

A stylized graphic of a globe, composed of several overlapping, curved lines in shades of blue and grey, positioned in the bottom-left corner of the slide.

# **Estimating Accrued-to-Date Pension Liabilities (ADL) for Poland in 2015 using the PROST model**

Warsaw Poland

April 20<sup>th</sup>, 2018

# Plan of the meeting

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1. Description of the PROST model
2. Data sources used for ADL modeling
3. Assumptions used for the ADL modeling
4. Presentation of output results
5. Sensitivity to changes in discount rate

# **Description of the PROST model**



# Modeling Framework

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- Goal is to calculate ADL for each of Poland's public pension systems in local currency and as % of GDP
- Breakdown by plan:
  - General employees (administered by ZUS)
  - Farmers' (administered by KRUS)
  - Security personnel
  - Judges and prosecutors
- Within plan, breakdown by
  - Pensioners: Old age, disability and survivor separately
  - Actives: Old age, disability and survivor separately

# Pension System Modeling is Complex

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- Many factors have to be taken into account when assessing a pension system and different reform options
  - Demographic
  - Labor market
  - Macroeconomic factors and wage growth
  - Policy choice/ pension system parameters
  - Individuals' behavior
- Pension system analysis requires long-term projections (75 to 100 years)
- Useful to have a tool to assist with pension system diagnosis and evaluation of reform options; to organize thinking about pension systems.

# What is PROST?

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- PROST – computer-based toolkit to simulate pension systems over a long timeframe
- Created to support World Bank pension policy dialogue in client countries
- User-friendly, input-output in Excel, programmed in Visual Basic for Applications
- Regularly updated with new features (currently version 15)
- Individual country and cross-country studies (used in about 100 WB client countries and some cross-country studies)
- More details in “Modeling Pension Reform: The World Bank’s Pension Reform Options Simulation Toolkit” ([www.worldbank.org/pensions](http://www.worldbank.org/pensions))

# Key features of PROST

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- Generic, flexible, easily adapted to various country circumstances
- Deterministic cohort-based model: models single year cohorts, tracks them over time
- Projects coverage, benefits and financial flows
- Allows to look at pension system as a whole as well as at individuals

# Key features of PROST (cont.)

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- Addresses all main pension policy dimensions; all policy variables are exogenous
- Modeling reforms is relatively fast and easy
- Flexible projection period, annual results
- Allows assumptions to vary by year



# Key features of PROST (cont.)

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- Model has functionality beyond just ADL calculations.
- Outputs include both intermediate and final results:
  - Population projections and life expectancy
  - Labor force and employment
  - Pension system coverage and dependency ratios
  - Number of contributors and beneficiaries
  - Expected benefit levels (replacement rates)
  - Expected revenues and expenditures

# Inputs: Data and Assumptions

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## Demography

- Population
- Fertility
- Mortality and mortality improvement
- Migration

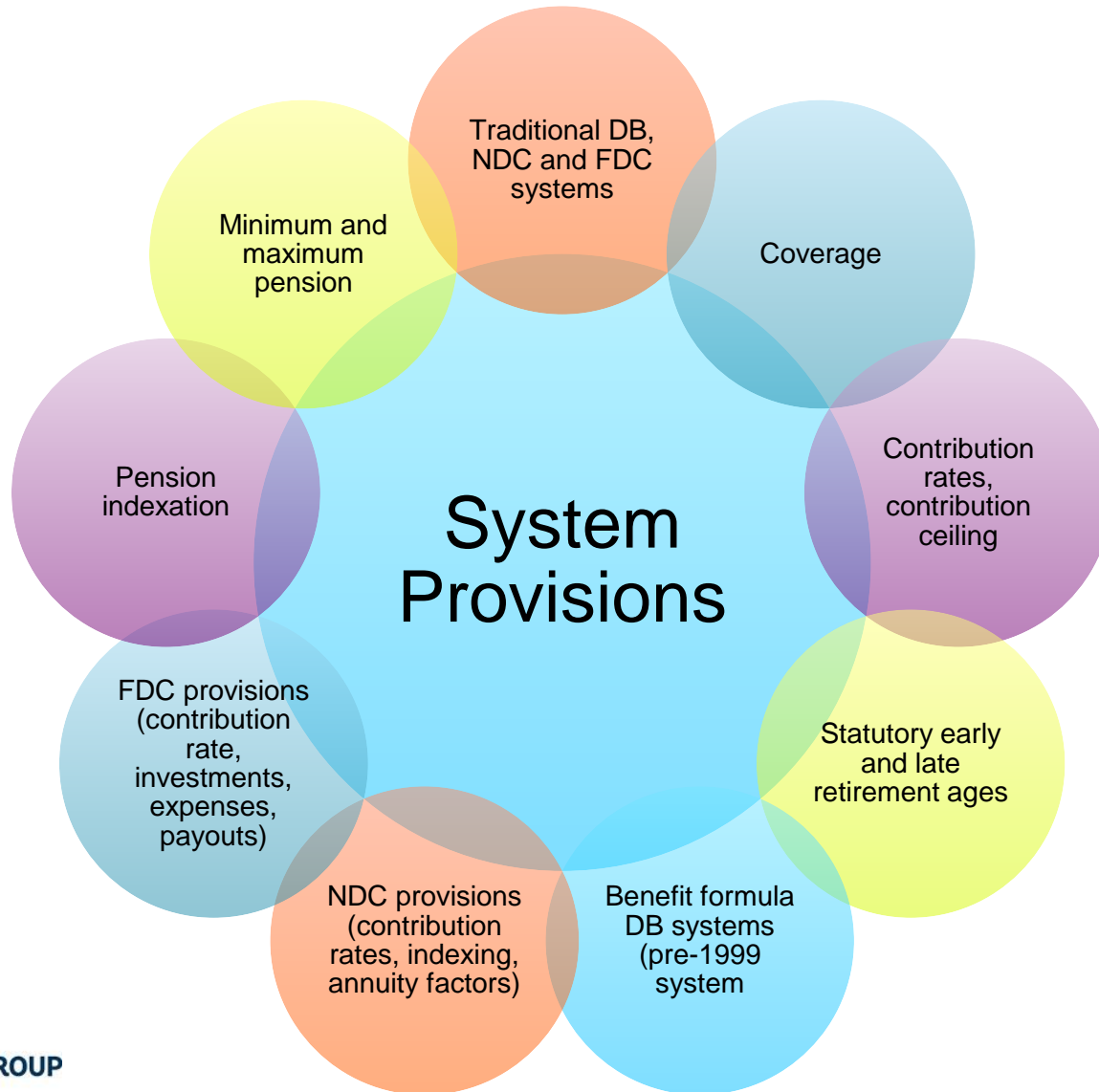
## Economy

- Macroeconomy (GDP, inflation, interest rates)
- Labor market (LFPR, unemployment)
- Average wage by age and sex; distribution of wages

