Development of pension expenditure projections as a share of GDP 2017-2060

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2nd annual Research Capacity Building 4-lateral Meeting
May 18 2018, Institute of Economic Sciences, Belgrade

Methodology

- Based on the European Comission methodlogy
  - Economic Policy Committee (EPC)
  - Directorate General for Economic and Financial Affairs (DG ECFIN)
  - Ageing Working Group (AWG)

- Data
  - Labour Force Survey (LFS)
  - Penn World Table’s (PWT)
  - AMECO
  - Pension and Disability Insurance Fund (PIO)

Outline

- GDP projections
- Pension expenditure projections
- Pension expenditure as a share of GDP
- Decomposition and sensitivity tests

GDP projections

Production function

- Production fucntion (Cobb-Douglas) is on the long-term determined by demographic pojections (provided by SORS) and the assumptions related to the other growth components

$$GDP = TFP * L^{\beta} * K^{1-\beta}$$

- GDP – Gross Domestic Product (current prices, 2016)
- L – Labour market component (total weekly working hours)
- K – Capital Stock
- TFP – Total factor productivity
- β – Labour share – 0,65*

$$\text{GDP growth}(\%) = \text{TFP growth }(\%) + \beta * \text{L growth }(\%) + (1-\beta)\text{K growth }(\%)$$

GDP projections

Labour supply (L)

$$L = \text{Total hours} = (LF * (1 - UR) * \text{Hours})$$

- LF – Labour force (total active population)
  - based on demographic projections (SORS) and Cohort simulation model (IES)
- UR – Unemployment rate
- Hours – weekly hours of work

GDP projections

Projection of the LF - Cohort simulation model

1. The starting point of the projection are **participation rates by gender and single age cohorts** for the last year available (2016)
2. In the next step, we calculate the **entry/exit rates by gender and single age cohort** (average 2008/2013 and 2014/2016)

$$Ren_{x+1} = \frac{Pr_{x+1}^{t+1} - Pr_x^t}{1 - Pr_x^t}$$

   - the exit rates for older workers (55-74) are adjusted for future effects of pension reforms: early (both genders) and old age retirement (women)

