, educational activities, retirement and labour force participation. Transitions between states over the life course depend on individual characteristics, and the transition probabilities have been estimated from observations in a recent period. The model includes an accurate description of the pension rules and captures all relevant details of the population dynamics, as well as the heterogeneity of individual age-earnings profiles and individual public pension entitlements.⁶

⁶ For a detailed model documentation, see Fredriksen (1998).

Figure 1: Structure of the dynamic microsimulation model MOSART



2.2 The CGE Model

The CGE model MSG6⁷ provides a rather detailed description of the Norwegian economy. It assumes that the Norwegian economy is too small to affect world prices and the world interest rate. The exchange rate is normalised to unity. Perfect international capital mobility equates the Norwegian interest rate to the exogenous world interest rate. Most imported products are close but imperfect substitutes for the corresponding domestic products. Goods and factors are perfectly mobile between industries. Firms are run by managers with perfect foresight, who maximise present net-of-tax cash flow to owners. They face exogenous world prices of exports, whereas most of them engage in monopolistic competition in most domestic markets. Industry production functions exhibit decreasing returns to scale.

⁷ Heide, Holmøy, Lerskau and Solli (2004) provides an overview of the structure of MSG6 and its empirical characteristics.

Since all markets clear in all periods, the simulated scenarios are basically determined from the supply side. In each period, the representative consumer determines labour supply according to standard consumer theory. The uncompensated wage elasticity equals 0.1, consistent with the econometric results in Aaberge et al. (1995). The model allows for factor- and industry specific exogenous growth in total factor productivity (TFP). The economy as a whole faces an intertemporal budget constraint, as foreign trade is balanced in present value terms, corrected for initial net foreign wealth. This constraint is met by endogenous determination of the labour cost per hour.⁸

The model includes comprehensive and detailed accounts of government revenues and expenditures. All tax bases are endogenous. The growth in real government consumption has been derived from specialised models⁹, whereas government pension expenditures result from an iterative use of MOSART and MSG6. Specifically, the equilibrium effects on the wage rate and labour supply have been accounted for in the results produced by the microsimulation model.

3. Baseline scenario: The case of no pension reform

The National Insurance Scheme (NIS) was established in 1967 as a mandatory, defined benefit, pay-as-you-go pension system that combines a flat-rate universal pension and an earnings-related income pension. In addition, a special means-tested supplement is awarded to individuals with an income pension that falls short of the minimum pension level. Benefits are then calculated by the formula:

Pension benefit = universal pension + max(special supplement, income pension)

The universal pension and special supplement are awarded to individuals based on residency in Norway, irrespective of earnings. The income pension is based on labour market earnings after introduction of the NIS. In addition, pension entitlements are granted to parents caring for young children and recipients of benefits compensating for unemployment, sickness, rehabilitation, and disability. The income pension scheme is intended an income replacement and insurance role in the NIS, but has several non-actuarial elements: For instance, a full benefit is obtained with 40 years of covered earnings, based on the average of the 20 years with highest earnings. Using MOSART to account for all elements in the public pension system for a representative sample of the Norwegian population, we find that increasing labour market earnings by 1 NOK raises the average present value

⁸ In our scenarios the growth rate of the labour cost turns out to be very close to the sum of the growth rates of, respectively, world prices and labour productivity in the traded goods sectors. Thus, the complex wage determination in MSG6 is quite well approximated by the much simpler Scandinavian model of inflation.

⁹ The projections of government consumption within the sectors of *health care* and *education* have utilised a model which decomposes changes in the input of labour and intermediate inputs into (a) changes in the number of persons in different age groups; (b) changes in the service standards; and (c) changes in coverage ratios. Thus, the projections capture the fact that ageing, *cet. par.*, increases public health care expenses.

of future pension benefits by 0.11 NOK. There is a large variation in the individual increments in benefits. Moreover, the complexity of the rules makes it hard for individuals to compute the impact on pension benefits of increasing their earnings.

Given the political intention of wage indexation of both pension entitlements and individual benefits, the NIS benefits imply a pre-tax replacement ratio equal to about 50 per cent for a person with 40 years of labour market earnings and a steady and normal income level. Special tax rules for pensioners raises the average after-tax replacement ratio of NIS benefits to about 65 per cent. Private pension schemes and special pension schemes for public employees may increase the compensation level further.

The formal retirement age in the NIS is 67 years. Both disability pensioners and early retirees obtain entitlements as if they were working until the age of 67. Roughly 40-50 per cent of the population is receiving disability pension when reaching retirement age, and about 60 per cent of the (still) employed are entitled to early retirement from the age of 62. Disability pension and early retirement imply that the present effective retirement age averages 59-60 years in Norway. Note that early retirement through these arrangements does not reduce future pension benefits at any point in time, neither because of a shorter period of labour market earnings nor through a longer period as pensioner.

3.2 Key Exogenous Assumptions¹⁰

The baseline scenario prolongs the present fiscal and welfare policy. Specifically, this means prolongation of

- the present public pension system and other schemes regulating government welfare transfers
- wage indexation of most welfare transfers
- standards, measured by man-hours per user, of public individual services as in 2004
- the same age specific use of public individual services as in 2004
- the 2004-levels of government employment in *Defence* and *Administration*
- the 2004-composition of inputs in government sectors
- all tax rates in real terms, except the payroll tax rate
- the present fiscal policy rule (explained above). The time path of the budget surplus implied by this rule is obtained by endogenous pay-as-you-go adjustments of the payroll tax rate.

Table 1 summarizes key exogenous assumptions underlying our baseline scenario. The demographic development is taken from the medium alternative in the most recent population projections (Statistics

Norway, 2005). It implies that the ratio of those of working age 20-66 to those 67 and older will decrease from 4.7 in 2005 to 2.7 in 2050. This is basically due to increased longevity: Life expectancy for males increases from 77.5 years in 2004 to 85.5 years in 2050. The corresponding increase for females is from 82.3 to 89.8 years.

