PASSAGES

A microsimulation model for retirement income in Canada

January 8, 2024

HEC Montreal

Statistics Canada

Overview of the Initiative (1/2)

- Employment and Social Development Canada (ESDC) project – 4-year project for the first phase
- Projection of Canadian Pension Plan (CPP) (and Quebec Pension Plan)
- What is CPP:
  - Part of the second retirement pillar
  - Mandatory contribution during working period
    - 60B$ in 2022
  - Several benefits:
    - Retirement, survivor, disability (58B$ in 2022)
  - The province of Quebec has its own plan – the Quebec Pension Plan (QPP)
- Created as a partnership between RSI – HEC, Statistics Canada (StatCan) and ESDC

Overview of the Initiative (2/2)

- Dynamic Microsimulation model
- Model to be open-source
- 2 versions of the starting database will be available
  - Confidential: must be run on secure StatCan network.
  - Public: can be run anywhere
    - Synthetic version of the confidential database
    - Created by StatCan using, in part, the Synthpop R package [Nowok et al., 2016]
      - which uses Fully Conditional Specification (FCS) [Drechsler, 2011]

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Overview of the Model

- Projection of the Canadian population and the socio-economic life-courses of its underlying individuals and families at the micro level
- Includes detailed C/QPP program rules
- Based on several assumption about the future, including Office of the Chief Actuary (OCA) assumptions
- Users can change assumptions or program rules to create various "what-if" scenarios
- Model is coded in OpenM++, an open-source C++ based microsimulation language / pre-compiler.
- Number of demographic and economic modules/models are included

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New Data was created for the Project

- 2016 census linked to tax data going back to 1989
  - Census includes demographic information, education attainment, date of immigration, etc…
  - Tax data includes earning histories for all provinces as well as family and marital union histories

- CPP administrative data going back to 1966 (the start of the program) was also linked in. This includes earnings, CPP benefits and CPP contributions for all Canadians except Quebec resident which are covered by the QPP.

- Family and marital union histories prior to 1989 were imputed using the General Social Survey (GSS)

