DEMEC - a tool for identifying long-term challenges for public finances in Norway

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Outline

1. Motivation for key characteristics of model structure
2. Examples of results and insights
3. Response to some of the criticism of DEMEC based analyses
4. Plans for new analyses and modelling

Origins of DEMEC

1. Long tradition of using long run model based analyses in planning
   - CGE model MSG, and Generational Accounts
2. Different *main* issues => different models => MSG6 replaced by DEMEC and SNOW
3. DEMEC: Fiscal sustainability
   - Detailed wrt population heterogeneity and government revenues and expenditures
4. SNOW: Climate- and environmental policy
   - Detailed wrt industry structure, technologies, environmental policy measures

Fiscal sustainability (FS): Issues

1. **How does FS depend on**
   a. Fertility, mortality, migration
   b. Economic integration = Labour income of «marginal groups»
   c. Productivity growth in private and government sectors
   d. Petroleum revenues, fiscal rule(s)
   e. Ambitions of tax financed provision of private goods

2. **Effects of policy responses to FS problems (not done yet)**
   a. Higher tax rates
   b. Less tax financing, privatization
   c. Policies raising employment
   d. ???

Low priority in our modelling:

- Many private industries, markets and input factors
- Rigidities and realistic short run dynamics
- Behavioural ***changes*** (substitution), *provided* small changes in relative prices

High priority in our modelling

- Detailed classification of government expenditures and tax bases
  - Private substitutes to tax financed services
  - Nonworkers end up with social insurance
- Population classified wrt charcteristics important for labour income versus social insurance:
  - Age, gender, country of origin, years of residence
- Fiscal contributions from average person in each group

- Life cycle perspective => Long run equilibrium: Output determined from the supply side (?)
- Small open economy

Public budget components

- 23 tax financed services
  - Defence is independent of population
  - 6 public s. => uniformly distr. Depend on total population
  - 16 individual s. Depend on gender and age.
    - Independent of country background

- 12 types of cash transfers to households

- Taxes:
  - 5 taxes on personal income (observed distribution of tax bases)
  - Payroll tax (proportional to wages)
  - Tax on business surplus (endogenous distribution)
  - Industry aid (endogenous distribution)
  - Indirect taxes and subsidies (endogenous distribution)

- Petroleum revenues (exogenous)

Population groups defined by…

- Age: 0, 1, 2, ..., 119 years
- Gender
- Origin: 4 groups of countries
  - R0: Norway
  - R1: Western (Western Europe, North America, Australia, New Zealand
  - R2: EEA-countries in East-Europe
  - R3: Rest of the world
- 5 groups of time of residence
  - 0-1, 1-2, 3-5, 6-10, 11+ years
- 4 groups of Norwegians («natives» + 3 decendants)
- 4 types of groups main income

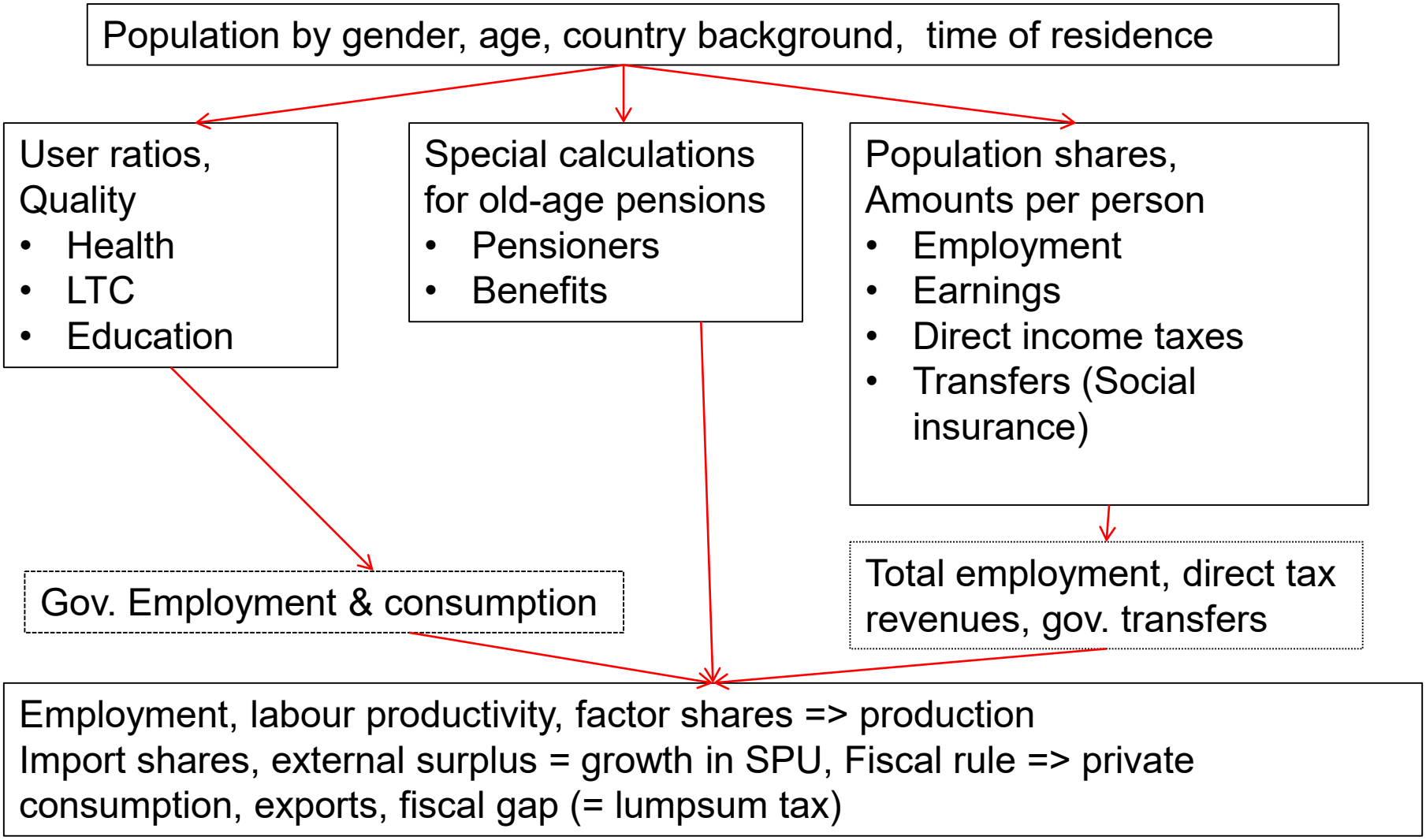
Fiscal contribution from a group

- ***Expenditures*** = *standard x user ratio x persons*
  - Standard = costs/benefit per user/recipient
  - User ratio = user/recipient per person

