

Combining observed and simulated data in comparing expected discounted pension benefits and contributions for cohorts born between 1910 and 2070

DENNIS FREDRIKSEN AND NILS MARTIN STØLEN

STATISTICS NORWAY

ONLINE DATA FORUM ON LIFE COURSE ANALYSIS

UNIVERSITY OF ESSEX, JULY 6-7 2021

REFERENCE: IJM (2017) 10 (2)

[HTTPS://MICROSIMULATION.PUB/ARTICLES/00161](https://microsimulation.pub/articles/00161)



Statistisk sentralbyrå
Statistics Norway

Aim of the project

- Illuminate effects from the Norwegian old-age National Insurance system on distribution of income between birth cohorts from 1910 to 2070
- Compare discounted pension benefits with discounted contributions
- Combining observed statistics with simulations based on dynamic microsimulation
- Lack of detailed data for the working period for the first cohorts included partly solved by starting the simulation in 1960
 - Combining detailed information from the Population Census in 1960 with aggregate data for the following years
- Every person resident in Norway in 1960 or born or immigrated afterwards are included



Main characteristics of the system for old-age pensions in the National Insurance System

- First and most important pillar covering the entire population
- Minimum benefit and income dependent benefits
- Introduced as DB in 1967, major reform to NDC in 2011
- Integrated part of Central Government budget
- Financed pay-as-you-go
 - Yearly expenditures have to be balanced by direct contributions and general taxes
 - In this analysis contributions calculated as a tax put on labour incomes necessary to cover expenditures