- The database was adjusted to reflect December 31st, 2015

- A synthetic version of this starting database was created for the public version of the model
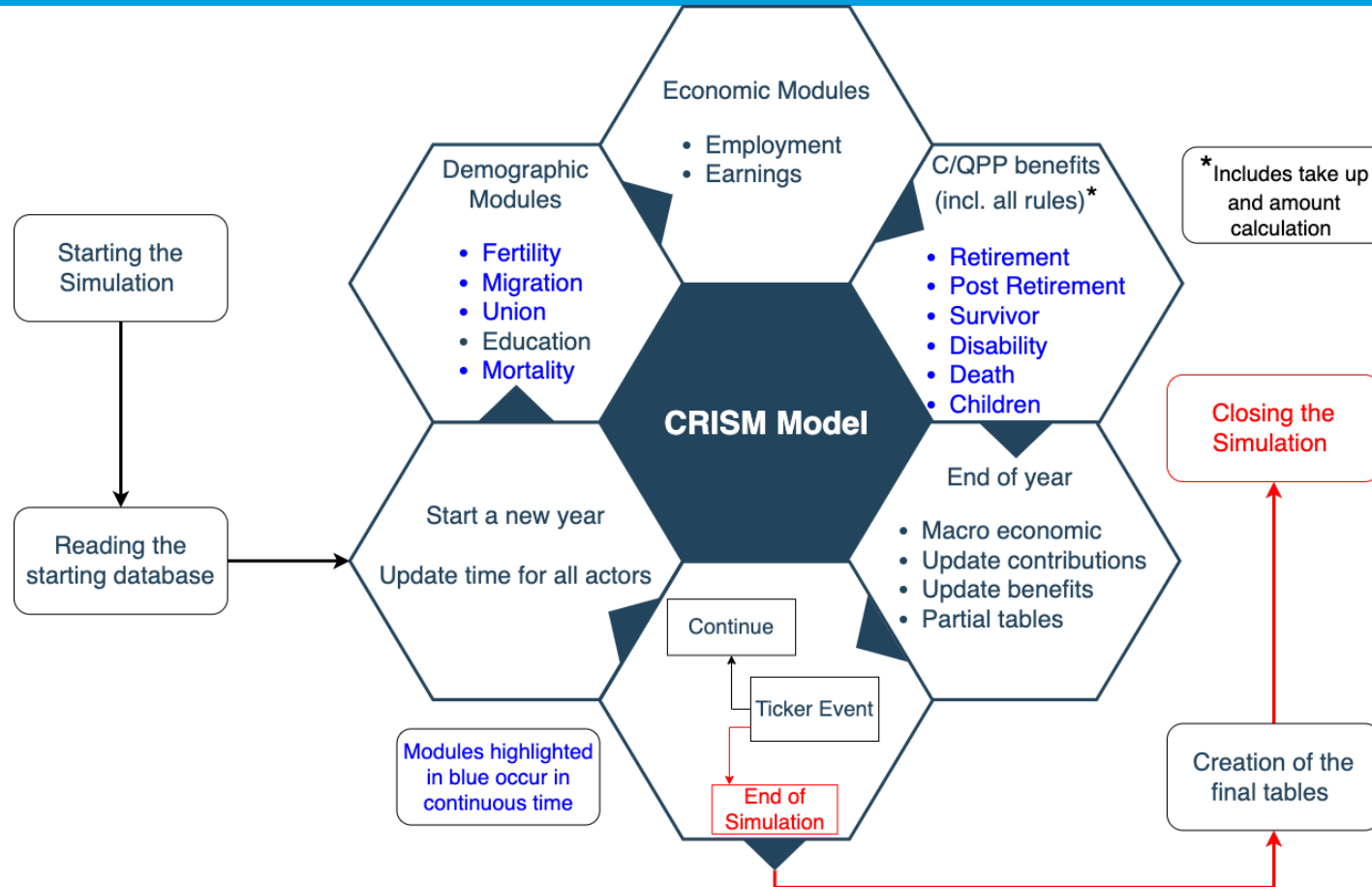
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Visual presentation of the model

Model Features (1/2)

- <u>Starting database, December 31st, 2015</u>

- <u>Fertility</u>: module models the incidence and timing of births, with equations differentiated by birth order (10 equations, GSS-based).

- <u>Education</u>: module including transitions in and out of school (Longitudinal and International Survey of Adults (LISA)-based). Highest level obtained; 4 levels modelled (LFS-based)

- <u>Marital transition</u>: module models common law unions, marriages, separations, divorces (44 equations, GSS-based).

- <u>Mortality</u>: module models mortality with a differential mortality model (calibrated based on mortality by age and sex that replicates three STC population projection scenarios and the OCA projections.)

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Model Features (2/2)

- Inter-regional migration between Quebec/Rest of Canada (ROC) (Census-based).

- Immigration module: cloning of existing immigrants based on annual net immigration rates by region, age and sex. Emigration and non-permanent residents are also modelled.

- Pseudo-open (hybrid) spouse market: cloning spouse and their histories.

- Earnings and employment modules (20 & 35 equations respectively, based on linked 2016 census and longitudinal tax data, and the LISA).

- Detailed modelling of C/QPP rules. All C/QPP rules are coded, included retirement, survivor, disability, child and post-retirement benefits. It also includes rules for DUPE (division of unadjusted pensionable earnings)

- Modeling of C/QPP retirement and disability benefit take-up.

