AGE AND EDUCATION IN THE COURSE OF DEVELOPMENT: DOES COMPOSITION MATTER?

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Project

- Part of a larger project to look at the relationship between changes in the age distribution and economic development at the local level in both Brazil and Mexico.
- Motivated by results for Asia and their relevance to Latin America.
- Awareness that the heterogeneity that prevails in Brazil and Mexico could work to our advantage.
- Figuring out how to take advantage of this heterogeneity led us to look at studies that had been done on another major demographic shock... the “baby boom” in the US.

“Baby Boom” and US Labor Market

- **Large literature on age-education shifts in the US:**
  - **Exceptionally large cohorts born during the “baby boom” entered the American labor market in the 1970s with higher levels of education.**
  - **Freeman (1979), Welch (1979), and Berger (1985) concluded that large cohorts depressed earnings, and effects increased with education.**
  - **Triest, Sapozhnikov and Sass (2006) indicated that “baby boomers” will still affect income structure after their retirement.**
- **Might such compositional changes have influenced earnings in a large Latin American country such as Brazil?**

Our Quest

- As in other developing countries, age-education transitions in Brazil provide a lot of variation in demographic structure.
  - Fertility decline varied in timing and speed across states and municipalities.
  - Educational enrollment increased substantially from very low levels, but with much regional variation.
- Our idea is to use this regional variation to analyze who gains and loses from these compositional shifts, with a cross-section time series approach.

