

# Projecting the Evolution of Poverty in Canada

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## Context

- Changing labour markets and demographics will affect who will be vulnerable to poverty in the future
  - Increases in female labour supply  $\Rightarrow$  widows likely less vulnerable in the future.
  - More educated male and female cohorts will perhaps be better prepared for retirement
- Need for a microsimulation model to project how poverty will evolve in the future
- What role for public policy ?
  - Will the Survivor's Pension still be necessary in the future ?

## Projecting future income

- Our projections rely on SIMUL.
- SIMUL is a microsimulation model combining demographic and economic transitions
- Demographic transitions are calibrated to match official Statistics Canada transitions
- Individual level transitions are estimated from microdata

# SIMUL: Main modules

## 1 Initialization

- Based on the National Household Survey (NHS), the “non-mandatory census” of 2011.
- The base population is representative of the Canadian population: gender, age, educational level, income, employment status, immigration status and province of residence

## 2 Demographic transitions

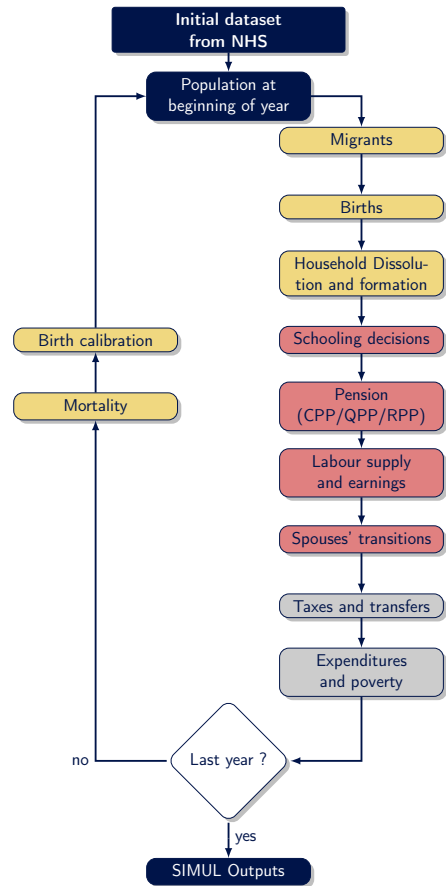
- Births, mortality, immigration, household formation/dissolution. . .
- General Social Survey, 2006, 2011

## 3 “Economic” transitions

- Education, labour supply, pensions. . .
- Longitudinal and International Study of Adults (LISA, 2012): retrospective information on tax returns

## 4 Taxes and transfers (SIMTAX)

- Detailed account of federal and provincial taxes and transfers.
- Important for poverty analysis.



## Labour supply in SIMUL

- The central model of SIMUL is the labour supply model.
- Each period, an individual can *leave* the market if he was *working* or *enter* the market if he was *not working* in the previous period.

$$\Pr(d_{i,t+1} = 1 | d_{i,t} = 0, \mathbf{x}_{i,t}) = \Lambda(\mathbf{x}_{i,t}\beta_0 + \alpha_0^c)$$

$$\Pr(d_{i,t+1} = 0 | d_{i,t} = 1, \mathbf{x}_{i,t}) = \Lambda(\mathbf{x}_{i,t}\beta_1 + \alpha_1^c)$$

where  $\Lambda$  denotes the logistic CDF.

- Covariates ( $\mathbf{x}_{i,t}$ ) include age (and squared), birth year, gender, education, province of residence.
- $\alpha_0^c$  and  $\alpha_1^c$  capture the unobserved heterogeneity. Each term can take one of two values. Hence, there are four types of workers.
- Estimation of the model is based upon the EM algorithm, from which we directly get the probability that an individual belong to each of these types.
- These probabilities are used in the estimation the earnings in order to control for selection.

## Earnings in SIMUL

- Each period, individual earnings are given by:

$$\log y_{i,t} + \mathbf{x}_{i,t}\boldsymbol{\beta} + \delta^c + \nu_i + \varepsilon_{i,t},$$

where  $\nu_i$  is a random effect which is normally distributed with variance  $\sigma_\nu^2$ , and  $\varepsilon_{i,t}$  is a white noise with variance  $\sigma_\varepsilon^2$ .