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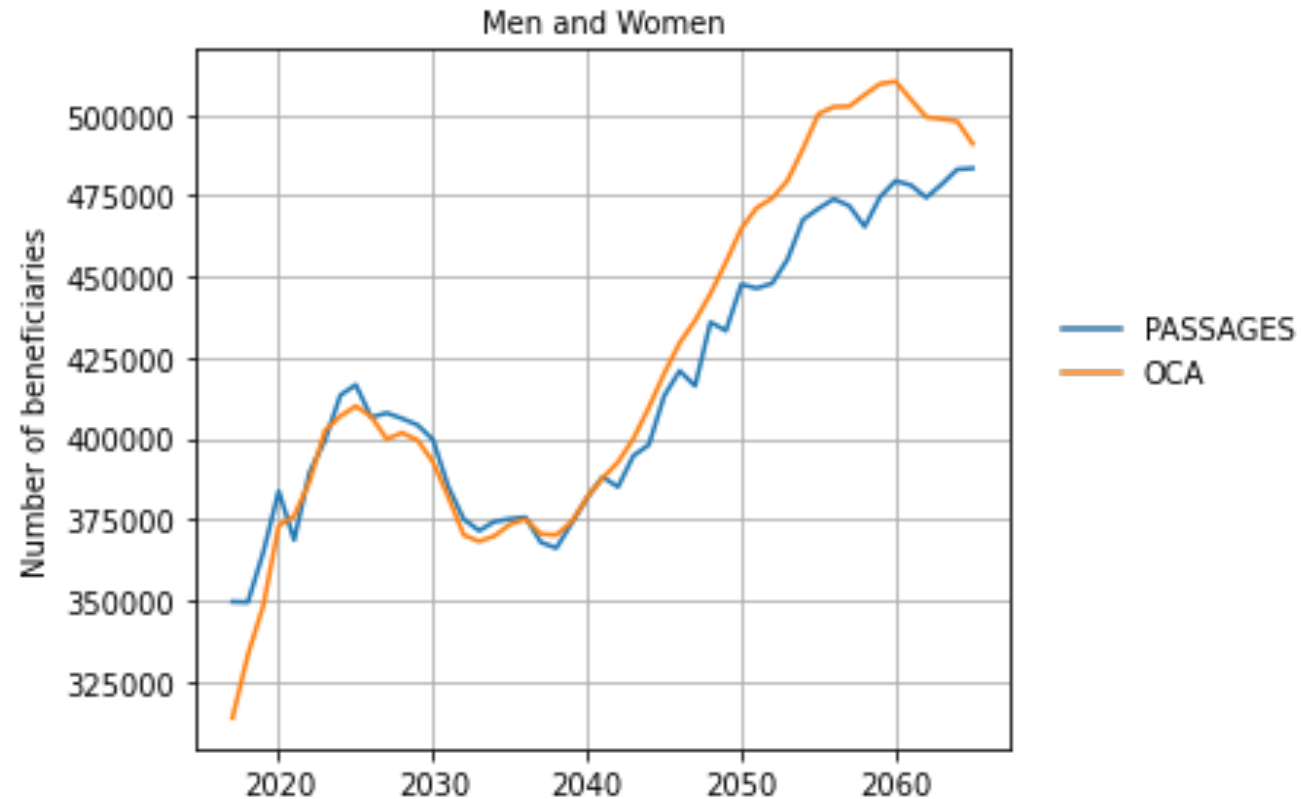Institut sur la retraite et l'épargne
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Results - Validation

