

Demographic change and economic development at the local level in Brazil

Ernesto F. L. Amaral

Outline

- Research question and background.
- Data and methods.
- Results.
- Internal migration.
- Final considerations and future projects.

Research question

- **Main question:** What are the effects of changing age and educational compositions on male earnings in Brazil?
- Within the labor force (15–64 years of age), the population is getting older and better educated with regional variation.
- Age and education increase earnings.
- Larger proportion of older and more educated males causes:
 - Competition in the labor market.
 - Negative impacts on earnings of competing workers.

Previous studies

- **Human capital:** schooling and work experience have positive impacts on earnings (Mincer, 1974).
- **Baby boom:** large cohorts of better educated individuals entered the U.S. labor market, decreasing their relative earnings.
(Berger, 1985; Bloom and Freeman, 1986; Bloom, Freeman, and Korenman, 1987; Easterlin, 1978; Freeman, 1979; Sapozhnikov and Triest, 2007; Welch, 1979)
- Larger cohorts also had positive impacts on labor outcomes.
(Autor, Katz, and Krueger, 1998; Katz and Autor, 1999; Katz and Murphy, 1992; Shimer, 2001)
- Effects of cohort size on the labor market have been estimated for several **developed countries**.
(Biagi and Lucifora, 2008; Borjas, 2003; Brunello, 2010; Korenman and Neumark, 2000; Skans, 2005)

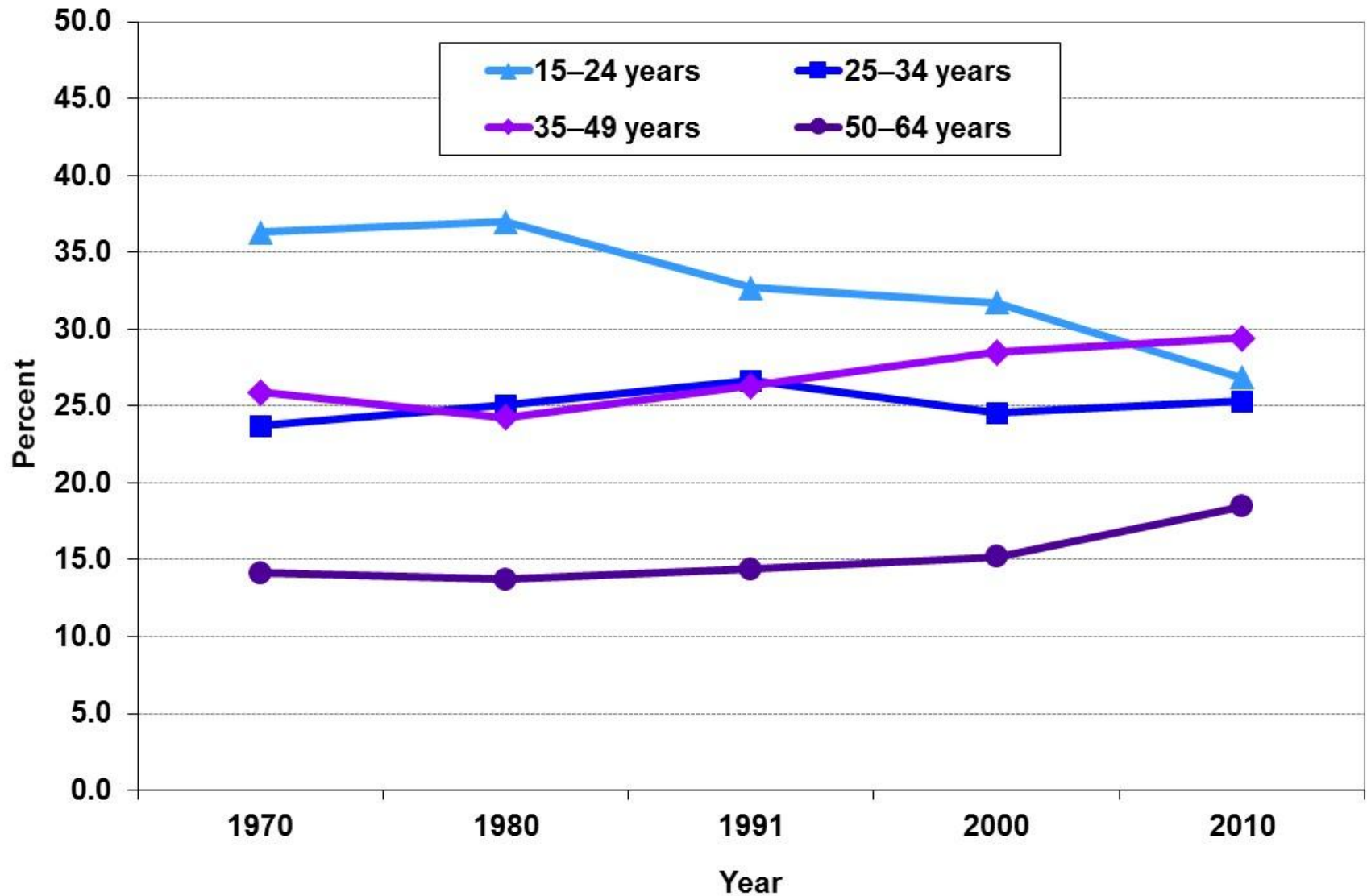
Main contribution

- Few studies have addressed how demographic and educational compositions affect earnings in **developing countries**.
- Contributes to the literature on demographic change in developing countries by predicting earnings using:
 - Variations in age-education composition.
 - Regional differences.
- This project is part of a broader research agenda dealing with the effects of population changes on demographic, social, and economic outcomes.