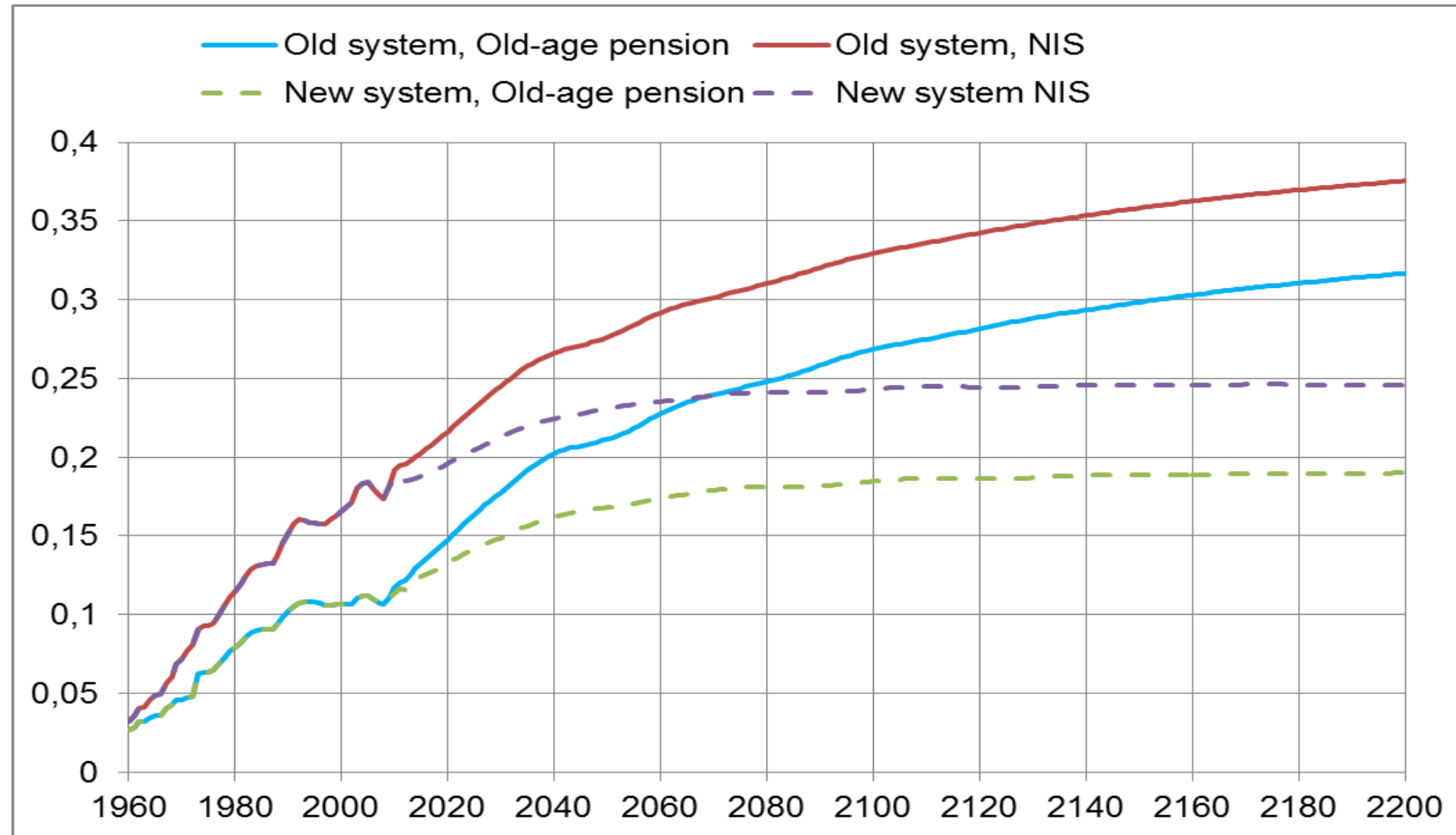


The new NDC-system in Norway from 2011

- Individual accounts for accumulation of entitlements during working age
- Actuarial with flexible retirement between age 62 and 75
- Annual benefits calculated by dividing accumulated entitlements by expected remaining life-expectancy
- Early retirement and growing life-expectancy cause lower benefits
- Lower benefits caused by growing life-expectancy may be counteracted by postponing retirement
- Accumulated entitlements indexed by average wage growth
- Pension under payments indexed by wage growth minus 0.75 per cent



Average contribution rate dependent on pension system and benefits included. Per cent



Literature analysing distributional effects between generations

- Generational Accounts: Auerbach, Gokhale and Kotlikoff (1991)
- Models for overlapping generations: Miles and Iben (2000), Bettendorf et al. (2011)
- Dynamic microsimulation models: Nelissen (1995), Pettersson, Pettersson and Westerberg (2006)
- Our approach: Dynamic microsimulation model Mosart, cf. Andreassen et al. (2020)



Advantage of dynamic microsimulation

- Capture the heterogeneity of the population in combination with rather complicated benefit rules
- Common use in analyses of distributional effects from the social security system on life cycle incomes for persons within specific cohorts
- This analysis: Redistribution between different cohorts – Demands a lot of data
- With dynamic microsimulation: Not only possible to simulate the future, but may also be used to construct data from the past
- Also possible to combine observed and simulated data simultaneously



Information for each person in every cohort over the life course

- Necessary with data for labour market incomes and pension benefits for each person belonging to the considered cohorts
- Mosart used to simulate the further life course for each person
- Major weakness: Lack of data from the first years of working activity for the first cohorts
 - Start the simulation in 1960 based on detailed information from the Population Census
 - Combine with aggregate information from the following years
 - Is still lacking information on contribution to the system for working cohorts before 1960



Further progress towards Mosart 2021

- Based on microdata for the entire Norwegian population from 1967 to 2018
- Constructed consistent microdata for most important characteristics back to 1967
- If beneficial we are now able to start the simulation in 1967
 - The model simulates the historical years in the same way as simulations ahead
 - Yearly updating of characteristics every year based on observations until 2018
 - Calculations of pension benefits for every person and construction of aggregate tables possible from 1967
- We would have used this approach if the project were carried out today probably with only minor effects

Simulate labour supply effects as a result of the 2011-reform

- A closer connection between accumulation of pension entitlements and former labour incomes means a reduction in implicit tax rates
- A direct reform effect on the extensive margin, cf. Hernæs et al (2016)
 - With the old system benefits from the early retirement scheme curtailed against labour incomes
 - Early retirement had no consequences for NIS old-age pensions from age 67
- Effects on retirement from further growth in life expectancy