Number of new CPP retirement benefit beneficiaries every year projected by PASSAGES and the Office of the Chief actuary (OCA), 2016 to 2065
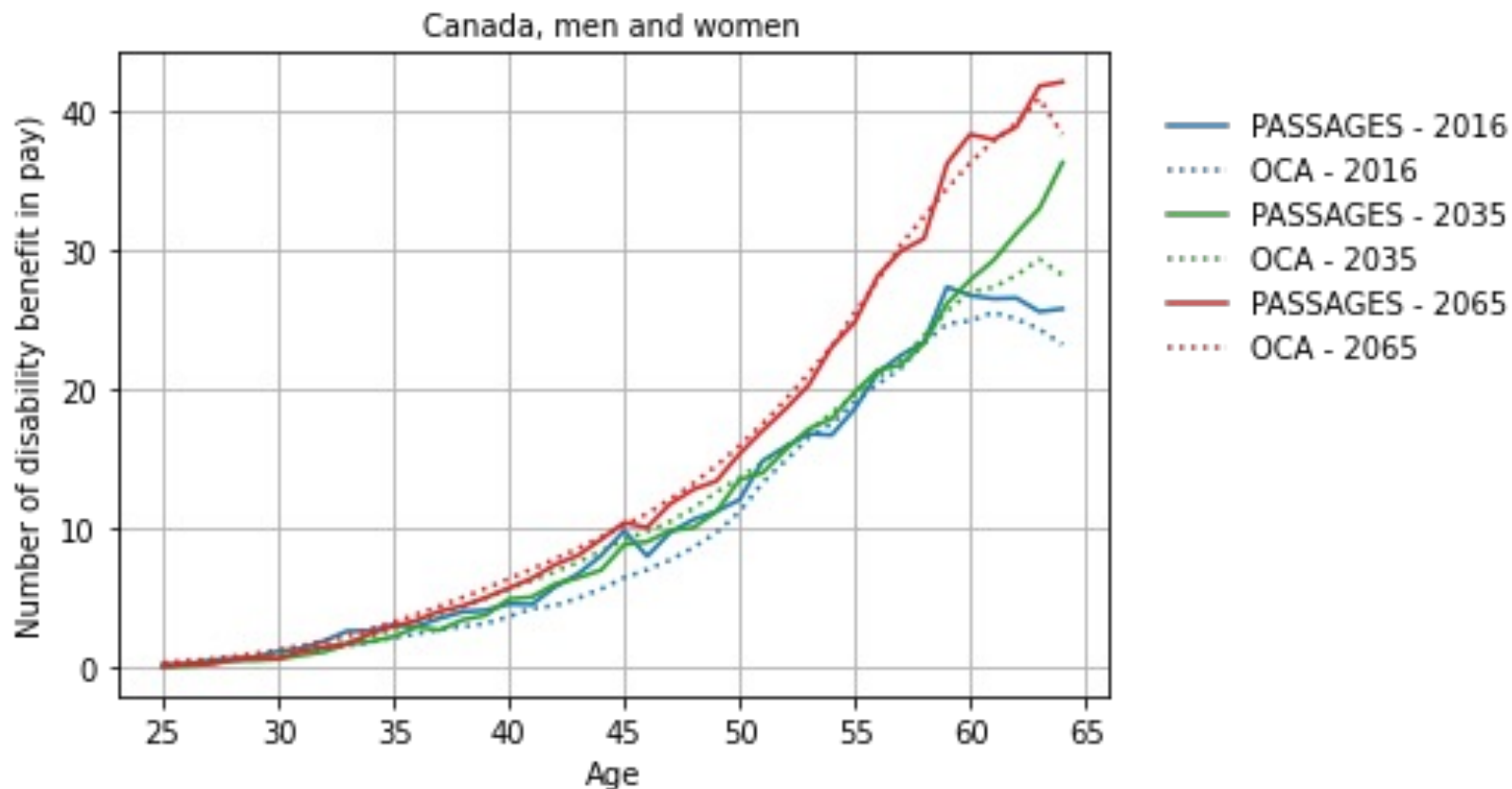

