This project is co-funded by the European Union

Medium-term projection for Belgium of the at-risk-of-poverty and social exclusion indicators based on EU-SILC

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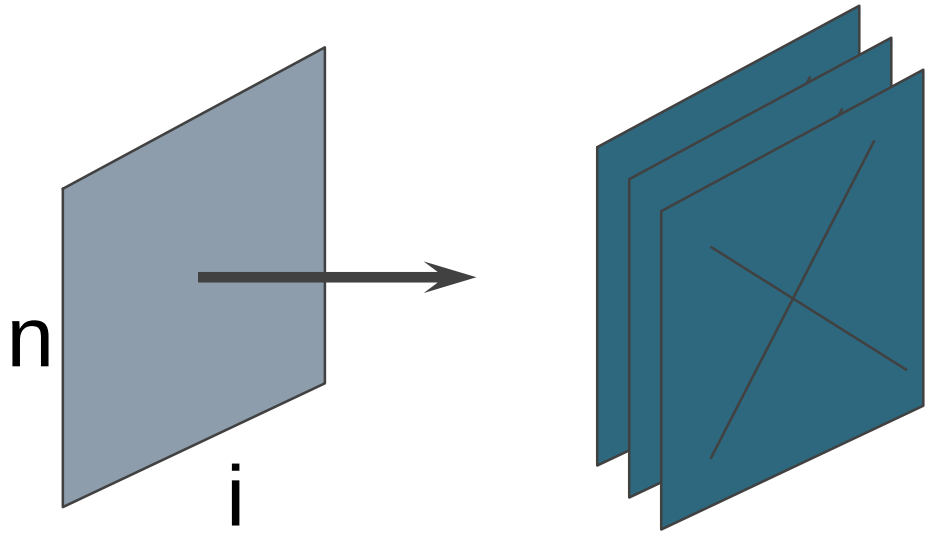
The “Nowcasting” project

- Co-financed by the European Commission (VS/2015/0179) and the Federal Public Service Social Security of Belgium
- nowcasting and medium-term forecasts (currently up to 2020) of indicators of poverty and social exclusion.
- Using aligned dynamic microsimulation, starting from the EU-SILC 2014 cross-sectional dataset
- Take into account all more recent demographic and socio-economic developments and projections
- The model is built using experience and technical modules from the existing model MIDAS.
- Developed in LIAM2 (de Menten et al., 2014).

What is microsimulation?

- The purpose of any microsimulation model is to impute missing data
  - Alternative realities
  - Prospective scenarios
- Based on actual or synthetic micro-level datasets



What is microsimulation? (2)

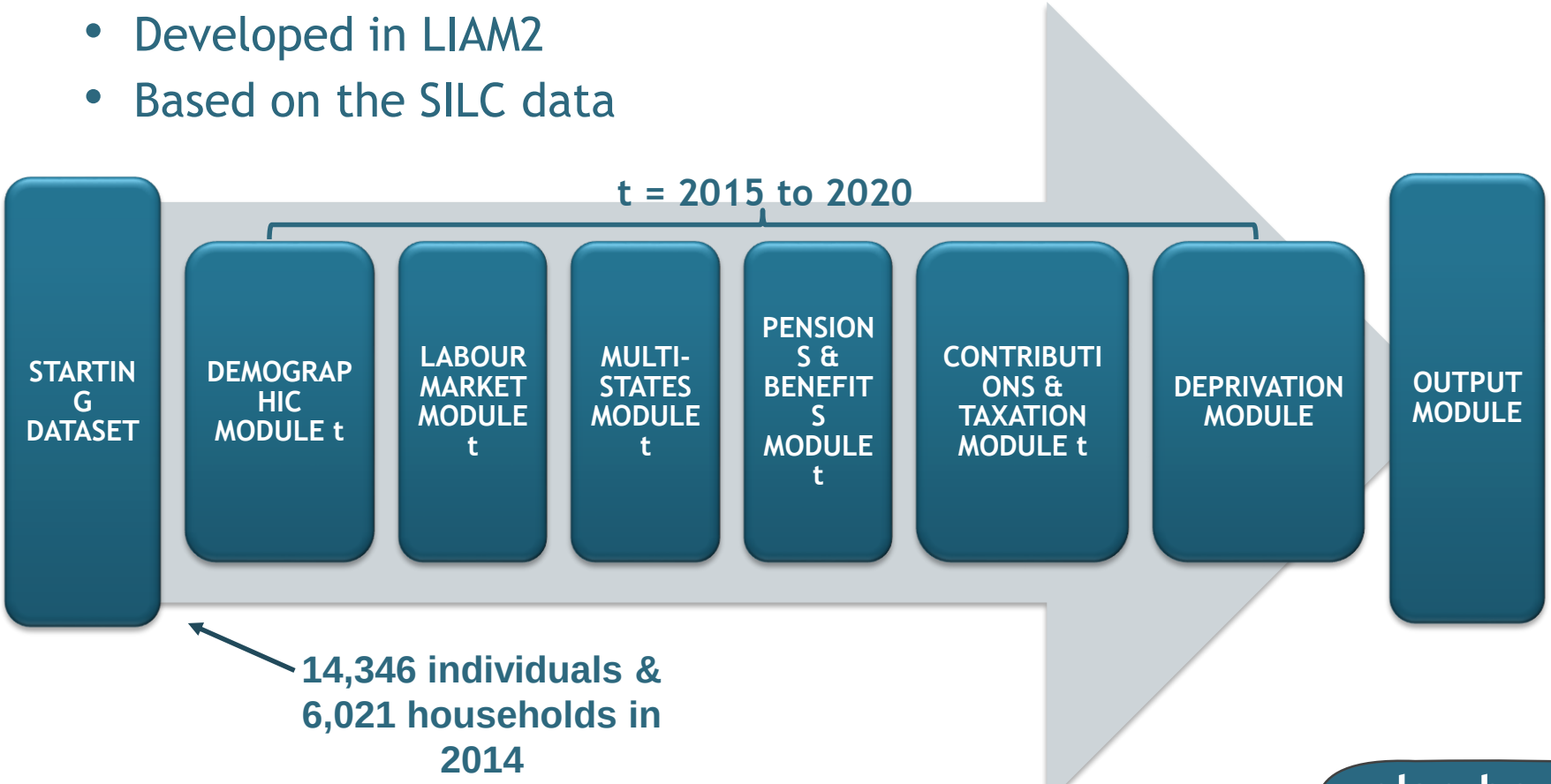
- Microsimulation models are used to evaluate the *effects of policy changes at the level of the decision making units* rather than focusing on the aggregate information.
- Focus is on the *distribution* of the target values, rather than on the means or the aggregates.
- Also, microsimulation can be used to discern “winners” and “losers” of developments and/or policy measures.
- Estimates of *aggregate outcomes* can however still be derived by summing up individual predictions.