- ***Direct tax revenue*** = *tax rate x average taxable income x share of tax payers x persons*

- Contributions from each group to ***Indirect taxes and Business taxes (IB)*** determined by the modelling of relevant tax bases

DEMEC-system



Quantification

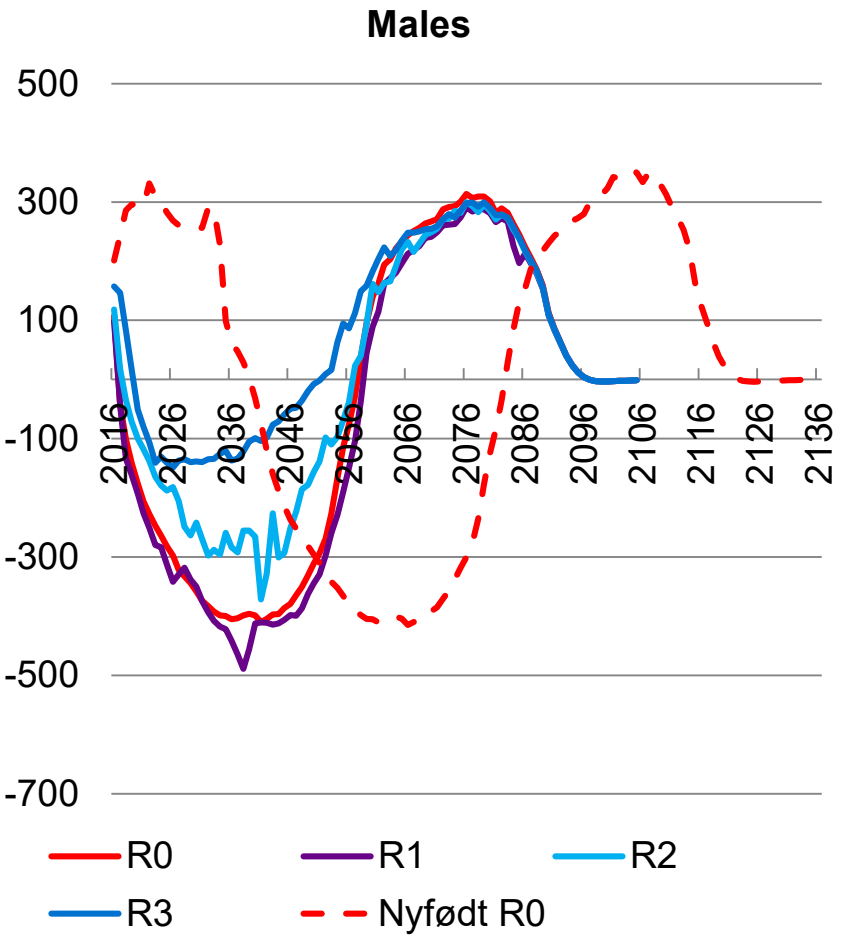
- SSB's demographic assumptions
- Macro variables from National Accounts
- Individual data used to estimate individual contributions to totals. Base year = 2013
- Individual data = Cross sections => hypothetical life courses.
- Cohort effects on life courses reduced by
  - Account for time of residence
  - Corrections for females, especially old age pensions
  - Correcting data for old immigrants (few so far)

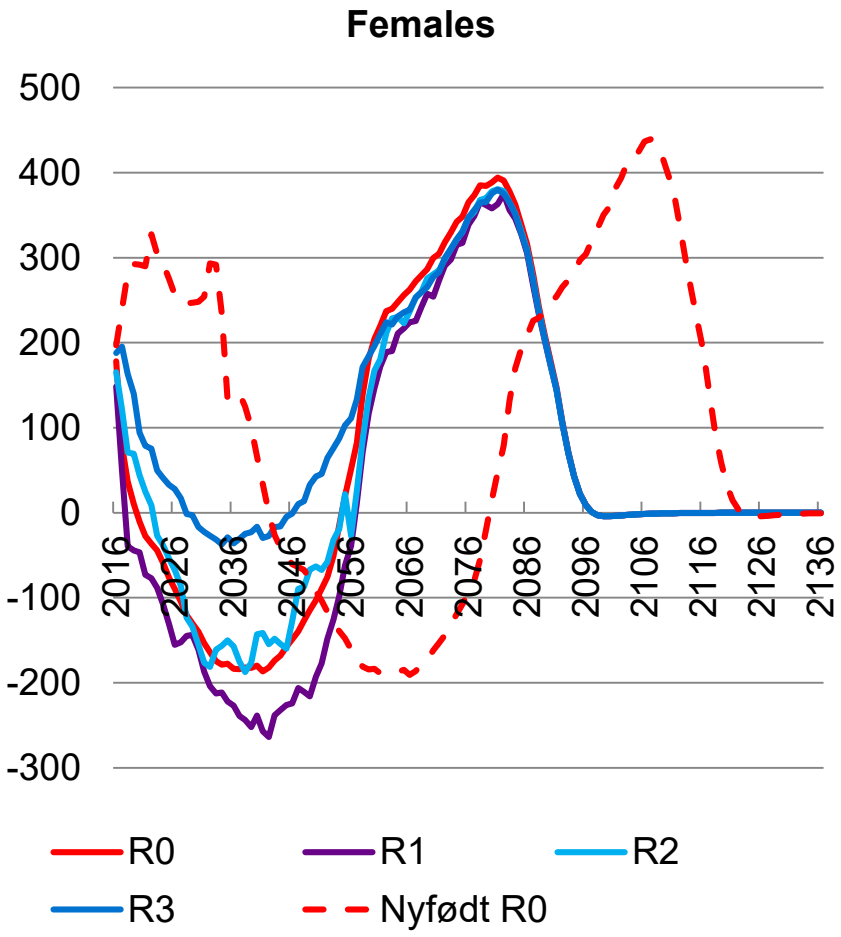
Observed versus latent behaviour

Example:

- Earnings per person = (Earnings/ #employed) x (#employed/ #person)
  - Use observed wages or employment ratios
  - Do not explain them!
  - Implicit prolongation of forces having determined observed behaviour
  - Employment may differ from latent labour supply
- Analogous for other components (Health care, LTC, Disability benefits, …)

Individual fiscal contributions per year from age 25 (0). No decendants, no emigration. 1000 2013-NOK.