Men and Women

Number of CPP disability benefit beneficiaries projected by PASSAGES and the Office of the Chief actuary (OCA), by age, 2016, 2035, and 2065
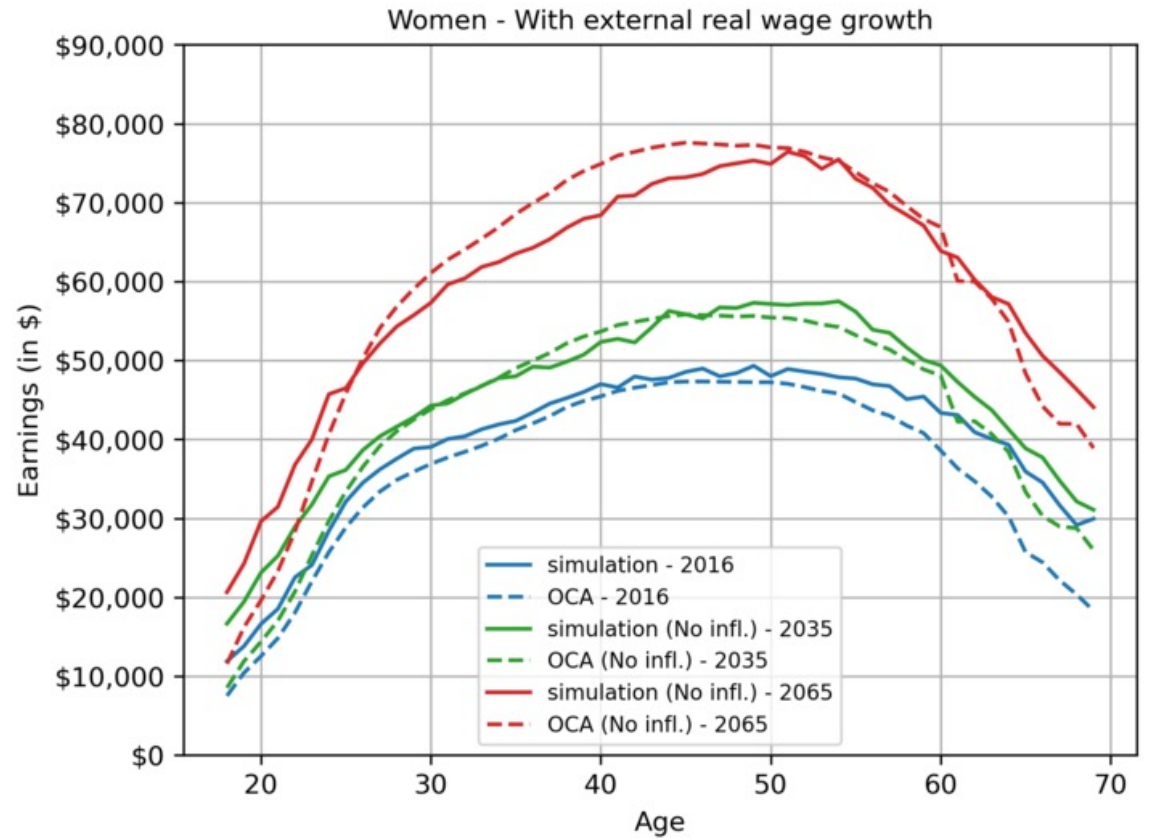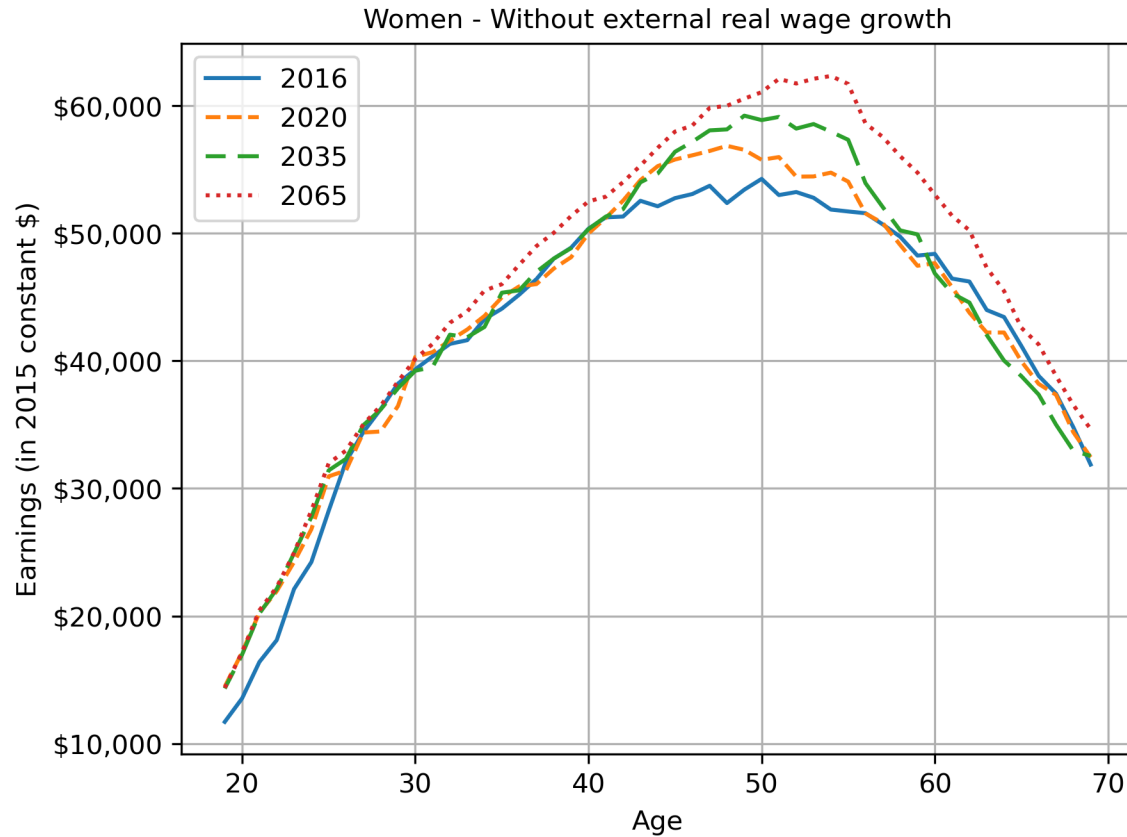