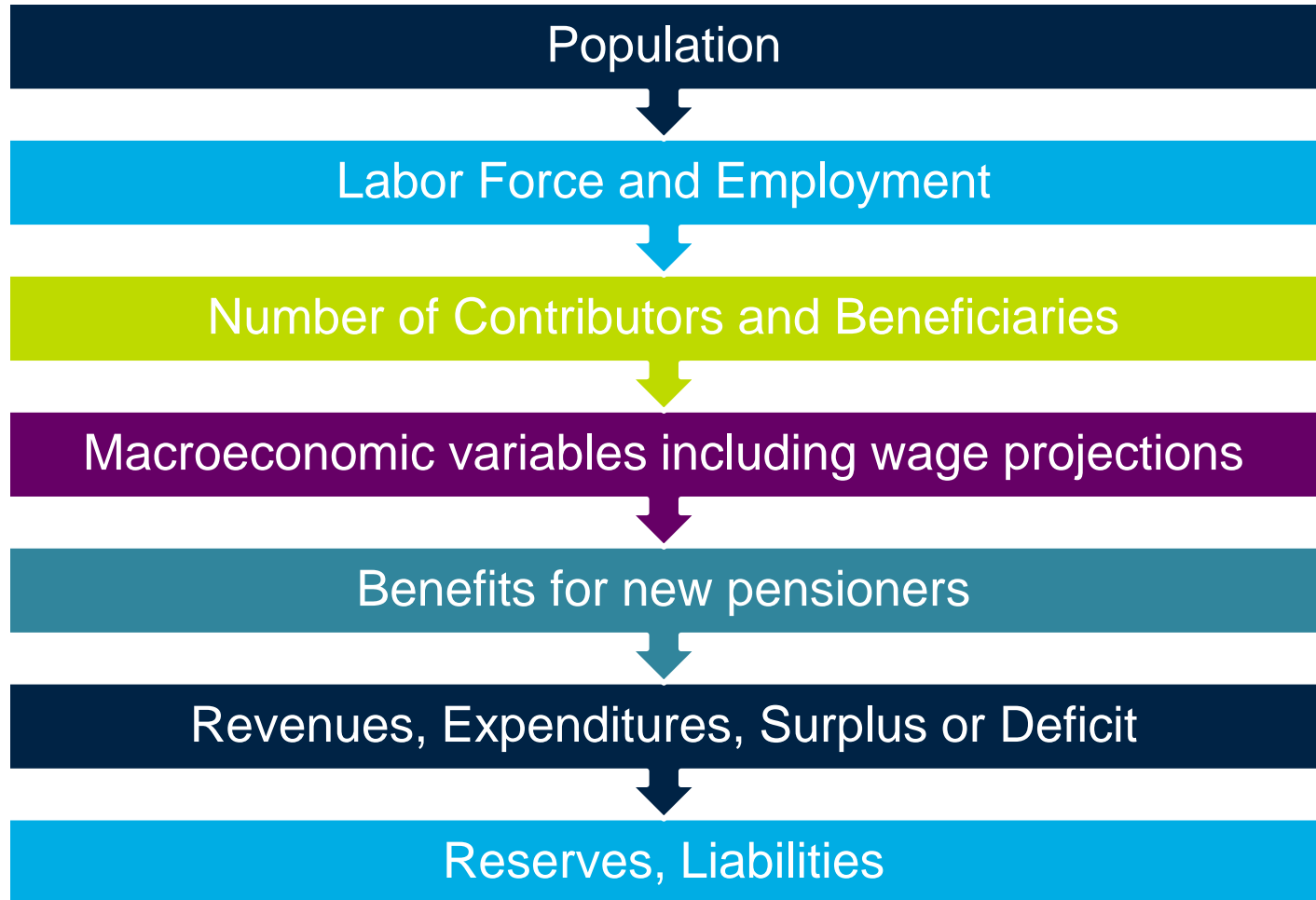
## Pension system

- Pension system data (number of contributors, pensioners, wages, initial pension amounts)
- Pension policy
- Behavior of pension system members (contribution density, retirement and disability pattern, etc.)

# System Provisions



# General Calculation Scheme



**Data sources**

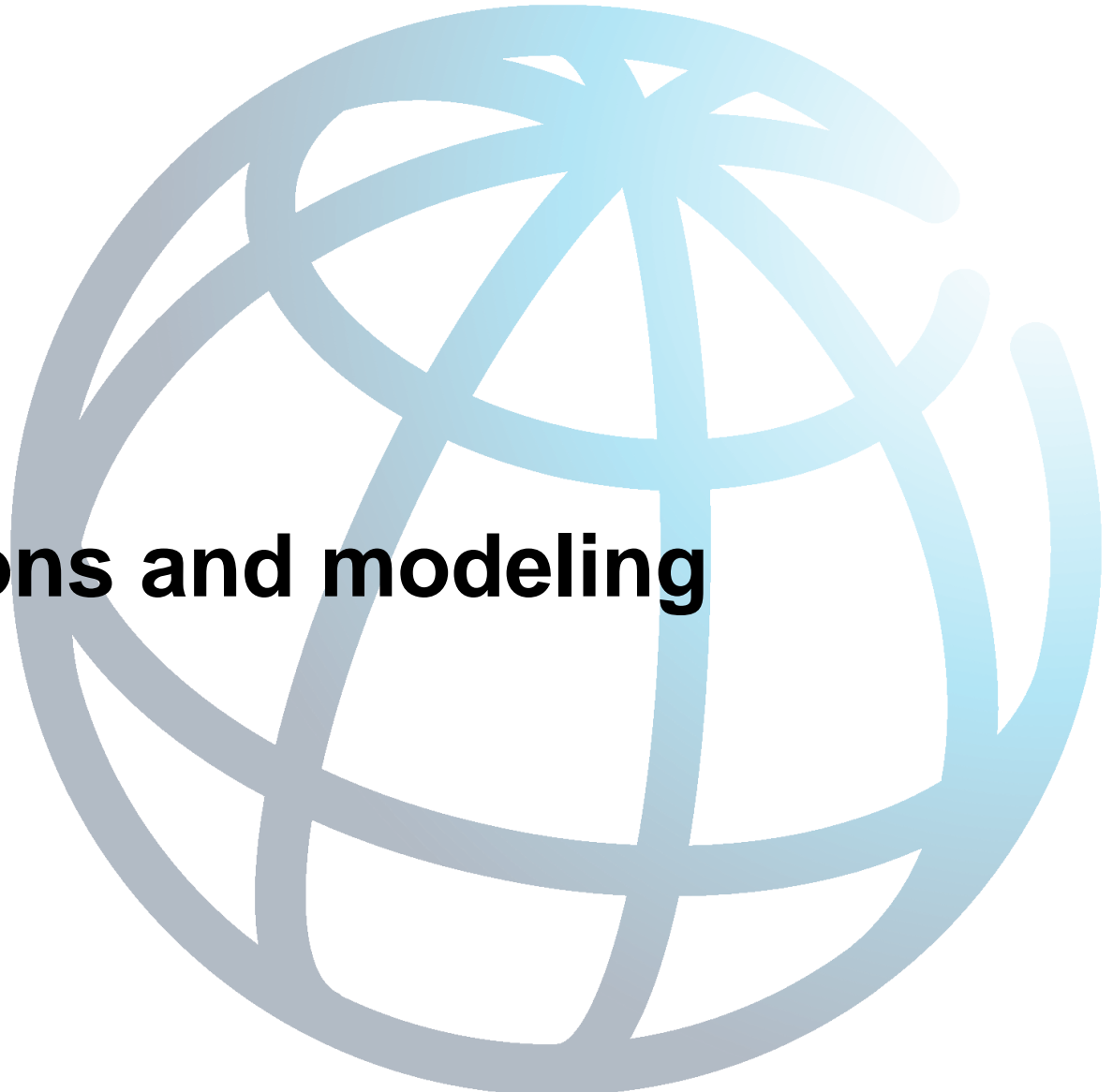


# Data sources - summary

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- Macroeconomic, population and labor force assumptions – AWG
- Pension system administrative data
  - General and farmers' plans: Summary data by age and sex and individual data provided to GUS by ZUS and KRUS
  - Military: Summary data by age and sex collected by GUS and Ministry of Finance
  - Judges and prosecutors: Summary data by age and sex from courts collected by GUS