3. The participation rate from 2016 onwards is then calculated as

$$Pr_{x+1}^{t+1} = Ren_{x+1}(1 - Pr_x^t) + Pr_x^t$$

4. LF = age/gender specific projected participation rates * corresponding population projections (SORS)

Cohort simulation model - results

Graph 2: Average entry and exit rates for men and women, by age cohorts

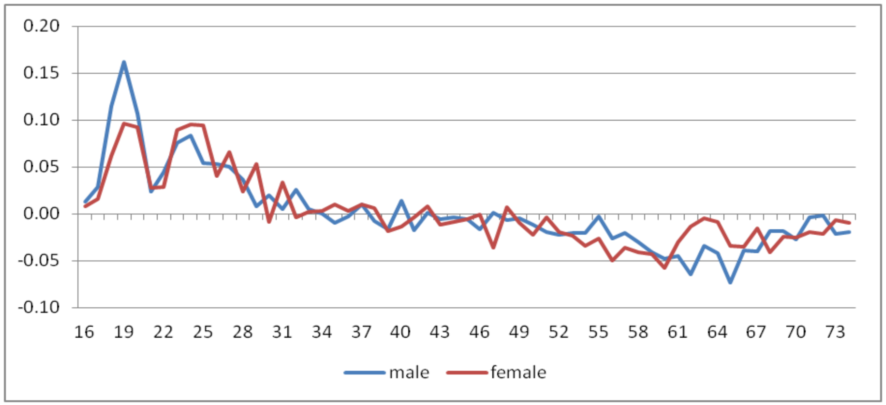
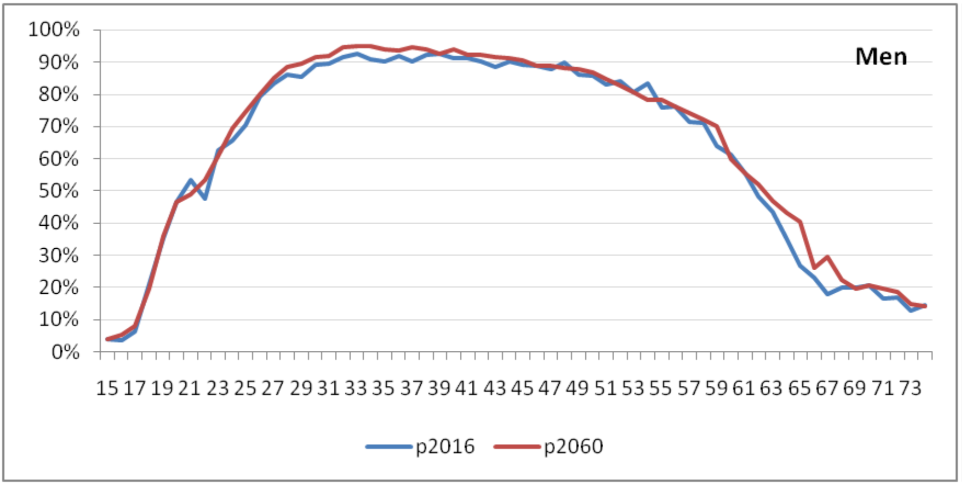
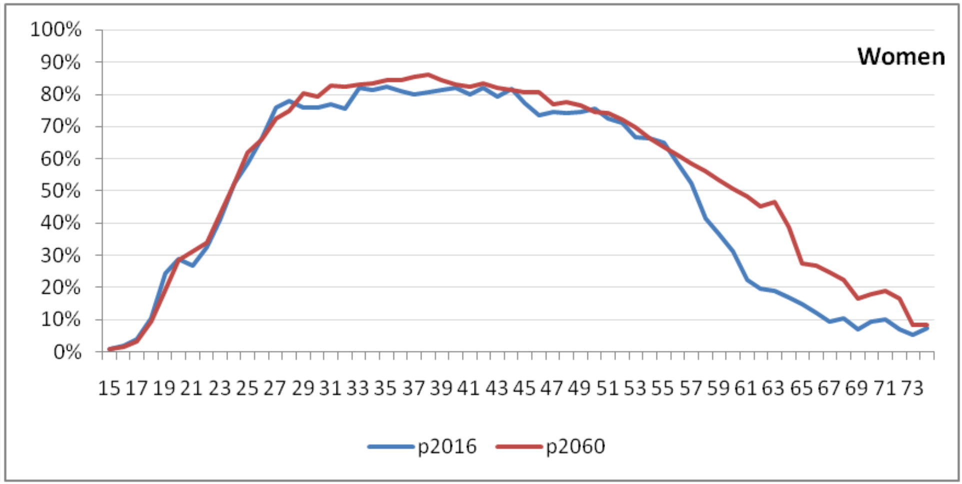


Table 4: Projected participation rates

	Male			Female		
	2016	2060	d	2016	2060	d
Total (20-64)	78.1%	80.2%	2.1p.p.	62.1%	68.9%	6.7p.p.
Youth (20-24)	55.6%	55.8%	0.2p.p.	36.6%	37.8%	1.1p.p.
Prime age (20-24)	87.8%	89.2%	1.4p.p.	76.1%	78.6%	2.5p.p.
Old age (55-74)	59.8%	63.1%	3.3p.p.	35.3%	52.4%	17.1p.p.