Calculation of average contribution rate

- Defined by Disney (2004): *The average rate on earnings that would be required to finance current spending on public pensions without budgetary transfers or the accumulation or decumulation of public pension funds*
- Contributions paid by different persons in working age each year are calculated by using the average contribution rate on their labour income



Net rate of interest

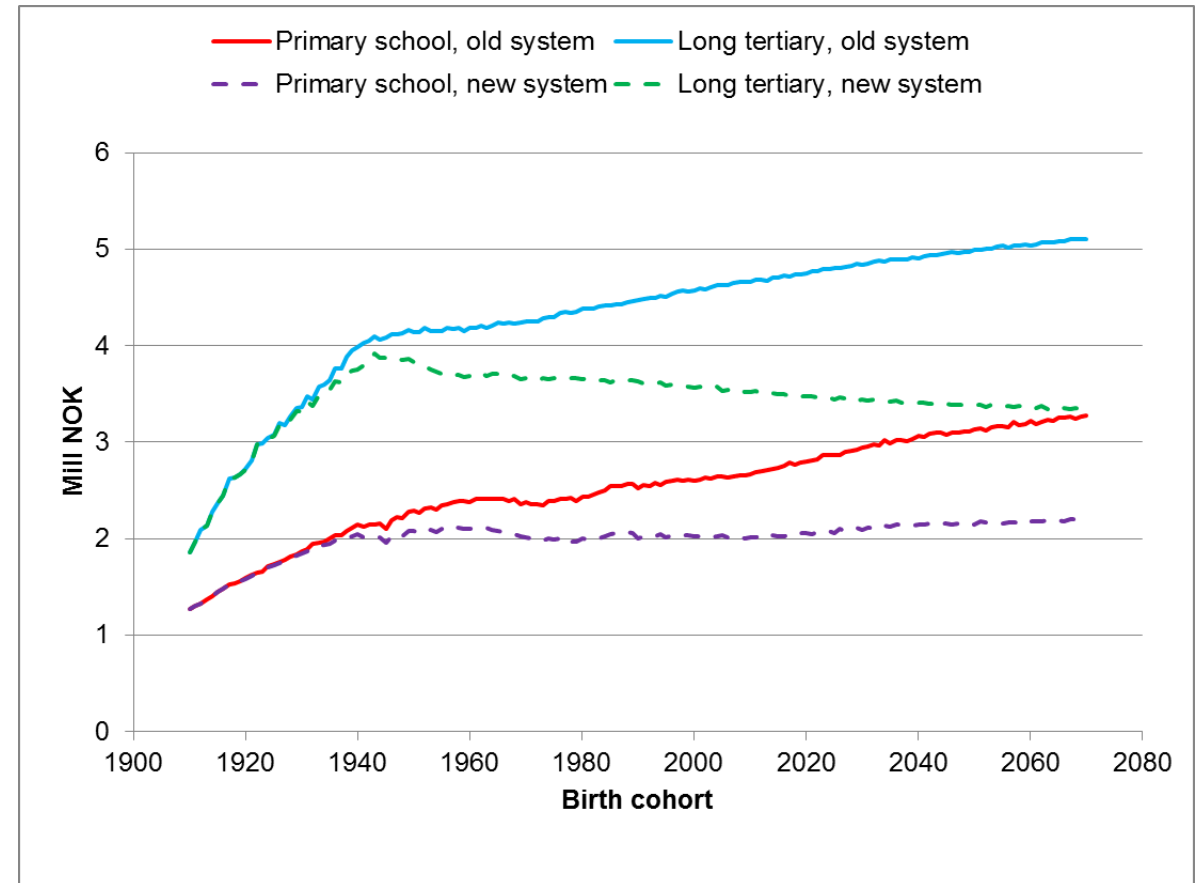
- In NIS accumulated entitlements for old-age benefits indexed by wage growth
- Not appropriate when comparing the present value of contribution with present value of benefits
- To be relevant for long-term analyses the rate of interest must be higher than wage-growth – Otherwise there would be no budget constraint
- Not obvious what rate that should be used. When the analysis was executed in 2015-2017 common to use a long term net rate of 2. Now more common to use 1
- Pension benefits and contributions discounted to the age of 62 for every cohort



Average discounted gross pension wealth at age 62. Net rate 2.