# **Assumptions and modeling methods**



# Assumptions applicable to all plans

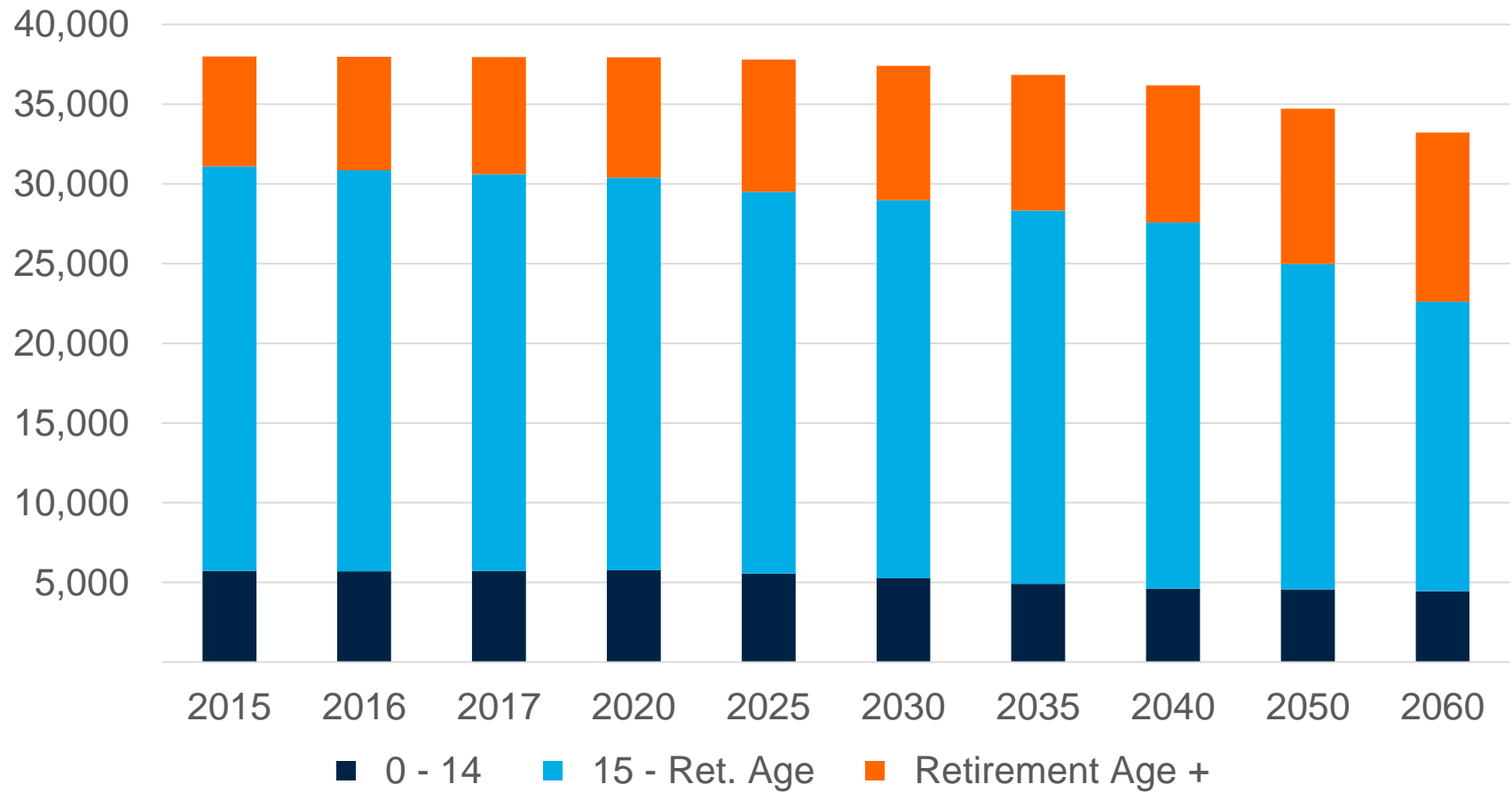
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- Based on same assumptions used to prepare projections for the Aging Working Group
- Modeling of total population, labor force and macroeconomic variables are same for all plans
- Assumed inflation rate and discount rate for baseline ADL calculations specified by Eurostat
  - Inflation: 2%
  - Discount rate: 3% real (5% nominal)