Graph 3: Participation rates 2016 and 2060 for men and women, by age cohorts





GDP projections

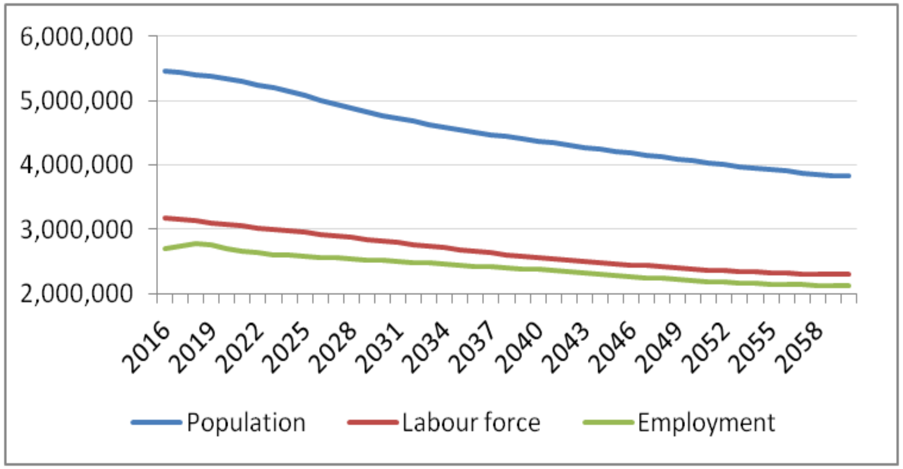
- **Unemployment rate**
  - Short-term - AMECO estimates (13.1% - 2017, 11.0% - 2018)
  - Mid-term (until 2024) – convergence towards 13.1%*
  - Long term – convergence towards long-term Anchor for the countries with high unemployment – 7.5% until 2040 (DG ECFIN & AWG, 2014) and remains at that level until the end of the period
  - Gender-age specific unemployment rates are calculated by keeping the structure of the unemployment rate (by age and gender) from the base year (2016) unchanged throughout the projection period
- **Employed** = Active – Unemployed
- **Hours of work** assumptions
  - Constant by the type off work (full/part time) and gender
  - Constant part-time share by gender and age groups (15-24, 25-54 and 55-74)

GDP projections

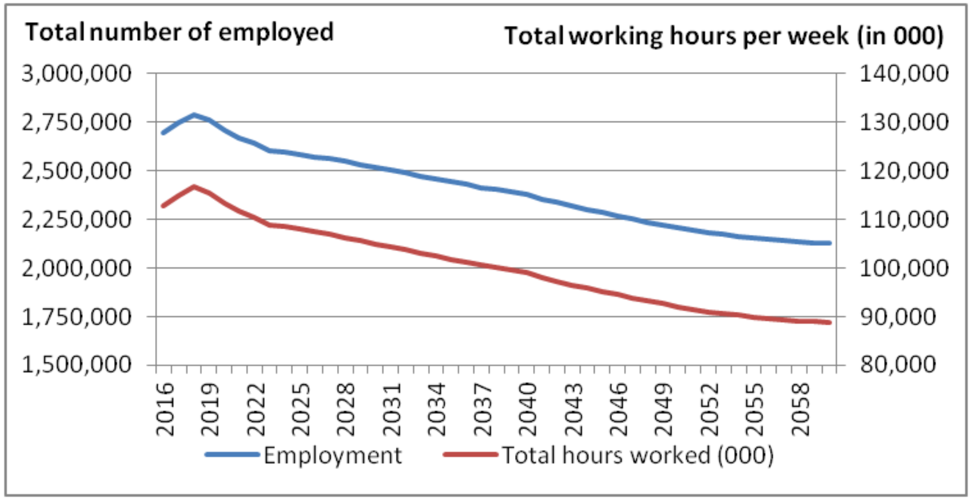
Labour supply (L) – Total hours worked

- Although the participation rates are expected to increase, long term labour supply is expected to decrease due to population projections
- Total hours worked drop is going to be lower than the population drop due to higher participation and lower unemployment rates

Population, Labour Force and Empoyment projections



Employment and Total hours worked projections



GDP projections

Capital stock (K)