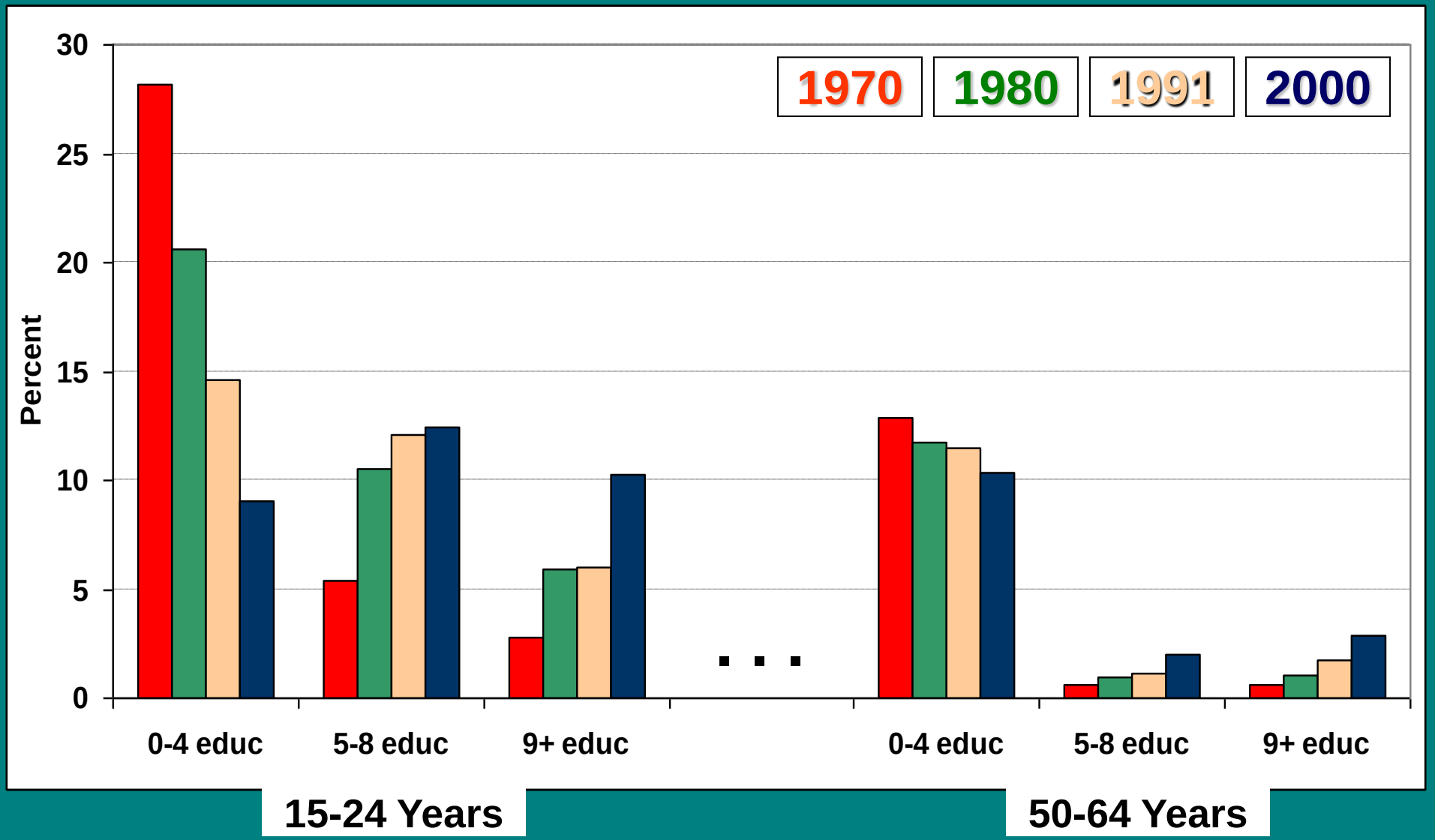
Data

- Microdata from the 1970-2000 Brazilian Censuses.
- Census long forms are available for 25% (1970 and 1980) and 10% or 20% (1991 and 2000) of households.
- Long forms contain information on age, sex, education, income, occupation, and migration.
- We aggregate municipalities to the microregion level, yielding 502 comparable areas across the four censuses.

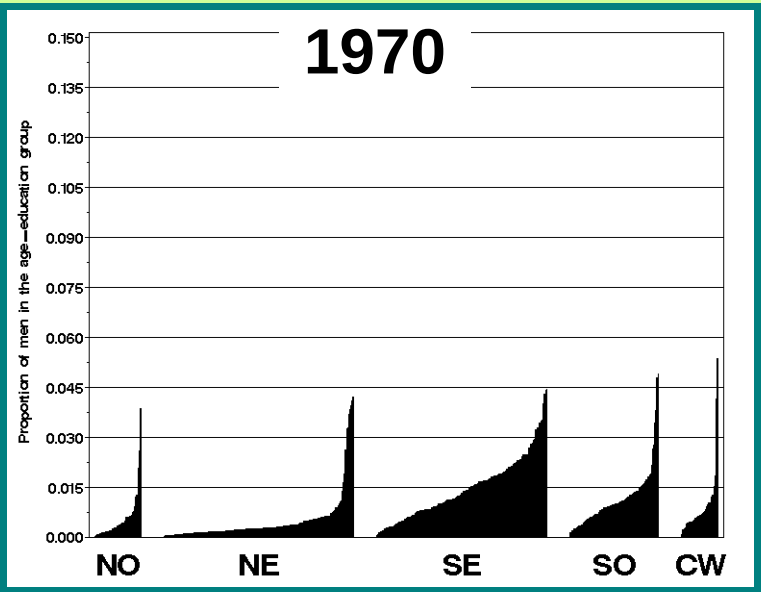
Categories

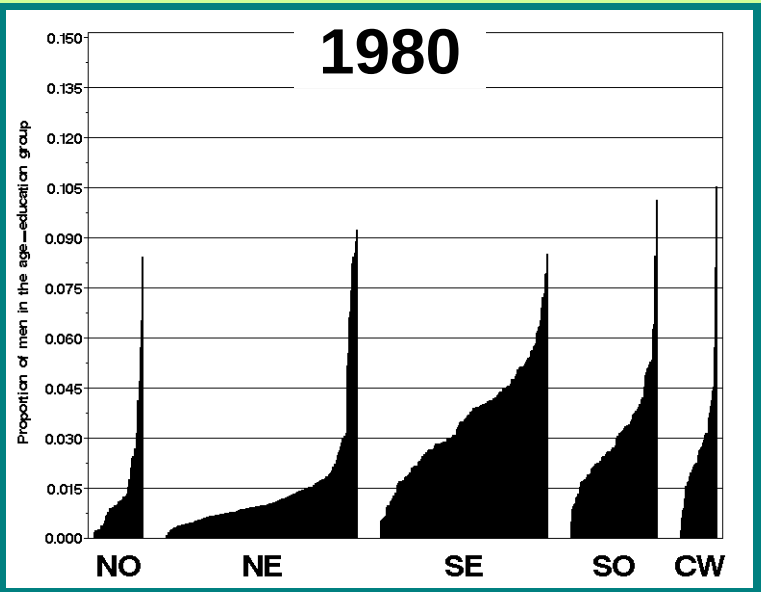
- Time (census years): 1970, 1980, 1991, and 2000.
- Age is categorized in four groups:
  - Youth population (15-24).
  - Young adults (25-34).
  - Adults (35-49).
  - Mature adults (50-64).
- Educational attainment was classified in three groups according to years of schooling completed:
  - No further than the first phase of elementary school (0-4).
  - Second phase of elementary school (5-8).
  - At least some secondary school (9+).