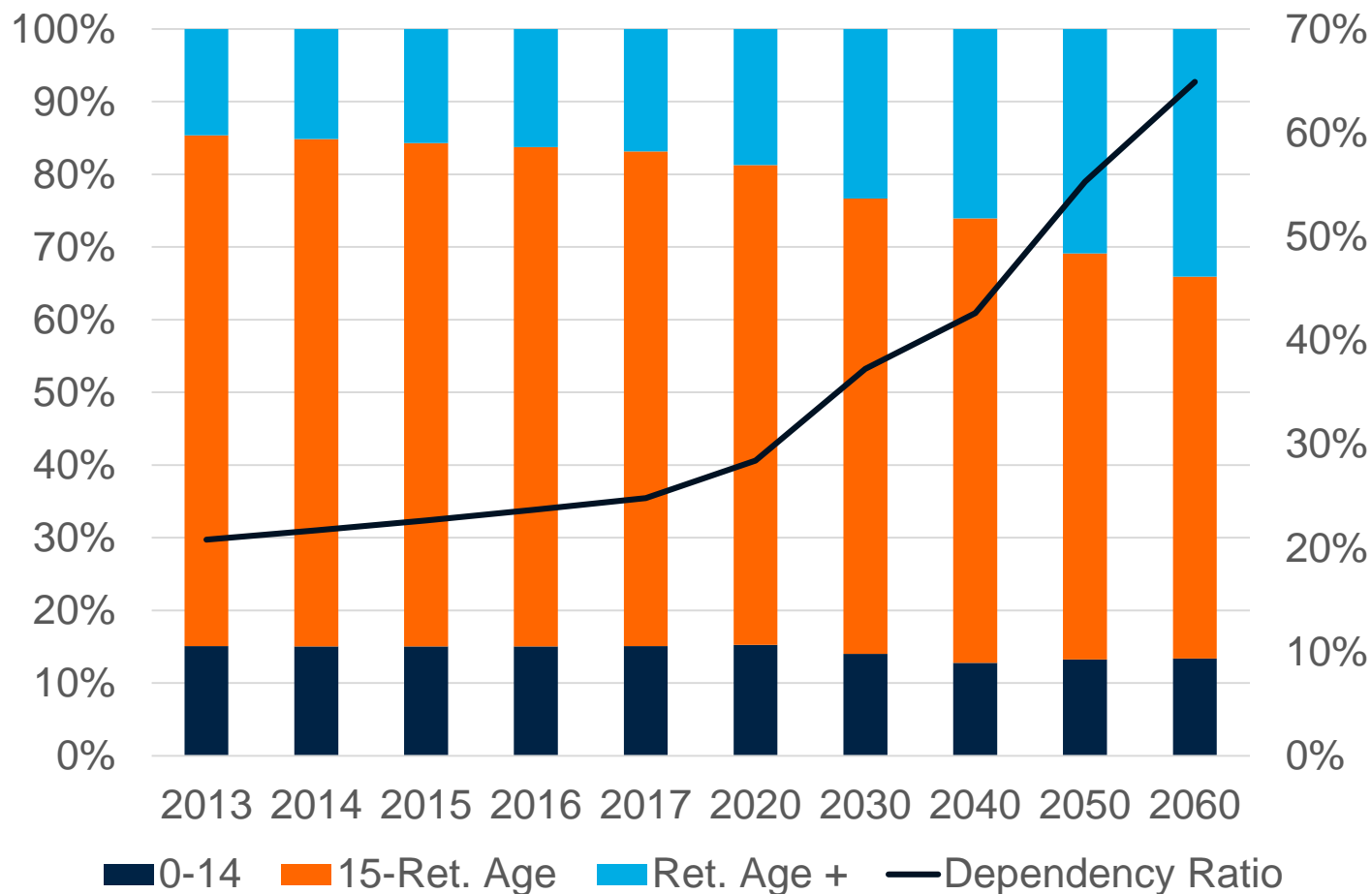


# Population

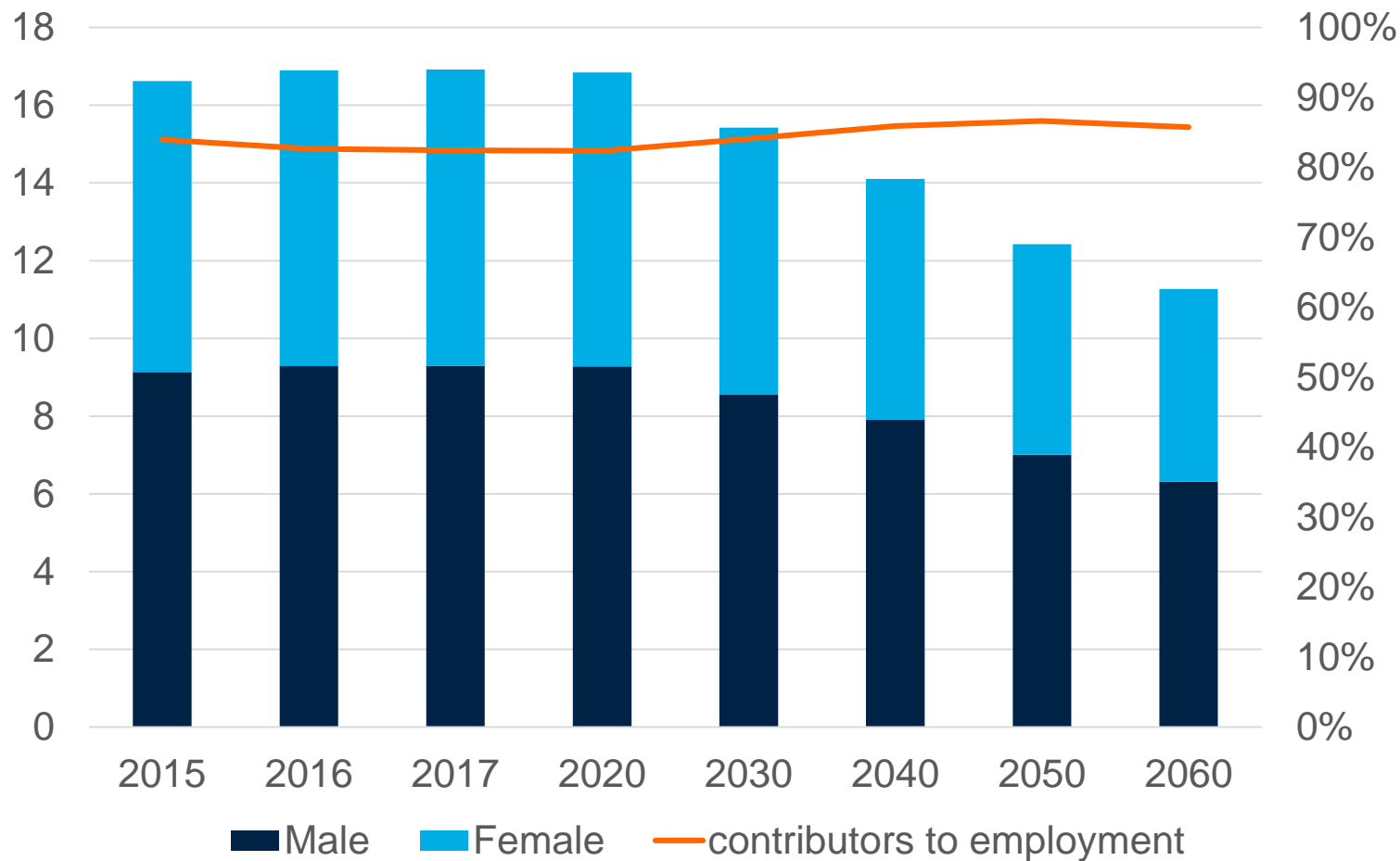
Population by Age Brackets



# Population – AWG assumptions



# Employment – AWG assumptions



# Plan Specific Assumptions

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- Developed from administrative data provided to GUS by the pension program administrators and the government
- Administrative data used to project current and future:
  - Total number of contributors and beneficiaries
  - New old age and disability pensioners
  - Wages of contributors by age and sex
  - Revenues and benefit payments

# ZUS Modeling Method

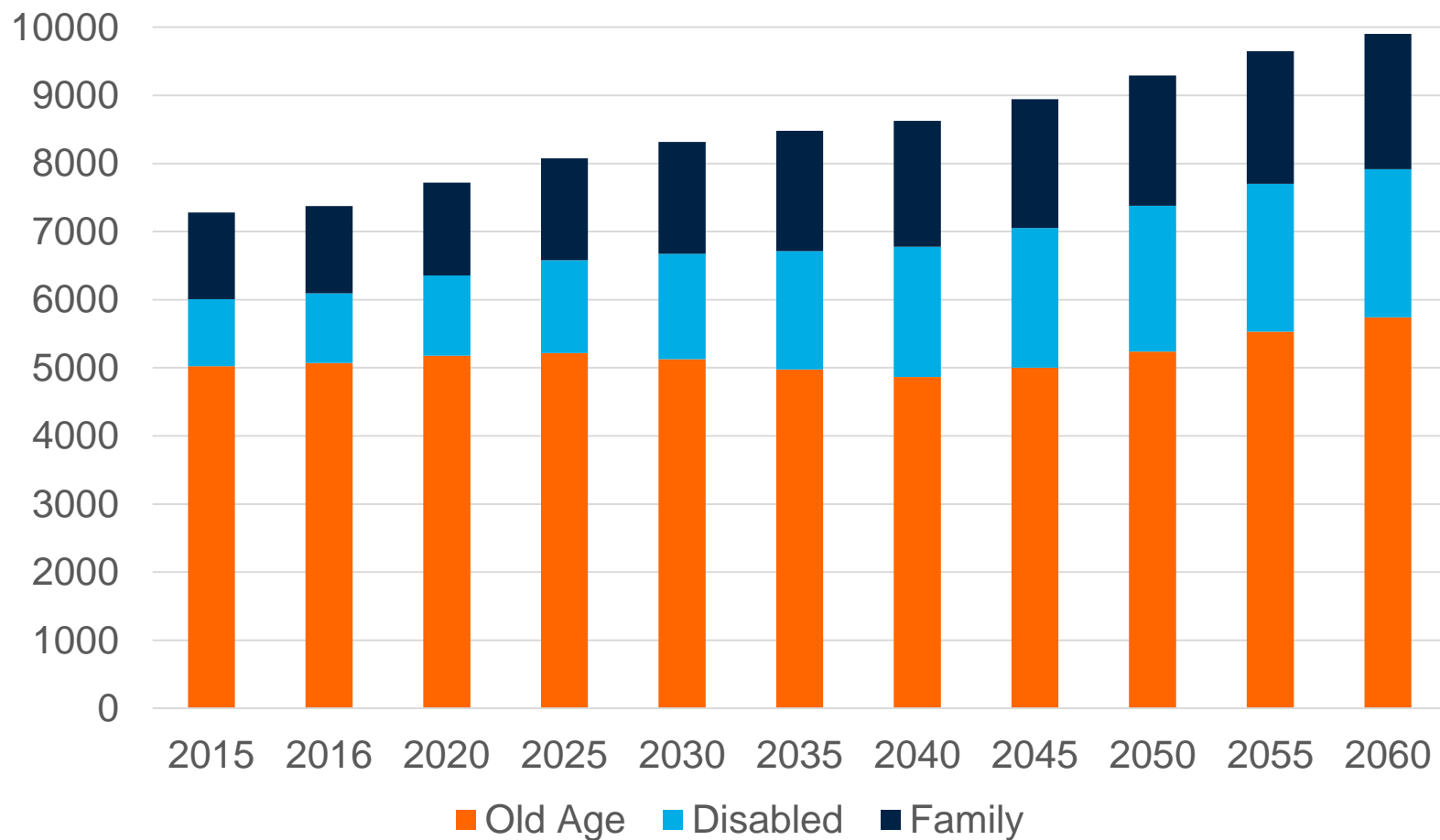
Group	Description	Have account balance today in:			Contribution rate today to:			OFE membership
		NDC1	NDC2	FDC	NDC1	NDC2	FDC	
1	Participate in pre-1999 plan				0%	0%	0%	-
2	Participate in NDC1 only. Never had NDC2 or FDC account	x			19.52%	0%	0%	N
3	Have NDC1 and NDC2 accounts, frozen FDC account	x	x	x	12.22%	7.30%	0%	Y
4	Have NDC1 and NDC2 accounts, and active FDC account	x	x	x	12.22%	4.38%	2.92%	Y