Table 1. Exogenous assumptions for macroeconomic development 2004-2050 in the baseline scenario. Average annual growth rates, unless otherwise indicated. Percent

| | |
|--|------------|
| Total Factor Productivity (TFP) | 1.3 |
| Labour productivity growth in government sectors | 0.5 |
| Nominal interest rate, <i>level</i> | 5.5 |
| World prices | 1.5 |
| Labour force (individuals aged 20-66, net of disabled) | 0.3 |
| Number of individuals older than 66 | 1.6 |

Projections of petroleum revenues are crucial in any assessment of fiscal sustainability in Norway. In 2005 the net petroleum cash flow amounted to 41 percent of government revenues. We rely on the production forecasts in Ministry of Finance (2004). These imply that if, hypothetically, the 2004-production level were kept constant, the profitable resources would be depleted after 34 years (from 2004). The real oil price is assumed to stay at 50 dollars per barrel, which is about twice the pre-2005 level, but about 25 dollars below present (July 2007) price.¹¹ The price of natural gas follows the oil price.

3.3 Fiscal implications of Maintaining the Existing Pension System

The macroeconomic growth performance in the reference scenario, summarized in Table 2, indicates the real growth in the main tax bases. Growth in GDP averages 1.7 percent over the period 2004-2050, mainly as a result of TFP growth and capital deepening. Most of the difference between the growth in private consumption and GDP reflects our assumption of zero-growth in the quality of government services, and – to a lesser extent – the intertemporal allocation of the consumption possibilities created by the petroleum revenues.

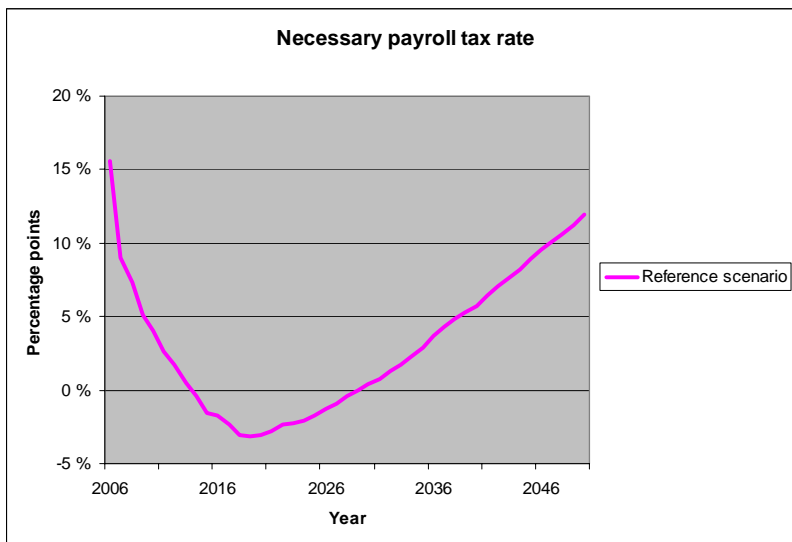
¹⁰ Heide, Holmøy, Solli and Strøm (2006) provide more details on the exogenous assumptions.

¹¹ The assumptions on the petroleum prices represent the main deviations from the scenarios presented in Fredriksen, Heide, Holmøy and Solli (2007) and Heide, Holmøy, Solli and Strøm (2006), in which the real oil price was assumed to stay at 25 dollars per barrel.

The total government budget effects are summarized by endogenous pay-as-you-go adjustments of the payroll tax rate, which serves as a representative of a broad tax on labour income. These adjustments ensure that the government obeys the government budget constraint that follows from (a strict interpretation) of the present fiscal policy rule adopted in 2001. According to the rule the government petroleum revenues are saved in the Government Pension Fund – Global (GPF), owned by the state, and the non-petroleum primary deficit should not exceed the expected real rate of return (presently set to 4 percent) on the GPF assets.¹²

The time path of the necessary payroll tax rate, see figure 1, demonstrates that a long run perspective is perhaps even more important in Norway than in most other countries. The present fiscal stance is impressive. The GPF capital is likely to surpass one GDP during 2007. In addition, other general government net financial wealth at the end of 2006 is estimated to about 0.5 GDP. Moreover, the demographic development is quite favourable from a fiscal point of view until 2013, when the first baby-boom generation reaches the statutory retirement age of 67. The reference scenario implies that the growth in non-petroleum tax bases exceed the growth in government expenditures until 2020. Starting from the present 13 percent, the deviation may be used to gradually remove such a broad based tax as the payroll tax completely. A projected negative payroll tax rate in 2020 indicates that it will be possible also to reduce other tax rates, see figure 2.

Figure 2. The projected necessary payroll tax rate



¹² Formally, the fiscal policy rule limits the non-petroleum primary deficit, D , to $(i - \pi)B_{t-1} = D_t$, where i is the expected international inflation, and B is the value of the accumulated GPF assets. The rule then implies that the fiscal surplus equals $B_t - B_{t-1} = \pi B_{t-1} + P_t$, where P is government net cash flow from the petroleum sector. Since i , π and P are exogenous variables in MSG6, the time path of B is effectively exogenous.

After 2020 the picture is altered, and so dramatically that one may question if the no-pension-reform scenario is politically feasible. Despite the substantial petroleum wealth and the assumption of constant quality in government services, the payroll tax rate must be raised successively by about 0.5 percentage points in every year. The increasing trend would be prolonged if the horizon were extended beyond 2050. The estimated continuous increase in the payroll tax rate after 2020 is much stronger than corresponding estimates for other countries, see Heide, Holmøy, Solli and Strøm (HHSS) (2007).¹³

Growth in public pension expenditures is the main source of the necessary rise in the payroll tax rate. Measured in per cent of GDP, these expenditures grow from 4.5 to 15.8 per cent from 2006 to 2050.¹⁴ Maturing of the existing pension system, as well as increased female labour market earnings, imply a 21 per cent increase in the average public old-age benefit from 2006 to 2050.¹⁵ Demographic changes exert a twofold pressure on the expenditure level. First, baby-boom cohorts born after World War II will retire and replace small cohorts born in the inter-war period. Second, longevity is expected to increase by 2060 expected to improve by approximately 8 years for both genders, compared with the 2005-level of 78 and 82 years for men and women respectively .