Current Nowcasting models: Euromod

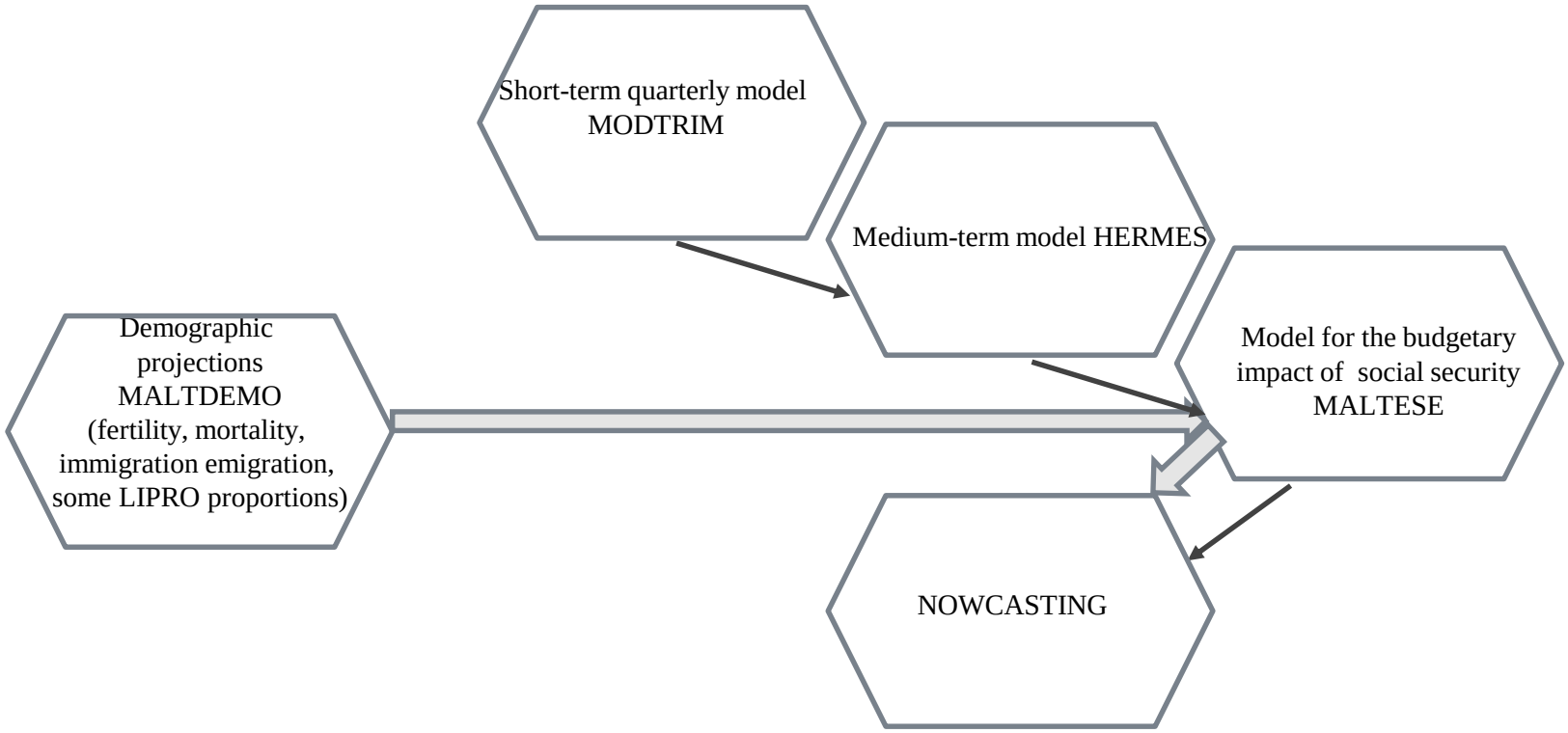
- Indicators of poverty and inequality are important in the European semester
  - ✓ "flash estimates" of these indicators published in 2017 and 2018 (income years 2016 and 2017)
  - ✓ Main method is microsimulation modelling, where the static model EUROMOD is enhanced to adjustments in the micro-data
    - ✓ Population structure, employment and growth of the main income components
    - ✓ 16 countries (including BE) through static ageing at the household level, using LFS
    - ✓ 8 countries dynamic ageing of gross changes between non-, un- and employment.
    - ✓ Updating all non-simulated incomes to the target year

Recursive Structure

- Full dynamic aligned discrete-time cross-sectional microsimulation model
- Developed in LIAM2
- Based on the SILC data



