THE EFFECT OF EDUCATION ON THE DEMOGRAPHIC DIVIDEND: AN ANALYSIS OF THE BRAZILIAN CASE

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INTRODUCTION

- Our goal in this paper is to replicate this, which uses data from Mexico and Spain, in the Brazilian context.
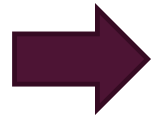
The Effect of Education on the Demographic Dividend

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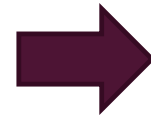CONCEPCIÓ PATXOT

INTRODUCTION

- Economic Support Ratio (ESR): Combines economic and demographic information. It is a proxy for the first demographic dividend.

  - Mason (2005) and Mason and Lee (2006):

$$g\left(\frac{Y(t)}{N(t)}\right) = g(SR) + g(Pr)$$

$$C(t) = \sum_i N_i(t) \cdot c_i$$

$$L(t) = \sum_i N_i(t) \cdot ly_i$$

$$g(ESR) = g(L) - g(C)$$

PURPOSE

- To analyze the role of educational attainment in the demographic dividend in the context of the Brazilian demographic transition

METHODOLOGY

- Decompose the economic support ratio (ESR) with three effects: Age, education, and rate, using a decomposition method -- Da Gupta (1993)

- Simulate using population projections by age and education stratum, as produced by the *Wittgenstein Centre for Demography and Global Human Capital* (WICD), available in five-year intervals between 1970 a 2100, with different scenarios

DECOMPOSITION

- Mason (2005) and Mason and Lee (2006):

$$ESR = L - C \quad (1)$$

$$C(t) = \sum_i N_i(t) \cdot c_i \quad (2)$$

$$L(t) = \sum_i N_i(t) \cdot ly_i \quad (3)$$

- Renteria et al. (2006):

$$C(t) = \sum_j C_j(t) = \sum_i \sum_j N_{ij}(t) \cdot c_{ij} \quad (5)$$

$$L(t) = \sum_j L_j(t) = \sum_i \sum_j N_{ij}(t) \cdot ly_{ij} \quad (6)$$

$$g(ESR) = g(L) - g(C) \quad (4)$$

DECOMPOSITION

$$g(ESR) = g(L) - g(C) = \frac{L(t+x) - L(t)}{L(t)} - \frac{C(t+x) - C(t)}{C(t)} = \frac{R_L + A_L + E_L}{L(t)} - \frac{R_C + A_C + E_C}{C(t)} = g(R) + g(A) + g(E)$$

Given that,

$$L(t+x) - L(t) = \underbrace{[\bar{R}(t+x) - \bar{R}(t)]}_{rate\ effect\ (R)} + \underbrace{[\bar{A}(t+x) - \bar{A}(t)]}_{age\ effect\ (A)} + \underbrace{[\bar{E}(t+x) - \bar{E}(t)]}_{education\ effect\ (E)}$$

$$C(t+x) - C(t) = \underbrace{[\bar{R}(t+x) - \bar{R}(t)]}_{rate\ effect\ (R)} + \underbrace{[\bar{A}(t+x) - \bar{A}(t)]}_{age\ effect\ (A)} + \underbrace{[\bar{E}(t+x) - \bar{E}(t)]}_{education\ effect\ (E)}$$

DECOMPOSITION

Operationalization:

- STEP 1: Calculate rate, education, and age both in consumption and labor income

$$\bar{R}(t+x) - \bar{R}(t) = \sum_{i,j} \frac{\frac{N_{ij}}{N}(t+x)+\frac{N_{ij}}{N}(t)}{2} ly_{ij}(t+x) - \sum_{i,j} \frac{\frac{N_{ij}}{N}(t+x)+\frac{N_{ij}}{N}(t)}{2} ly_{ij}(t)$$

$$\bar{E}(t+x) - \bar{E}(t) = \sum_{i,j} \frac{ly_{ij}(t+x)+ly_{ij}(t)}{2} \cdot \frac{a_{ij}(t+x)+a_{ij}(t)}{2} \cdot e_{ij}(t+x) - \sum_{i,j} \frac{ly_{ij}(t+x)+ly_{ij}(t)}{2} \cdot \frac{a_{ij}(t+x)+a_{ij}(t)}{2} \cdot e_{ij}(t)$$

$$\bar{A}(t+x) - \bar{A}(t) = \sum_{i,j} \frac{ly_{ij}(t+x)+ly_{ij}(t)}{2} \cdot \frac{e_{ij}(t+x)+e_{ij}(t)}{2} \cdot a_{ij}(t+x) - \sum_{i,j} \frac{ly_{ij}(t+x)+ly_{ij}(t)}{2} \cdot \frac{e_{ij}(t+x)+e_{ij}(t)}{2} \cdot a_{ij}(t)$$