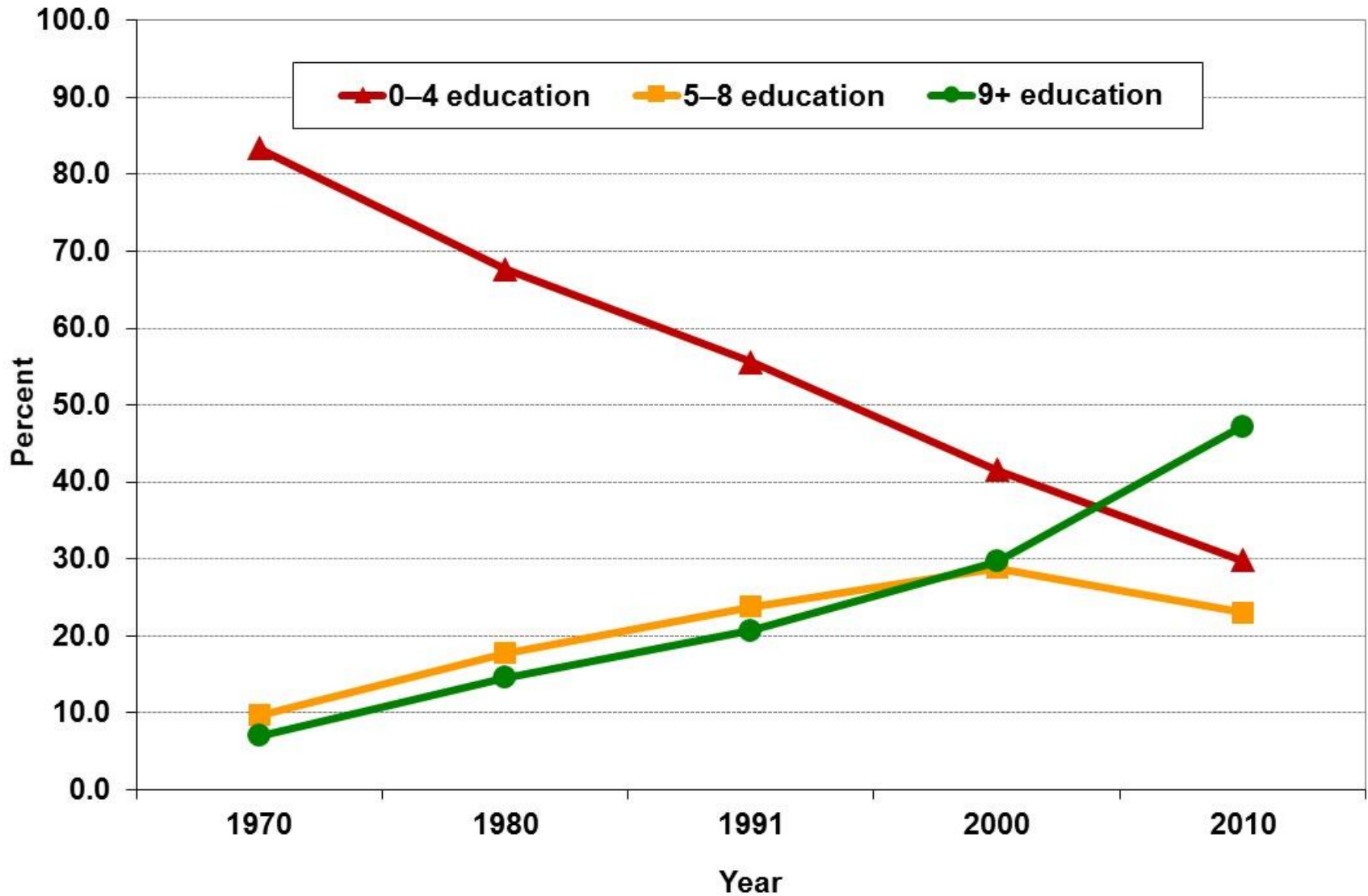
Example of Brazil

- Total Fertility Rate: 5.8 in 1970; 1.9 in 2010 (IBGE, 2012).
- Educational expansion began late and has a long way to go (Barro and Lee, 2001; Marcílio, 2001, 2005; Rios-Neto and Guimarães, 2010).
- Improvement in educational attainment coincides with decline in family size and school-age children (Lam and Marteleto, 2005, 2008).
- The country has extensive data that captures information on:
 - Population aging.
 - Educational improvement.
 - Geographic variation.

Age composition, males, 1970–2010



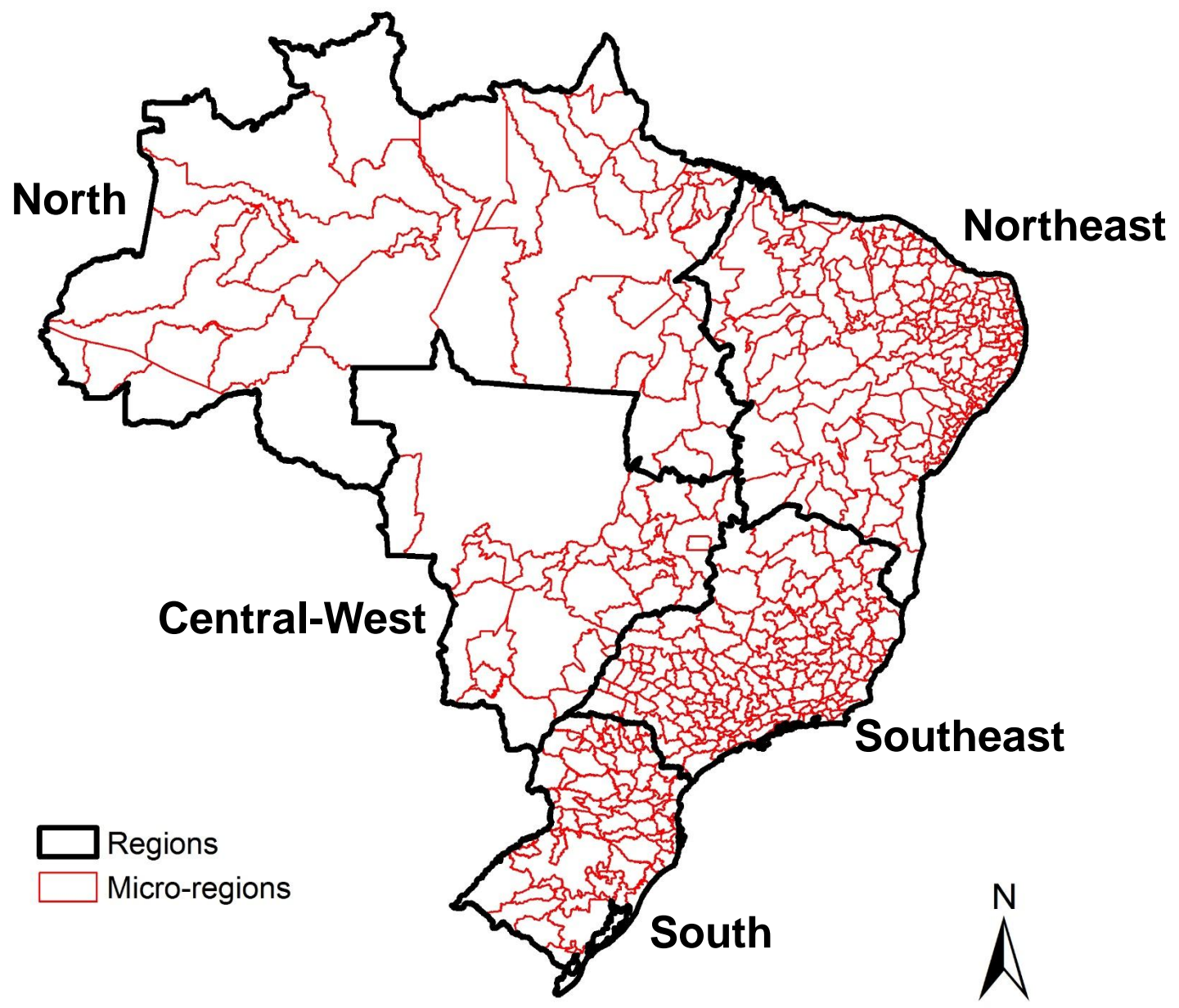
Educational composition, males, 1970–2010



Regional variation

- **Developing countries:** changes in age-education structure usually vary across different areas within the countries.
- In Brazil, **fertility** decline has varied in timing and pace across states and municipalities (Potter et al., 2002; Potter et al., 2010).
- **Educational attainment** increased, but with a great deal of regional disparity (Riani, 2005; Rios-Neto and Guimarães, 2010).

Five regions & 502 micro-regions



Micro-data

- **Brazilian Censuses:** 1970, 1980, 1991, and 2000.
- **Minimum comparable areas:** 502 micro-regions.
- **Age** in years is categorized into four groups:
 - Youths (15–24).
 - Young adults (25–34).
 - Experienced adults (35–49).
 - Older adults (50–64).
- **Education:** three groups indicating years of schooling:
 - No further than the first phase of elementary school (0–4).
 - Second phase of elementary school (5–8).
 - At least some secondary school (9+).
- **Earnings** from main occupation: converted to Jan. 2002.

Aggregate-level data

- **Database** is aggregated by census years, micro-regions, and age-education groups (24,096 observations):
 - 4 years * 502 micro-regions * 12 age-education groups.
- Cells with less than 25 people receiving income were excluded:
 - 19,727 observations remained.
- **Only male population:** labor force participation is not driven by level of earnings, fertility decline, and changes in educational attainment.