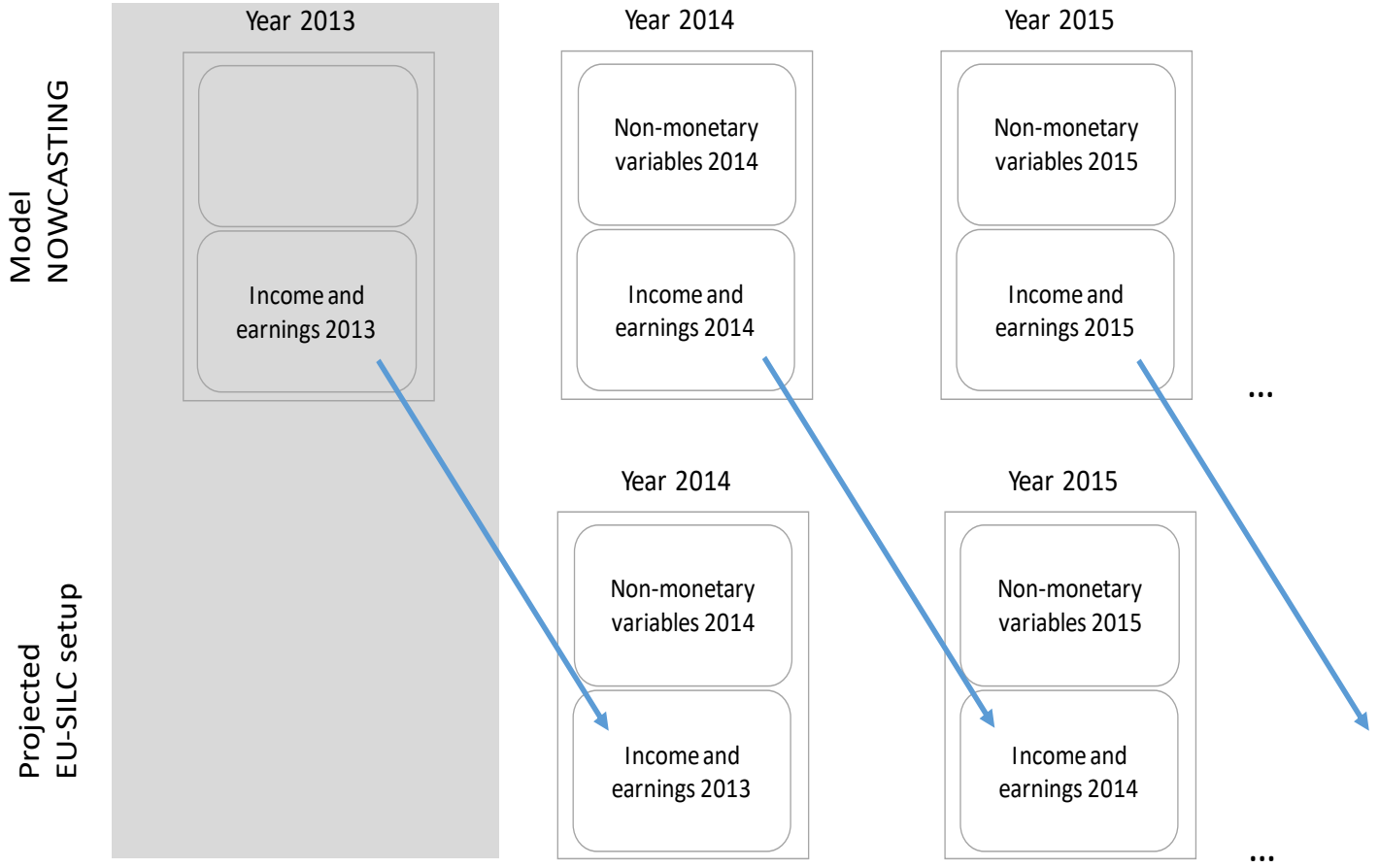
Alignment structure



3 channels of consistency:

1. State alignment
2. Alignment of the growth rates of earnings
3. Alignment of social security benefits

Data structure



What's new in the Nowcasting model?

- Module for **labour market state to month**, allowing for simultaneous occurrence of earnings and benefits.
- Correction for "**residual** taxes"

  Mechanical simulations result in net incomes being too low, due too

  1) witholding tax being unequal to the final tax, and
  2) the impact of tax evasion or ad-hoc reductions.
- Statistical versus mechanistic simulation of **pension benefits**
- Endogenous statistical modeling of **SMD**
- Endogenous SMD, LWI and AROP => **AROPE**
- Immigration and emigration

Pensions and benefits module

- Benefits: from unemployment, disability, unemployment with company supplement, social assistance, family allowances

- Pensions: retirement, survival, guaranteed income for the elderly (GIE)
  - Simulated only for new pensioners: retirement and survival pensions are based on estimations using longitudinal EU-SILC (6 estimated equations); GIE obtained by means-test

➢ All observed benefits and pensions are uprated and possibly adjusted based on the assumptions and application of regulations

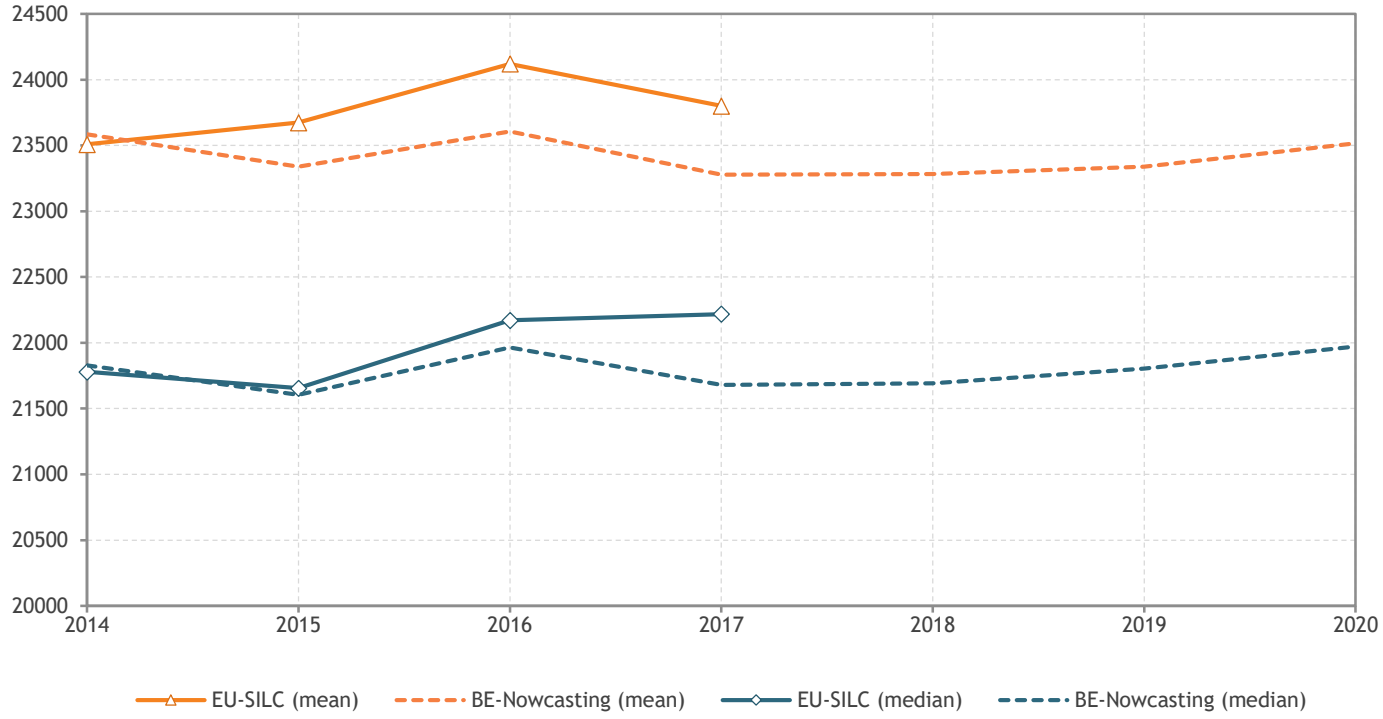
Projected incomes

- Certain sources of income are not simulated: pension benefits from the 2nd and 3rd pension pillars, education-related allowances, net received rents, housing allowances, etc.