Where,

$$a_{ij}(t) = \left(\frac{N_{ij}(t)}{N_j(t)} \cdot \frac{N_i(t)}{N(t)} \right)^{\frac{1}{2}}$$

$$e_{ij}(t) = \left(\frac{N_{ij}(t)}{N_{i.}(t)} \cdot \frac{N_{.j}(t)}{N(t)} \right)^{\frac{1}{2}}$$

DECOMPOSITION

Operationalization:

- STEP 1: Calculate rate, education, and age of both consumption and labor income

$$\bar{R}(t+x) - \bar{R}(t) = \sum_{i,j} \frac{\frac{N_{ij}}{N}(t+x) + \frac{N_{ij}}{N}(t)}{2} ly_{ij}(t+x) - \sum_{i,j} \frac{\frac{N_{ij}}{N}(t+x) + \frac{N_{ij}}{N}(t)}{2} ly_{ij}(t)$$

$$\bar{E}(t+x) - \bar{E}(t) = \sum_{i,j} \frac{ly_{ij}(t+x) + ly_{ij}(t)}{2} \cdot \frac{a_{ij}(t+x) + a_{ij}(t)}{2} \cdot e_{ij}(t+x) - \sum_{i,j} \frac{ly_{ij}(t+x) + ly_{ij}(t)}{2} \cdot \frac{a_{ij}(t+x) + a_{ij}(t)}{2} \cdot e_{ij}(t)$$

$$\bar{A}(t+x) - \bar{A}(t) = \sum_{i,j} \frac{ly_{ij}(t+x) + ly_{ij}(t)}{2} \cdot \frac{e_{ij}(t+x) + e_{ij}(t)}{2} \cdot a_{ij}(t+x) - \sum_{i,j} \frac{ly_{ij}(t+x) + ly_{ij}(t)}{2} \cdot \frac{e_{ij}(t+x) + e_{ij}(t)}{2} \cdot a_{ij}(t)$$

Where,

$$a_{ij}(t) = \left(\frac{N_{ij}(t)}{N_j(t)} \cdot \frac{N_i(t)}{N(t)} \right)^{\frac{1}{2}}$$

The same calculations are performed for labor income and consumption

$$e_{ij}(t) = \left(\frac{N_{ij}(t)}{N_{i.}(t)} \cdot \frac{N_{.j}(t)}{N(t)} \right)^{\frac{1}{2}}$$

DECOMPOSITION

Operationalization:

- STEP 2: Calculate the effects' rate of growth: $g(R)_L, g(A)_L, \ g(E)_L, g(R)_C, g(A)_C$ e $g(E)_C$

Ex: $\quad g(R)_L = \dfrac{\bar{R}(t+x) - \bar{R}(t)}{L(t)}$ e $g(R)_C = \dfrac{\bar{R}(t+x) - \bar{R}(t)}{C(t)}$

- STEP 3: Calculate the effect of each component of ESR

Ex: $\quad g(R) = g(R)_L - g(R)_C$

SIMULATION

- Projection Period: 1970 to 2100
- Scenarios:
  - Three scenarios with the same dymanic demographic conditions (fertility, mortality, and migration); the only difference is the educational context
  - Scenario 1: Educational attainment follows a general global development trend – medium variant
  - Scenario 2: Assumes that educational attainment is constant – low variant
  - Scenario 3: Assumes rapidly expanding educational attainment, similar to the experience of South and Southeast Asia – hight variant
- Decomposition applied to each five-year interval