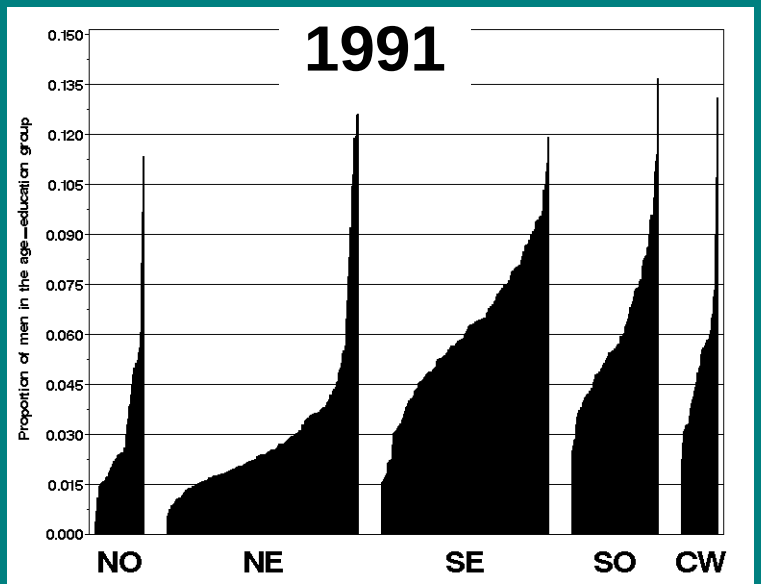
Percent of Male Population by Year and Age-Education Group in Brazil, 1970-2000

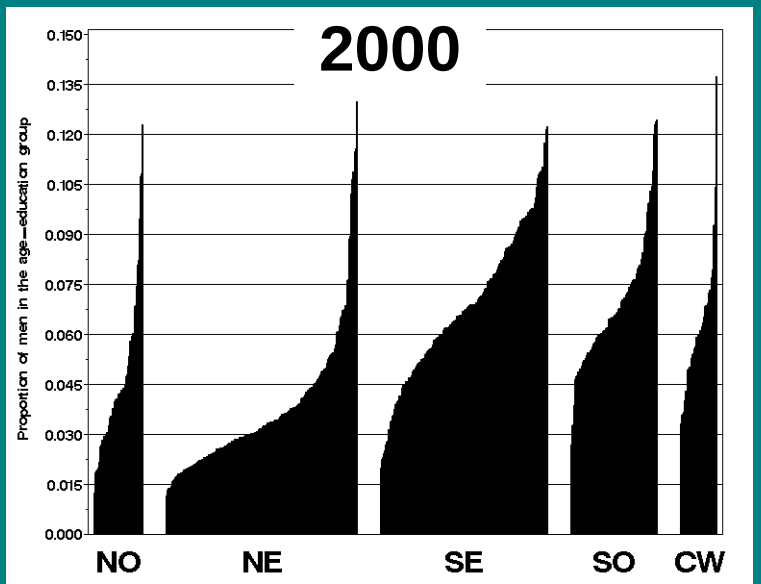


Proportion of Men with 25-34 Years of Age and 9+ Years of Schooling in 502 Brazilian Microregions, 1970-2000 Censuses