Nominal government consumption expenditures will grow faster than the tax bases after 2020, despite the cautious assumption of constant service standards. Ageing alone implies an annual growth in government employment of 0.5 per cent from 2006 to 2020, about 0.9 per cent in 2021-2040, and 0.6 per cent thereafter. More importantly, wage growth invokes Baumol's disease. The wage growth is basically determined by the growth in world prices and labour productivity in the exposed industries,

¹³ Projections presented in OECD (2001) show that budgetary pressures from ageing populations on average require a 7 per cent increase in the ratio between taxes and GDP. This exceeds the corresponding estimates in Chauveau and Loufir (1995) for the seven major economies. On the other hand, McMorrow and Roeger (2002) find that the ratio between social security contributions and wages in the EU must increase from 16.1 per cent in 2000 to 26.9 per cent in 2050, and this is due uniquely to the rise in the old-age dependency ratio. McMorrow and Roeger explain why their estimate of increase in public pension expenditures as a share of GDP from 2000 to 2050 is about 4 percentage points higher than the corresponding estimate made in the European Commission (2001).¹³ According to Feldstein (2005) the actuaries of the U.S. Social Security Administration estimate that the payroll tax rate must increase by 48 per cent from today to 2075 to finance the benefits specified in current law (i.e. about half of the percentage increase in the payroll tax rate in our reference scenario). However, the projection neglects the development in other government expenditures as well as general equilibrium effects. Taking these effects into account, Feldstein assesses that the necessary increase in the tax rate must become about 70 per cent. The model based estimate in Kotlikoff et al. (2001) is somewhat higher; they find that the payroll tax rate must increase by 77 per cent over the next three decades. With respect to welfare state schemes Denmark is more similar to Norway than the U.S. The Danish Welfare Commission (2004)¹³ projects that government expenditures as a percentage of GDP will increase from 52 per cent in 2001 to 59 per cent in 2050 if the present welfare state schemes are maintained. Over the same period government revenues as a percent of GDP will increase from 54 to 55 per cent. One way of obtaining fiscal sustainability is to increase the base income tax rate permanently from 2011 by 8.7 percentage points, corresponding to an increase in the tax revenue-GDP ratio of 5.1 per cent compared to a scenario based on constant tax rates.

¹⁴ This figure includes both the old age pensions and government subsidies to the early retirement programme (AFP).

¹⁵ The scheme for occupational pensions in the government sector guarantees that the sum of all old-age benefits to government sector employees equals two thirds of previous earnings. This implies that a reduction in the public pension benefit is exactly compensated by an increase in the occupational benefit. We have assumed that the pension reform does not affect this scheme, but any increase in the occupational benefits is financed by higher premiums. Thus, continuation of this scheme does not imply any additional need for raising taxes.

exceeding the labour productivity growth in government sectors by about 2 percentage points annually. A related point is that economic growth makes it somewhat harder – not easier - to finance the Norwegian welfare state. Productivity growth in the private sector raises most tax bases, but the induced wage growth will raise government expenditures even more. This finding follows from two country-specific characteristics: Norwegian public pension benefits are indexed to wages rather than prices (as in, e.g. the U.S). Furthermore, wage dependent government expenditures exceed wage dependent government revenues, basically as a result of the fiscal policy rule. The wage rate adjustments will also significantly dampen the fiscal effect of higher petroleum prices.¹⁶

The fiscal future in our reference scenario looks much brighter than the one used in HHSS (2006) and FHHS (2007). In 2050 the payroll tax rate will still be lower than the present rate. The main reason is that our scenario is based on the assumption that the real oil price stays at 50 rather than 25 \$ per barrel. In addition the demographic projections have been updated. However, the main message is still alarming since it is unlikely that the fiscal development until 2020 will be utilized to reduce tax rates. As a matter of fact, the present “red-green” government has explicitly stated that it will not reduce taxes, but expand the welfare state. With such a policy the starting point for the growth in the payroll tax rate in 2020 would be 13 percent. Given the simulated tax rate growth, the payroll tax rate would then pass 25 per cent around 2050. Recall also that we have assumed no growth in the standard of government services, whereas the growth in real private consumption averages 3 percent. If the fiscal room prior to 2020 is used to improve the service standards for the elderly, the growth in the payroll tax would be much steeper due to the ageing of the population, see HHSS (2006).

The effective tax on marginal labour income is already rather high in Norway.¹⁷ It may be doubted if continuous increments in the payroll tax rate from the present level will be politically acceptable. If implemented, the resulting distortion of labour supply incentives is likely to cause a significant social efficiency loss, and increase rent seeking activities. Higher international mobility of tax bases exacerbates both these problems. The combination of high present tax rates and our simulated growth in the necessary tax rate(s) after 2020 serves as a good motivation for a pension reform intended to reduce the *growth* in government pension expenditures.

¹⁶ Holmøy (2006), Holmøy (2007) and HHSS (2007) discuss these effects further.

¹⁷ In addition to the payroll tax rate, most important elements in the labour tax system includes an average marginal tax on personal labour income approximately equal to 40 percent, compulsory social security premiums averaging 7 percent of wages, and net indirect taxation of consumption (including VAT) averaging 19 percent. The tax wedge made up by these tax rates makes the ratio between the social and the private marginal rate of transformation of leisure into consumption as large as 2.3. In addition, the pension system and especially the early retirement scheme, magnifies the labour supply distortions at the extensive margin.

4. Reform effects

4.1 Main reform characteristics

The pension reform is to be gradually phased in from 2010. It continues to be a defined benefits system financed on a pay-as-you-go basis. The reform aims at reducing the *growth* in future government pension expenditures, primarily through a quasi-actuarial mechanism that neutralises the effects from further growth in life expectancy. This mechanism will also reward postponed retirement. Labour supply is also stimulated by strengthening the present rather weak connection between former labour incomes and pension entitlements. The most important reform characteristics include:

1. The pension benefit continues to include two elements, a granted minimum benefit and an income based benefit. The former is generally known as a first-tier redistributive benefit, whereas the latter represents a second-tier insurance scheme. The minimum benefit is maintained at the same level as the current minimum benefit. Contrary to the basic benefit in the present system, however, it is means-tested against the income based pension benefit. Different indexation rules imply that the minimum benefit over time is reduced relative to the income component.
2. The system implies a stronger dependency between earnings and pension benefits, thereby reducing the effective tax on labour income. The income based benefit is basically 1.35 per cent of lifetime labour market earnings below an annual wage-indexed threshold.¹⁸
3. The current early retirement arrangements are phased out. They are replaced with a flexible retirement age from the age of 62 years, available to everyone. The system becomes more actuarial as the pension benefit is adjusted in accordance with retirement age and current remaining life expectancy. For a given level of entitlements, the present value of total pension benefits is then independent of retirement age.¹⁹ This is one implementation of what Lindbeck (2006) identifies as an “automatic rule mimicking the functioning of actuarially fair private income insurance systems”. See Stølen (2007) for details.
4. The income dependent entitlements are indexed by wage growth only until retirement, and by an average of wages and prices in payment.