SIMULATION

Population Composition by Education Level beteen 1970 and 2010
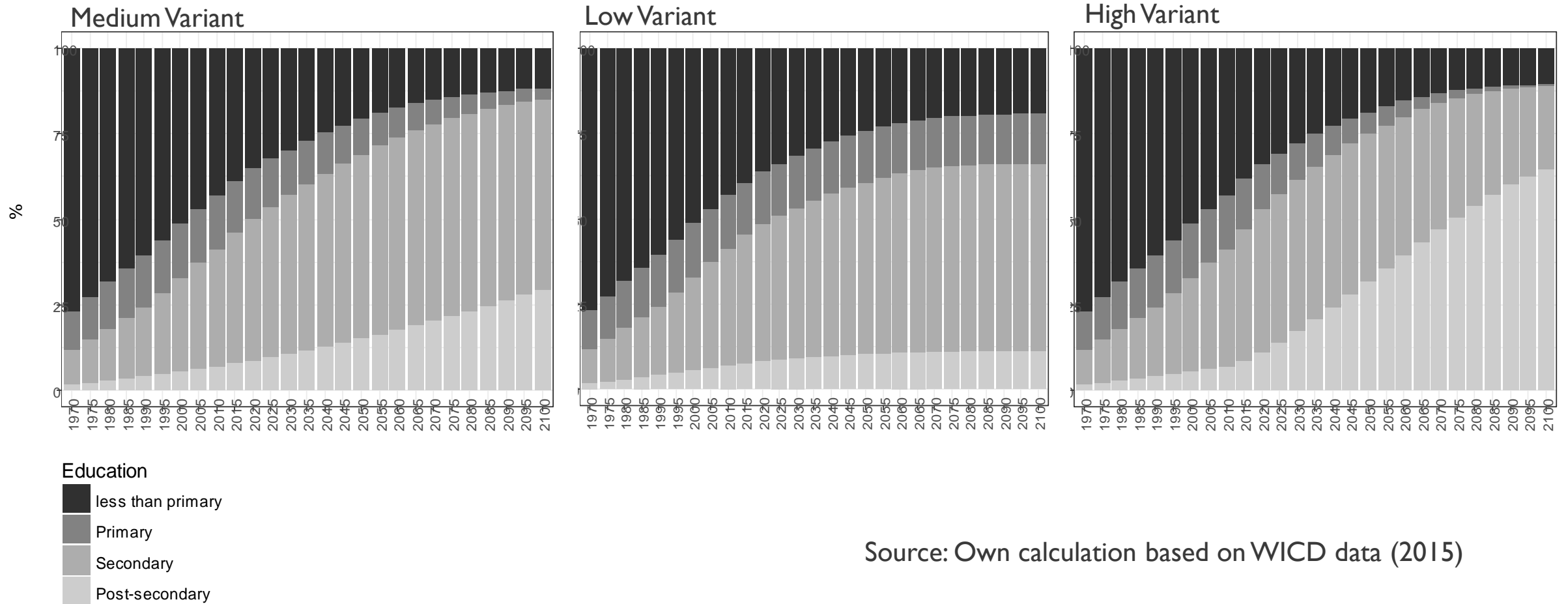
Source: Own calculation based on WICD data (2015)

SIMULATION

Dependency Ratio of Brazilian Population between 1970 and 2010
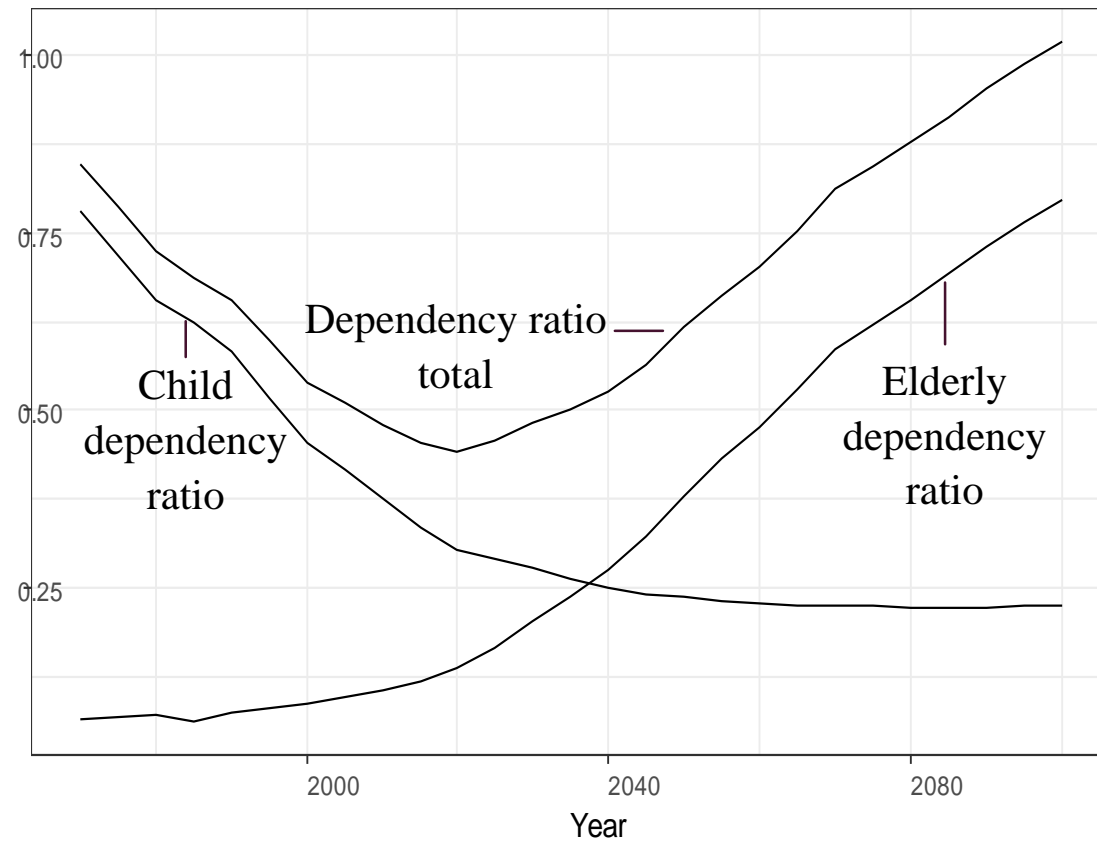
SIMULATION