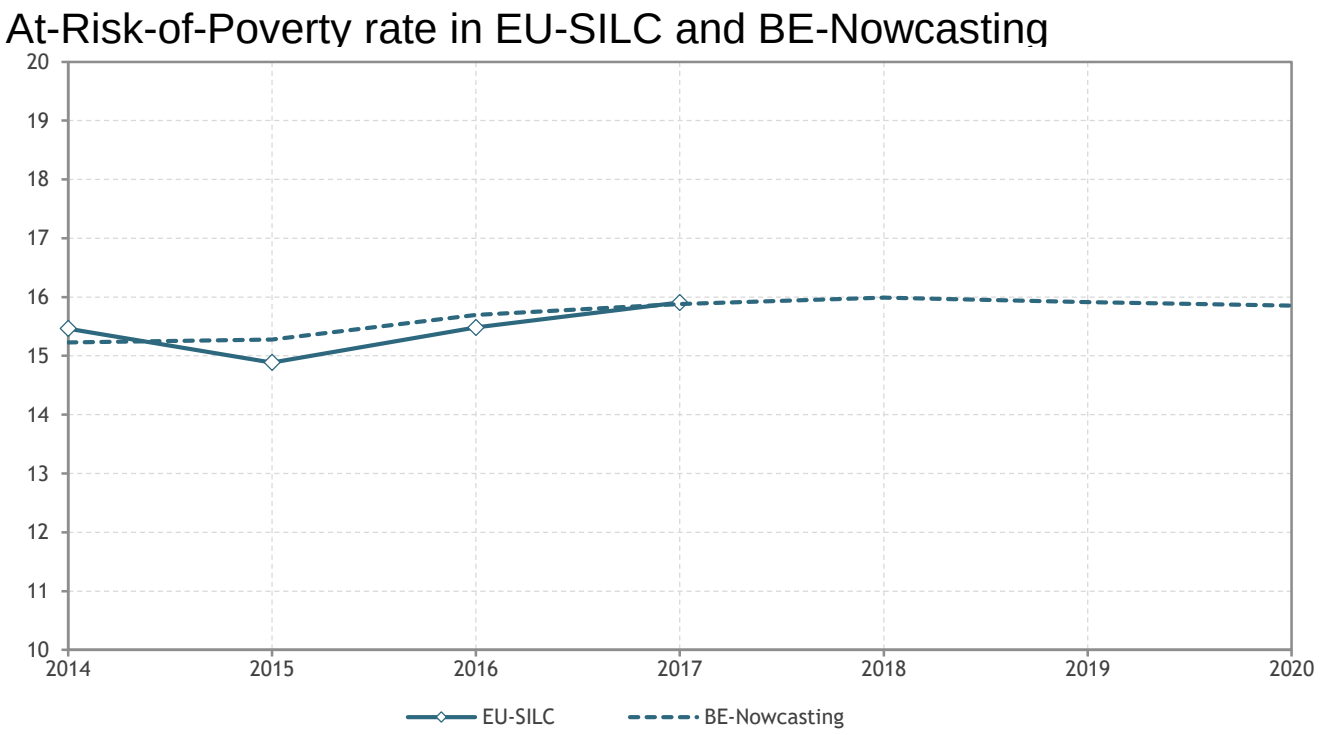
- Those are projected as they are observed in the original data

results

Mean and median equivalised disposable income in EU-SILC and BE-Nowcasting

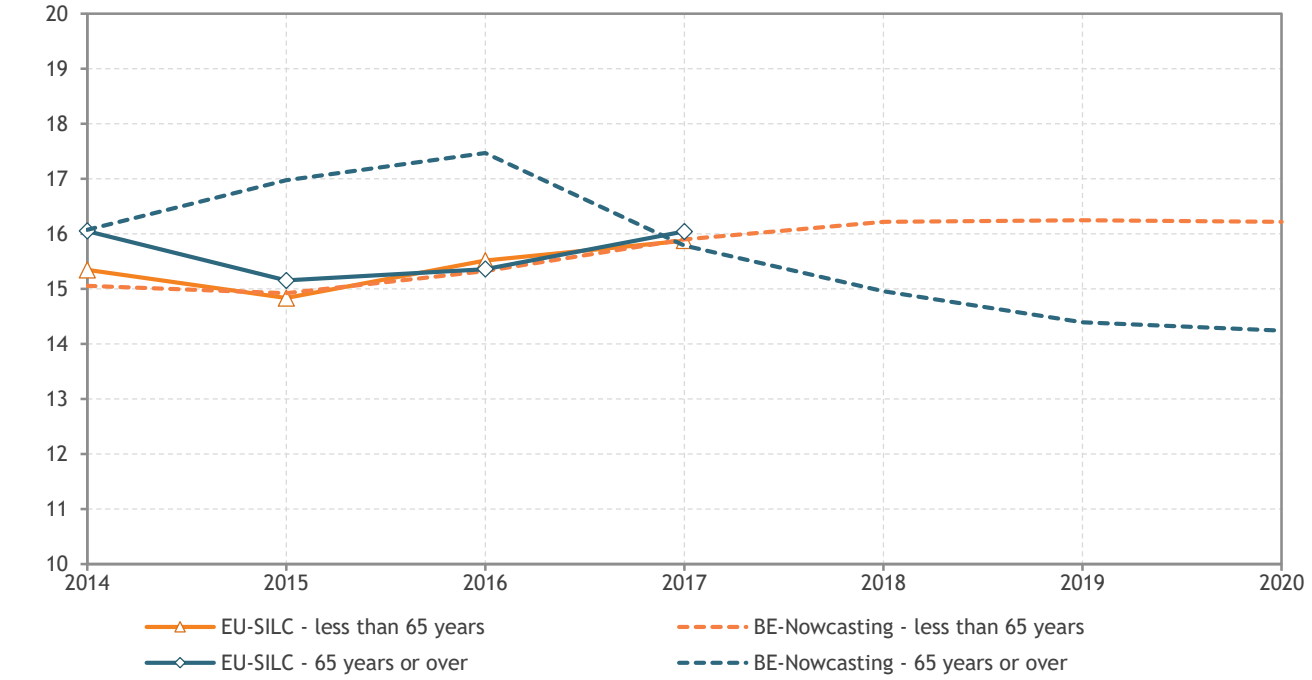


Results


At-Risk-of-Poverty rate in EU-SILC and BE-Nowcasting
20
19
18
17
16
15
14
13
12
11
10
2014
2015
2016
2017
2018
2019
2020
EU-SILC
BE-Nowcasting

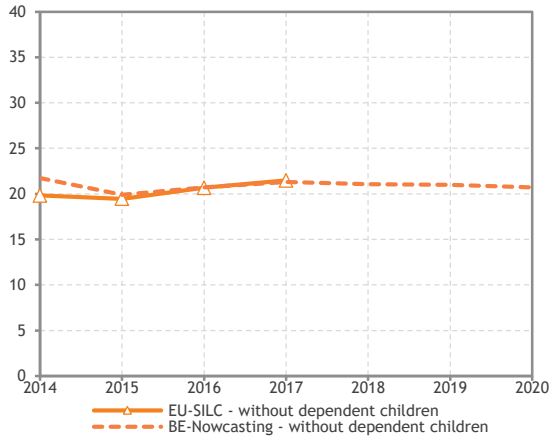
Results (no, they're not equally superb everywhere)