The new system is calibrated such that those from the 1943-cohort, who retire at the present statutory retirement age of 67 in 2010, will receive the same pension benefit in 2010 as in the existing system. However, lower indexation in payment and the life expectancy adjustment imply that over time retirees receive lower annual benefits than in the present system, unless retirement is postponed.

¹⁸ In 2007 the ceiling was approximately 58 000 euro.

Although the reform strengthens the incentives to retire as a disability pensioner, the disability pension scheme is not altered, and we assume that the reform does not change the rates of transition from work to disability.

4.2 Direct effects

The reform may affect the economy through four channels: (1) labour supply at the intensive margin, (2) labour supply at the extensive margin, (3) government pension expenditures, and (4) private and government savings. The subsequent paragraphs draw extensively on FHHS (2007).

Savings

We assume that the reform does not affect the fiscal policy rule and thereby neither government savings.²⁰ We further assume that the reform does not change aggregate private financial savings. Any specific assumption on the private savings response is hard to justify due to lacking relevant empirical evidence (Carman et al., 2003). Our main rationale for assuming no adjustment in private financial savings is that the average annual public pension benefit will be nearly unaffected by the reform for individuals who work until (possibly postponed) old-age retirement, given the assumptions on retirement behaviour we outline below.²¹ Since neither government nor private financial savings changes, the time path of net national financial investments and the foreign financial assets will be the same under the reform as in the reference scenario. However, aggregate savings will change as firms adjust their fixed capital stocks to changes in relative prices.

Labour Supply at the Intensive Margin

Simulations on MOSART reveal that the average increment in the present value of future pension benefits of raising labour market earnings by 1 NOK, increases from 0.11 NOK to 0.20 NOK when the present system is replaced by the reformed system. In addition, the reform makes the individual income dependency more transparent and more similar between individuals. All effects contribute to raise the effective marginal wage rate facing workers at the intensive labour supply margin, but any estimate of the increase in the average effective after tax marginal wage rate will be uncertain. This estimate should also account for the negative correlation typically found in microeconomic studies between income and the wage elasticity of labour supply (see e.g. Aaberge et al., 2000). Our preferred

¹⁹ However, special rules imply deviations from an exact actuarial adjustment. For instance, the annual benefits and pension premium are independent of gender and other observable characteristics correlated with life expectancy.

²⁰ The motivation of the fiscal policy rule is to ensure a fair intergenerational distribution of the petroleum wealth and to ensure that the use of the petroleum wealth is gradually increased. On the other hand, the main intention of the pension system is to help individuals to achieve a rational allocation of consumption possibilities over their life span. In this perspective, there is no reason why a pension reform should change the general long and short run considerations underlying the fiscal policy design.

²¹ Individuals who are disabled before they become old-age pensioners will experience a substantial reduction in their annual old-age benefits. However, the majority of this group has low income, which makes an increase in savings implausible.

estimate is that the increased income dependency of the benefits translates to an 8 per cent increase in the average effective marginal wage rate.²²

Labour Supply at the Extensive Margin

Several studies find that labour supply is more elastic on the extensive than on the intensive margin, see e.g. Heckman (1993), Gruber and Wise (2004), Chan and Stevens (2003).²³ Hernæs et al. (2002) survey Norwegian studies on retirement behaviour. To sum up, we assume that the average retirement age increases by 0.6 years when the present early retirement scheme has been phased out by 2015.²⁴ Increased life expectancy strengthens the effect over time; average retirement age is delayed by 1.6 years in 2030 and by 2.6 years in 2050. These figures balance the following positive and negative reform effects on the average age of retirement, and will be affected by the following factors.

First, the reform increases the individual cost of early retirement. Whereas early retirement in the present system does not reduce benefits in subsequent years, the new system implies that the annual pension benefit is cut, in a close to actuarial way, the earlier one retires. We have not found reasons to change the estimate on this *cost effect* from the one given in FHHS (2007), assuming that a *perfectly actuarial* pension system would raise the present relatively low participation rates of the age groups 60-69 to the average of the present rates and the rates observed in the early 1980s, when no early retirement schemes had been introduced. Keeping the present life expectancy fixed, this response implies an increase in the average retirement age equal to 2.4 years. Taking into account that only 60 per cent of the labour force has access to the present early retirement scheme, the postponed retirement corresponds to an increase in total labour supply of about 2 per cent. This response is in line with the estimate in Brinch et al. (2001) of abolishing the present early retirement scheme.

This estimate of the cost effect should be modified, since the reform includes several non-actuarial elements. Most significantly, the most important of which is the minimum income offered by the guaranteed pension. We also believe that the gravity towards the new statutory retirement age of 62 years as the norm for the retirement decision will be stronger after the reform. The empirical importance of these modifications reduce is highly uncertain. These effects reduce the cost effect on the retirement age from 2.4 to 1.2 years.

²² If the difference between the interest rate and the wage growth is set to 2.5 instead of 1.1, this estimate falls to 5 percent. Assuming this growth-adjusted interest rate to be 0 implies an increase in the effective wage rate by 11 percent.

²³ On the other hand, Samwick (1998) finds that levels of pension and other wealth are not major determinants of retirement.

²⁴ When the reform is implemented in 2010 the immediate increase in the average retirement age is only 0.1 years because it is assumed to take 5 years to phase out the existing early retirement scheme.

Finally, the cost effect is only relevant for the 60 per cent of the labour force that has access to the present early retirement scheme. From this cost effect we must subtract the effect of making early retirement optional for the whole labour force. Provided that the retirement behaviour is not systematically different between the two groups, the *ex post* reform retirement age will be the same as the one assumed above. This implies that the 40 per cent without access to the present early retirement scheme will reduce their retirement age by 0.3 years. Given the present life expectancy, the estimate on the increase in the average retirement age of a more actuarial system becomes $0.6 * 1.2 \text{ years} + 0.4 * (-0.3 \text{ years}) = 0.6 \text{ years}$.