Fixed effects models

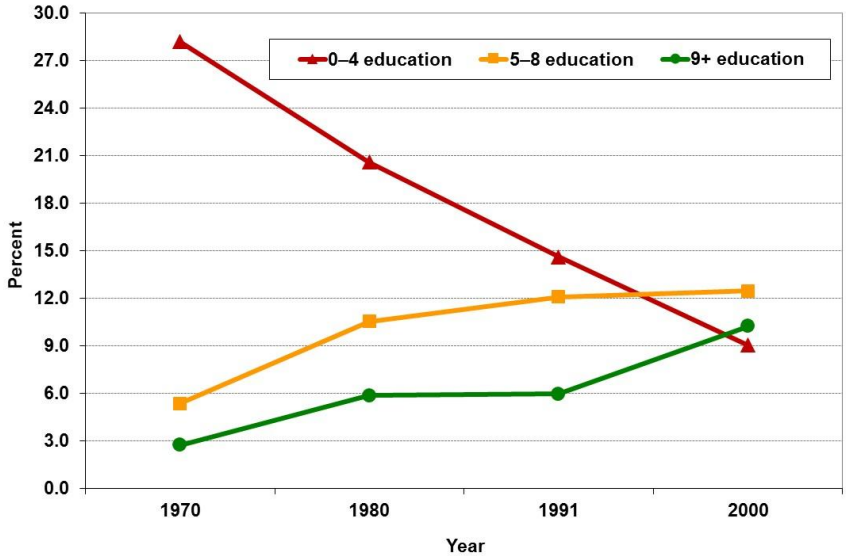
	Baseline model	Composition model
Dependent variable		
Logarithm of the mean real monthly earnings by age-education group, area, and time	$\log(Y_{git})$	$\log(Y_{git})$
Independent variables		
12 age-education indicators * time	$(G_{11}-G_{43}) * \theta_t$	$(G_{11}-G_{43}) * \theta_t$
Distribution of male population into 12 age-education groups * time		$(P_{11}-P_{43}) * \theta_t$
2008 area-time fixed effects	α_{it}	α_{it}

Brazilian male working-age population

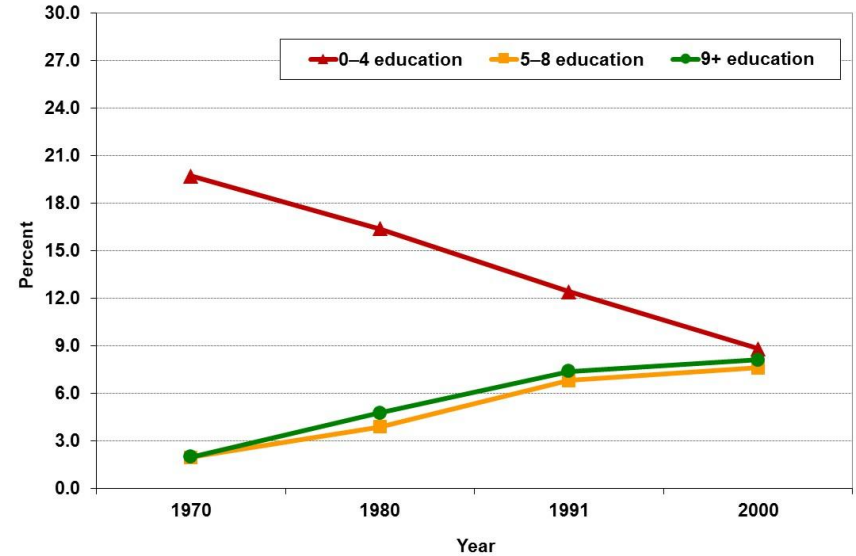
- Main results: published in *Demographic Research* (2013).
- Description of **15–64 year-old males**:
 - Age-education composition, 1970–2000.
 - Proportion with 9+ years of schooling by micro-region, 1970–2000.
 - Mean real monthly earnings in main occupation, 2000.