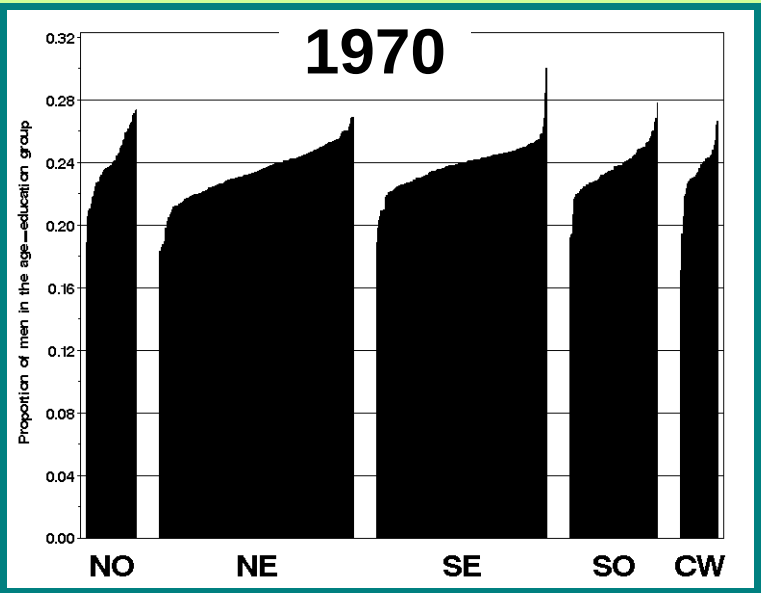


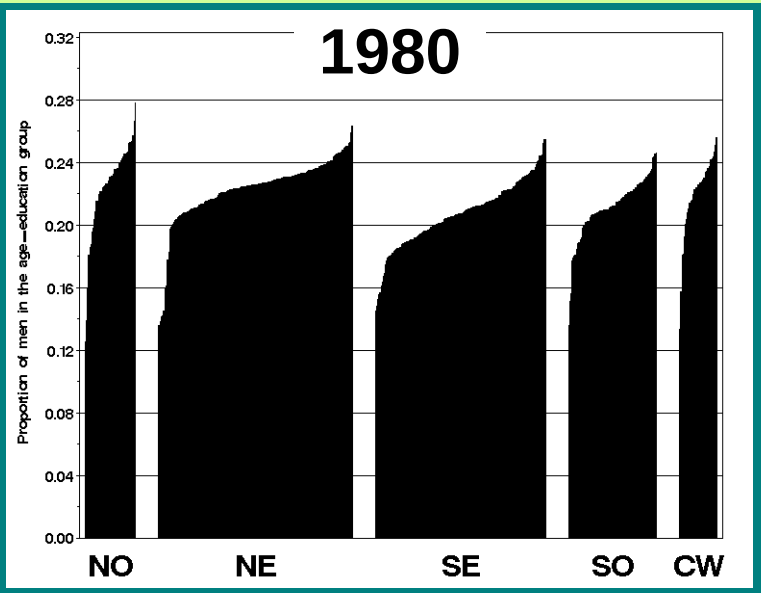


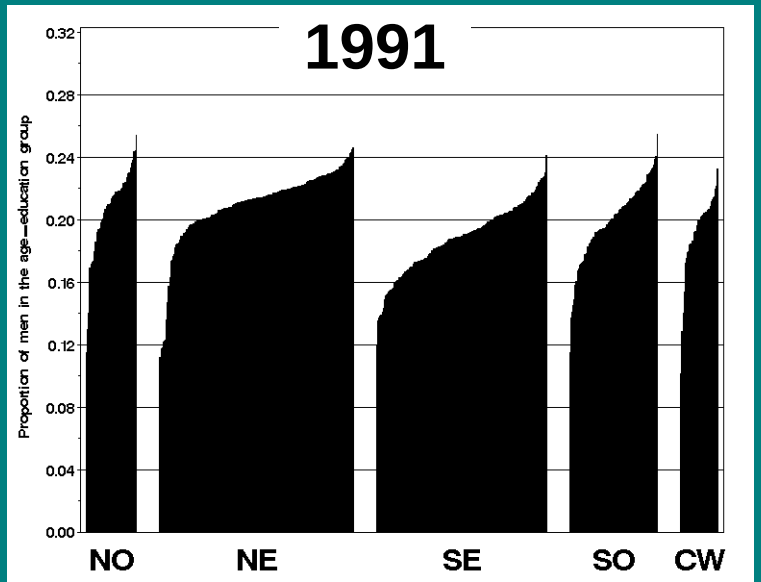


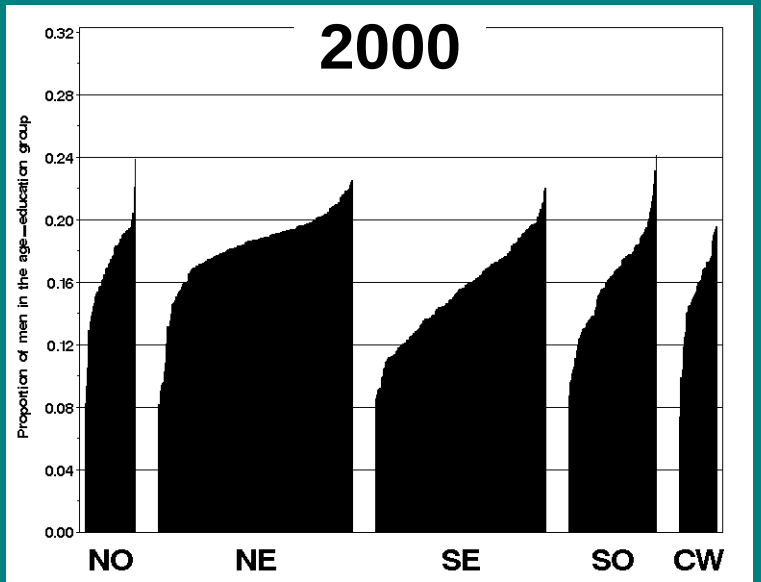


Proportion of Men with 35-49 Years of Age and 0-4 Years of Schooling in 502 Brazilian Microregions, 1970-2000 Censuses









Estimation of Models

- Fixed-effects models allow the estimation of coefficients that reflect relationships within microregions over time on labor outcomes.