- The estimator that we use is a weighted version of the maximum likelihood estimator given by:

$$\begin{aligned} & \ln L(\boldsymbol{\beta}, \boldsymbol{\delta}, \sigma_\nu, \sigma_\varepsilon \mid y_{i,t}, \mathbf{x}_{i,t}, \mathbf{z}_i, \mathbf{d}_i) \\ &= \sum_{c=1}^C \Pr(c \mid \mathbf{x}_{i,t}, \mathbf{z}_i, \mathbf{d}_i) \ln L(\boldsymbol{\beta}, \boldsymbol{\delta}, \sigma_\nu, \sigma_\varepsilon \mid y_{i,t}, \mathbf{x}_{i,t}, \mathbf{z}_i, \mathbf{d}_i, c) \end{aligned}$$

## Other sources of income

- Quebec/Canada Pension Plan
  - Computed according to the simulated income history.
- Registered Pension Plans
  - Imputed based on auxiliary regression models
- Government transfers
  - Computed with **SIMTAX** based on family income.
  - Include important transfers such as Old Age Security and social assistance.
    - Guaranteed Income Supplement
    - Allowance (60–64, with spouse on OAS)
    - Allowance for the Survivor



## Measuring poverty

- We use a “Market Basket Measure” of poverty (MBM).
- Advantage:
  - Captures regional variations in cost of living (*i.e.* housing cost)
- Disadvantage:
  - Based on a basket of goods for a family with adults aged 25 to 49 and two children. May not reflect the needs of the elders.
- The threshold is given by:

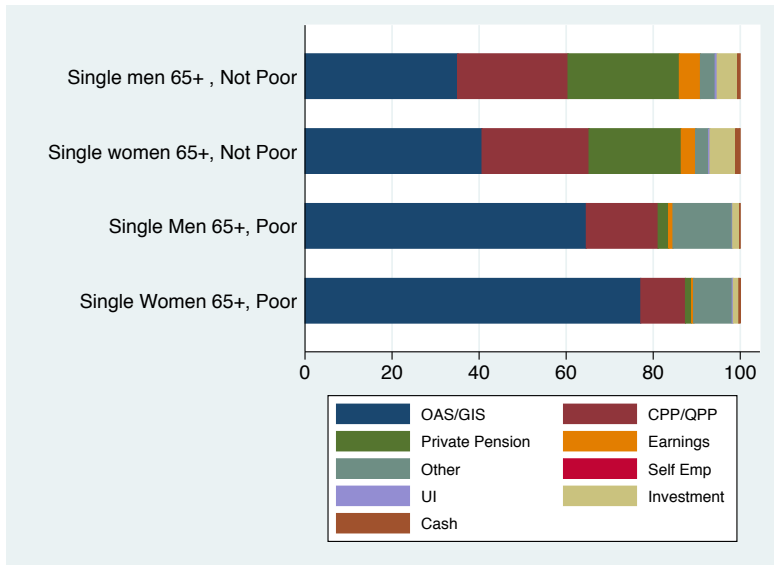
$$MBM(size) = \left( \frac{\sqrt{size}}{\sqrt{4}} \right) 30,552$,$$

where the amount 30,552\$ is the average provincial threshold for a family of 4 in 2010.

## Low Income According to MBM, 2011

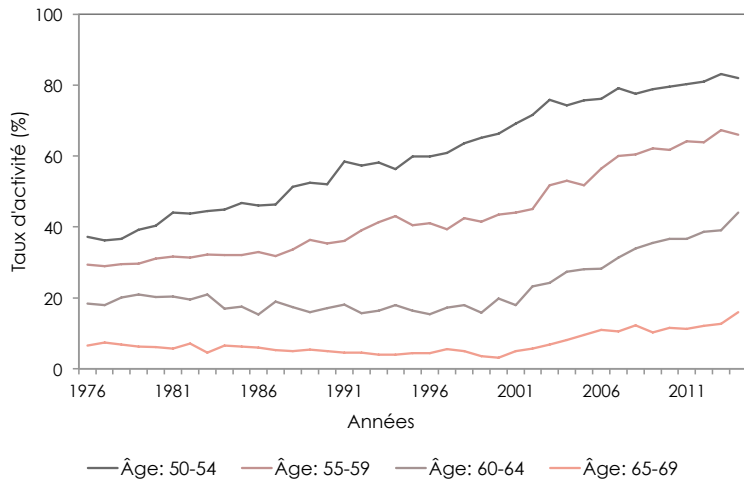
	SLID	NHS
All Families	14.8%	13%
Singles	27.1%	28.5%
Single Males	27%	29.3%
Single Females	27.1%	27.6%
Singles $\leq$ 65	32.6%	33.8%
Singles $\geq$ 65	12.5%	13.7%
Single Males $\geq$ 65	7.8%	11.4%
Single Females $\geq$ 65	14.7%	14.8%