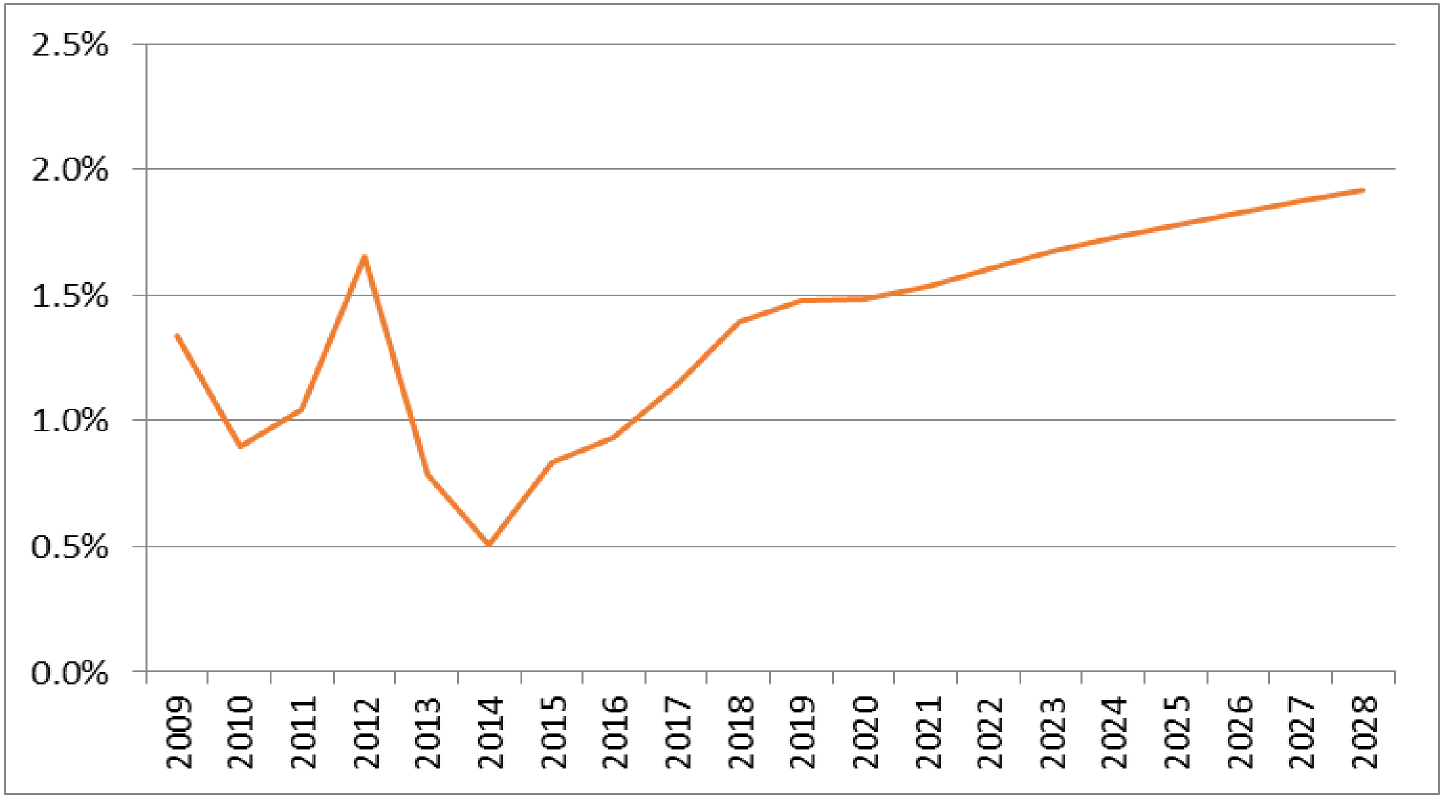
- ***Starting point*** of the analysis: Penn World Table (Feenstra, et al., 2015)
  - last available data 2014
- ***Short term estimates*** (2015 – 2018) – Perpetual Inventory Method

$$K_t = K_{t-1} + I_t - D_t$$

  - I_t - AMECO estimates of the Gross fixed capital formation
  - D_t constant, based on average 2005-2014 Capital stock depreciation rate (Penn World Table)
- ***Mid-term estimates*** (2019 – 2028)
  - "investment rule“ – net investments follow a univariate AR model
  - Our estimates indicate that the ***growth of investments*** is an AR(2) process