Dependency Ratio of Brazilian Population between 1970 and 2010
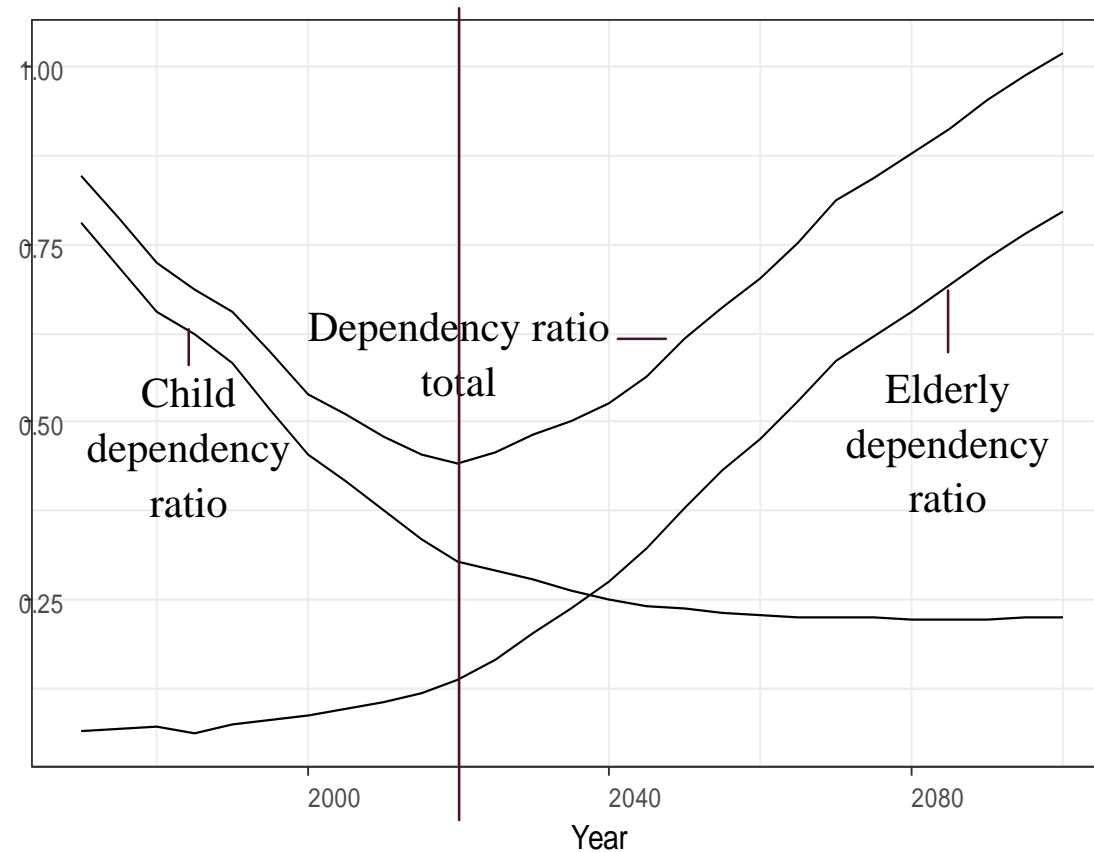
END OF THE DEMOGRAPHIC DIVIDEND