Age-education composition, 1970–2000

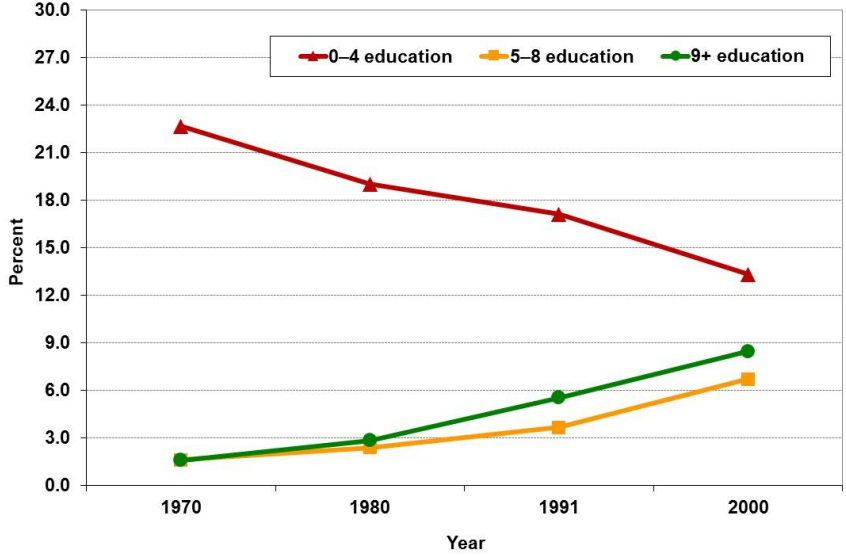
15–24



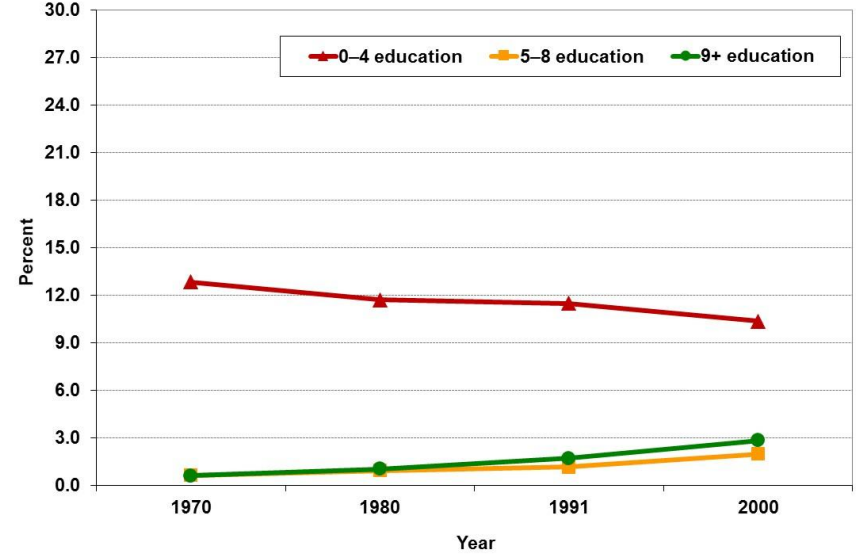
25–34



35–49

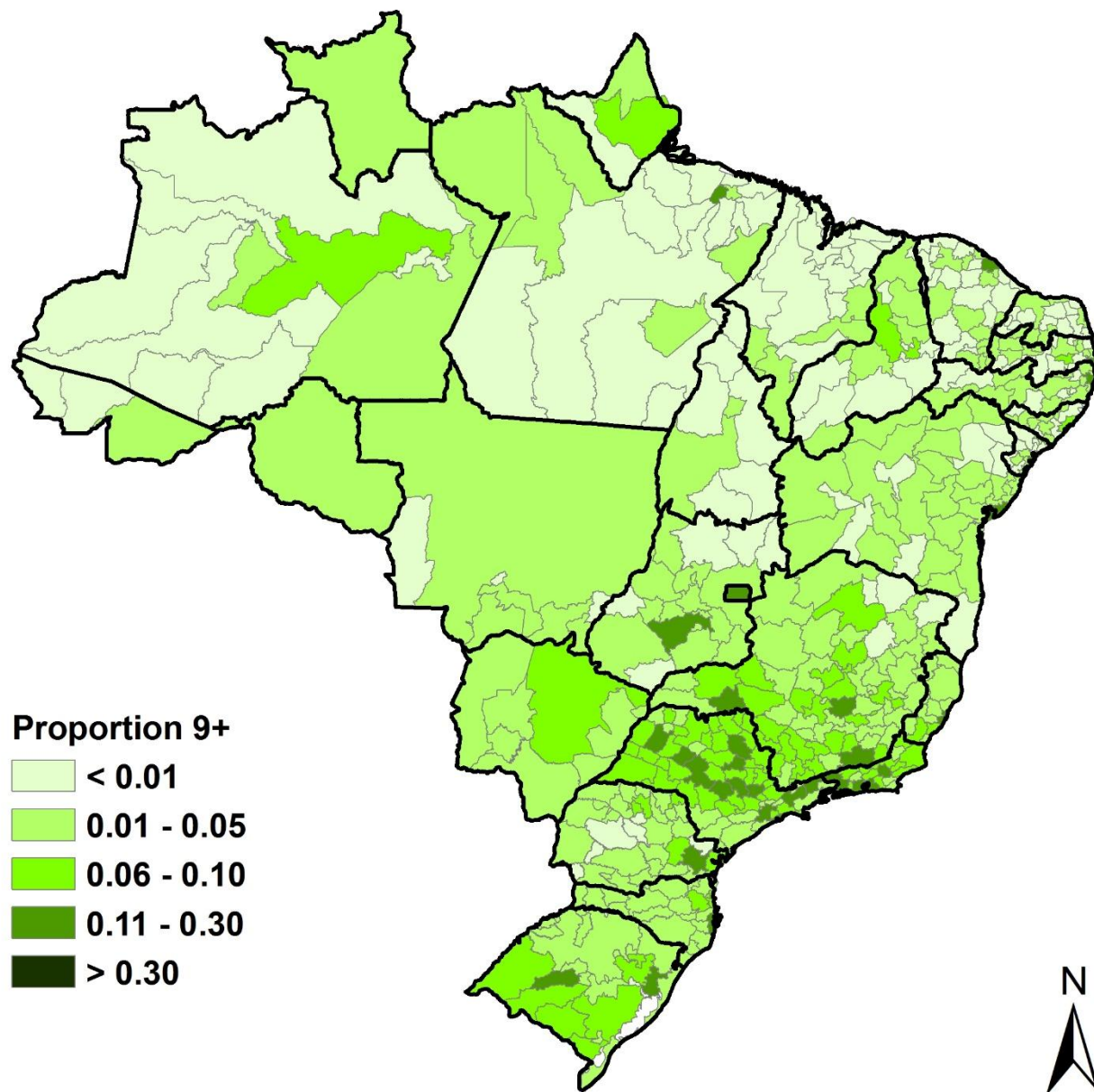


50–64

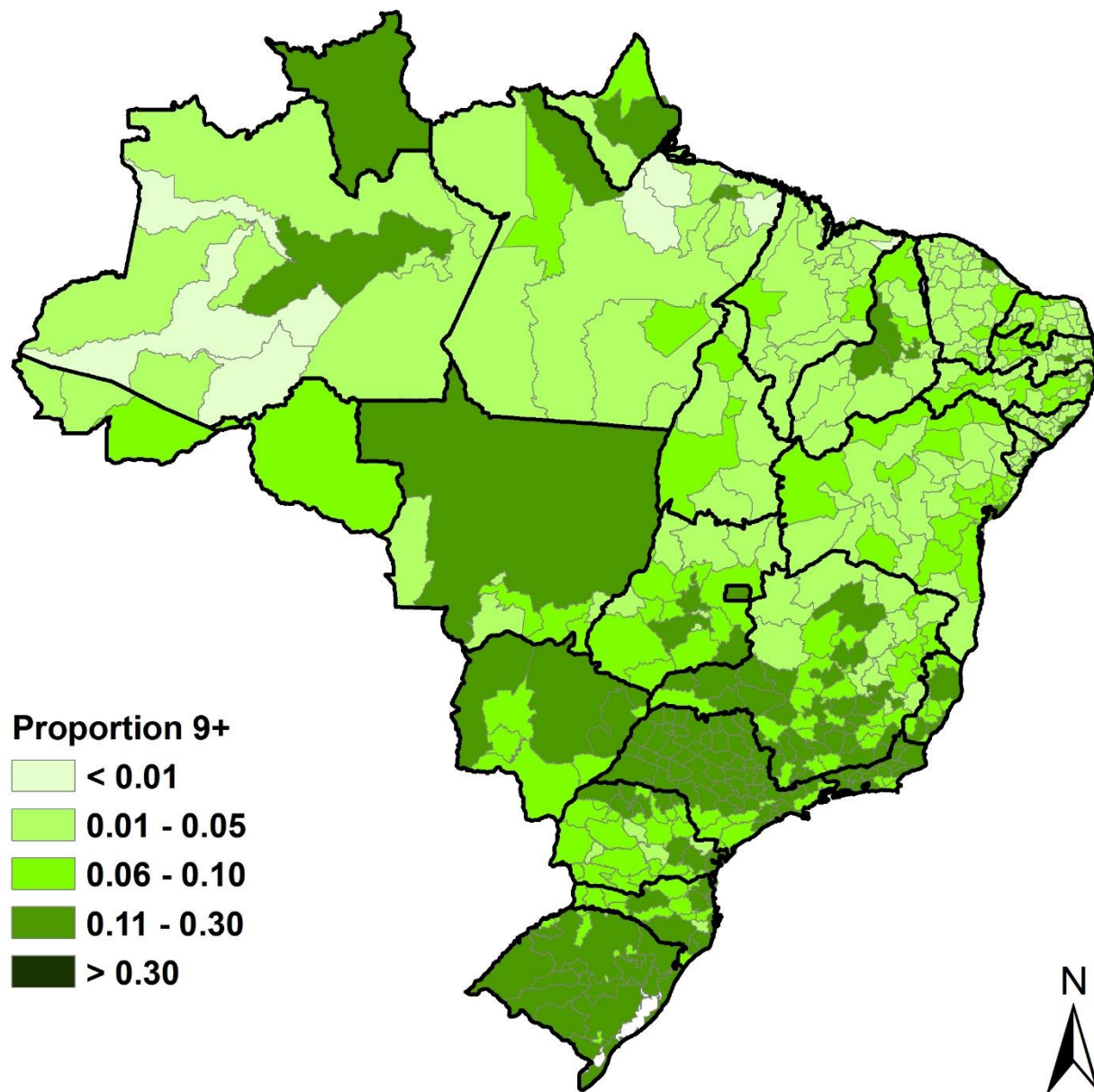


Source: 1970, 1980, 1991, and 2000 Brazilian Demographic Censuses.