# ZUS Modeling Method

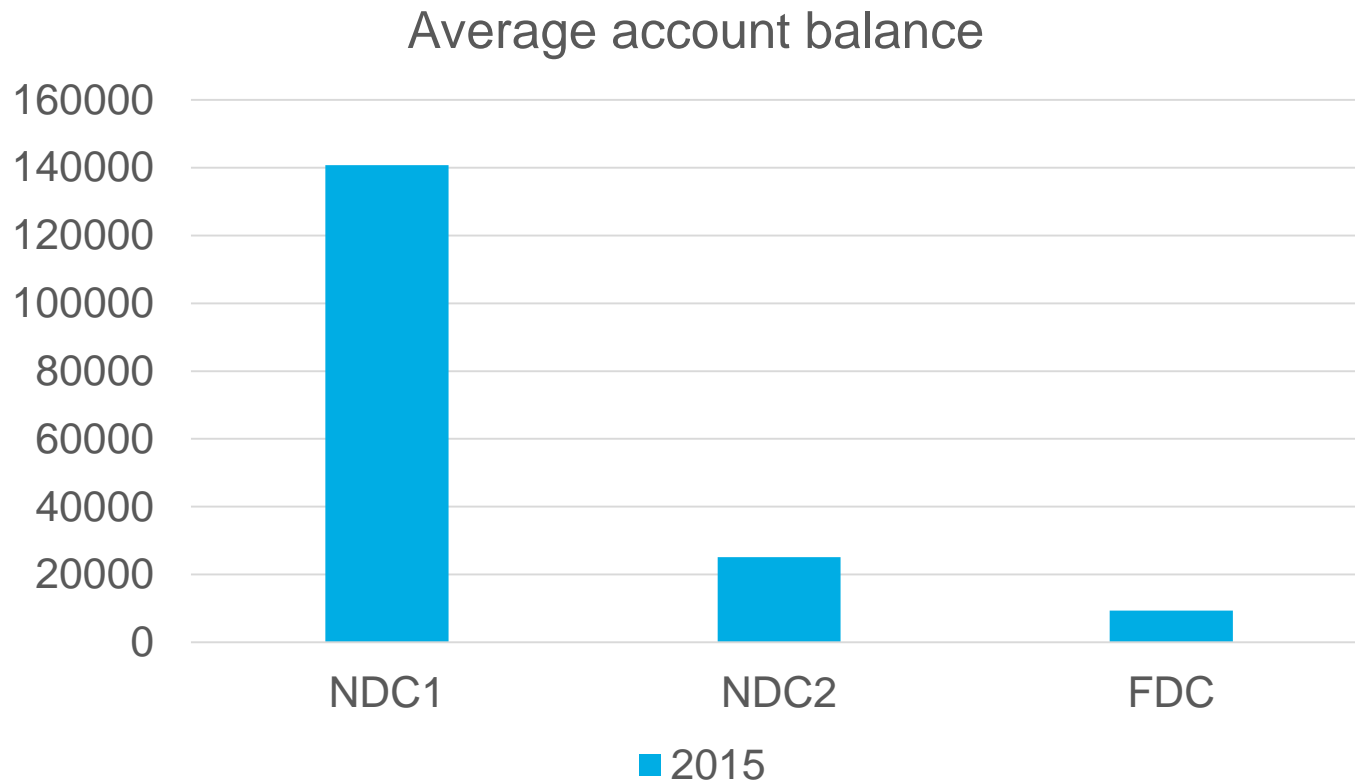
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- Summary counts by age and sex for actives and pensioners
- 3% randomized data sample including actives, inactives and pensioners
- Sample data needed for following purposes
  - Percent by age and sex in each of the 4 active “groups”
  - Calculating average NDC1, NDC2 and FDC account balances by group, age and sex
  - Average covered wages and old age pensions by age and sex and distribution of wages/pension amounts by “bands”
  - Study patterns of retirement and disability by age and sex
  - Determine contribution density (frequency/consistency of payment)

# ZUS - Total Beneficiary Composition



# ZUS Average Account Balances



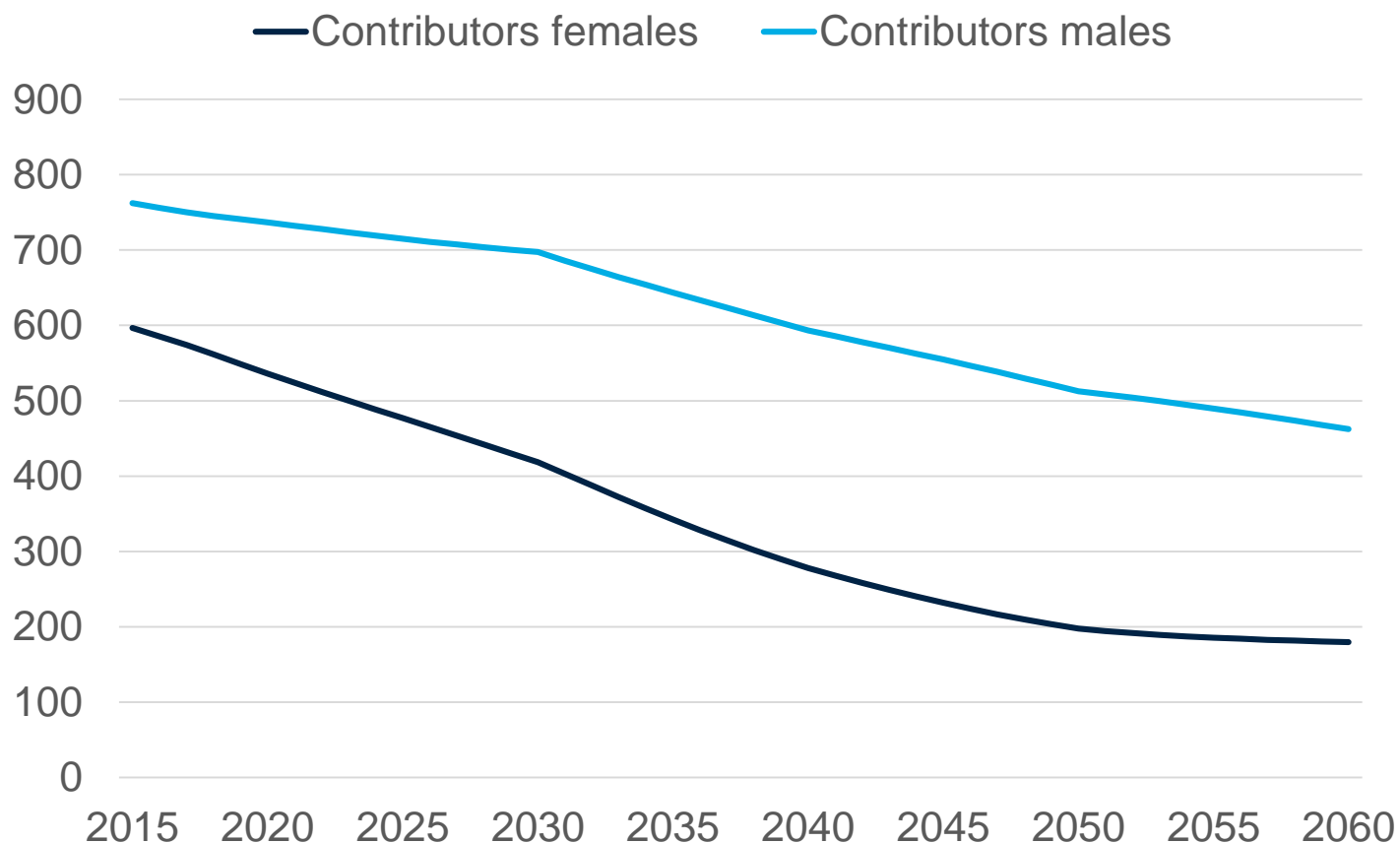


# Modeling of KRUS

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- Reflects an expected decline in the size of the agricultural workforce
- Does not impact 2015 ADL calculation but does impact projection of future ADL
- The rates of change in the workforce were applied from the Paweł Strzelecki paper titled „*Using dynamic cohort model for projection of agriculture workforce in Poland.*”  
*KAE Working papers 28/2012*

# KRUS - contributors



# Modeling of security personnel

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- Need to separately model
  - Old Plan for those hired before 2013
  - New Plan for those hired in 2013 and later
- The two plans have different retirement ages and benefit formulas

# Modeling of judges and prosecutors

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- Model adjusts for the elimination of early retirement rights starting in 2018, as this provision was already included in the law in 2015