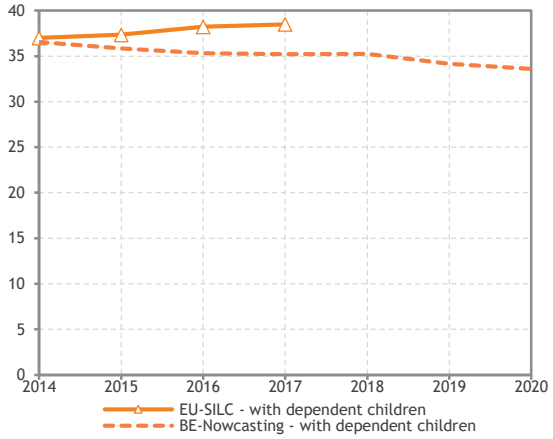
At-Risk-of-Poverty rate in EU-SILC and BE-Nowcasting, to age group



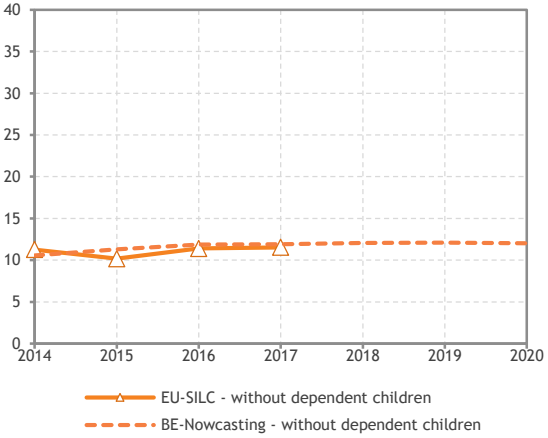
Results

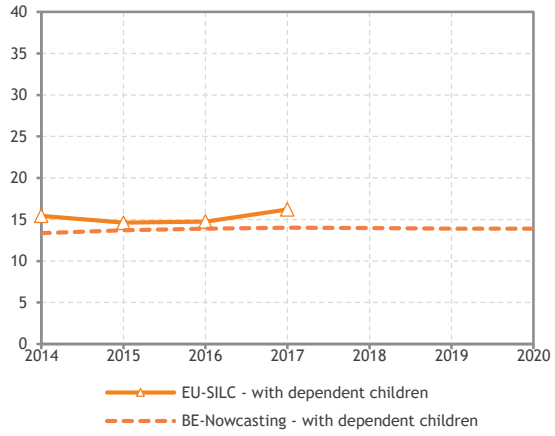
AROP among adults living in single-adult households without and with dependent children



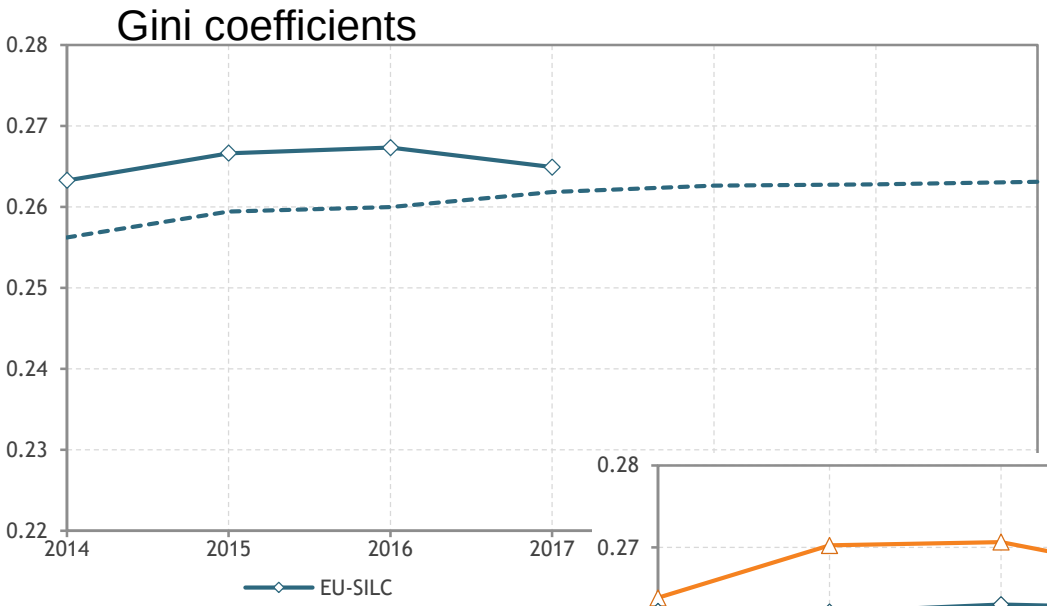


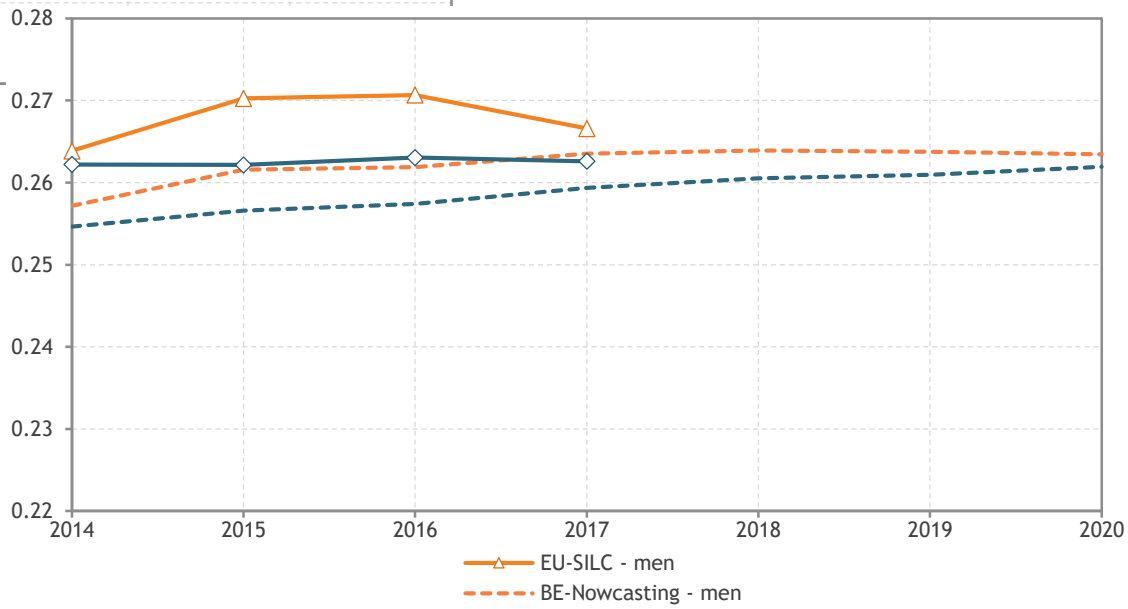
AROP among adults living in multiple-adult households without and with dependent children