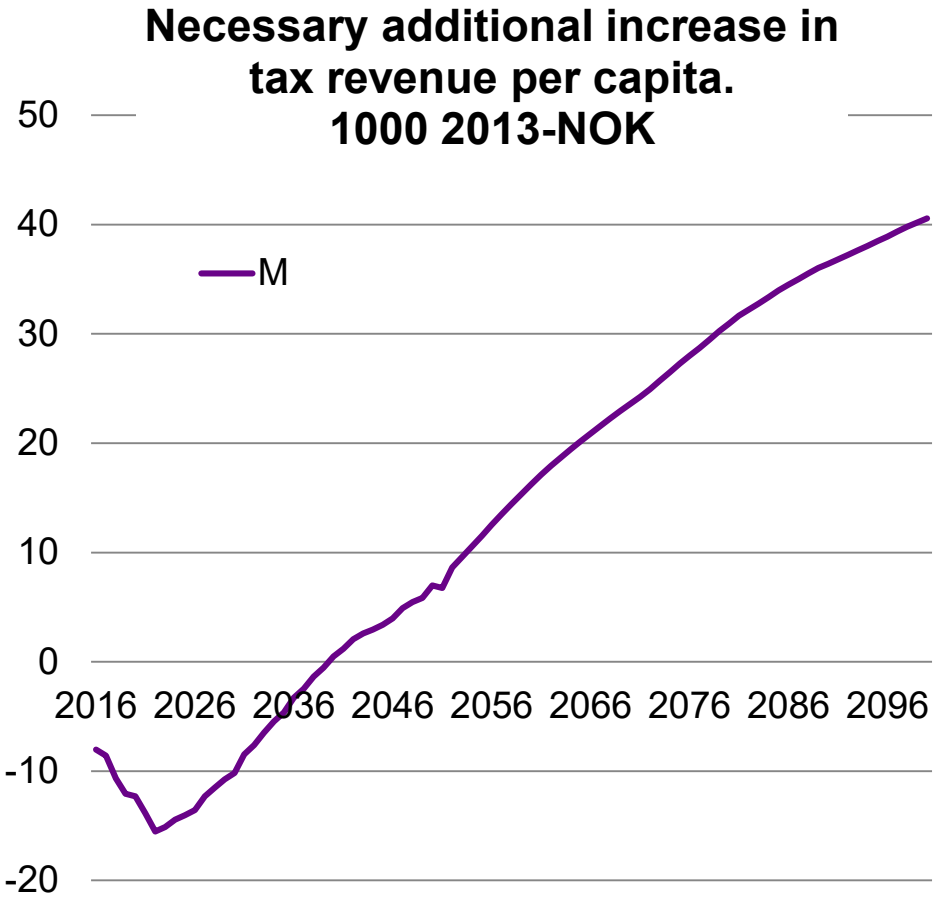


Most groups raise net expenditures

Fiscal contribution during life in Norway starting in 2016
Average persons aged 25 (0) in 2016
Ignore emigration and descendants

Origin	Age at start	Present value, mill. 2013-NOK		Present value/64 years, 1000 2013-NOK	
		Male	Female	Male	Female
Norway	0	1,6	12,1	24	189
Norway	25	-4,1	6,3	-64	98
Western	25	-6,2	2,8	-96	44
EU-East	25	-0,3	6,3	-4	99
Others	25	5,7	11,1	89	174

The Fiscal Sustainability (FS) problem



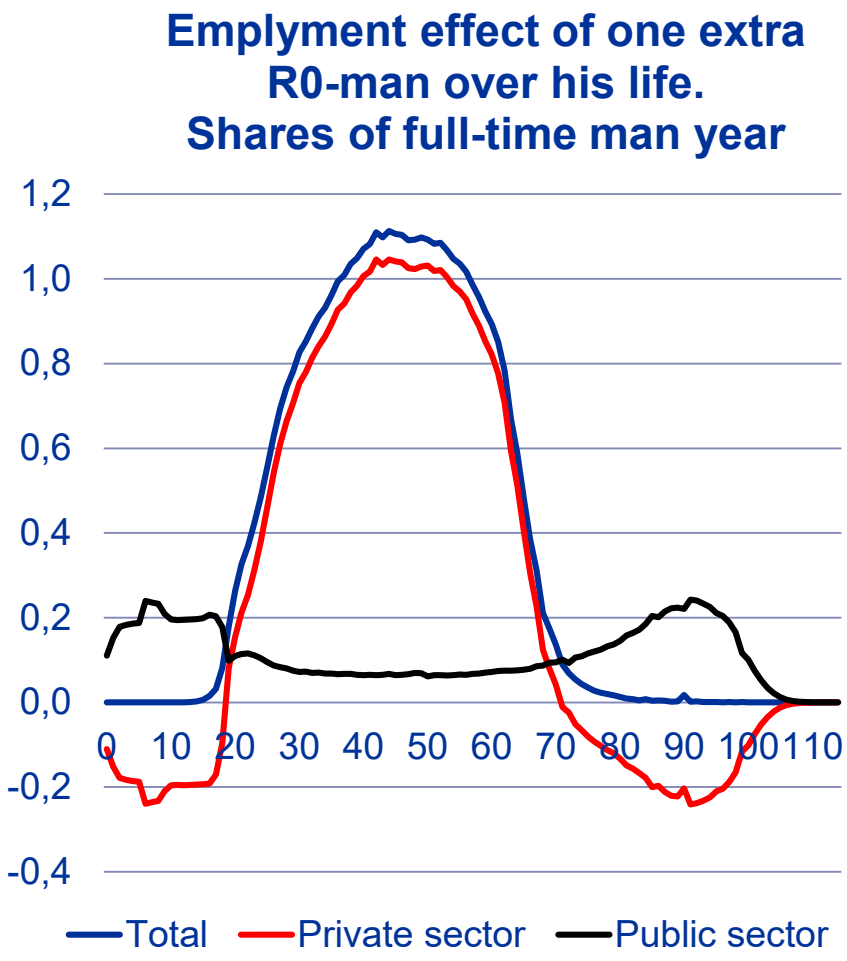
- Maintaining present tax and welfare systems: Gov. expenditures outgrow revenues after 2022
- Deficit compared to the «fiscal rule» increases by 123 2013-USD per capita *every* year 2025-2060
  - 4 % av non-petro GDP in 2060
- Working population/elderly (67+)
  - 2016: 4,5
  - 2060: 2,6 og 2100: 2,2
- Declining growth in the return of the Pension fund
- Contribution from migration = ?