**Results**



# Basic information

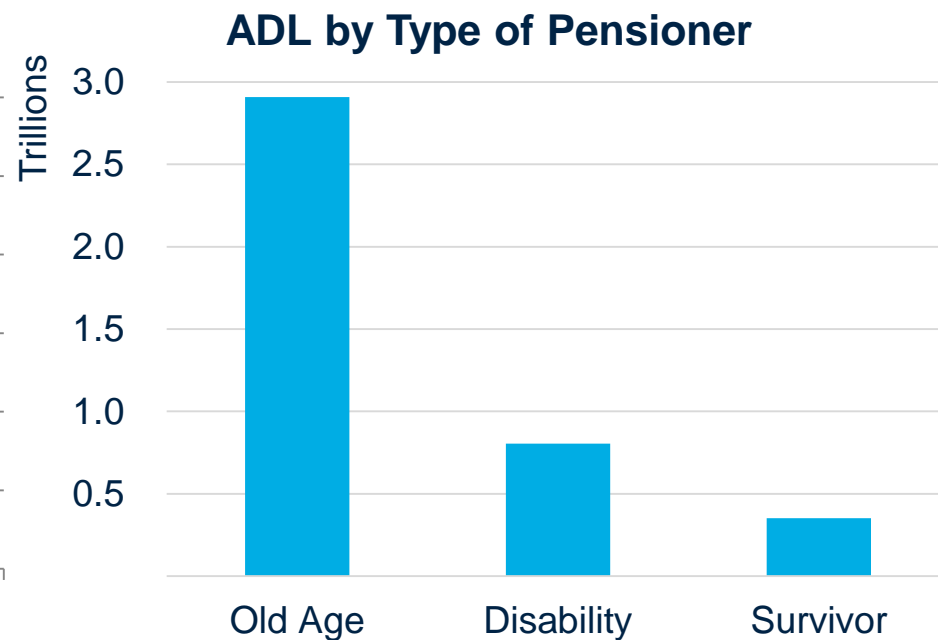
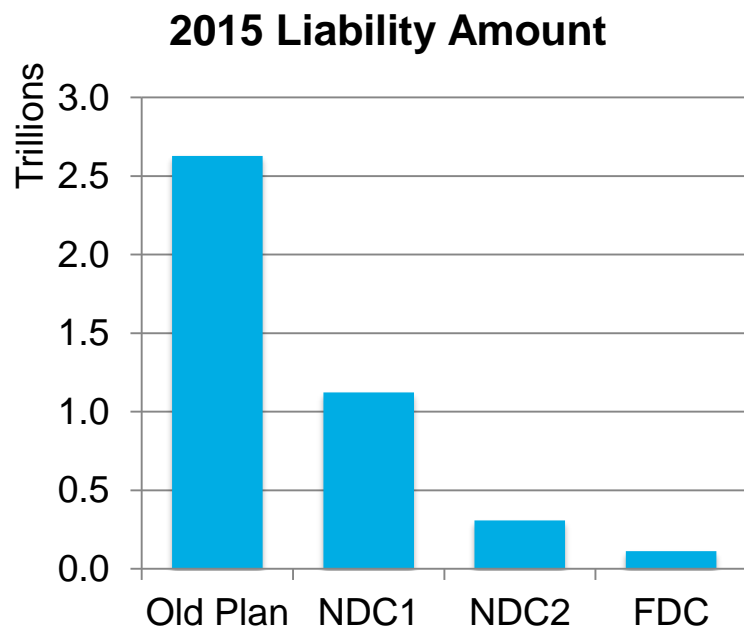
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- ADL is accrued-to-date liability, so the calculation does not take into account future entrants to the system
- ADL does take into account future indexing of 2015 NDC account balances
- ADL is based on **the system in 2015**, so it does not take into account the cancellation of retirement age increases – introducing the reform would likely increase liabilities
- ADL alone is not a measure of fiscal sustainability. It is primarily a measure of contingent household assets

# ADL on 31 December 2015

	2015	
Plan	ADL (mill PLN)	ADL as % of GDP
ZUS	4 056 811,7	225,5 %
KRUS	325 121,7	18,1 %
Military	391 778,4	21,8 %
Judges and prosecutors	34 313,2	1,9 %
OFE	140 496,0	7,8 %
PPE	10 623,0	0,6 %
<b>Total</b>	<b>4 959 144,0</b>	<b>275,7 %</b>