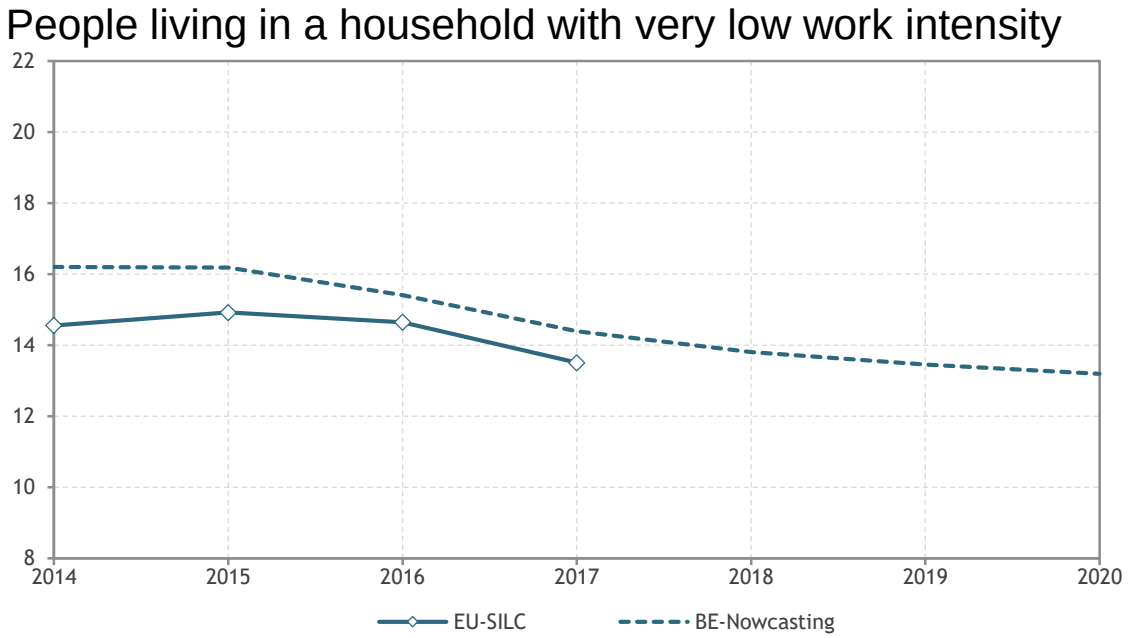
Inequality


Gini coefficients
0.28
0.27
0.26
0.25
0.24
0.23
0.22
2014
2015
2016
2017
EU-SILC


0.28
0.27
0.26
0.25
0.24
0.23
0.22
2014
2015
2016
2017
2018
2019
2020
EU-SILC - men
BE-Nowcasting - men

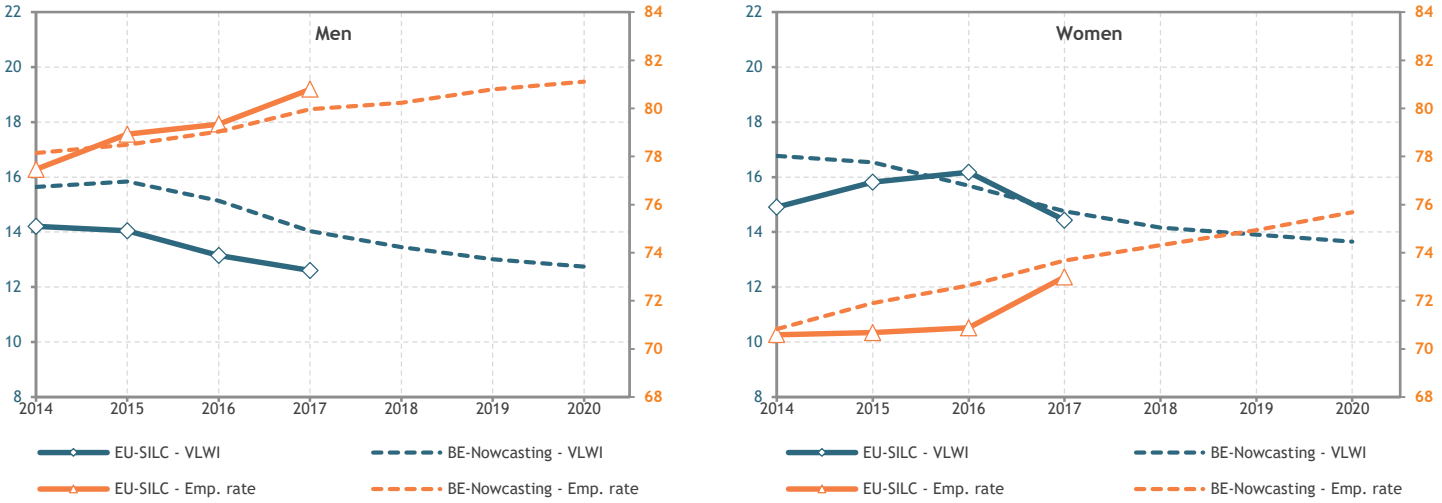
Very Low Work Intensity

- "People aged 0-59, living in households, where working-age adults (ages 18-59, excluding students aged 18-24) work less than 20% of their total work potential during the past year" (Eurostat, 2018)