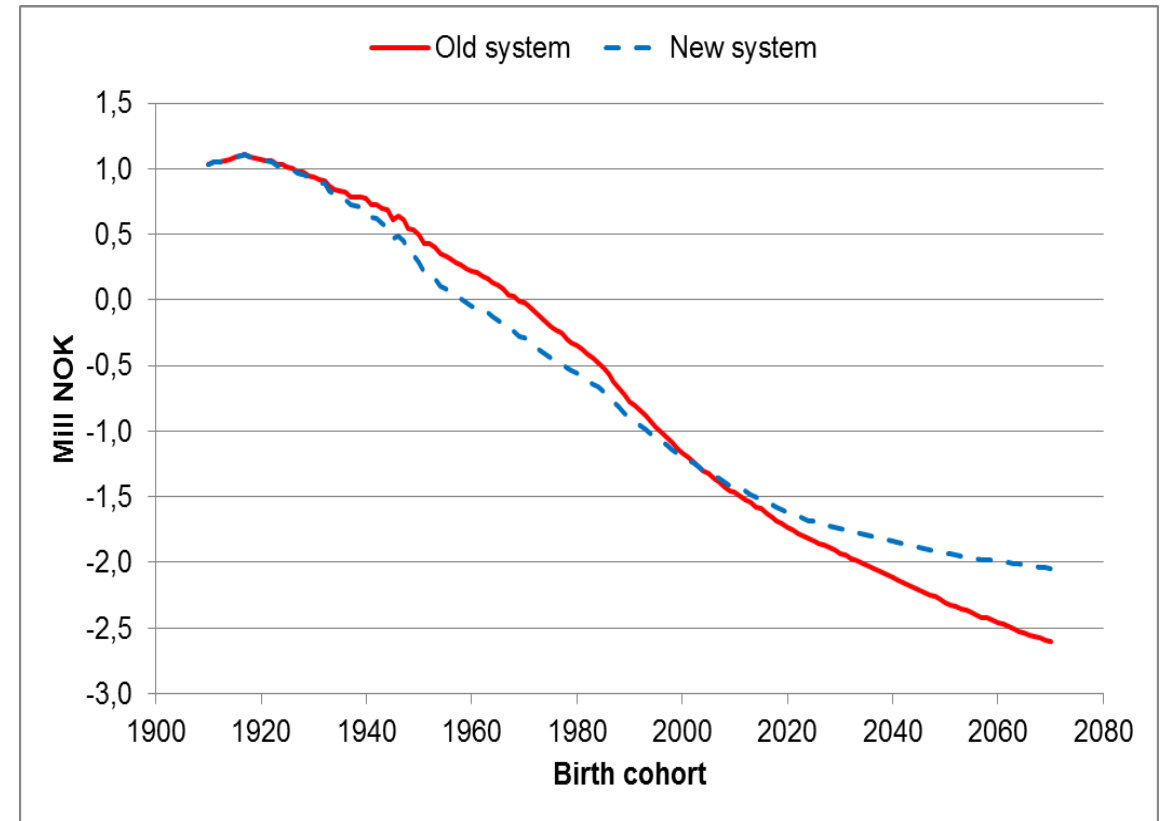
Mill. NOK in 2011 amounts

- Maturing of the 1967-system for the first cohorts
- Also some effects from growing life-expectancy
- Growing life-expectancy counteracted by the pension reform from 2011
- Lower formal indexing of pensions under payment than wage growth also for existing old-age pensioners from 2011
- Higher educated have higher pension wealth than lower educated, but are more hurt by the reform because of indexing over longer life-expectancy