Increased life expectancy is likely to have a negligible effect on the average retirement age if the present system is maintained, because the annual benefit is then independent of the number of years as a pensioner. Thus, if all consumption initially is financed by the benefit, this consumption-leisure combination can be maintained when life expectancy increases. If the initial consumption level is financed out of private funds in addition to the public benefit, the consumption level cannot be maintained when life expectancy increases without increasing labour supply. However, at the statutory early retirement age the individual faces a kinked budget constraint when he decides to work or retire. At this age the effective marginal tax rate of labour income jumps to a very high level, because he simply loses the pension benefit that alternatively could be received.²⁵

On the other hand, increased life expectancy is likely to increase the retirement age in an actuarial system through consumption smoothing, see e.g. Bloom, Canning and Moore (2004). In addition, if increased longevity results from improved health, it can be interpreted as an increase in income, taking the form of more leisure time. Given the consumer real wage rate, the optimal response would be to exchange some of the leisure increment for consumption in the labour market. Postponing retirement is one way of doing this. The guesstimate on these effects in FHHS (2007) is that increasing life expectancy by 1 year increases the average retirement age by 0.4 years.

Government Pension Expenditures

MOSART simulations show that the reform implies a cut in government old-age pension expenditures in 2050 to 88 per cent of the reference scenario level. This reduction can be decomposed into the following sources: First, keeping life expectancy and indexation rules fixed, the average benefits *increase* by 7 percentage points when the reform replaces the present system. Second, the impact of a more actuarial cut in annual benefits to increased life expectancy alone contributes to a reduction of government pension expenditures in 2050 of 14 percentage points. This reduction works through two

²⁵ Holmøy (2002) and Holtmark (2002) estimate the effective marginal tax rate on labour income when the early retirement scheme is taken into account.

channels. The first channel is a reduction in the number of pensioners. As explained above, those working until they become old-age pensioners will on average postpone retirement, so that their annual benefit will be approximately the same as it would have been under the present system. But the increase in the retirement age reduces the number of old-age pensioners in a given year. In 2050 the number of old-age pensioners will be reduced by 11 per cent (145 000) compared to the reference scenario, corresponding to the 2.6 years increase in the average retirement age. The other channel is a close to actuarial reduction of the annual old-age pension benefit to individuals who do not work prior to old-age retirement. Disability pensioners are the most important example in this category. In 2050 this effect contributes to an 8 per cent reduction of the average annual benefit received by all old-age pensioners. Third, in the reformed system, annual benefits are indexed to the average of the growth rates of wages and the consumer price index. In the present system the annual benefits are indexed to wage growth. Less generous indexation helps reduce government pension expenditures by an additional 5 percentage points in 2050 compared to the reference scenario.

4.4 General equilibrium effects

Table 3 shows the macroeconomic reform effects in 2050 when we account for both direct and general equilibrium effects through the iterative use of MOSART and MSG6. By 2050 employment becomes 13 per cent higher than in the reference scenario (see figure 3). The somewhat smaller expansion of private consumption and GDP of 11 percent is influenced by decreasing returns to scale in private industries. The increase in private consumption per capita is a large effect compared to what can be expected from most other policy reforms. CGE estimates of the consumption effect of tax- and trade policy reforms are typically close to 1 per cent. However, the effects of a pension reform need a long time to unfold. Figure 5 clearly brings out the point that even an 11 per cent shift becomes rather modest compared to the consumption growth that normal productivity growth is able to generate over 50 years, independent of the pension system.

The fall in the labour cost is a consequence of accounting for decreasing returns to scale. As the pension reform expands the economy, the marginal costs increase. A decrease in labour costs is then necessary to neutralize the income effect on the long run external balance. Lower labour costs can be combined with a higher real consumer wage rate due to the cut in the payroll tax rate. The stronger perceived dependency between earnings and pension benefits exacerbates the increase in the marginal effective after-tax consumer real wage rate.

Figure 3: Employment (Million Man-Hours)