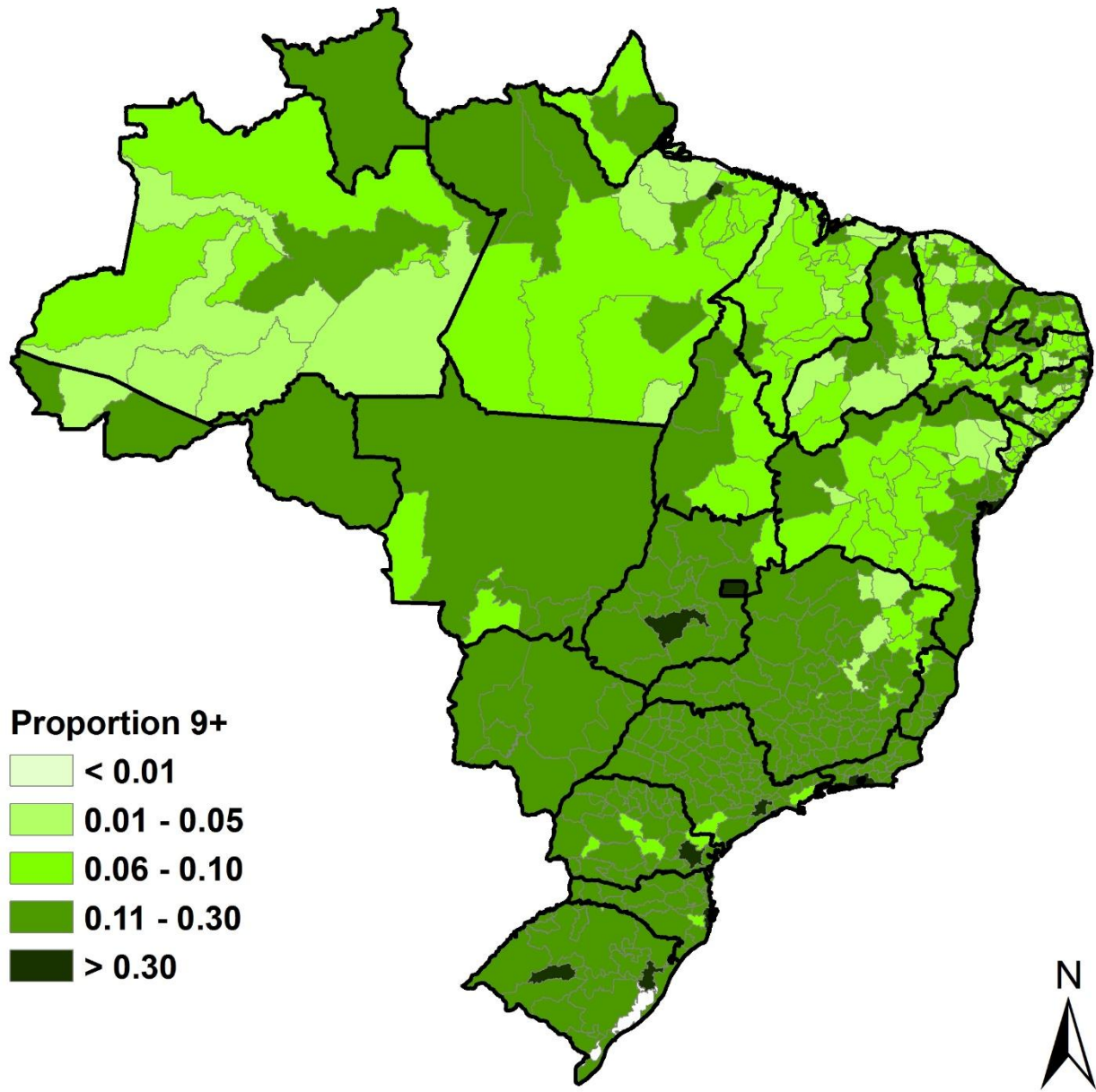
Proportion with 9+ years of schooling, 1970 ¹⁷



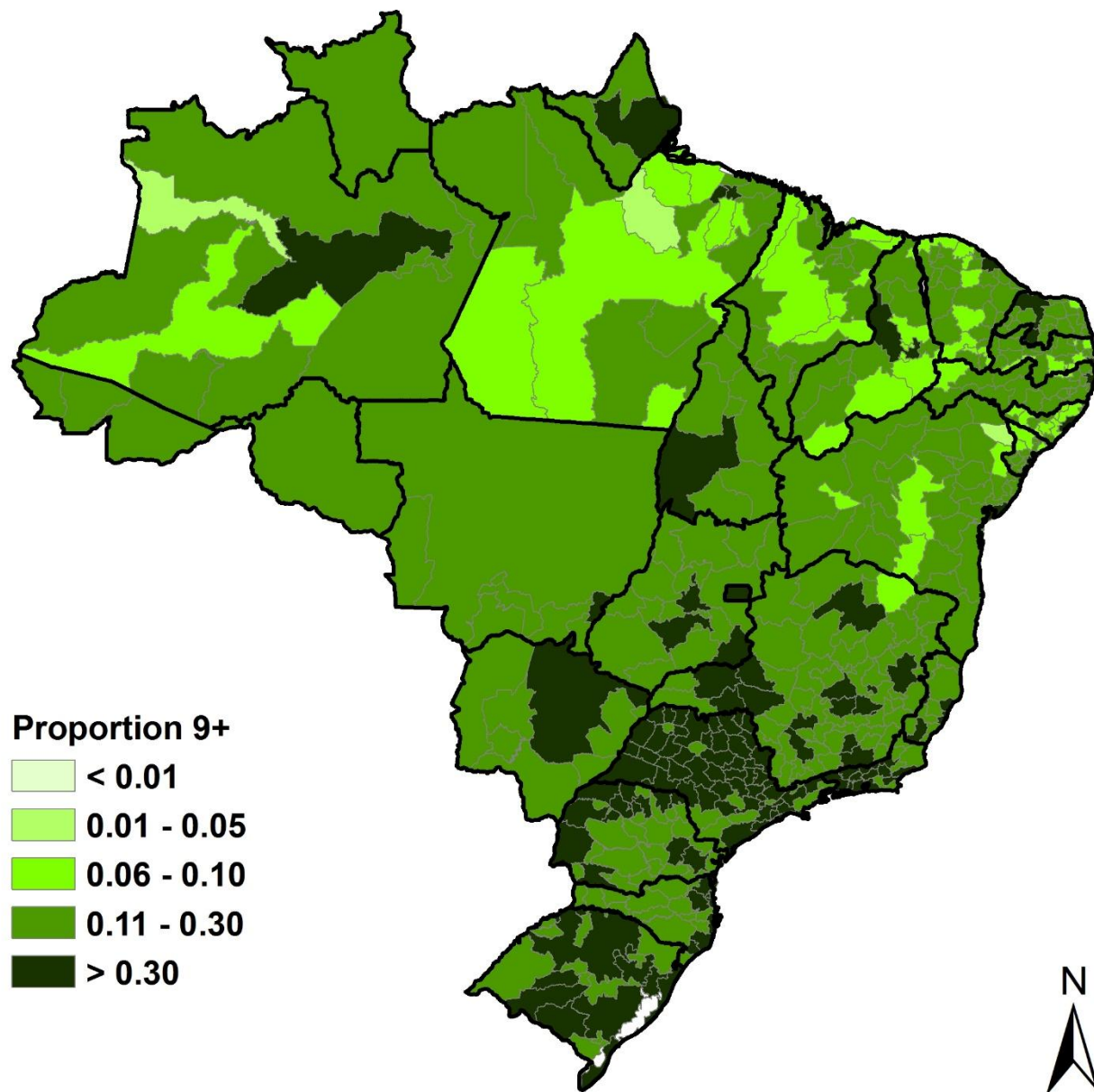
Proportion with 9+ years of schooling, 1980¹⁸