# Sources of Income

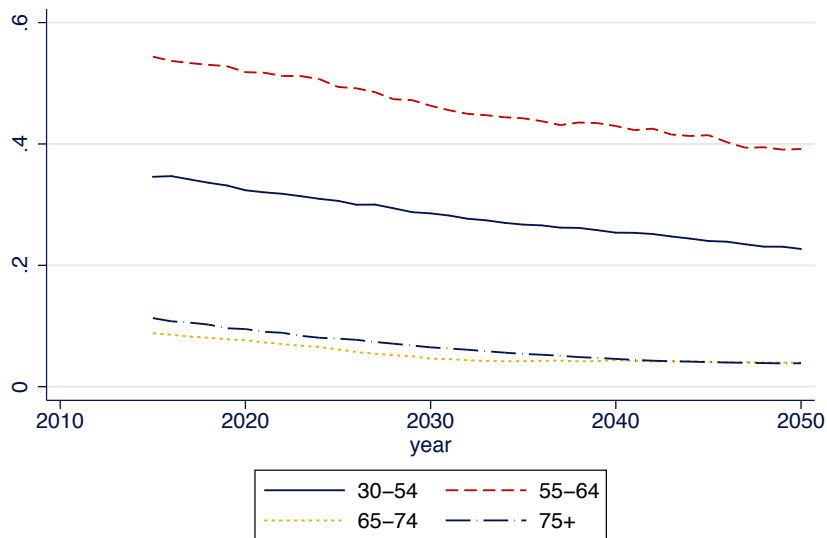


Source: National Household Survey, 2011

# Participation Rates, Women, Canada



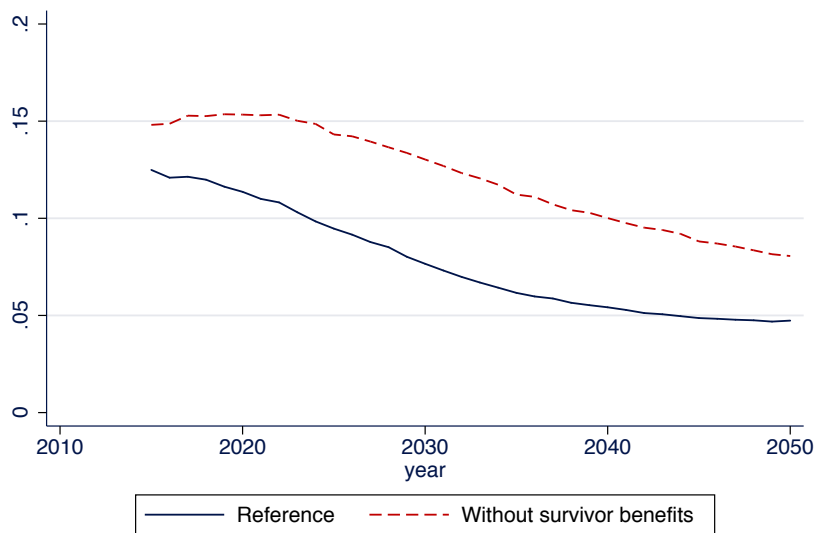
## Results 1: Projecting poverty rate of single women



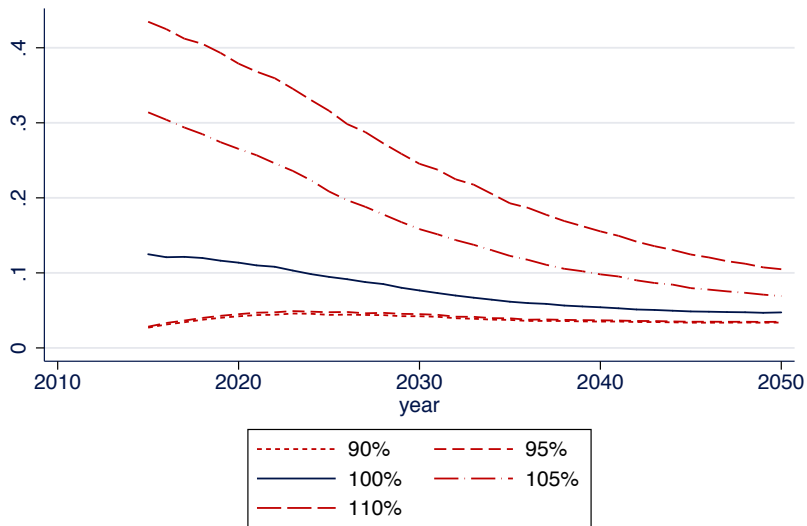
# The Role of the Survivor's Pension

- The Canada Pension Plan (CPP) **survivor's pension** is paid to the person who, at the time of death, is the legal spouse or common-law partner of the deceased contributor.
- The amount received depends on:
  - Whether the survivor also receives a CPP disability benefit or retirement pension
  - Age
  - How much, and for how long, the deceased contributor has paid into the CPP

## Results 2: Widows and the role of the Survivor's pension



## Results 3: MBM Threshold effects: Widows





# Conclusions

- 1 SIMUL is a powerful stochastic simulation model that allows rigorous distributional analyses of public policies
- 2 Poverty is projected to decline in coming decades for all groups, especially single women
  - Increased female labour participation in Canada, more so in Quebec
    - Increased contributions to RPP and CPP
  - Increased human capital
    - Better wages

# Contributors

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