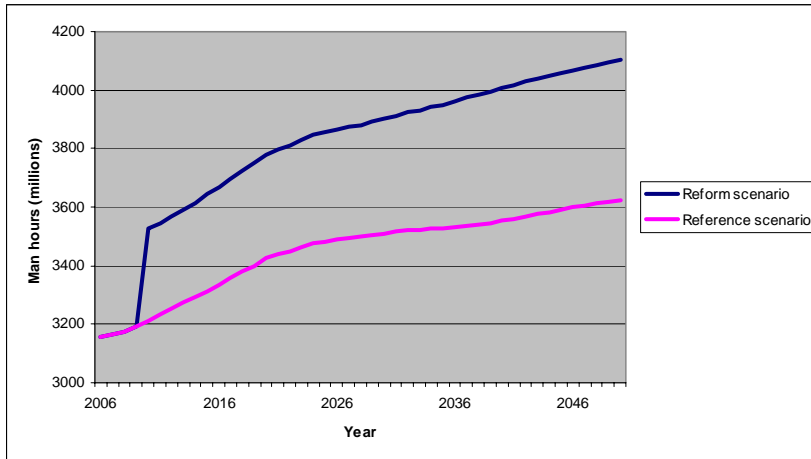


Figure 4: The Payroll tax rate

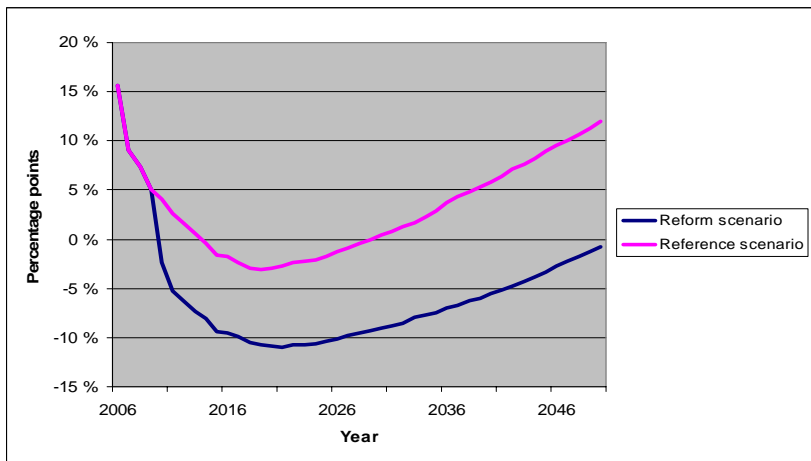
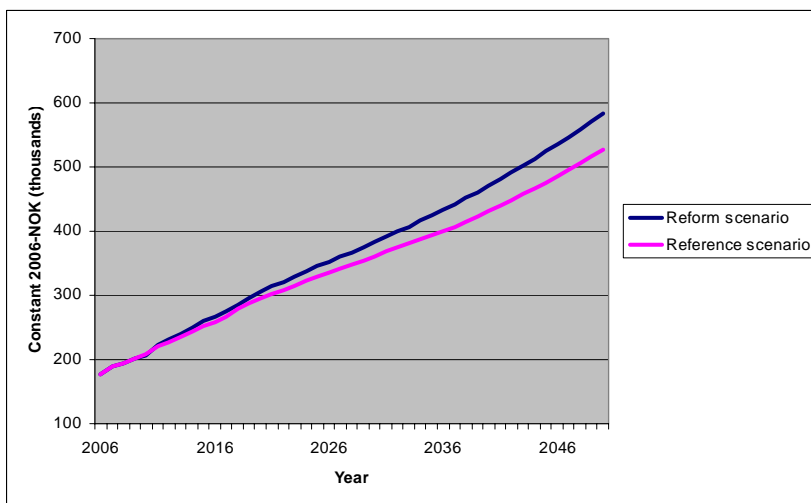


Figure 5: Private Consumption Per Capita



The magnitude of the fall in the labour cost (10 per cent in 2050) reflects basically that exports of crude oil and natural gas, constituting close to half of total exports, do not adjust to changes in the wage rate. Consequently, the relative increase in the *adjustable part* of total exports must be as large as 28 percent in 2050. Second, the effective cost share of wages is less than fifty per cent in the dominating traded goods industries. Since no other prices of primary inputs change, the necessary reduction of the labour cost must be more than twice as strong as the necessary reduction of the price index of all inputs.

Table 2: Macroeconomic reform effects in 2050. Deviations from the reference scenario in percent

| | |
|--|-------|
| Total employment | 13.2 |
| GDP | 10.7 |
| Private consumption | 10.7 |
| Labour cost per man hour | -9.6 |
| Payroll tax rate (<i>percentage points</i>) | -12.7 |
| Effective real consumer wage rate, incl. the pension effect of 8 percent | 12.3 |
| Real consumer wage rate, excl. the pension effect | 4.3 |

The reform makes it possible to reduce the payroll tax rate from the reference scenario by as much as 12-13 percentage points (figure 2). Indeed, within the simulation period other taxes can be reduced in addition to complete removal of the payroll tax rate. The decomposition in table 3 reveals that stronger labour supply incentives at both the extensive and the intensive margin have a much stronger effect on the total tax rate than the cut in the average old-age benefit. Note that the increase in employment expands most tax bases, not only the bases for the personal income tax and the payroll tax. Postponed retirement contributes to reduce the tax rate both by reducing the number of pensioners and by increasing the tax bases. The positive direct effects on labour supply are reinforced by the induced reductions in the payroll tax rate.²⁶

An important purpose of the pension reform is to shift some of the expenditure risk of increases in longevity onto pensioners. With some qualifications with regard to the redistributive guarantee pension, the system converts an implicit pension wealth to an annuity over average expected remaining life expectancy. Increases in longevity then imply lower annual benefits for a given

²⁶ The tax rate reduction is about 1 percentage point weaker than estimated by FHHS (2007) on an earlier reform proposal. Since then, the content of reform has been modified, demographic assumptions have been revised and the oil price assumption has been doubled.

retirement age. Since this quasi-actuarial mechanism is supposed to automatically stabilise pension expenditures in response to changes in longevity, we would expect the reform to reduce not only the *level* of government pension expenditures, but also the *growth rate* of these expenditures.

The annual growth in the necessary payroll tax rate after 2020 averages 0.5 percentage points. We find that the reform modifies this growth, but only with 0.16 percentage points. The ratio of government pension expenditures to GDP is only 2.4 percentage points lower compared to the reference scenario in 2050. To some extent the remaining growth in the tax rate reflects more rapid growth in government expenditures on services used by the elderly than in the tax bases. Assuming unchanged per capita employment in these services, as well as in the health sector, further reduces the annual growth by 0.13 percentage points. Baumol’s disease is the most important driver behind the remaining growth in the necessary payroll tax rate of 0.21.

Table 3. Decomposition of the reform effects in 2050. Deviations from the reference scenario in percent

| | Employment, per cent | Payroll tax rate, percentage points | Consumer real wage, per cent |
|---|-------------------------|--|---------------------------------|
| 1. Increased retirement age | 7.0 | -8.3 | 3.7 |
| 1.1. Direct effect | 4.5 | | |
| 2. 8 per cent increase in the effective wage rate | 5.9 | -5.0 | 0.7 |
| 3. Reduced average benefits | 0.2 | -0.6 | 0.4 |
| 4. Interaction effects (= 5 - 1 - 2 - 3) | 0.1 | 1.2 | -0.5 |
| 5. Total effect | 13.2 | -12.7 | 4.3 |

5. Distributional consequences

Because the MOSART model projects the life courses of a large sample of different individuals, it is well suited to capture heterogeneity with respect to age-earning profiles and accumulation periods. Our microsimulation approach thus moves beyond the limitations of stylised calculations for individual and household types, permitting a more accurate description of the distributional consequences of pension reform. Specifically, we consider the distribution of annual pension benefits between individuals as calculated by the MOSART model.