The main driver of the LWI is the employment rate

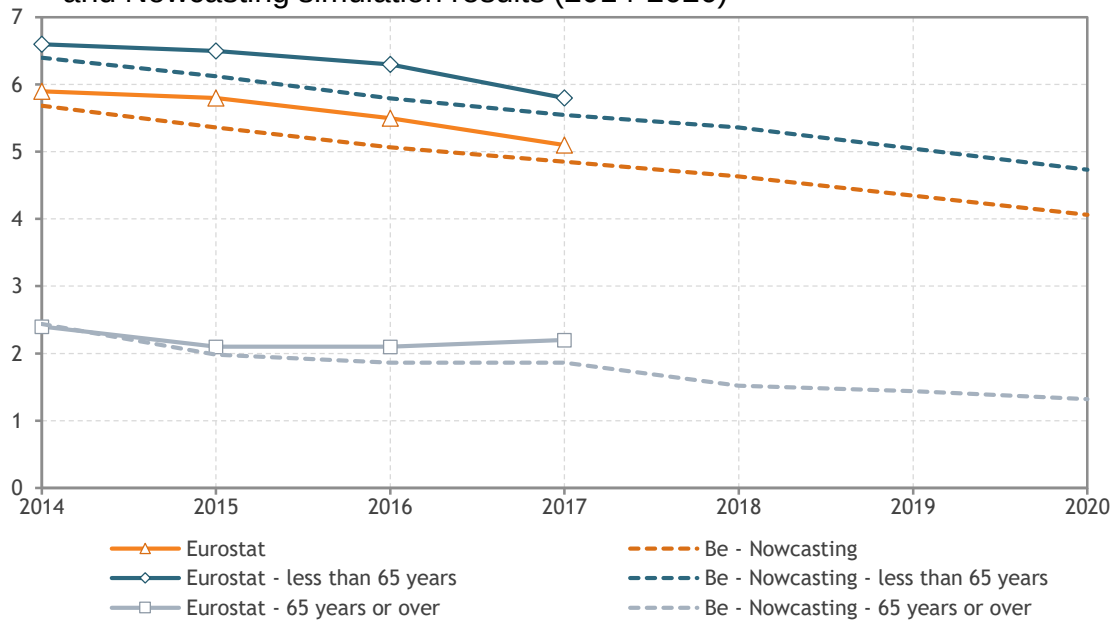
People living in a household with very low work intensity (VLWI, left axis)
and employment rate for working age adults (Emp. rate, right axis), by gender



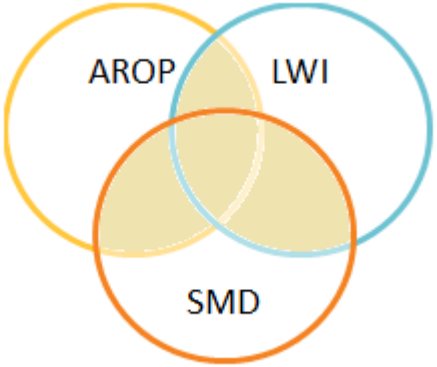
Severe Material Deprivation

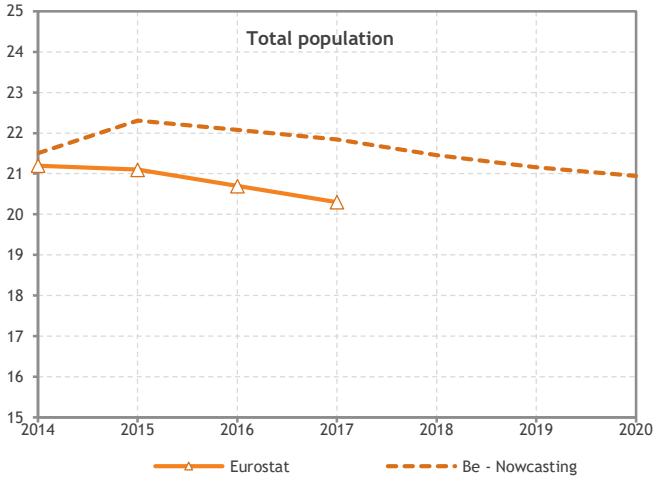
- Logistic regressions
  - ✓ Separate for heads aged < 60 and ≥60
  - ✓ using as covariates (combinations of) AROP, VLWI, age and gender of the head, basic activity status, region, # children in the hh, # other adults, head is single or not, and a cubic trend.

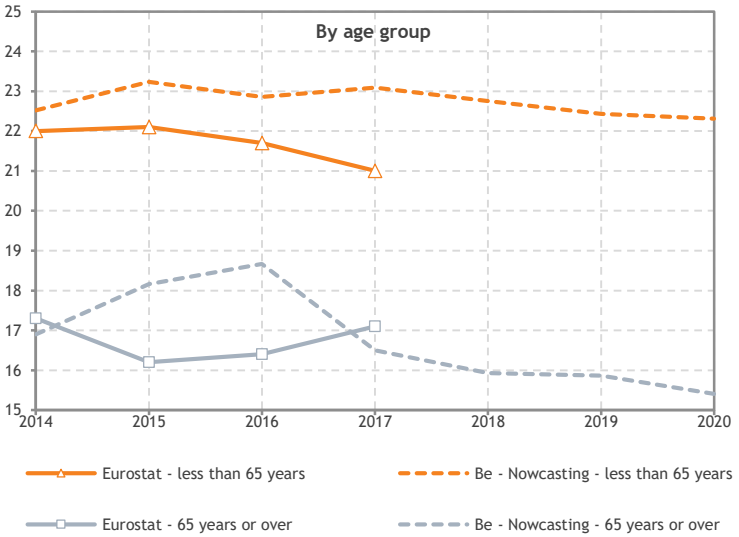
Severe Material Deprivation (SMD) rate for total population and by age group:
Eurostat data (Eurostat 2018c; 2018d - 2014-2017)
and Nowcasting simulation results (2014-2020)



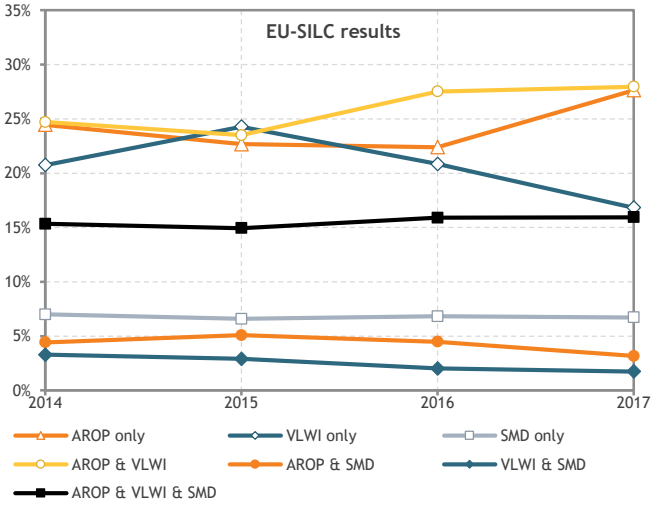
At Risk of Poverty or Social Exclusion

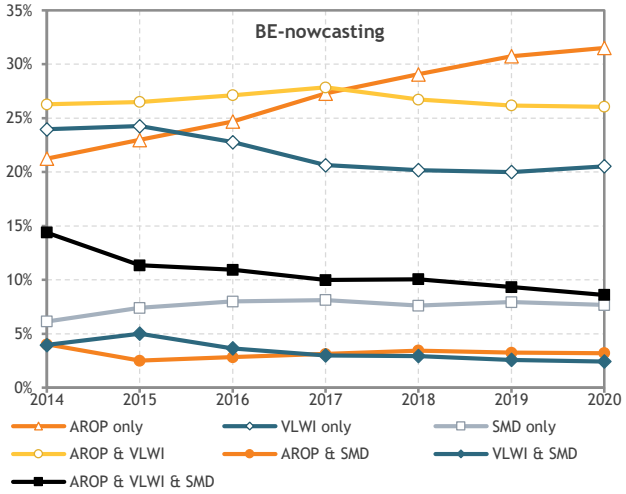






Overlap between AROP, VLWI and SMD in AROPE (age < 60).