Equilibrium effects (1)

- Entry of (many) new residents does not affect behaviour of any existing residents
  1. Immigrants cause no crowding out
  2. No Keynesian multiplier effects of spending on refugees
  3. No effect on individual wage rates

- Government employment crowds out IB-tax bases

Crowding out business employment



- Change in total employment = extra indiv. employment
- Government spending has no effect on total employment
  - For given tax rates
- Young and old are heavy users of tax financed services
- => loss of IB-tax bases = additional expenditure effect of gov. employment

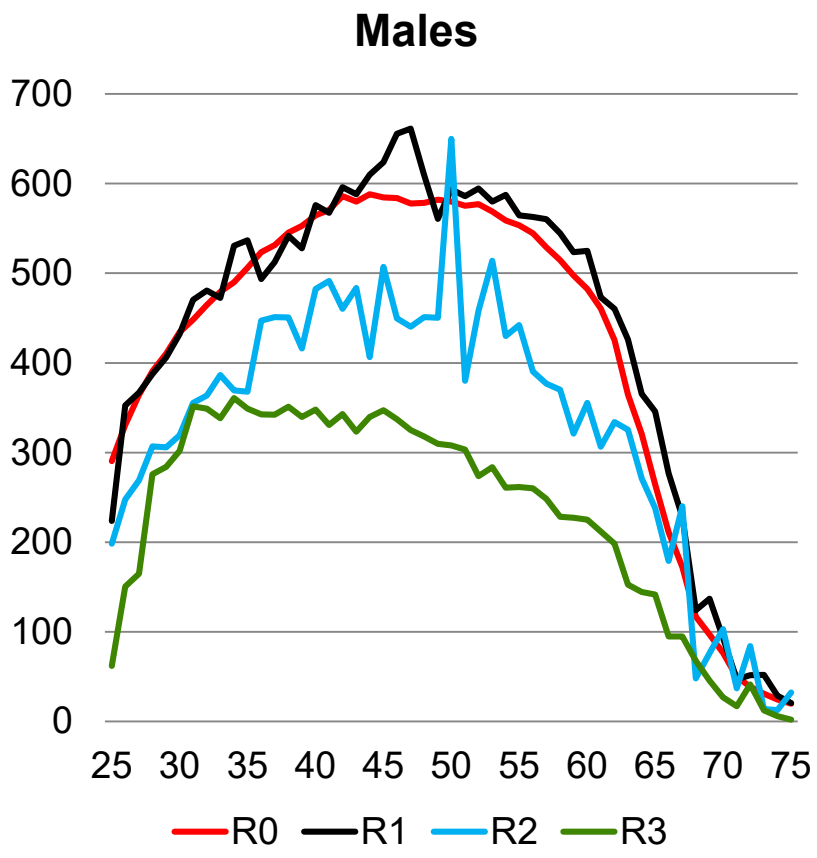
Equilibrium effects (2)

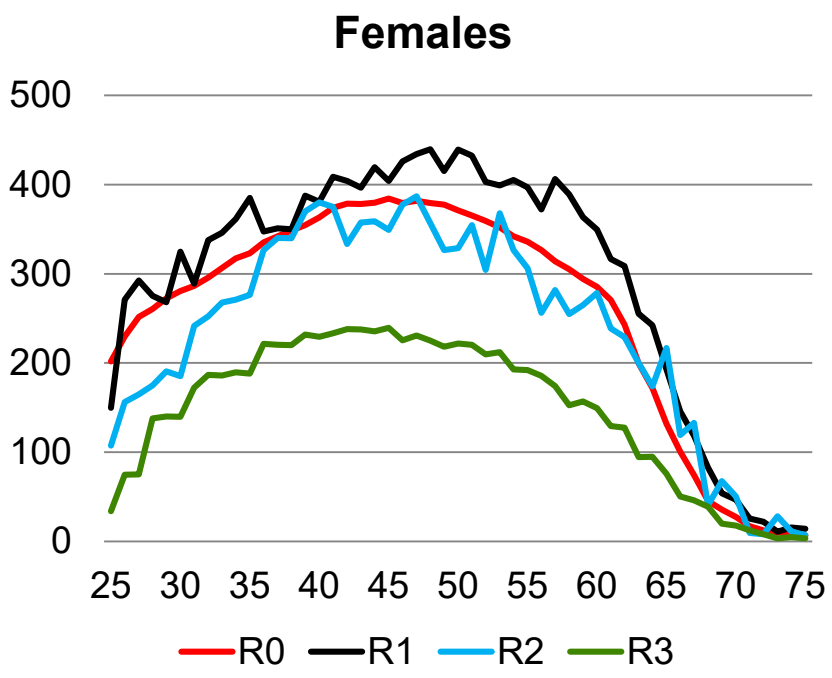
- IB- and payroll taxes produced by labour in private sector
  1. Supply side determination of output/consumption
  2. Tax bases produced by labour in the business sector
  3. Age profiles proportional to labour income profile
  4. Information about distribution of consumption hard to get – and not relevant (necessary)

- Equilibrium effects ignored in simpler models
  - For example Generational Accounts
  - Each public budget component computed independently
  - Typically, IB-tax revenue is distributed *pro rata*
  - Important! IB taxes = 37 % of non-petro primary gov. revenues