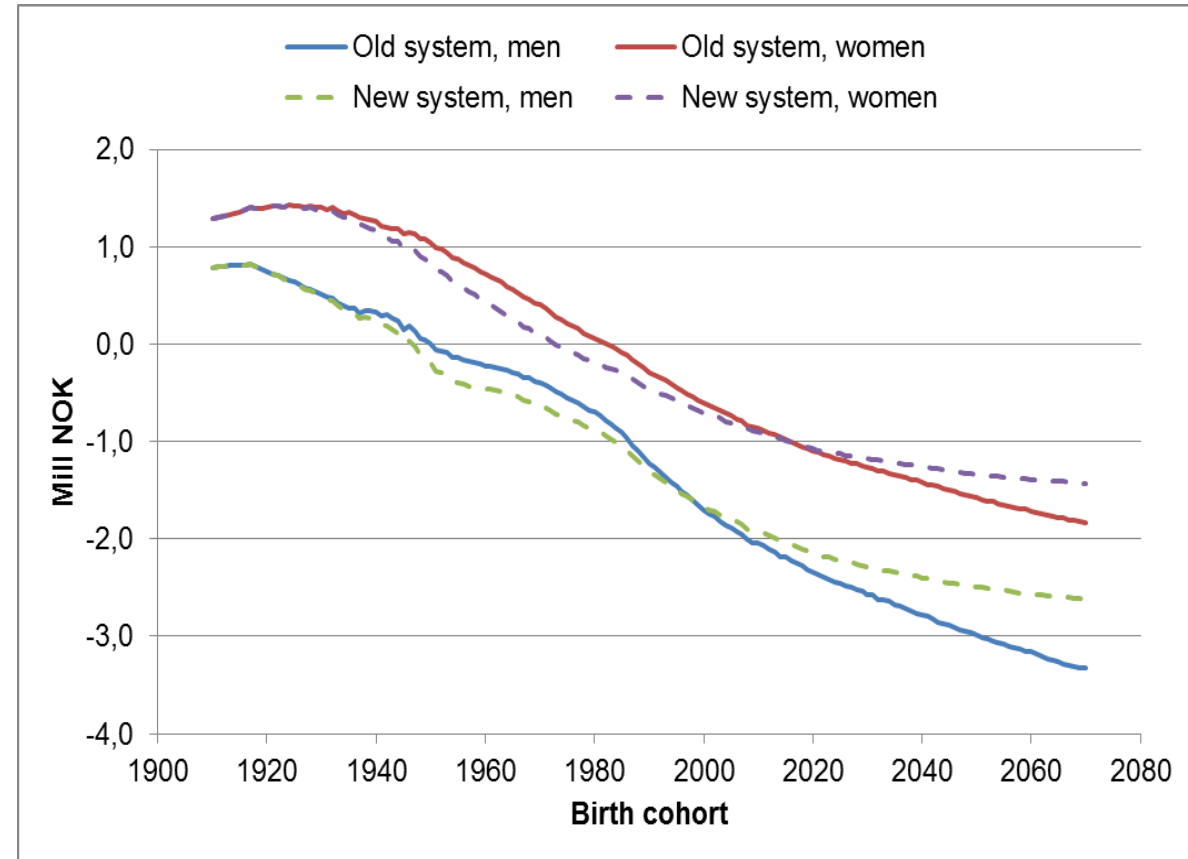
Net discounted value of old-age pension benefits and contributions at age 62. Net rate 2. Mill NOK in 2011 amounts

- The cohorts who established the system had a substantial gain by letting future generations pay
- Younger cohorts contributes to the system first and receives pensions afterwards
- Cohorts born between 1950 and 1980 lose most from the reform because the discounted value of future benefits are reduced more than their contributions
- Cohorts born after 2000 gain