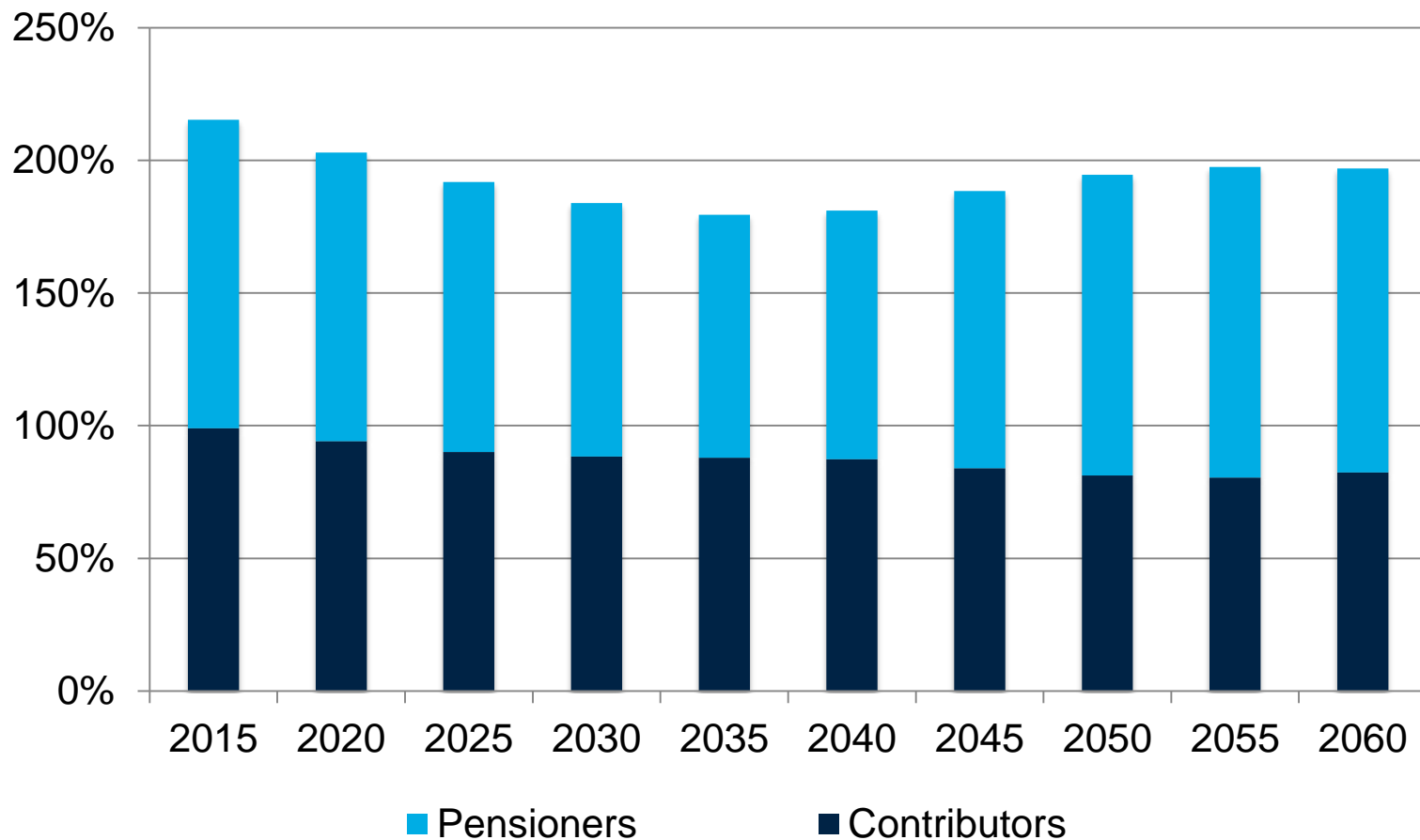
# ZUS ADL by source



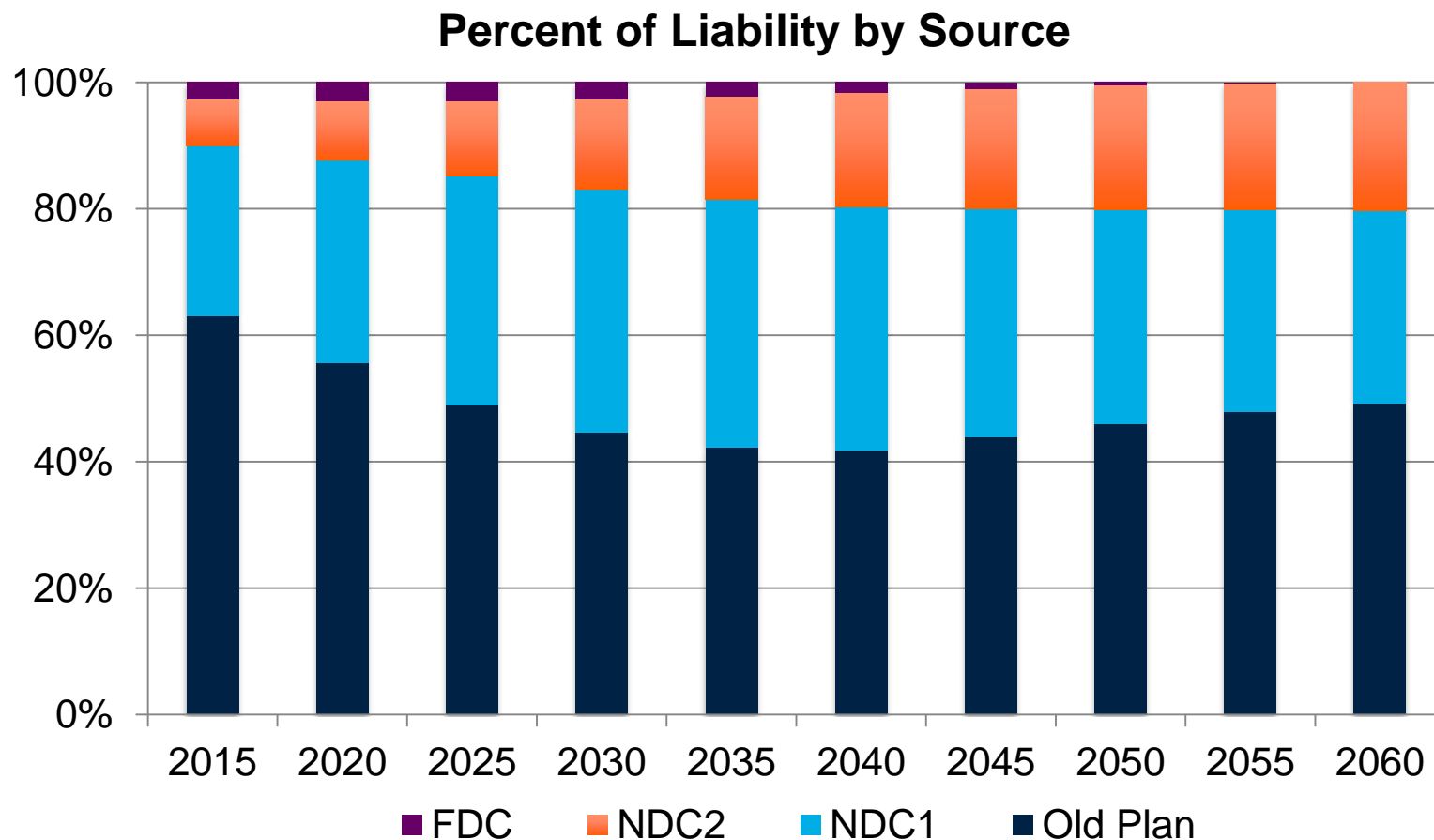


# ZUS ADL as % of GDP

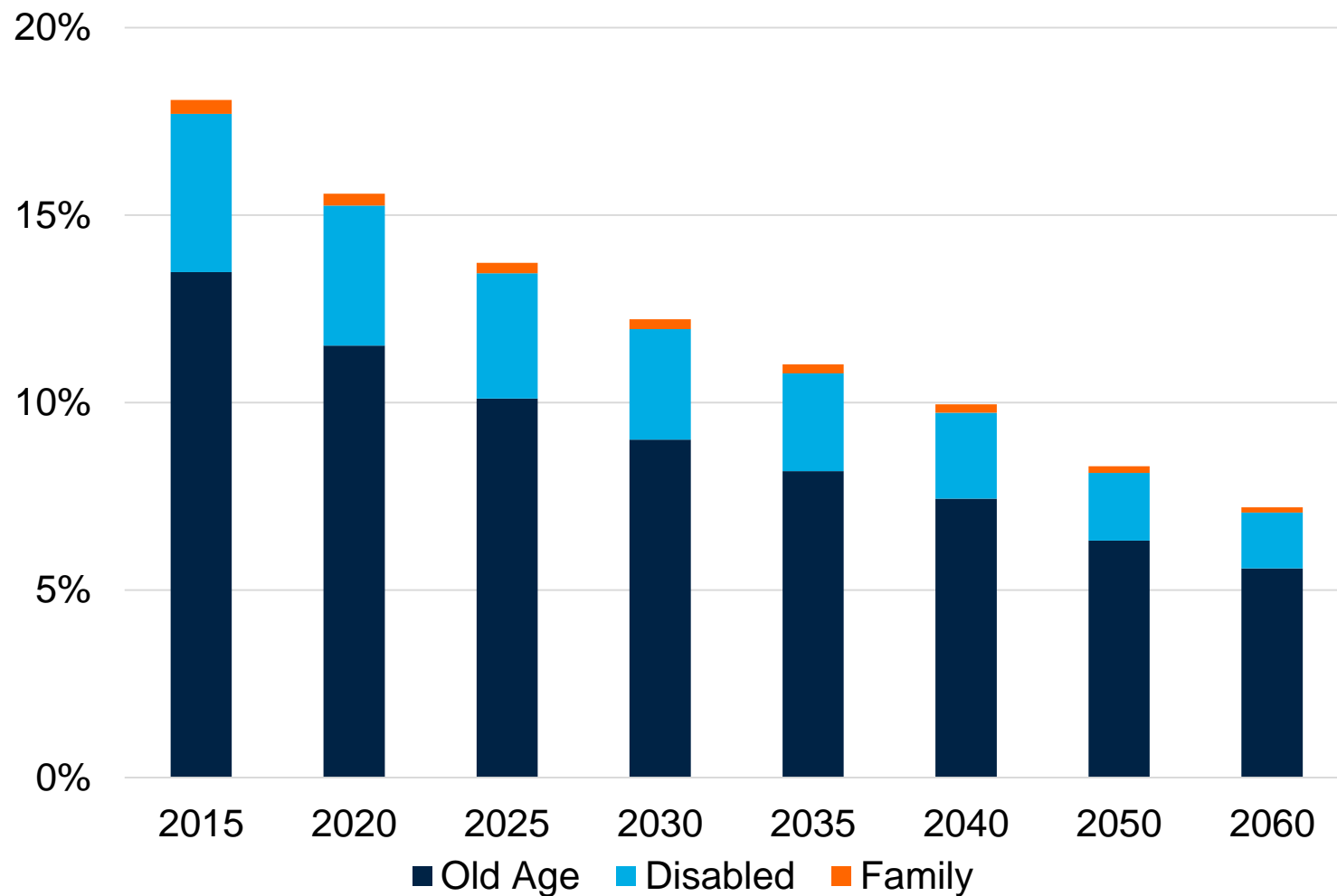
## Contributors and Pensioners Liability (% GDP)



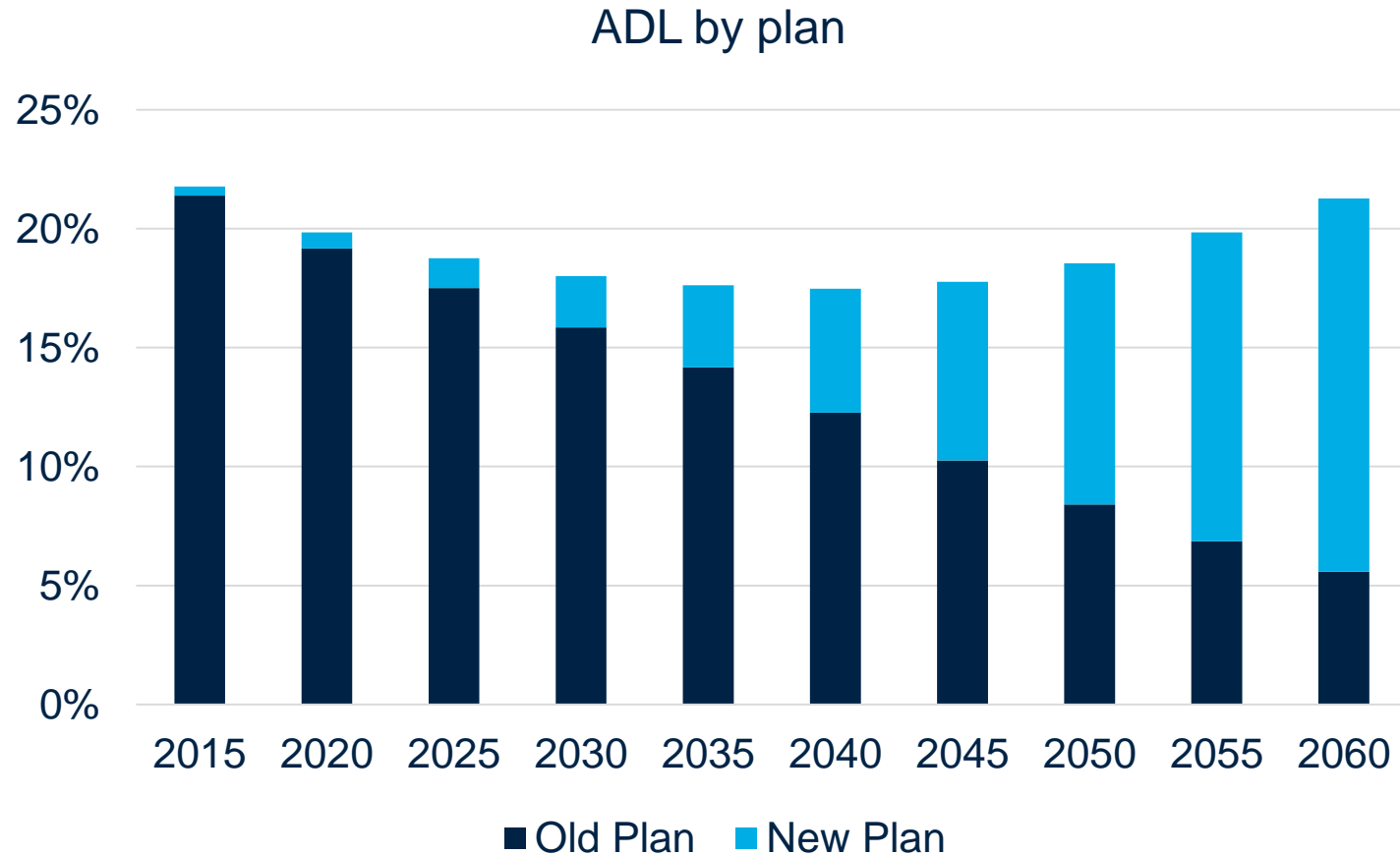
# ZUS ADL by Source (% of Total)