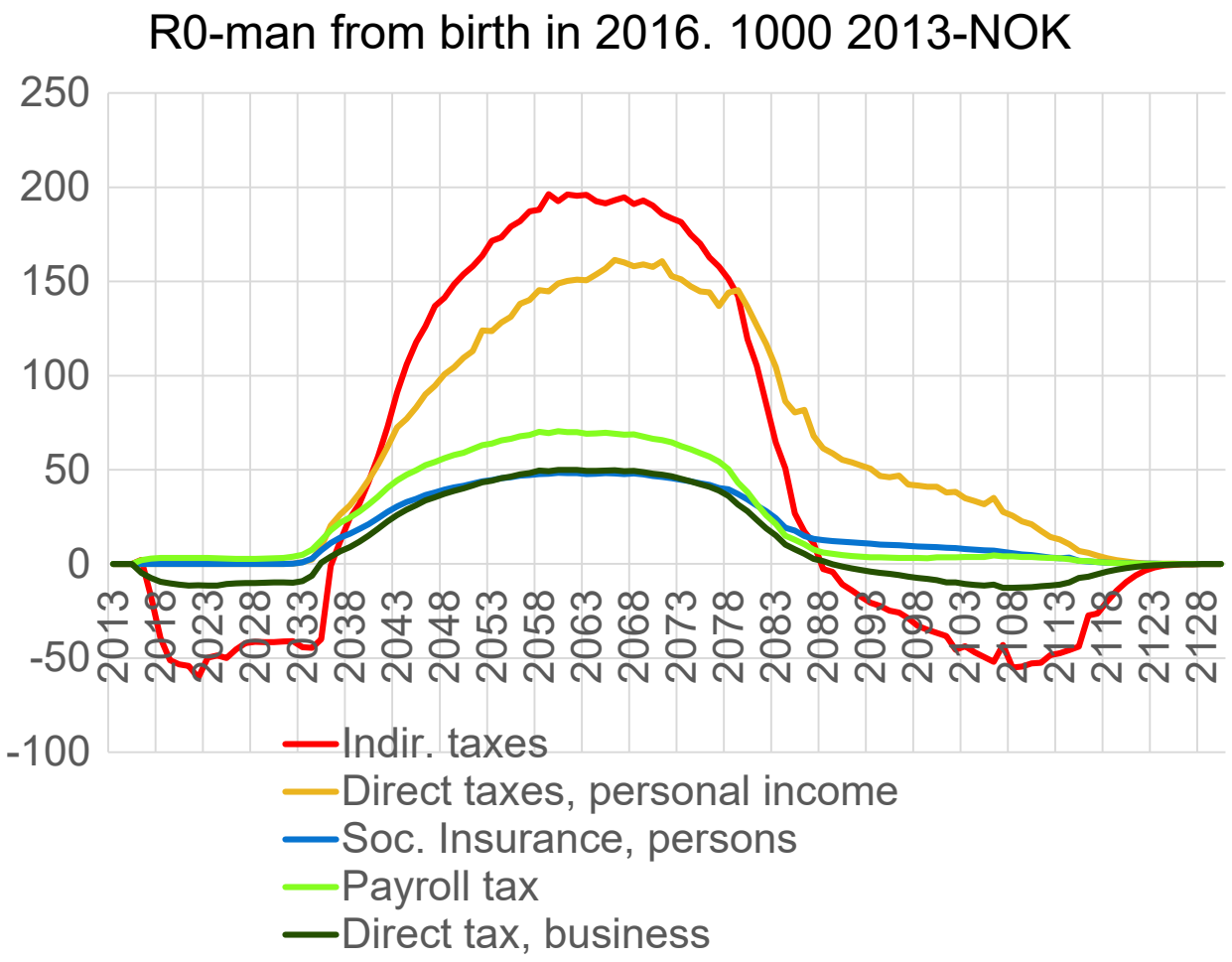
- Reinforces the fiscal role of private sector employment !

How labour income depends on age (25-75), gender and origin. 1000 2013-NOK



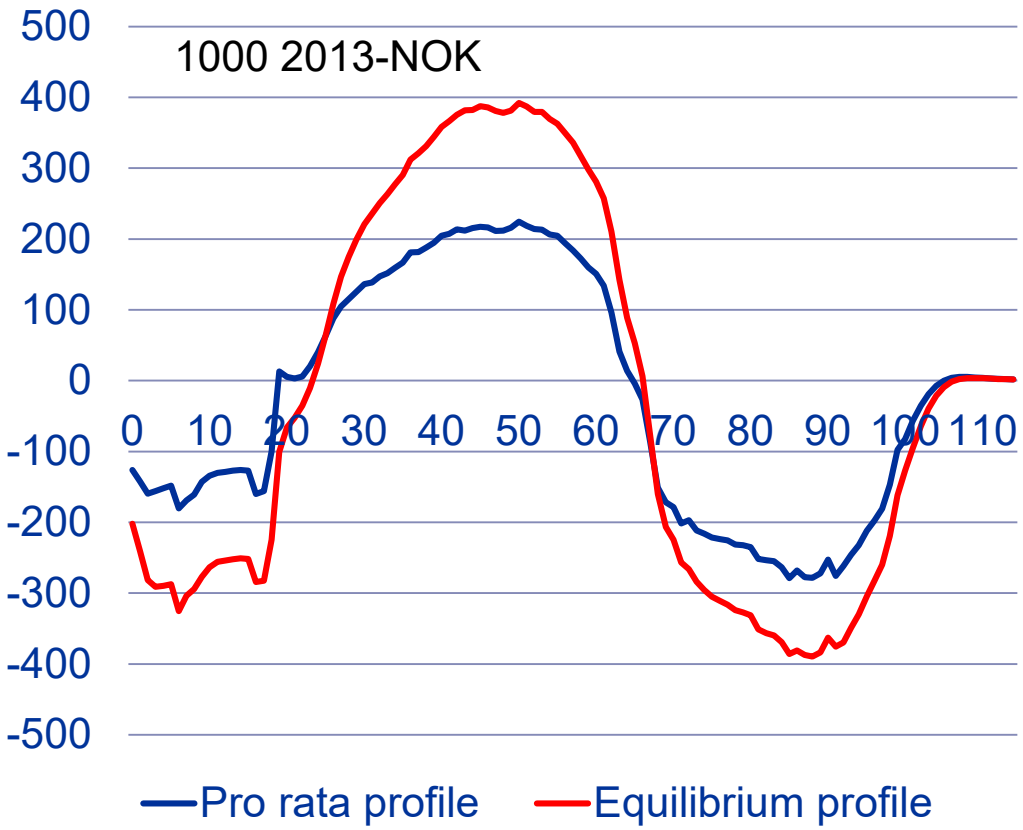


Non-petro tax revenues depend strongly on labour income



- Bases of personal income taxes are sector independant
- ***Effective bases of IB-taxes and payroll taxes*** proportional to labour income in private sector