Canada, men and women

Earnings simulated with PASSAGES for Women in 2016, 2020, 2035, and 2065 without and with external real wage growth.

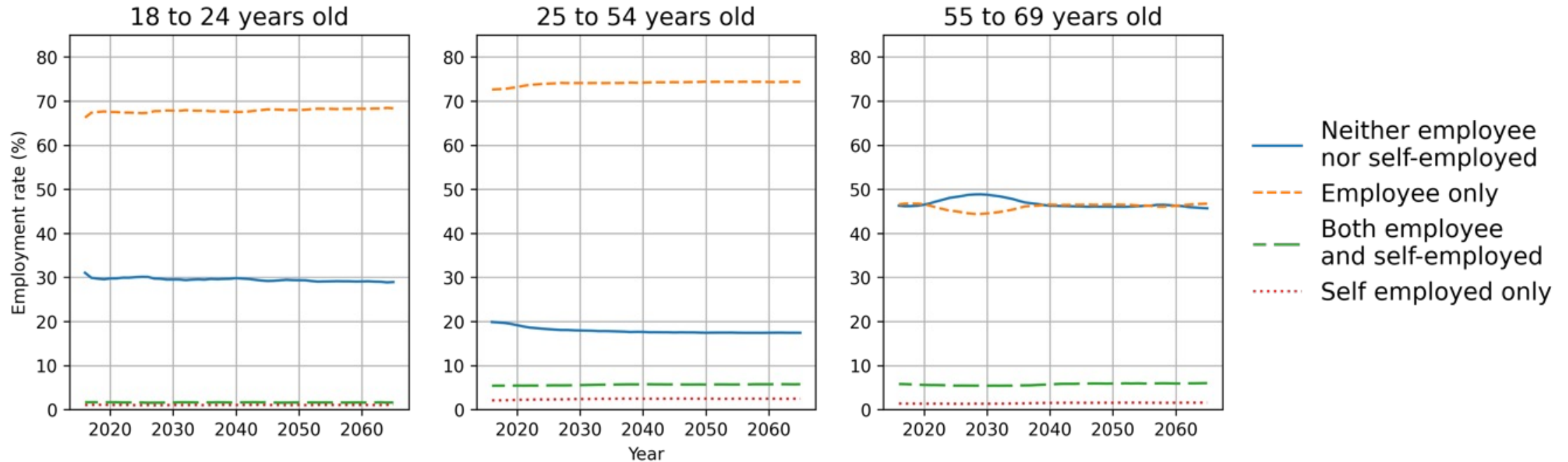# Projected employment rates by year and by age group (%), 2016 to 2065

Conclusion

- PASSAGES was delivered to ESDC last December
  - All core functionality implemented
  - Ready for external users to view and test

- Next steps:
  - Review of the model by ESDC and others
  - Further validation, bug-fixing and fine-tuning
  - Training
  - Translation (model to be available in French and English)

- Official release in April 2024
  - Model to be open-source

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How to access to the pre-release version of PASSAGES

- To get access to the pre-release version of PASSAGES, please email

  statcan.passagesmodel-modelepassages.statcan@statcan.gc.ca