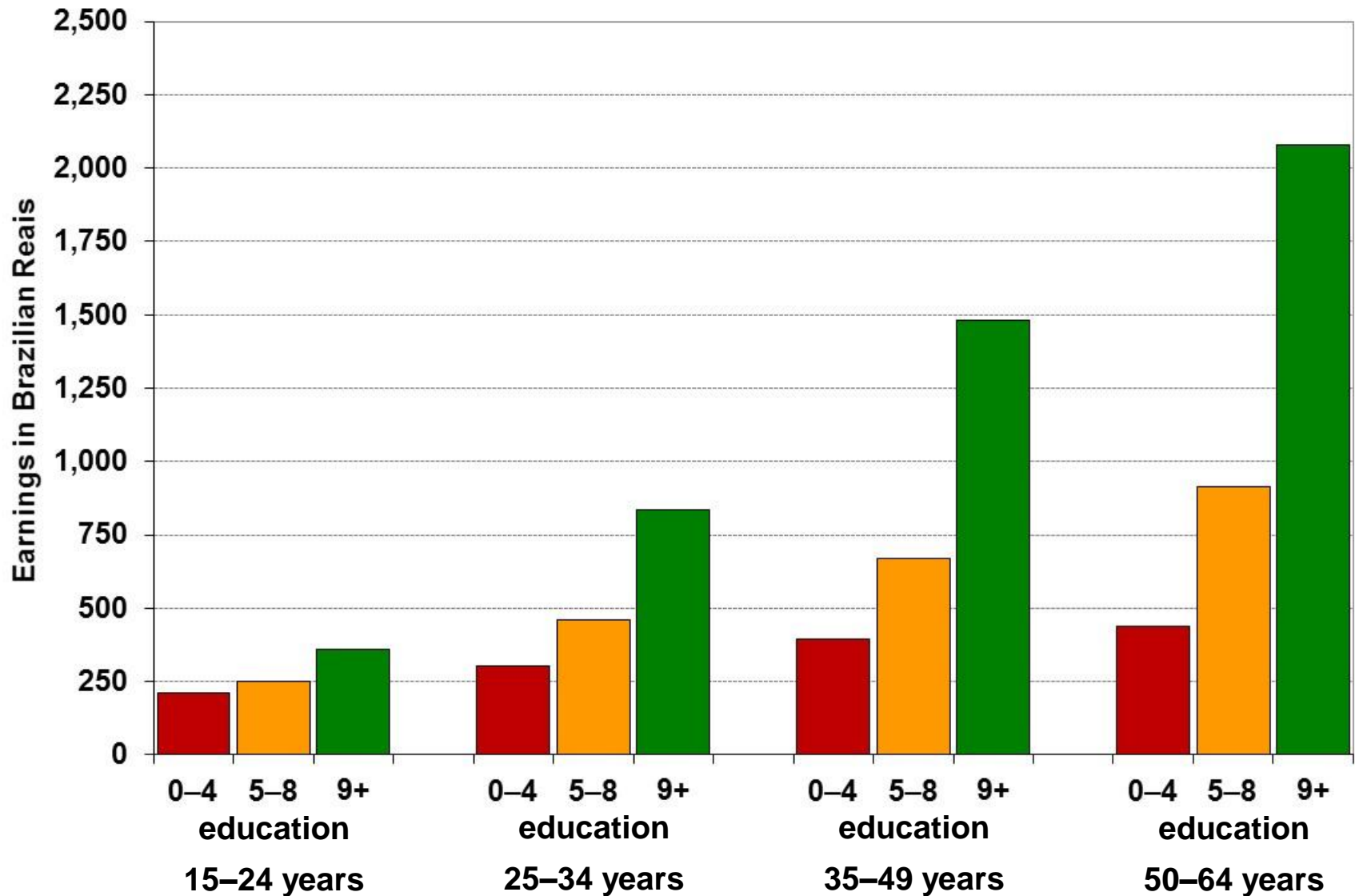
Proportion with 9+ years of schooling, 1991



Proportion with 9+ years of schooling, 2000²⁰



Mean real monthly earnings in main occupation, 2000



Estimating the impacts of relative group size on male earnings

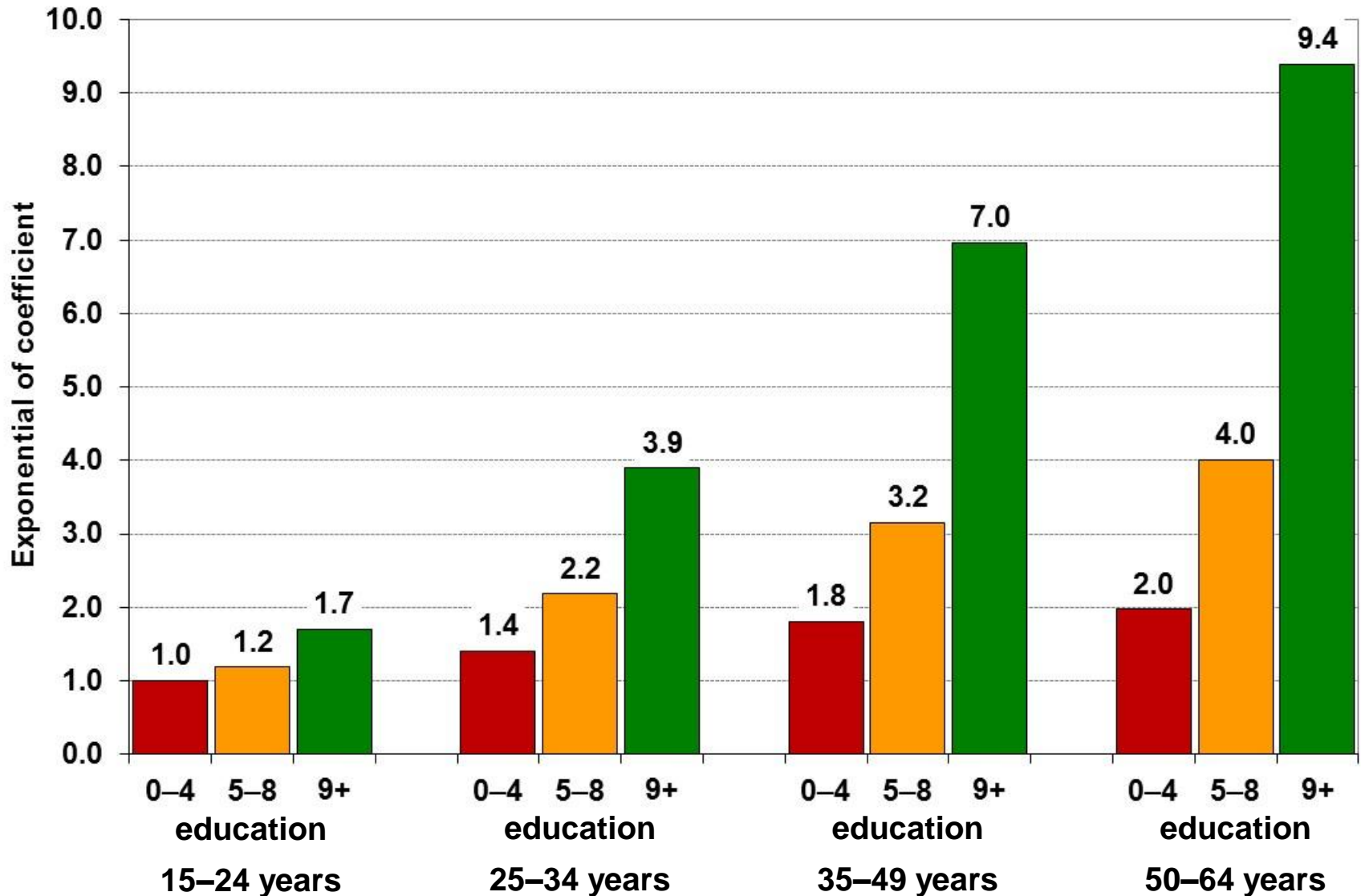
– **Baseline model:**

- Effects of age-education indicators (G_{11} – G_{43}), 2000.