Metodologija projekcije GDP

Short and mid-term projections of Capital Stock growth rate



GDP projections

Total Factor Productivity (TFP)

- ***Starting point*** of the analysis: Penn World Table (last available 2014)
- ***Short term estimates*** (2015 – 2018)
  - residual aproach based on the projection of GDP (SORS, AMECO), L (IES) i K (IES)

Short-term projections of Total factor productivity growth rate

	GDP	Labour input (L)	Capital Stock (K)	TFP
2015	0.8%	1.3%	0.8%	-0.35%
2016	2.8%	4.4%	0.9%	-0.37%
2017	1.9%	1.9%	1.1%	0.27%
2018	3.3%	1.6%	1.4%	1.78%

- ***Mid-term estimates*** (2019 – 2028) depend on projected GDP

$$TFP\ growth\ (\%) = [1.5\% * \left(1 - \frac{GDP_{Serbia,2018}}{GDP_{EU,2018}}\right) + 1\% * \left(\frac{GDP_{Serbia,2018}}{GDP_{EU,2018}} - 0.5\right)]/0.5$$

- 2018 GDP of Serbia in 2018 will represent 38.7% of the EU, and the TFP growth rate should **converge to 1.61%**

GDP projections

Long term estimates

Total Factor Productivity (TFP)

- 2029 – 2038 growth depends on projected GDP

$$TFP\ growth\ (\%) = [1.5\% * \left(1 - \frac{GDP_{Serbia,2028}}{GDP_{EU,2028}}\right) + 1\% * \left(\frac{GDP_{Serbia,2028}}{GDP_{EU,2028}} - 0.5\right)]/0.5$$

  - 2018 GDP of Serbia in 2018 will represent 43,6% of the EU, and the TFP growth rate should **converge to 1.56%**
- 2039 – 2060 TFP growth converges to 1%

Capital stock (K)