- The dependent variable is the logarithm of the mean real income in a group.
- Areas with less than 25 people receiving income were not included in the regression.
- Regressions only include males.

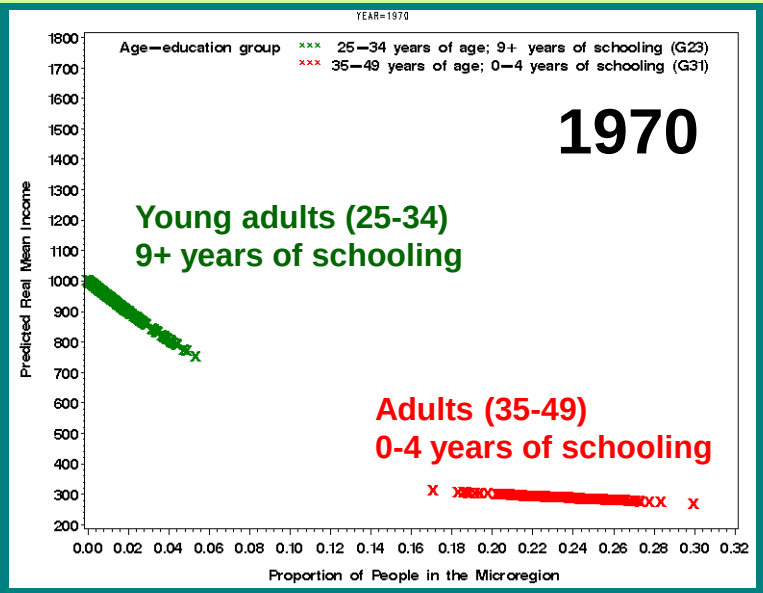
Equation 1: OWN-EFFECTS

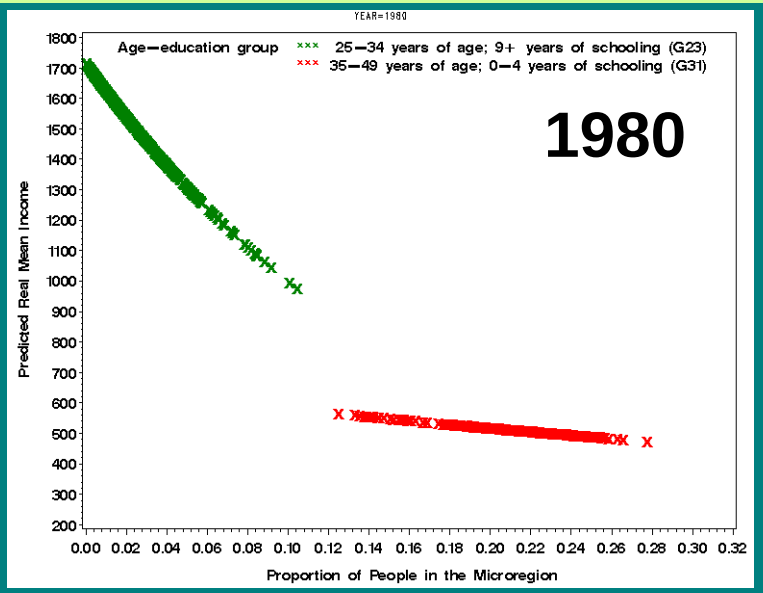
- **EQUATION 1:** within each area (i), at each time (t), income is predicted by the proportion of people in each one of the age-education cells (c). Giving 12 regressions of the following form:

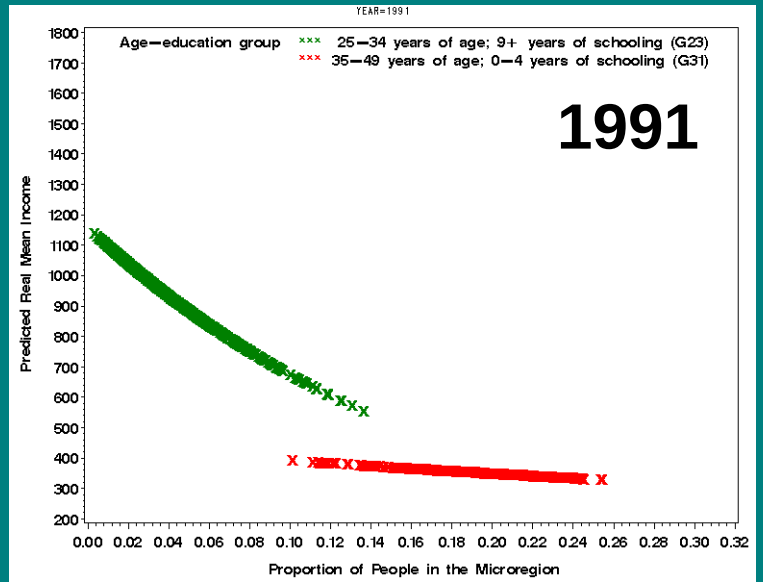
$$W_{itc} = \beta_0 + \beta_1 X_{itc} + u_i + \theta_t + \varepsilon_{itc}, \quad i = 1 \ldots K; \; t = 1 \ldots T$$

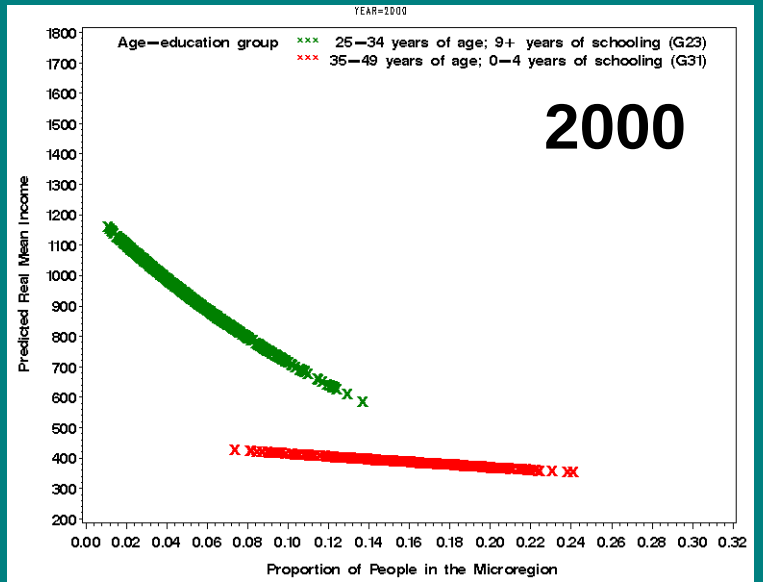
- **POOLED VERSION:**
  - Three dummies for census years.
  - Eleven dummies for age-education groups.
  - Twelve proportions of people in each one of the age-education groups.

Predicted Earnings from Own-Effects Model by Proportion of People in 502 Brazilian Microregions, 1970-2000









Equation 2: CROSS-EFFECTS

- **EQUATION 2:** allows for cross-effects.

$$W_{itc} = \beta_0 + \beta_1 X_{itc} + \beta_2 X_{itc'} + u_i + \theta_t + \varepsilon_{itc}\ ,\ \ i = 1 \ldots K;\ t = 1 \ldots T$$

- **POOLED VERSION:**
  - Three dummies for census years.
  - Eleven dummies for age-education groups.
  - Cross-proportions of people for each one of the twelve age-education groups (11x12=132 coefficients).