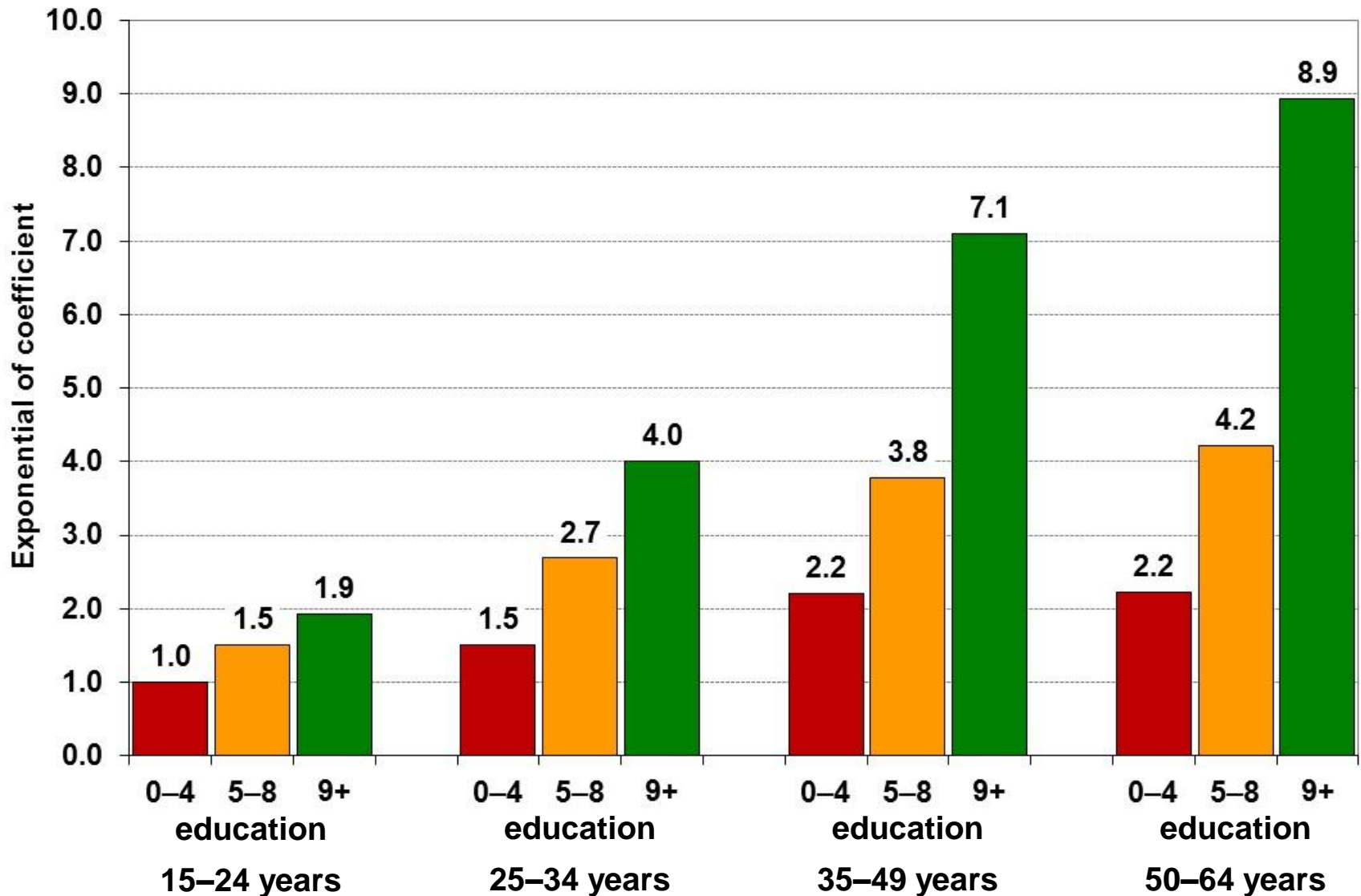
– **Composition model:**

- Effects of age-education indicators (G_{11} – G_{43}), 2000.
- Effects of age-education-group proportions (P_{11} – P_{43}), 1970 and 2000.

Effects of age-education indicators ($G_{11}-G_{43}$)²³ on earnings from baseline model, 2000



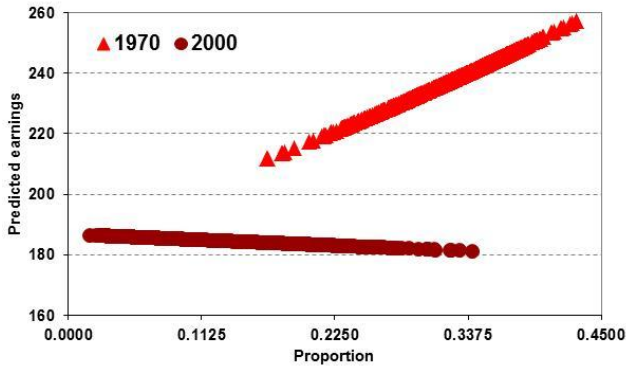
Effects of age-education indicators ($G_{11}-G_{43}$)²⁴ on earnings from composition model, 2000



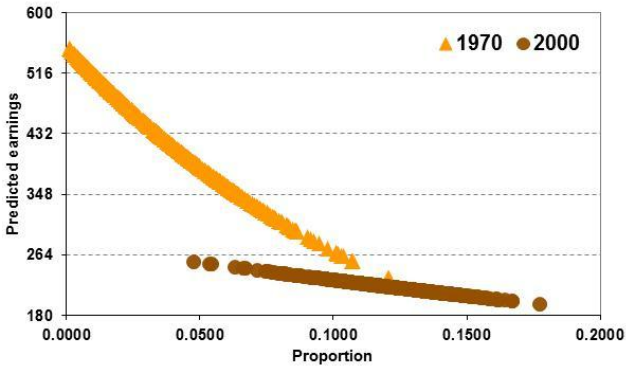
Effects of group proportions in 502 micro-regions (P_{11} – P_{23}) on earnings, 1970 and 2000