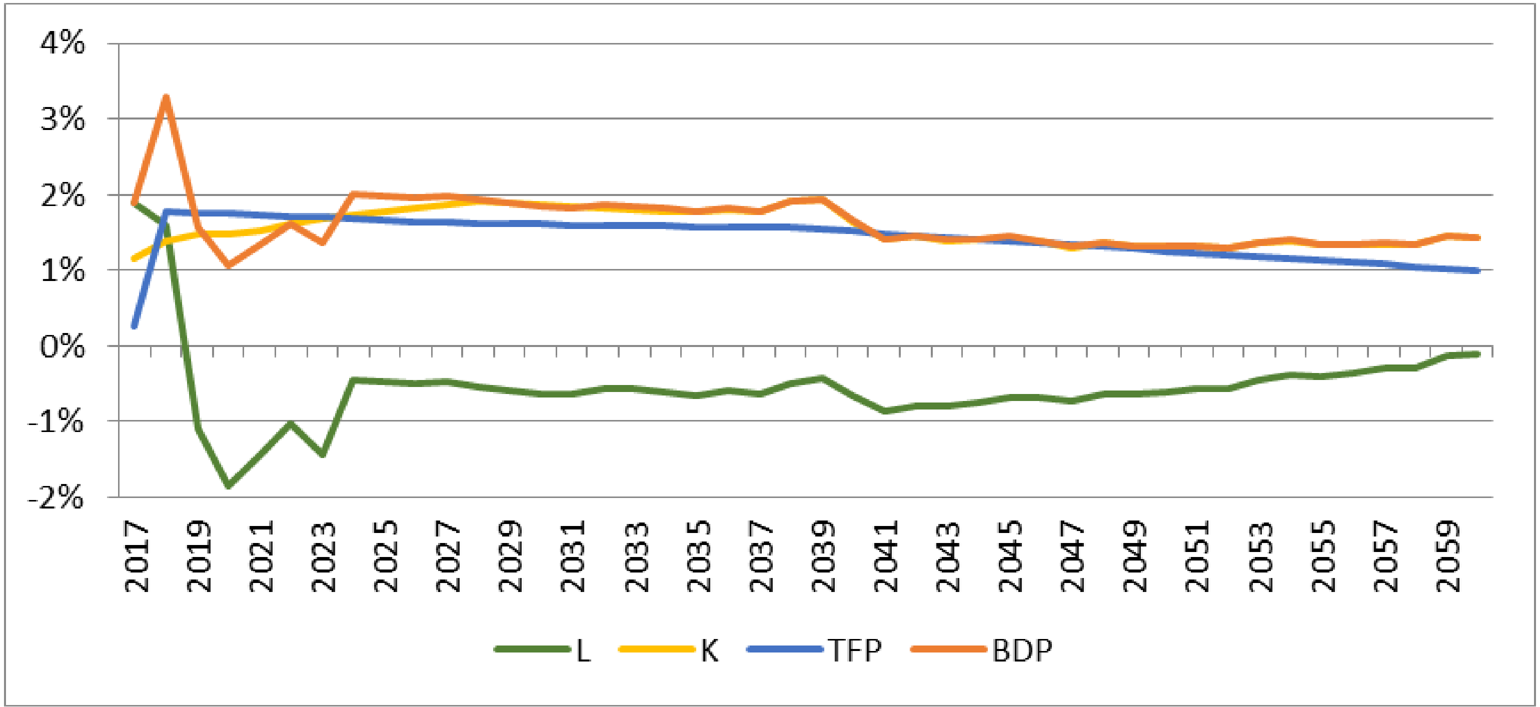
- Long-term K trend is determined by a long-term equilibrium K=L/(TFP/β)

Gross domestic product (GDP) mid-term and long-term growth:

$$GDP\ growth(\%) = TFP\ growth\ (\%) + \beta * L\ growth\ (\%) + (1 - \beta)K\ growth\ (\%)$$

GDP projections

- Mid-term GDP growth (2019-2028) of about 1.7% is dominantly determined by L trends
- Long-term GDP growth (2029-2060) of about 1.5%, determined majorly by the TFP i K assumptions



Pension projections

Number of pensioners

Separate projection for each type (old age, disability and survivor's), scheme (employees, self-employed and farmers), gender and age

1. ***Starting point*** **–** number of pensioners in 2016 (PIO data)
2. ***Exit rates*** - mortality rates $(1 - V_t)$ for each age and gender group (depend on population projections)
3. ***Entry rate*** (type, scheme, age and gender specific) **+ reforms**
   - Entry rate = Number of new pensioners / Population
   - Average for the period 2011-2016, constant throughout the period

- Total deceased $PD_t = P_{t-1}(1 - V_t)$
- New pensioners $NP_t = Entry\,rate * Pop_t * V_t$
- **Total pensioners in year t** $\boldsymbol{P_t = P_{t-1} - PD_t + NP_t}$