Equation 2': CROSS-EFFECTS X YEAR

- **EQUATION 2':** equals Equation 2, adding interactions of cross-proportions with 3 dummies for year.

$$W_{itc} = \beta_0 + \beta_1 X_{itc} + \beta_2 X_{itc'} + \beta_3 \theta_t X_{itc} + \beta_4 \theta_t X_{itc'} + u_i + \theta_t + \varepsilon_{itc} ,$$

$$i = 1 \ldots K; \; t = 1 \ldots T$$

- **POOLED VERSION:**
  - Three dummies for census years.
  - Eleven dummies for age-education groups.
  - Cross-proportions of people for each one of the twelve age-education groups (11x12=132 coefficients).
  - Interactions of those proportions with three dummies for census years (132x3=396 coefficients).

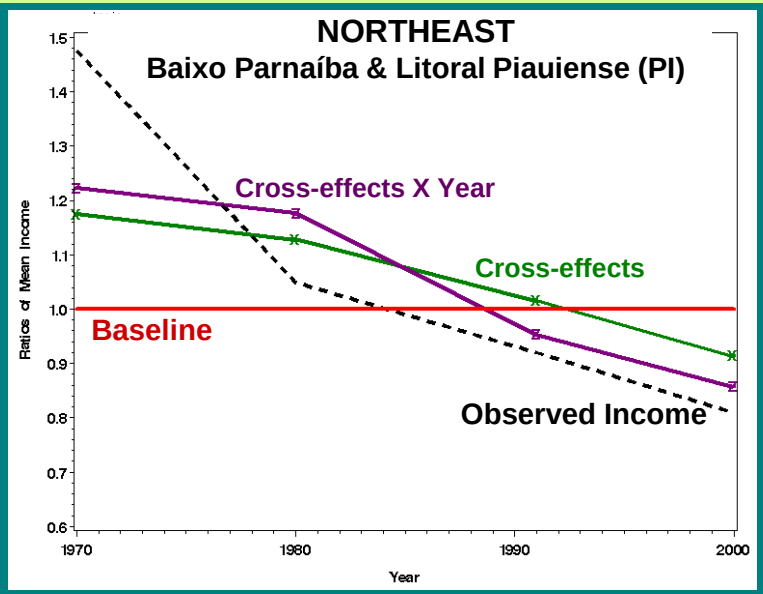
How to Look at the Results?

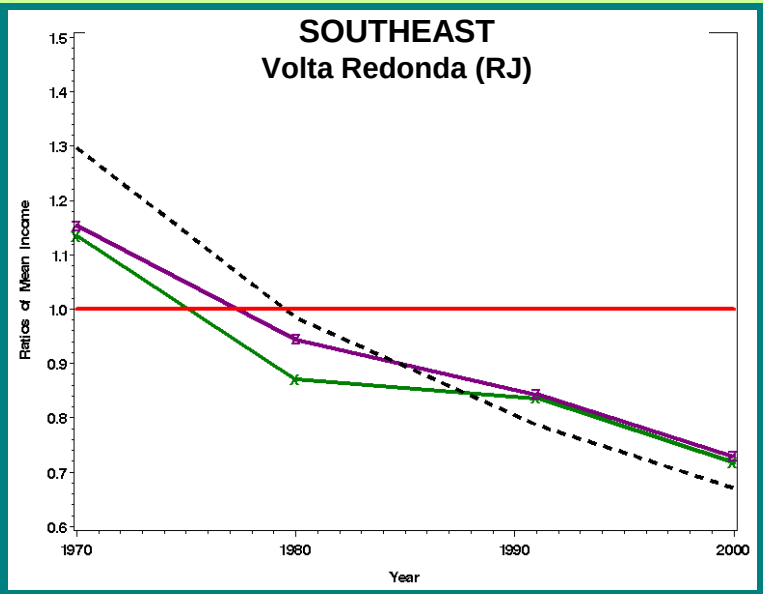
- Hundreds of coefficients… too many to look at!
- A way to graph the results:

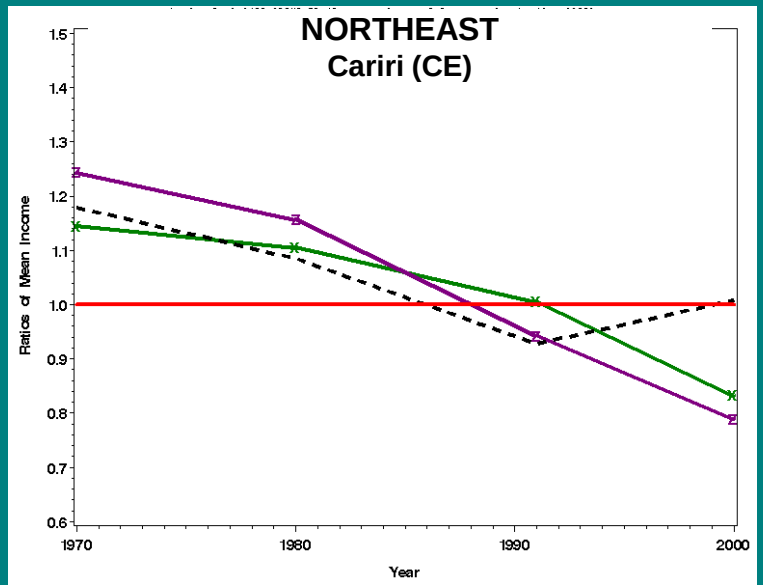
  For a given microregion, and age-education group look at predicted earnings by year from:

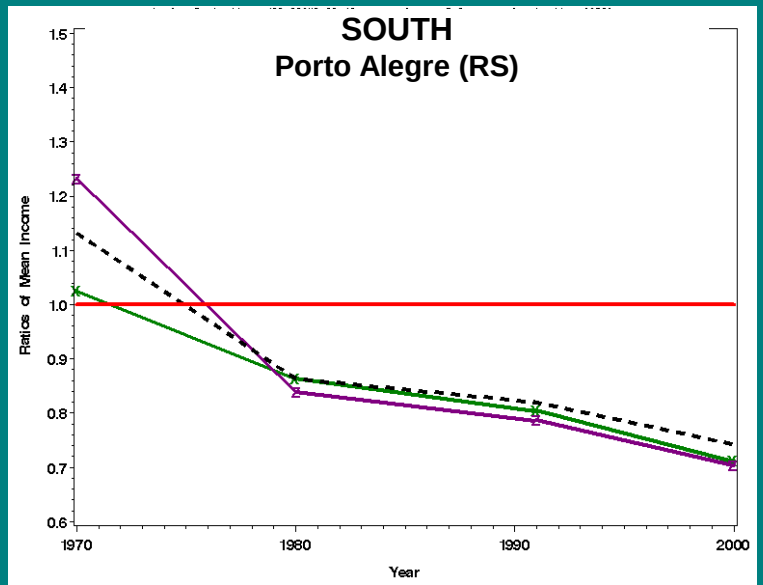
  - 1) simple model with just indicator variables for year and age-education group
  - 2) cross-effects model
  - 3) cross-effects * year model
- Calculate ratio of predicted values from models 2 and 3 to those predicted by simple model
- Add in observed data, also in relation to predicted value of simple model.

Ratios of Predictions from Cross-effects & Year-Interaction Models to Predictions from Simple Labor Market Model for Adults (35-49) with Medium Education (5-8), 1970-2000









Review

- The main focus in the dividend literature has been on the dependency ratio -- which is undergoing dramatic change in Brazil, with important consequences.
- However, it is also the case that the composition of the Brazilian labor force, in terms of both age and educational attainment, is undergoing dramatic shifts.
- What we have tried to investigate here is whether these compositional shifts will have an effect beyond the formal labor force equations.

What Did We Learn?

- Relative group size matters, with greatest negative impacts on income for groups with more years of education.
- As less educated workers become a smaller proportion of the labor force through time, their earnings increase.
- Shifts in “neighboring” and “own” groups are likely to have measurable redistributive effects on earnings.
- Above results are in line with US findings, and with theory that says that groups are not perfect substitutes ☺

Questions to Resolve

- Which of the many possible models best fits the data?
- How does migration between areas influence the results?
- Ditto for change in female labor force participation?
- Can we take these local level results and apply them to national level projections on earnings?