Our evaluation of distributional consequences is based on three important qualifications. First, we consider only pension benefits, and not taxes and pension premiums, although the possible tax rate may be designed to have distributional consequences. With Norwegian old age pensions being fully integrated into the general state budget, it is not possible to identify specific contributions to the system. Second, we analyse only the direct effects of pension reform for a given labour supply, both at the intensive and extensive margins. Neglecting indirect income effects caused by behavioural changes can be justified when focusing on changes in utility level; according to the envelope theorem, the utility of marginal income increases from increased labour supply is neutralized by the utility loss of reduced leisure, as long as the individual is free to choose hours worked. Third, we report the distributional effects measured as annual benefits in a cross-section of pensioners without accounting for indexation and the actuarial adjustment through the flexible pension scheme. This scheme effectively replaces a fixed retirement age with an individual retirement choice above 62 years, and the retirement decision will influence both retirement age and length. If we included the actuarial implication this choice has for annual benefits, they would be a poor approximation for pension wealth because they would indicate both (relevant) changes in pension wealth and (for our purpose irrelevant) changes in retirement spells.

Figure 6: Distributional indicators.

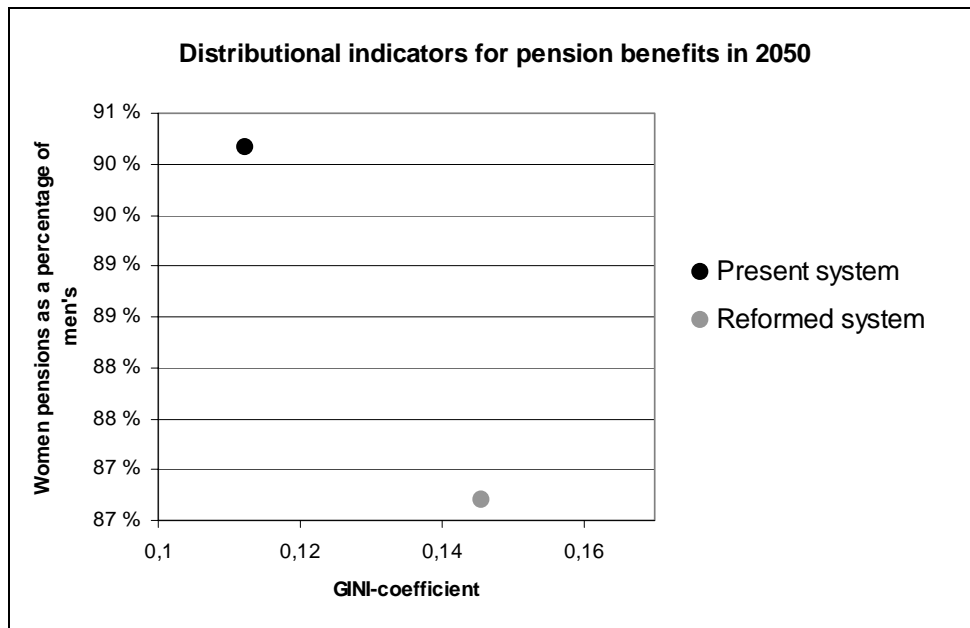


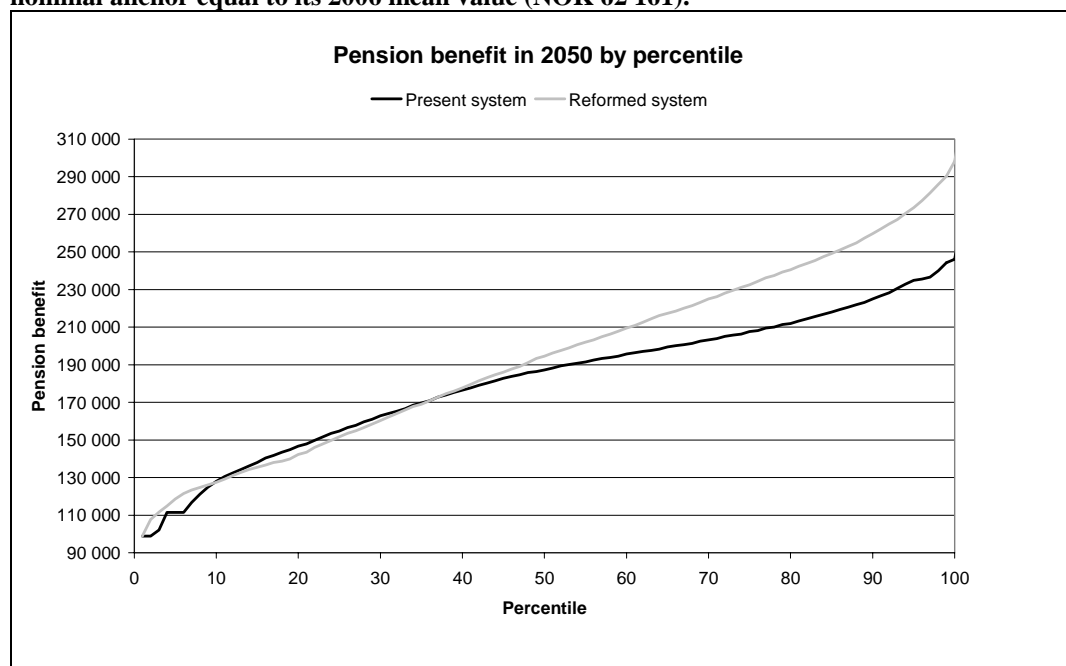
Figure 6 gives a first impression of how different accrual schemes distribute income between individuals at system maturity in 2050. The horizontal axis measures the GINI-coefficient of inequality and the vertical axis shows women's pensions as a share of men's, on average. Along the two dimensions, the upper left quadrant would therefore indicate more equality and lower right more inequality. How labour incomes and pension benefits are linked in the present and reformed accrual schemes is a key to understanding outcomes. As a starting point, it is worth noting that there is greater inequality in labour incomes than pension benefits in the schemes we consider. The public old age pension scheme is redistributive, due to components such as a minimum benefit and the annual income ceiling on accumulating pension entitlements. Income replacement ratios are therefore higher at the lower end of the income scale. A closer link between earnings and pensions in the accrual scheme will therefore tend to increase inequality in benefits, while this very link is also at the heart of improving work incentives by reducing the implicit tax rate on social security contributions. In deciding on a pension accrual scheme, policy makers face the classical trade-off between equality and efficiency. It should therefore come as no surprise that the present reform, aiming to stimulate labour supply, also will increase inequality in pension outcomes.