Pension projections

Average pension

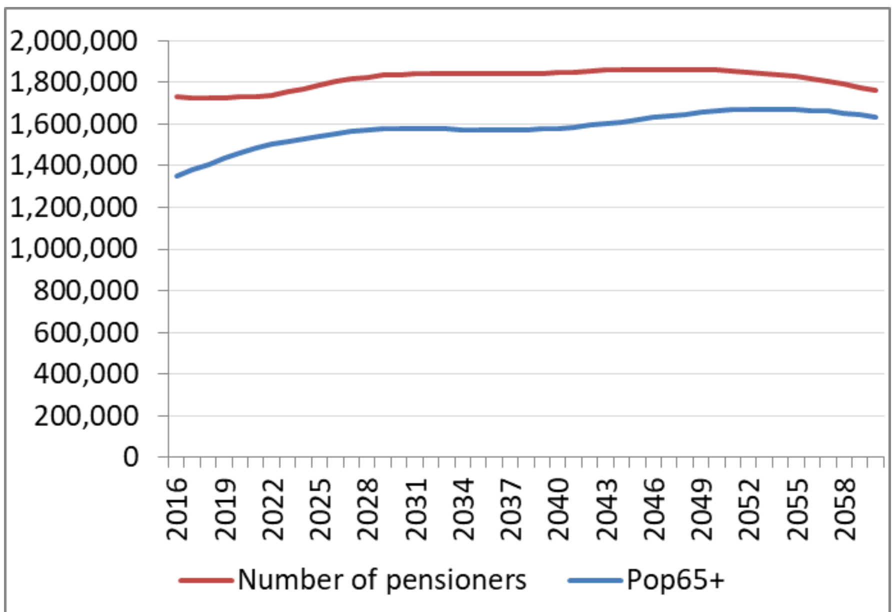
- There is no clear formula which defines the pension growth in Serbia, adjusted on a yearly level, depending on the budget
- Assumption: real annual growth of 1.2%
- Starting point – the amounts of pensions for each group from 2016. (PIO fund)

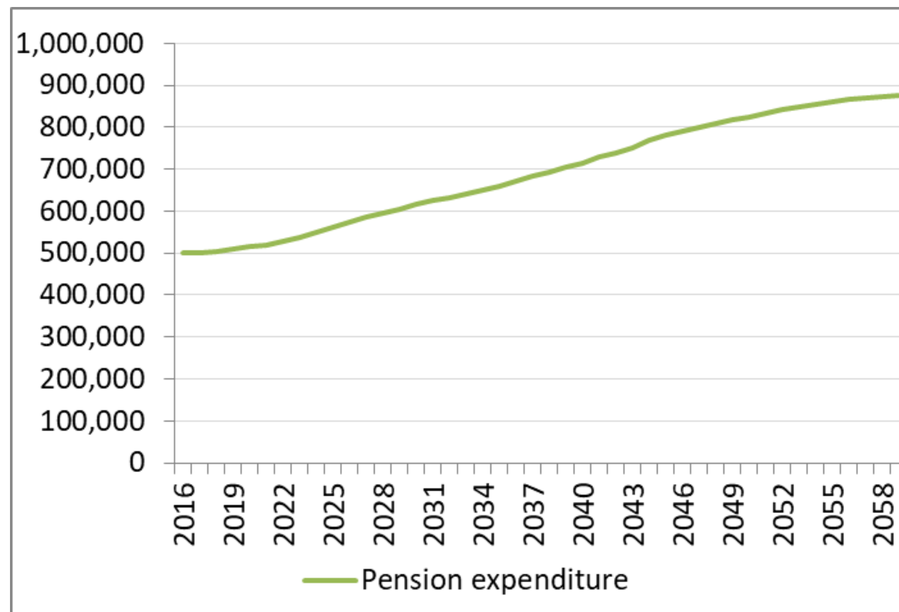
Total expenditures

- Sum of expenditures for individual groups
- Group expenditures $_t$ = average pension of the given group $_t$ * number of pensioners of the given group $_t$