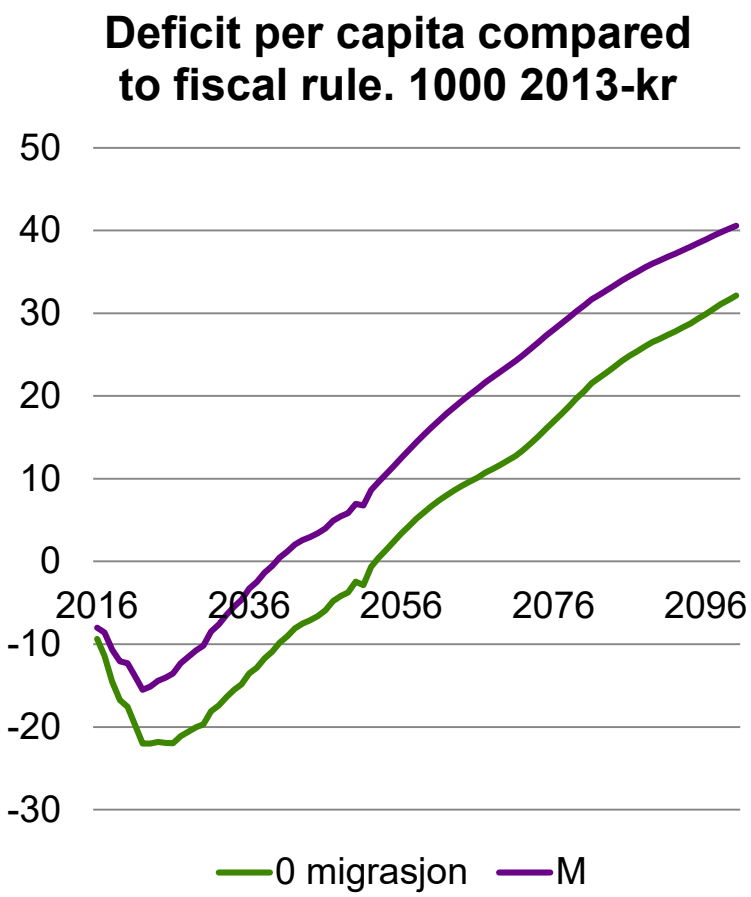
Age profiles of contribution to government primary surplus. R0-man



Pro rata profiles of IB-contributions

=> great underestimation of adverse fiscal effects of ageing

Realistic versus 0 migration



- Account for emigration => Net immigr 25k – 28k from 2025
- Higher share of immigrants from Africa/Asia, working less than others
- Account for decendants

- Reduces per capita returns on gov. wealth

Missing tax revenue increases:

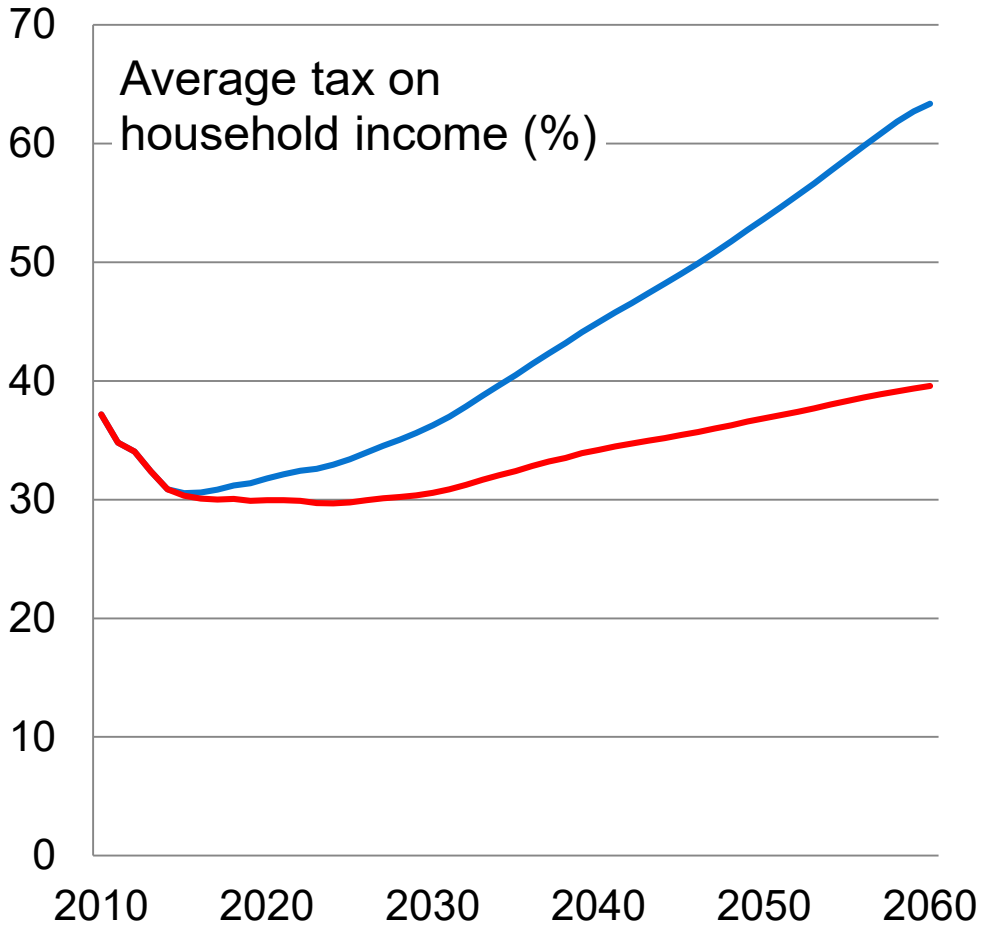
- 1 400 2018-$ each year after 2025
- From 1.6% to 4 % of non-petro GDP in 2060
- **=> Redistribution from «natives» to new immigrants and decendants**

Can Norway grow out of FS problems?