Source: Own calculation based on WICD data (2015)

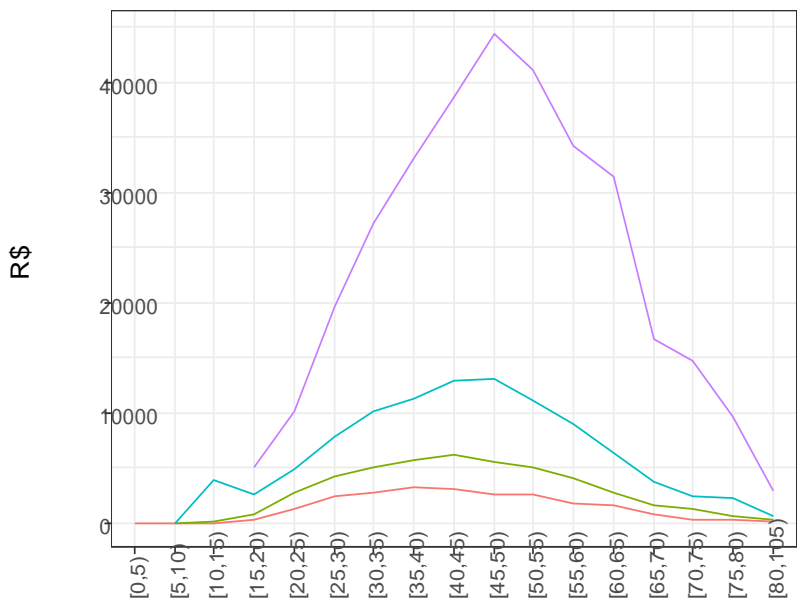# SIMULATION

Labor Income and Consumption Age Profiles, 2008

SIMULATION

Labor Income and Consumption Age Profiles by Education Level, 2008