Comparison of Nowcasting results with EUROMOD nowcasting estimates, 2015-2017 (1)

		Estimated change	Actual change 2015-17	Observed level 2017	
		EUROMOD	BE-Nowcasting		
Median income (2)		1.9	2.8	5.2	22,783
AROP rates (3)	Total population	0.5	0.6	1.0	15.9
	Men	0.5	0.5	0.8	14.9
	Women	0.5	0.7	1.3	16.9
	Age 0-17	0.4		1.3	15.0
	Age 18-64	0.4		0.6	18.6
	Age 0-64		1.0	1.1	15.9
	Age 65+	1.1	-1.2	0.8	16.0

Table 1 Comparison of Nowcasting results with EUROMOD nowcasting estimates, 2015-2017 (1)

(1) The years refer to the EU-SILC data collection years (as in the rest of this report). So, the estimates are in fact for the previous year. By contrast, in EUROMOD publications, the years refer to the income year.

(2) Median household equivalent income; percentage change, in current prices.

(3) Percentage-point change.

Strengths of Nowcasting

- Dynamic ageing
- Alignment with macro-economic indicators produced by FPB
- Reproduces SILC structure for nowcasted datasets
- Easily updated to new waves of SILC
- Delivers predicted indicators of poverty and social inclusion for the whole population but also (possibly) for particular subgroups
- Additional analyses are possible thanks to accessibility to the nowcasted data

Challenges of Nowcasting

- Some of the results are vulnerable to assumptions, modeling approaches and the sensitivity of the indicators.
- The nature of the SILC data
- The work in some way is not finished, and will require additional work
  - AROP elderly
  - Endogenous labour supply
  - Some sources of income were kept constant
  - Simulation of pension benefit

Conclusions

- The aim of Nowcasting model is to update the observed SILC data to the present time and the near future and predict a range of social indicators based on those simulated datasets
- Current version of the model is based on 2014 wave of SILC and produces synthetic datasets up to 2020
- It works as consistent as possible with observations and short-term projections through the semi-aggregate model MALTESE
- It reproduces SILC structure (non-monetary variables from *t*, while incomes and earnings from *t-1*)

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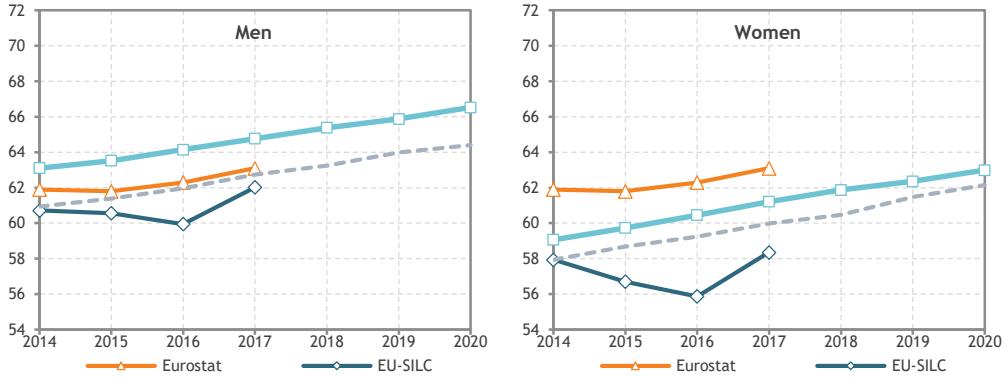
LIAM2

- Free & open source
- Python
- Used for statics & cs dynamics
- Network of users

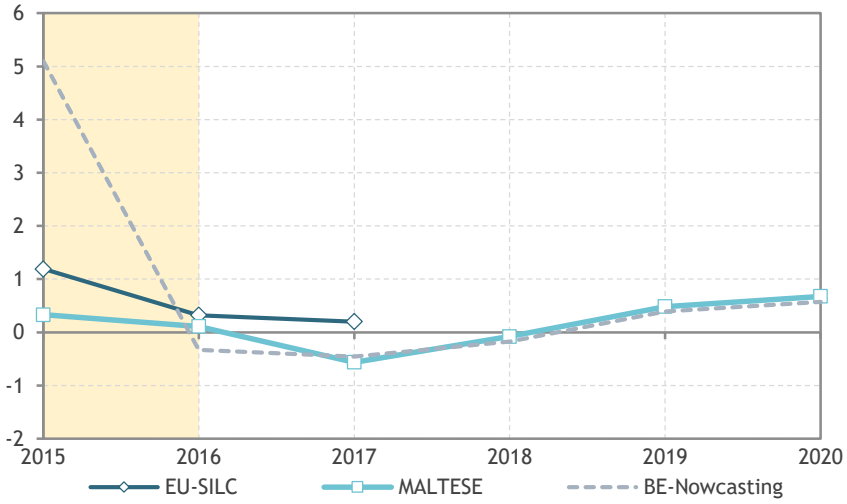
```
globals:
    periodic:
        - CPI: float                # Consumer Price Index
        - ...
entities:
    household:
        ...
    person:
        fields:
            - age: int
            - gender: bool          # "0" if female, "1" if male
            - m_id: int             # mother's identifier
            - ...
        macros:
            FEMALE:           gender == 0
            ...
        links:                                  # first one : Mother to Children
            mc: {type: one2many, target: person, field: m_id}
            ...
        processes:
            age: "age + 1"
            ...
            divorce: "..."          # the process is here DECLARED/SPECIFIED only
            ...
simulation:
    processes:
        - person: [
              year,
              age,
              ...
              divorce,              # the process now SIMULATED/used
              ...
              ]
    input:
        path:  "INPUT_DATA"
        file:  "INIT_MODEL_LXG_INPUT_2007.h5"   # "HDF5" format
    output:
        path:  "OUTPUT_DATA"
        file:  "FINAL_MIDAS_LXG_RESULTS.h5"     # "HDF5" format
    start_period: 2008              # first simulated period
    periods: 20
```

Alignment on corrected exogenous information

(Corrected) employment rate



Real growth rate of average gross employment income



Real growth rate of average gross retirement and survival pensions