Pension projections - results

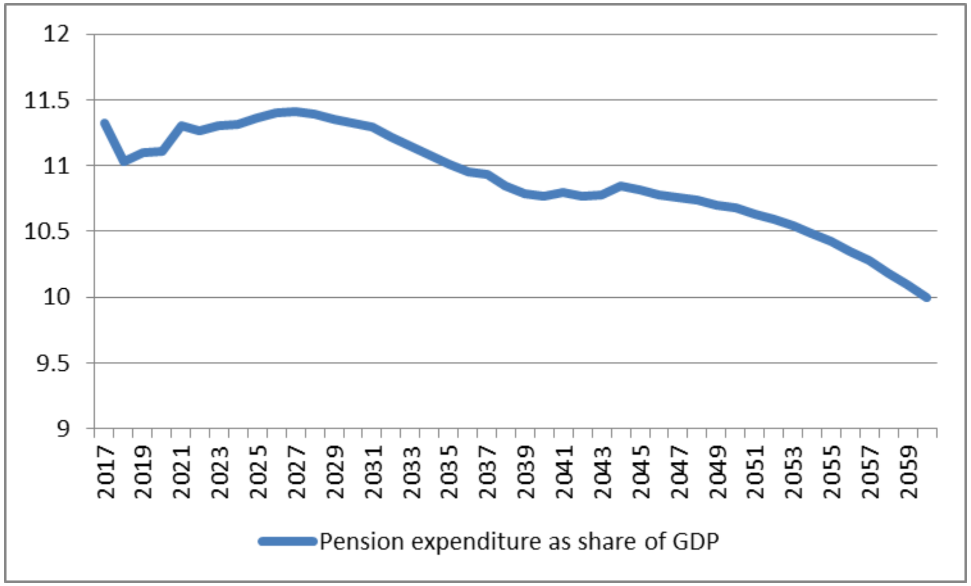
- The number of pensioners follows the demographic projections for the population 65+
- On the long term the rate of incrase of the average pensions in the main determinant of the pension expenditure
  - Pension expenditure grows by 75%, number of pensionsers by 2%





Pension expenditure as a share of GDP

- Share of pension expenditure in the GDP decreases from 11.8% to 10.2%, between 2017 and 2060
- Lower share is the consequence of the slower growth of the pensions, compared to the growth of the GDP
  - The pensions increase is about 75%, while GDP is about 100%



Decomposition

- Pension expenditure as share of GDP can be decomposed to analyse the factors driving the share

$$\frac{PensExp}{GDP} = \frac{Pop65+}{Pop(20-64)} x \frac{PensNo}{Pop65+} x \frac{Average\ Pension}{\frac{GDP}{Hours\ Worked\ 20-64}} x \frac{Population\ 20-64}{Hours\ Worked\ 20-64}$$

$$\frac{PensExp}{GDP} = Dependency\ ratio\ x\ Coverage\ ratio\ x\ Benefit\ ratio\ x\ Labour\ intensity$$

	Dependency ratio	Coverage ratio	Benefit ratio	Labour Intensity
2016	0.313	1.278	0.148	1.996
2060	0.574	1.076	0.099	1.668
Change from 2016 to 2060	+83.5%	-15.8%	-33.2%	-16.3%

Sensitivity tests

	Change in pension expenditure as %GDP from 2016 to 2060			Increase in pension expenditure from 2016 to 2060 (%)	Increase in GDP from 2016 to 2060 (%)
	2016 (%)	2060 (%)	change (pp)		
Baseline scenario	11.8	10.2	-1.6	75.1	103.8
1 Increased life expectancy (by 2 years)	11.8	10.5	-1.3	81.9	103.5
2 Lower migration (by 20%)	11.8	10.6	-1.2	71.7	90.8
3 Higher total employment rate (by 2 p.p.)	11.8	10.0	-1.8	75.1	106.9
4 Higher old age employment rate (by 10 p.p.)	11.8	9.9	-1.9	75.1	109.1
5a Higher labour productivity (by 0.25 p.p.)	11.8	9.3	-2.5	75.1	122.5
5b Lower labour productivity (by 0.25 p.p.)	11.8	11.1	-0.6	75.1	85.0
6 Lower TFP (converges to 0.8%)	11.8	10.9	-0.8	75.1	88.6

Thank you for your attention