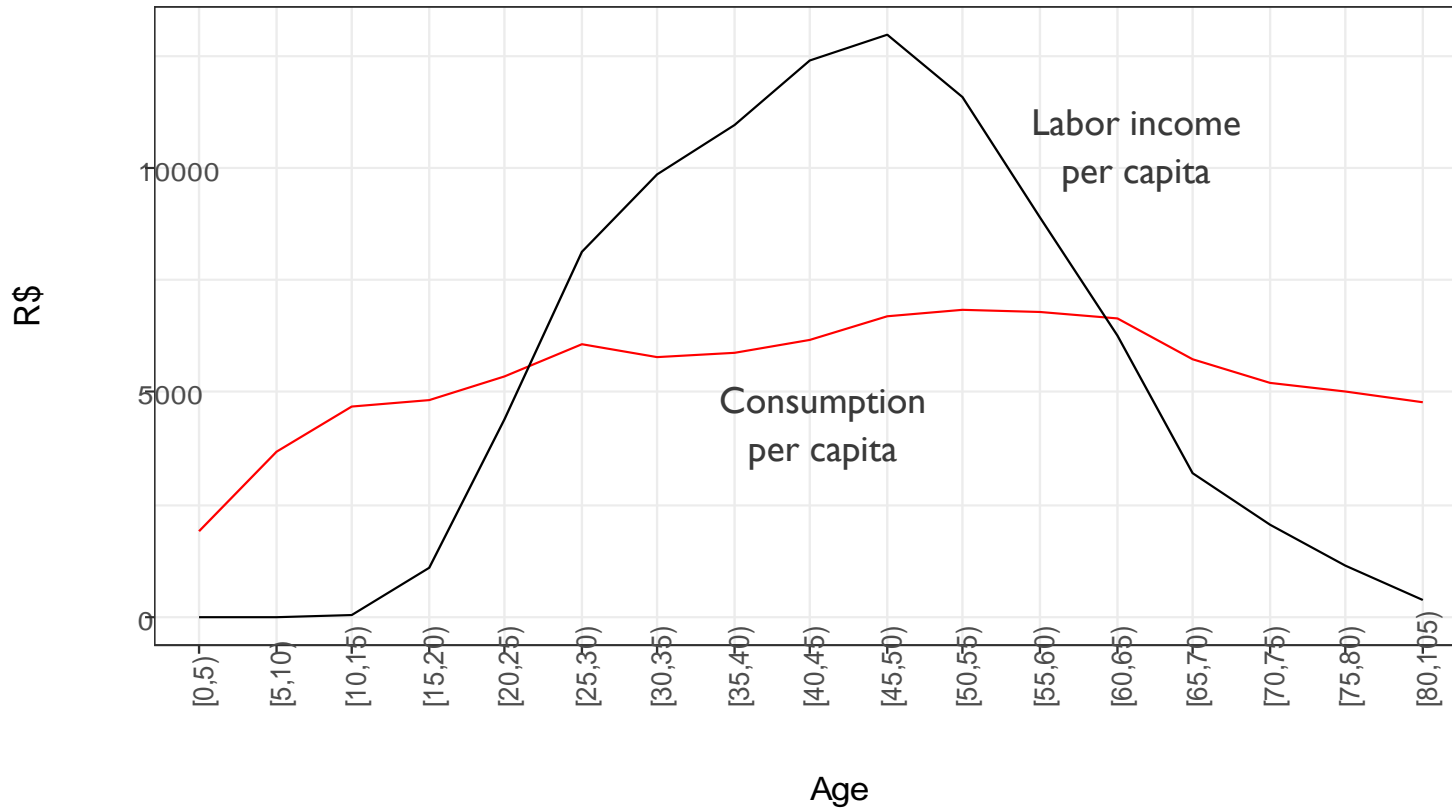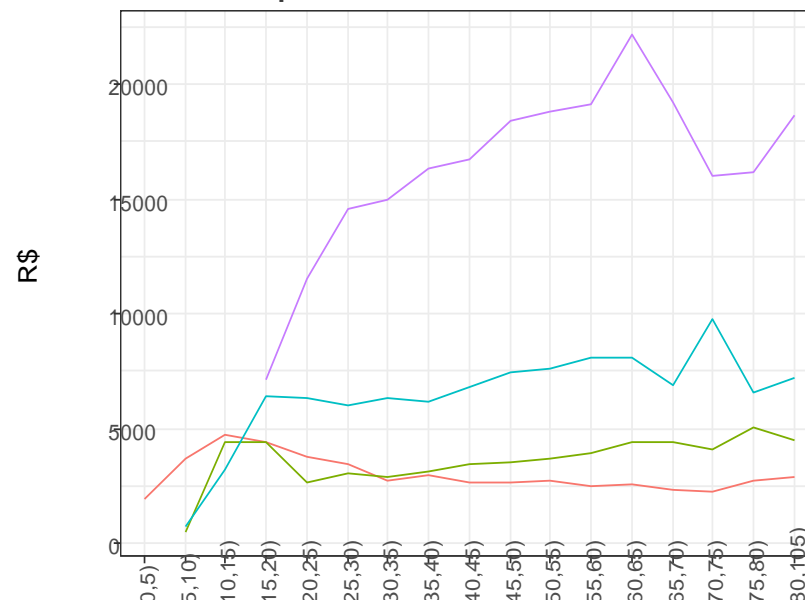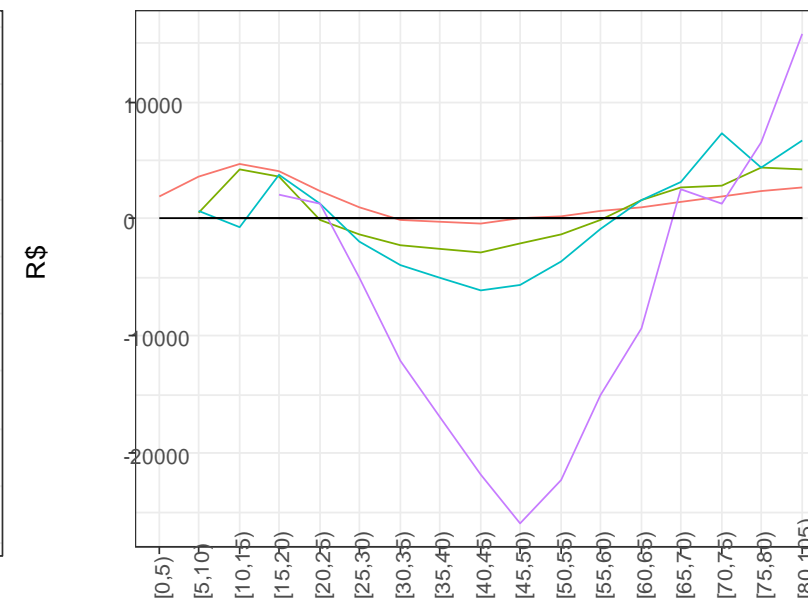
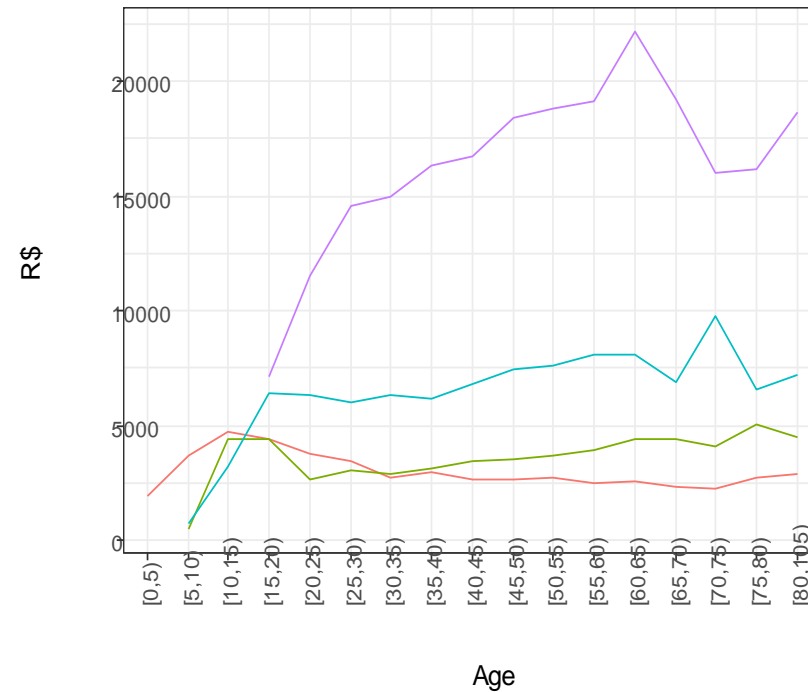Source: Own calculation based on POF data (2008)