Figure 5 breaks annual pension benefits in 2050 down by pension income percentile. For the bottom four deciles, pension levels will remain largely unchanged with pension reform because of two major opposing effects. On the one hand, pensions will be somewhat reduced because the minimum pension level is not fully wage indexed in the reform. Instead, the level is to be indexed to wages less increases in remaining life expectancy at 62 years. With the middle alternative in the present population

projections, this would in 2050 imply a reduction by 20 per cent relative to full wage indexation. On the other hand, the reform offers a high accrual coefficient combined with a more generous rule for tapering the minimum, guaranteed pension against earned income pension. Compared with a 100 per cent reduction in the present system, the reform reduced the tapering rate to 80 per cent. This will boost pensions for individuals who have low, but non-negligible entitlements for income pensions.

The top six pension income deciles will experience an increase in their benefits, reflecting both the increased accrual coefficient for pension entitlement and the sharpened actuarial properties of the system in general. The gains are largest for the highest income groups. For both schemes the curves are convex for the uppermost deciles, because they exhibit an increasing gap compared with the average incomes. Figure 7 illustrates an inherent paradox in the way the fiscal and distributional consequences are presented so far: How can pension reform reduce the fiscal imbalances if all income groups become better off? The manner by which the distributional consequences are presented gives the key to resolving the paradox: Corrections for life expectancy and indexation are excluded from the analysis for reasons give above. These are the major cost saving reform elements, whereas the system for accumulation of entitlements partially increases expenditures. On the other hand, the reported distributional effects also ignore income effects of possible tax cuts. Figure 5 is therefore a good indication of relative distributional consequences, but misleading seen from a fiscal perspective.

Figure 7. Pension benefits in 2050. Benefits are shows before indexation and exposure to the life expectancy adjustment divisor. Benefits are shown for a constant level of the BPU, which is given a nominal anchor equal to its 2006 mean value (NOK 62 161).



6. Conclusions

Long run projections reveal that the financial viability of the Norwegian welfare state is highly vulnerable to future population ageing. Government pension expenditures account for a significant share of gap between the growth rates of, respectively, government expenditures and the total tax base. The pension reform approved by the Norwegian parliament in 2006 is intended to improve long run fiscal sustainability, basically by stimulating employment, rather than significant cuts in annual benefits. Moreover, the reform seeks to maintain the redistributive characteristics of the present system. In this paper, we have estimated the effects of the approved reform on fiscal sustainability, employment and income distribution among pensioners. To this end we have simulated the Norwegian economy until 2050 under the present and reformed public pension systems by iterative use of a detailed dynamic microsimulation model and a large scale dynamic CGE model.

Regarding the fiscal motivation of the reform, we find that the present pension system can be financed on a pay-as-you-go bases until 2050 at tax rates below present levels without violating the government budget constraint implied by the present fiscal policy rule. Indeed, more than the payroll tax rate can be gradually removed until 2020. However, this scenario relies on no improvement in the standard of services financed by the government. After 2020 it will be necessary to raise tax rates successively in every year, and this trend is likely to continue beyond 2050, the end of our simulation period. This reflects more rapid growth in government expenditures, especially the pension expenditures, than in the total tax base. The fundamental problem of fiscal sustainability in Norway seems to lie in the gap between these growth rates. In the highly likely case where the scope for tax rate reductions until 2020 is not utilized, even such a broad based tax as the payroll tax rate must be raised to around 28 per cent in 2050, more than a doubling from the present average of 13 per cent. The necessary increase in the tax burden after 2020 is much stronger than that estimated for most of the seven major economies in Chauveau and Loufir (1995). It will be even stronger if the scope for tax cuts prior to 2020 is used to improve the standards of old-age care. Thus, the reference scenario provides a compelling case for a pension reform that stimulates labour supply and establishes some kind of actuarial mechanism to stimulate postponed retirement as life expectancy improves.

If one limits the evaluation to the change in the necessary tax rate *levels*, the pension reform is likely to contribute significantly to improve the financial viability of the Norwegian welfare state. Compared to the reference scenario, such a broad based tax as the payroll tax rate can be reduced by as much as 13 percentage points from the reference path in 2050. However, the annual average *growth* of the necessary payroll tax after 2020 is only dampened from 0.5 to 0.34 percentage points. In this respect the reforms has a rather limited effect on long run fiscal sustainability. This result is somewhat surprising given that the reform includes an automatic quasi-actuarial reduction of the annual old age

benefit to increased longevity as well as less generous indexation of these benefits. Three explanations stand out as most important. First, ageing raises government expenditures on health and caring services even if service standards are not improved. Second, lower productivity growth in government service sectors than in the wage setting private industries invokes Baumol's disease. Third, government pension expenditures continue to grow faster than the tax bases, due to remaining non-actuarial elements, wage indexation of entitlements, and the maturing of both the present and the new system.

Our results show that the lion's share of the scope for tax rate reductions from the reference scenario is achieved by expansion of the tax bases due to increased labour supply, rather than cuts in individual benefits. In 2050 employment exceeds the reference level by 13 percent. The labour supply stimulus is caused by increased individual cost of early retirement, stronger dependency between earnings and entitlements raising the effective marginal real wage rate, as well as the induced increase in the consumer real wage rate caused by tax rate reductions.

Compared to the estimates of the macroeconomic effects of other structural policy reforms reported in the CGE literature, our estimated effects of the proposed pension reform are very large. In sharp contrast to the 10-11 per cent expansion of the Norwegian economy generated by the pension reform, the consumption gains of tax- and trade policy reforms are typically estimated to be smaller than those resulting from one year with normal productivity growth. On the other hand, even such large reform effects will account for a relatively small fraction of the consumption growth that the average consumer is likely to experience over the next three decades or more, given a prolongation of historical productivity growth trends.

The efficiency gain caused by stronger labour supply incentives both at the intensive and extensive margins, comes with an equity loss: Inequality in benefits of old age pensioners widen and the GINI coefficient of inequality goes up by nearly 0.04. Furthermore, the gap between average benefits of men and women is magnified.

Although the model work underlying this paper has gone a long way in accounting for details of potential relevance, there is obvious scope for improvements. Specifically, consistency can be improved by merging the most important aspects of individual life courses and the general equilibrium mechanisms into a CGE-model with overlapping generations and income heterogeneity within each cohort. Moreover, the importance of the labour supply responses at both the intensive and the extensive margins suggests that future modelling work should probably give priority to capturing the heterogeneity of labour supply behaviour found in micro econometric studies.

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