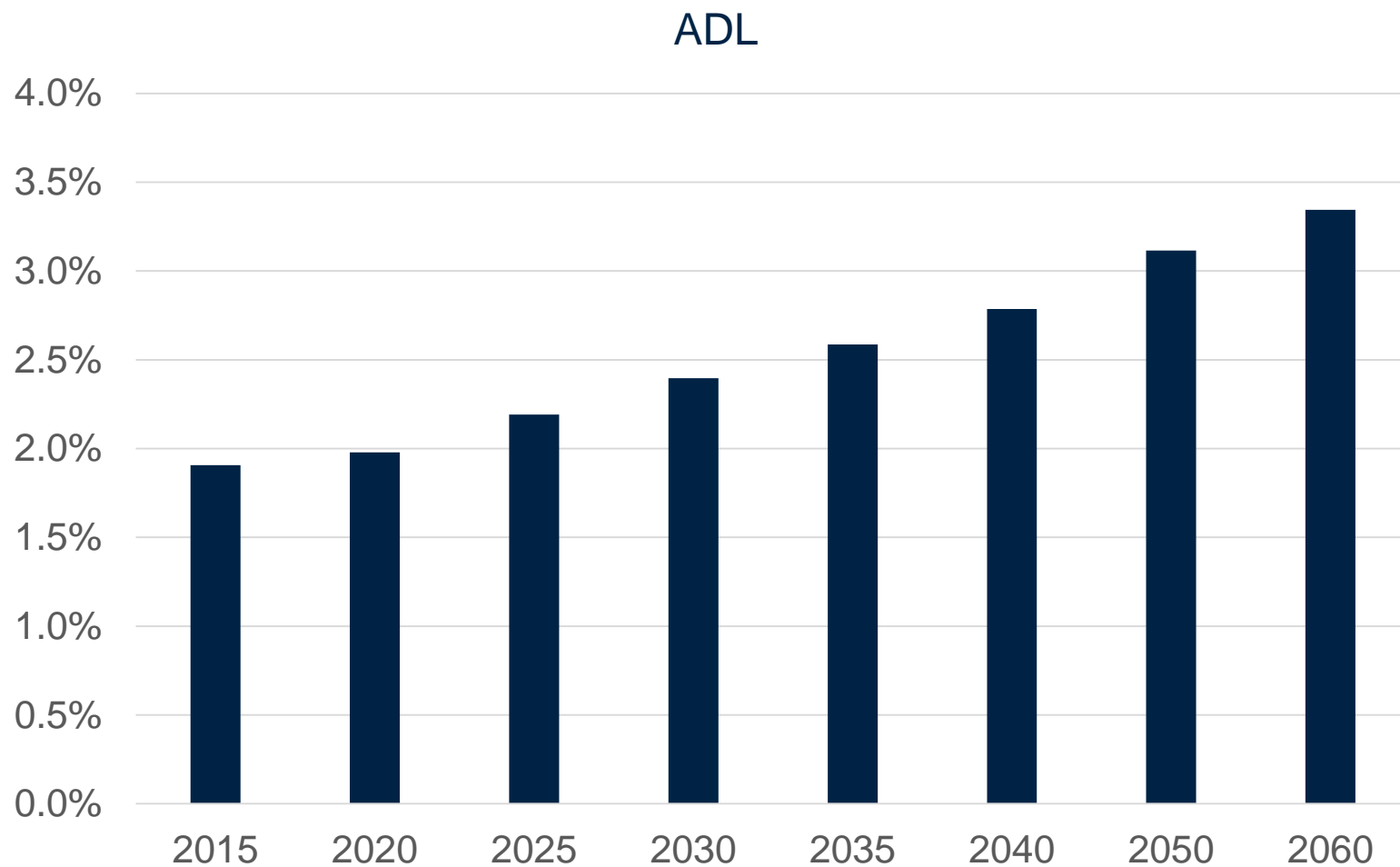
# KRUS ADL by Decrement (% GDP)



# Security Personnel - ADL



# J&P – ADL

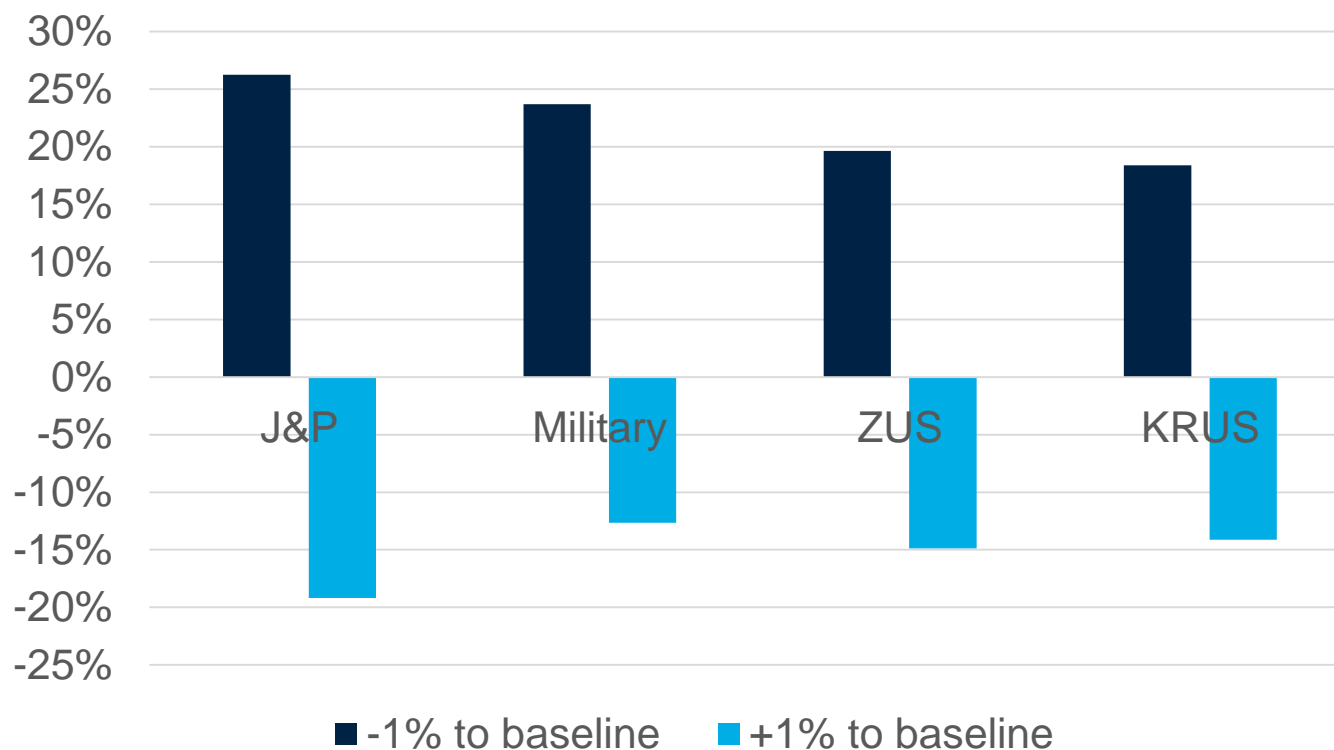


**Sensitivity analysis**



# ZUS – Sensitivity Analysis

- As required by Eurostat, sensitivity analysis was performed for discount rates +/- 1% from standard



**Thank you**