SIMULATION (THE SAME PROFILE IS APPLIED TO ALL FIVE-YEAR INTERVALS IN THE PROJECTION)

Labor Income and Consumption Age Profile, by education segments - 2008
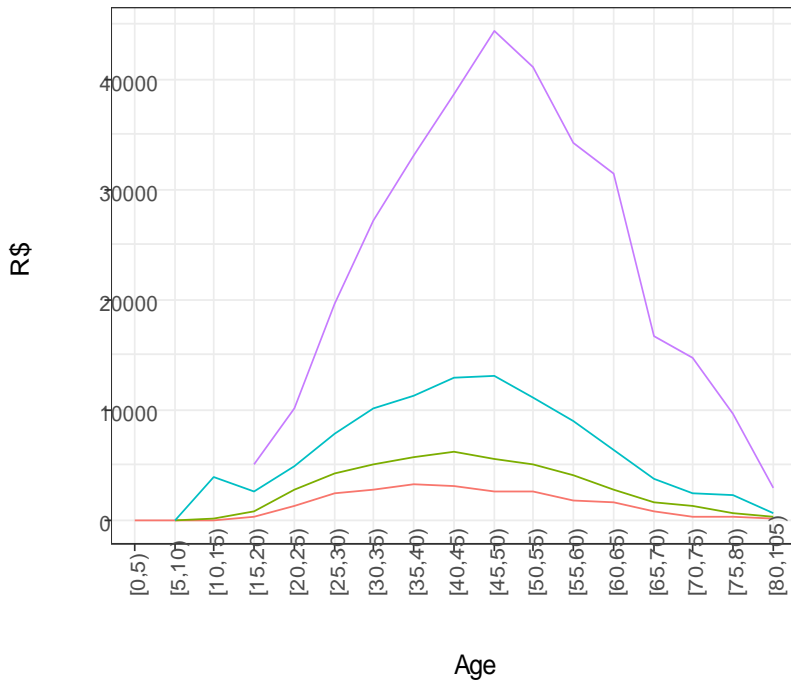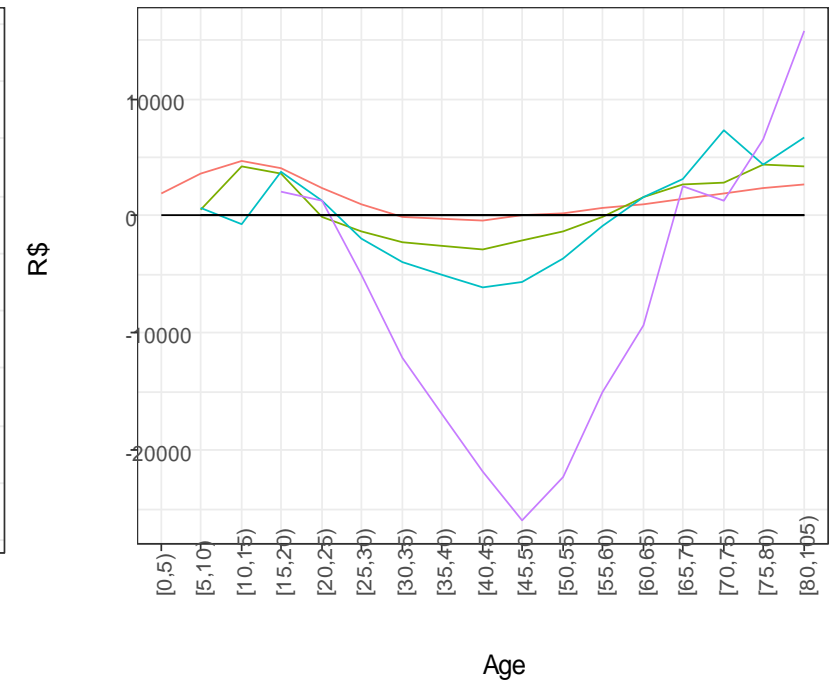