1. Productivity growth in business industries => nearly the same increase in revenues as in expenditures
   - In Norway, with petro-wealth and generous welfare state
   - Productivity growth => wage growth => transmitted to most sectors and social insurance
   - => Nearly equal wage content in tax bases as in expenditures
2. Income effect reduces labour supply
3. Demand for more and better tax financed welfare services (Health, Long-Term Care)
4. Same real income growth for pensioners as workers => no increase in private co-payment

Policy responses => Further developments of DEMEC

Trends => Unacceptable tax burden?



- Constant (red) vs. decline (blue) in working hours from 7,5 to 6 daily in 2058
- 1 % (blue) versus 0 % (red) quality improvments of health and LTC
- Both scenarios account for the pension reform of 2011

Pension reform (2011)

1. **Reduces gap in growth rates between expenditures and tax revenues after 2025**.
   - Old instead of the new system in 2060:
     - Revenues would have been 8,4 % lower,
     - Expenditures would have been 4,4 % higher (Old-age pension expenditures +21,8 %)
2. **Stimulates employment.** Old instead of the new system in 2060: **-**6,5%
   - Raises all tax bases except petroleum revenues
3. **But: Loss of equity**

Discussion (1): Modelling the future

- Criticism of our report on migration – not of other studies using similar DEMEC-projections
  - *Productivity, Comission*, *Perspective Report; Migration comittee*
- Model based analyses of the future criticized as a general approach
  - Less criticism of specific assumptions
- Models summarize relevant information and precise logical deductions
  - Widely accepted as a necessary scientific tool
  - Do models become bad when they replace simplifcations with realism to the extent that they must be solved by computers rather than pen and paper?
- DEMEC relies on standard theory of small open economies
  - Several effects not active due to the nature of our simulation experiments
  - Intentionally not original wrt theory
  - Accounts for important Norwegian characteristics
  - Much more sophisticated than Generational Accounts

1. Uncertainty
2. Behaviour

Discussion (2): Uncertainty

- Should projections be trusted? Errors of type 1 and 2
- Yes, we don't know what has not happened… But we know a lot, often enough
- The alternative to consistent and realistic modelling of policy today is inconsistent guesswork
- Projections contingent on today's policy not intended to be realistic
  - Show the need for policy changes
  - Global warming, Fiscal sustainability
- Too long horizon?
  - Do we study weather or climate?
  - Life cycle perspective important
  - Not very uncertain that persons aged 30 today will be 80 years in 2068,…
  - and that they then will be pensioners and consume a lot of health services,…
  - and that most of them will have worked until age 65-70
  - How should the fiscal rule and the pension reform be motivated if we in 2000 were cencored from taking ageing after 2025 into account?
- Projections are uncertain, but are they ***biased***?
- Sensitivity analyses show model properties and degree of robustness
  - May obscure what is regarded as most realistic

Discussion (3): Behaviour

- Models are simplifications
  - For good reasons DEMEC provides a detailed picture of relevant heterogeneity,
  - But analyses so far have ignored changes in behaviour
- Projections contingent on present policy
  - Constant tax rates => less reason to adjust behaviour
  - Isolate the diagnosis of FS problems from effects of solving them
- Effects of demography on relative prices (real wage)
  - Norway is a small open economy
  - «Scandinavian model of inflation» helped by centralized wage setting
  - Wages in some sectors have been negatively affected
  - Will that be the *long run* result if the future brings more of existing types of labour?