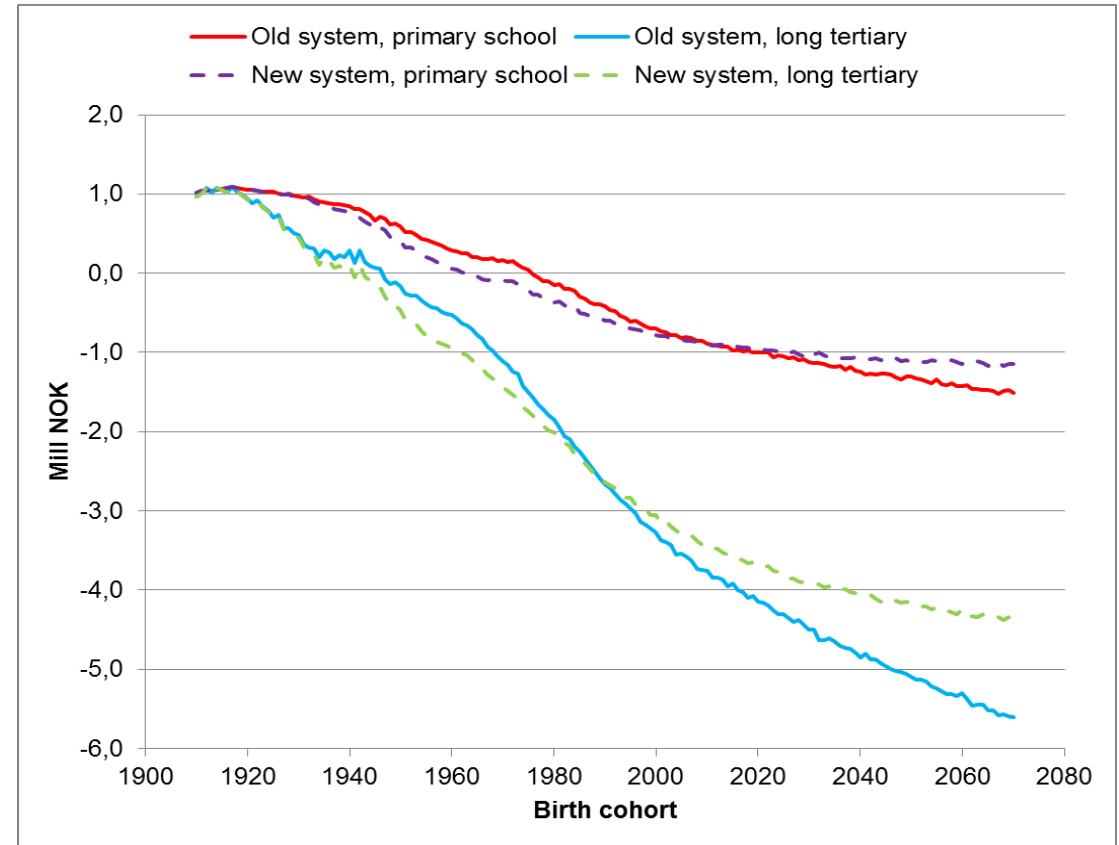
Net discounted value for old-age pension benefits and contributions at age 62 by gender. Net rate 2. Mill. NOK in 2011 amounts

- Women get higher returns than men because they live longer and are favoured by distributional elements
- Slightly smaller redistribution with the new system causes the tightening for women to be slightly stronger than for men
- Still strong redistribution from men to women with the new system



Net discounted value for old-age pension benefits and contributions at age 62 by level of education. Net rate 2. Mill NOK in 2011 amounts

- A significant redistribution from high educated to low educated
- Strengthened redistribution by distributional elements during the maturing of the system
- Stronger distributional elements in combination with no ceiling on contributions in Norway cause a high degree of redistribution
- Slightly smaller redistribution after the reform



Summary

- Dynamic microsimulation is an efficient tool in analysing distributional effects from pension system over the life-cycle **within and between cohorts**
- Possible to lengthen the time series of relevant micro-information for each cohort by
 - **Simulations beyond the last year of observation**
 - **Construction of micro-data before the first year of observation by combining detailed information from a Population Census in a given year with aggregate time-series data**
 - **By constructing consistent microdata we are now able to start every simulation in Mosart in 1967 if beneficial for the analysis**