Source: Own calculation based on POF data (2008)
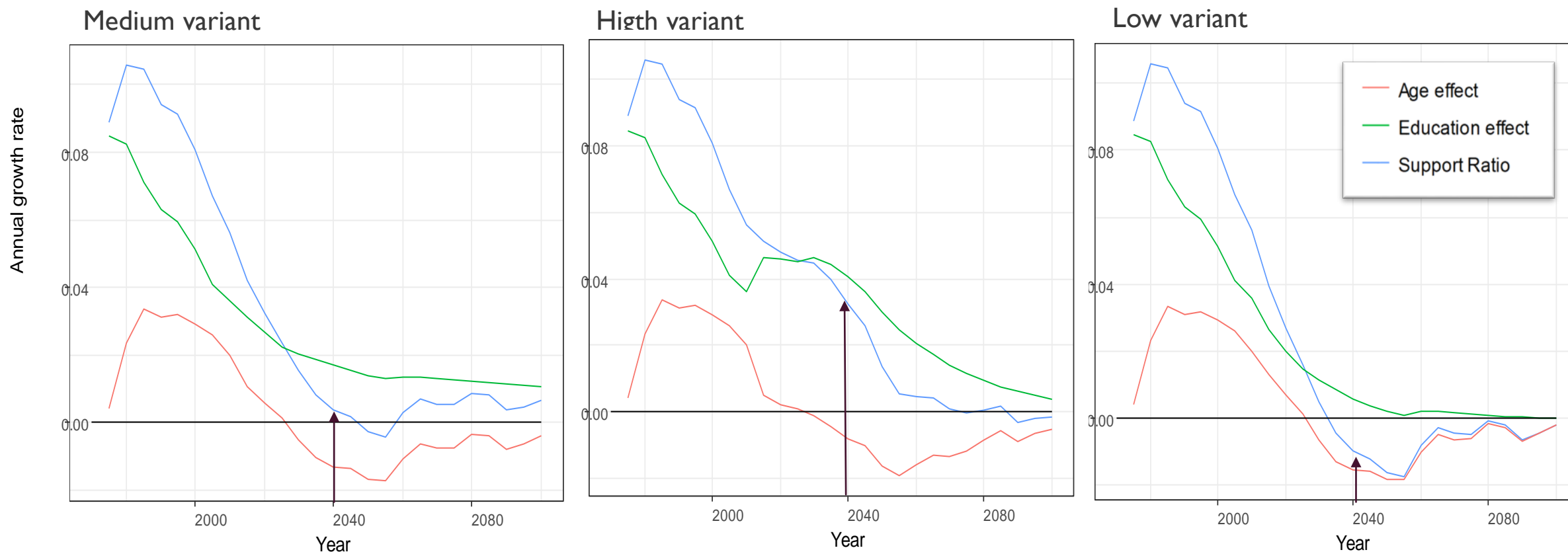
RESULTS

Economic Support Ratio, age and education effects: 1975-2100

Source: self elaboration based on the POF data (2008)

THANK YOU!