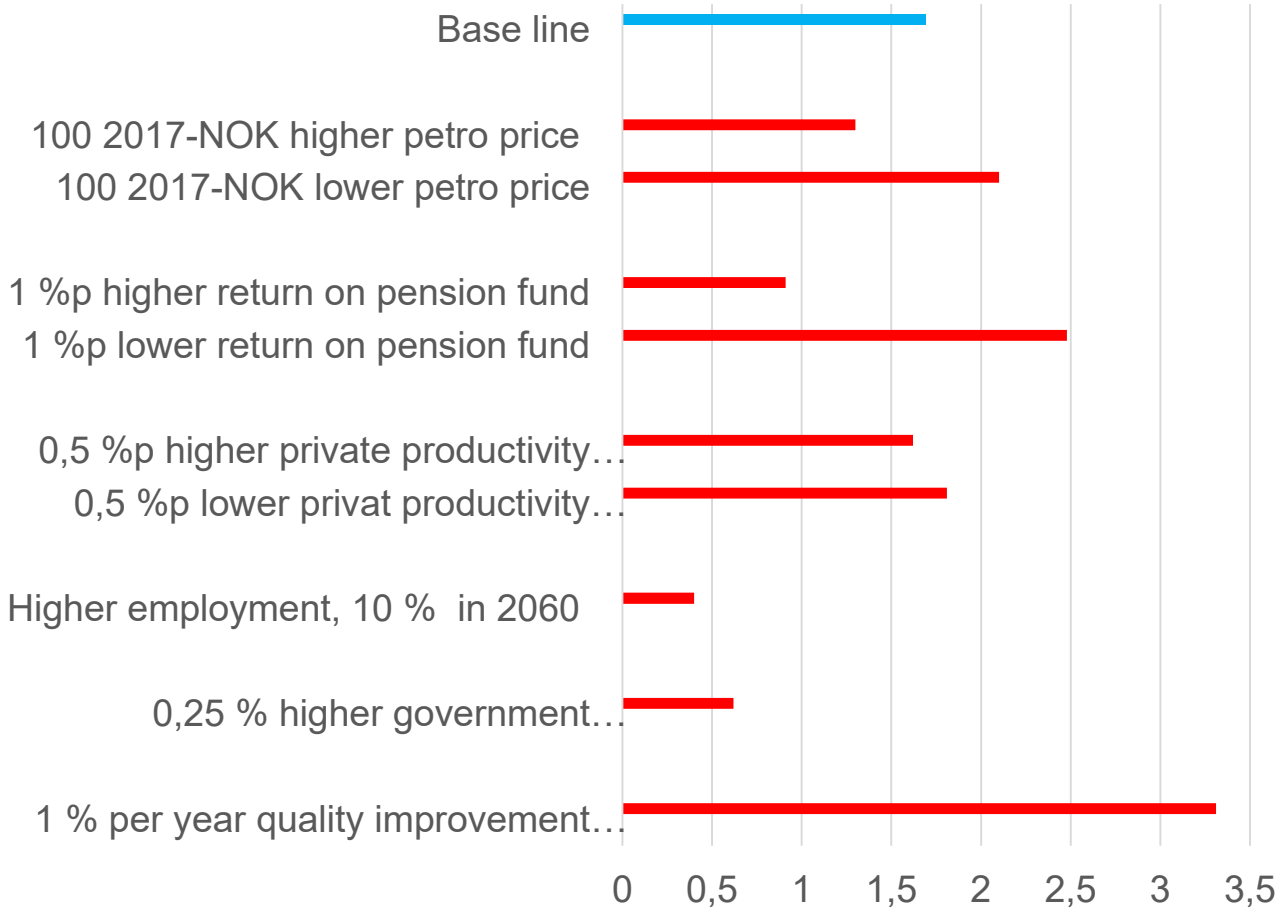
Plans for new analyses/modelling

- Effects, including behavioural, of closing the fiscal gap
  - Stimulating employment
  - Taxes
  - Decreasing share of tax financing

- Endogenous labour force
  - Focus on NEETs, Disabled/Sick, Migrants, Old workers
  - Supply incentives: Social insurance versus work
  - Demand incentives: How employ the least productive
  - Compressed wage distribution => minimum wage not much higher than social insurance

- No ambitions of adressing distributional effects

Deficit compared to Fiscal Rule. % of non-petro GDP in 2060 (Persp. Report)



Sensitive to:

- Employment
- Return on pension fund
- Productivity in tax financed production
- Quality of health and LTC services

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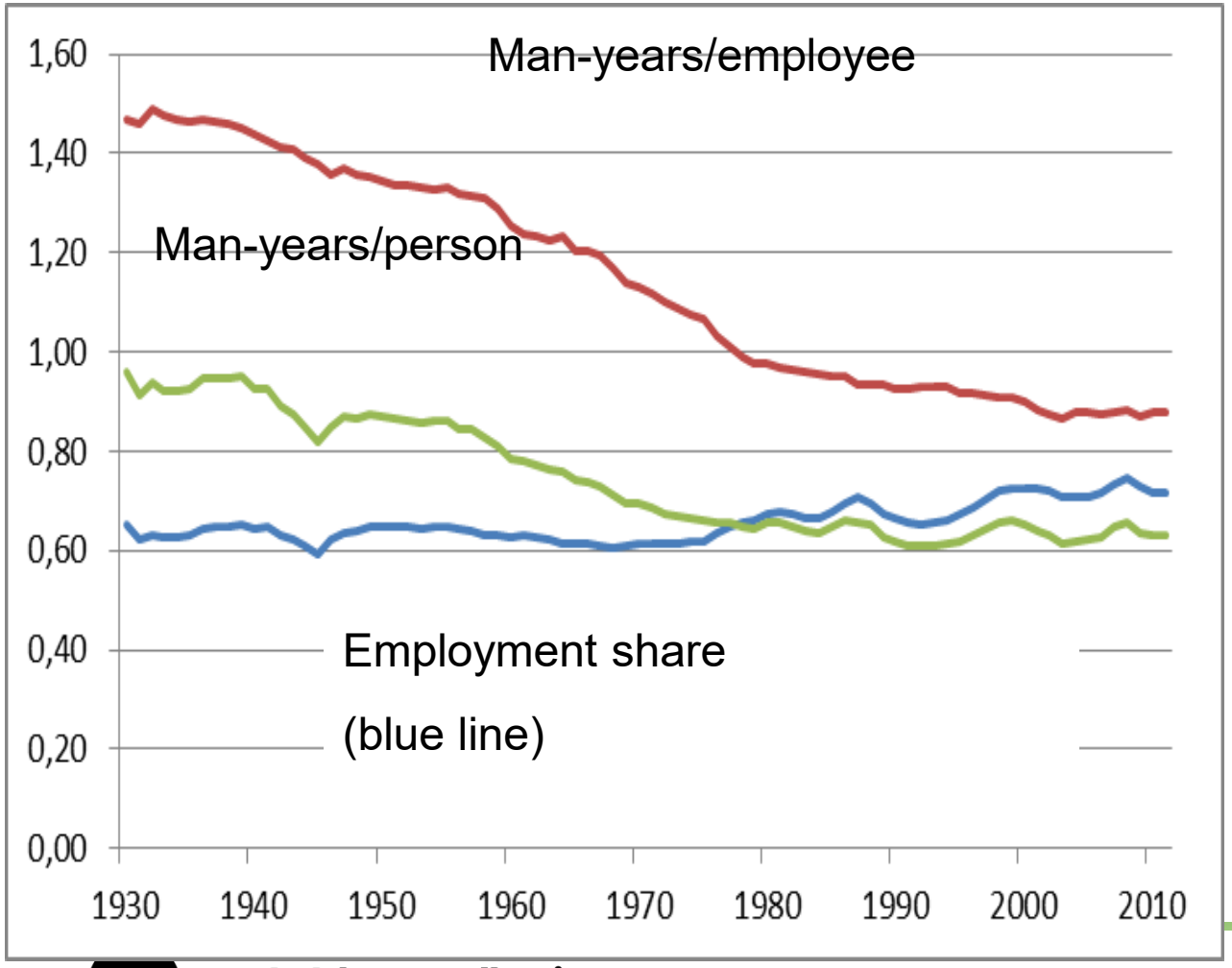
Productivity growth has reduced working hours



- High employmentsshares
- But nearly 20% of individuals in working age receives health benefits

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