15–24 years

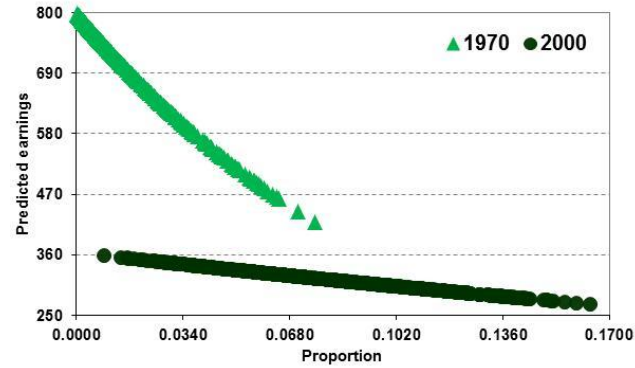
0–4 education



5–8 education

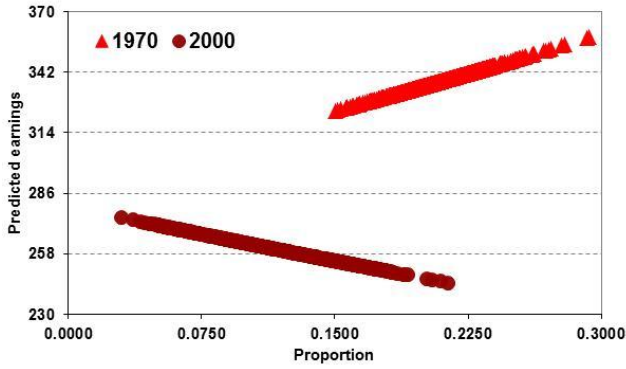


9+ education

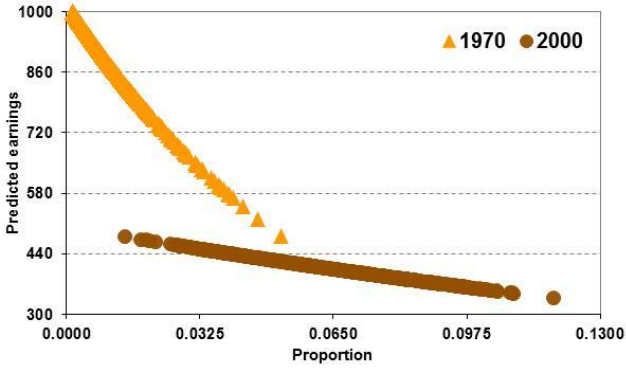


25–34 years

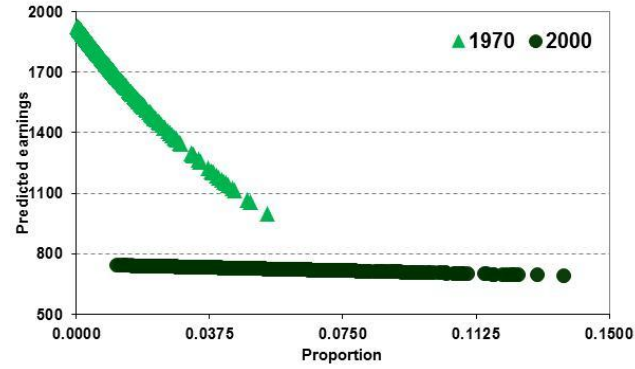
0–4 education



5–8 education



9+ education



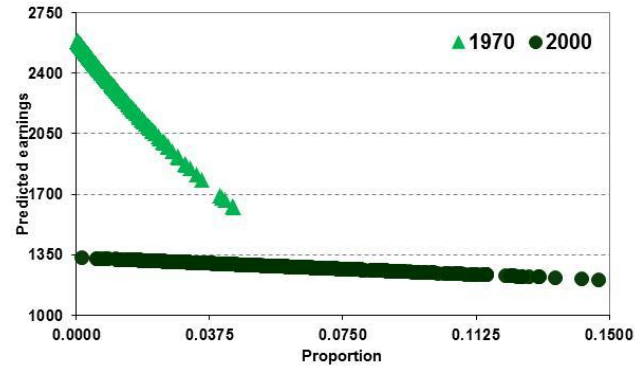
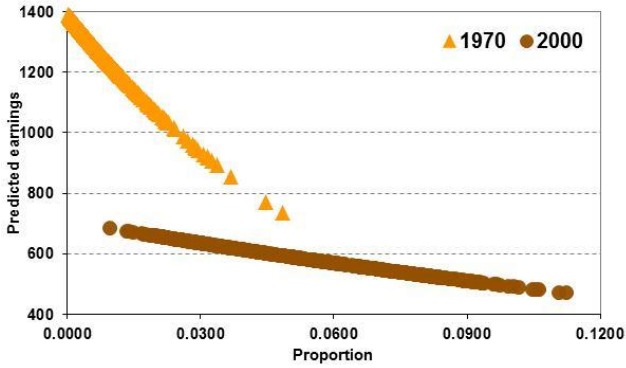
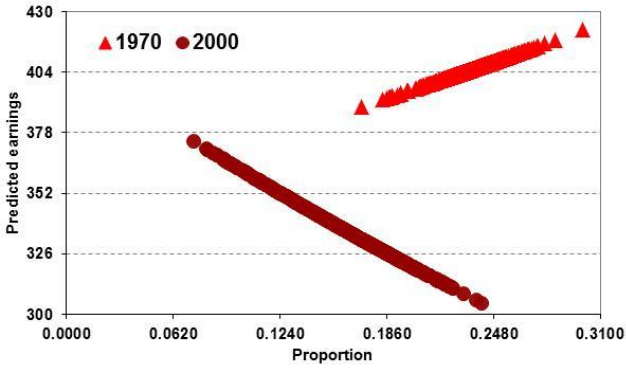
Effects of group proportions in 502 micro-regions ($P_{31}-P_{43}$) on earnings, 1970 and 2000

35-49 years

0-4 education

5-8 education

9+ education

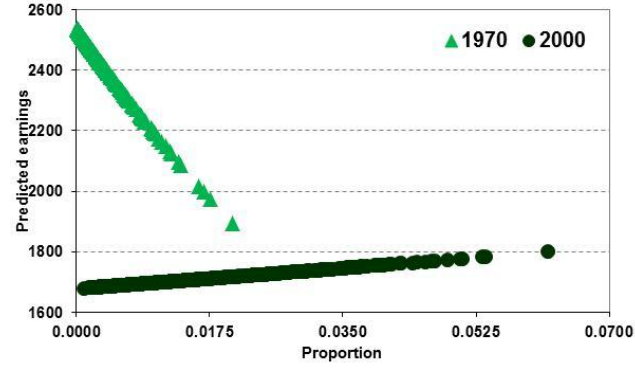
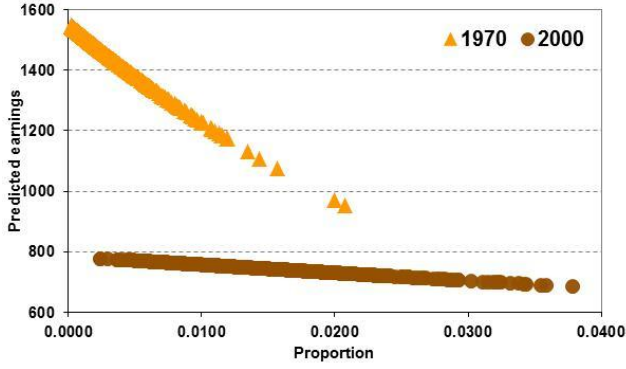
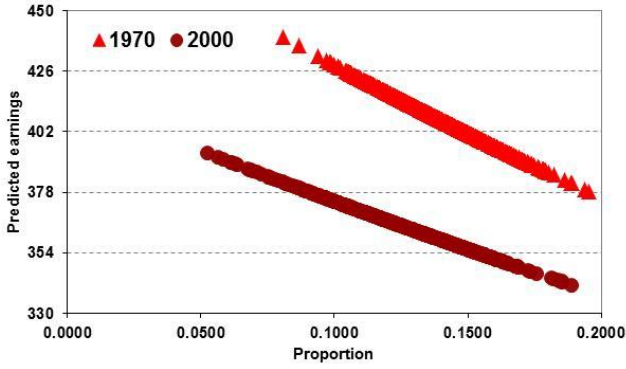


50-64 years

0-4 education

5-8 education

9+ education



Inter-micro-regional migration

- Need to consider impact of internal migration on earnings.
- Migration generates **spatial-economic equilibrium**.
- **Without migration:**
 - Sending areas would have even lower earnings.
 - Receiving areas would have even higher earnings.
- **Hypothesis:** negative impacts of proportions on earnings would be more negative when controlling for migration.

Reverse causality

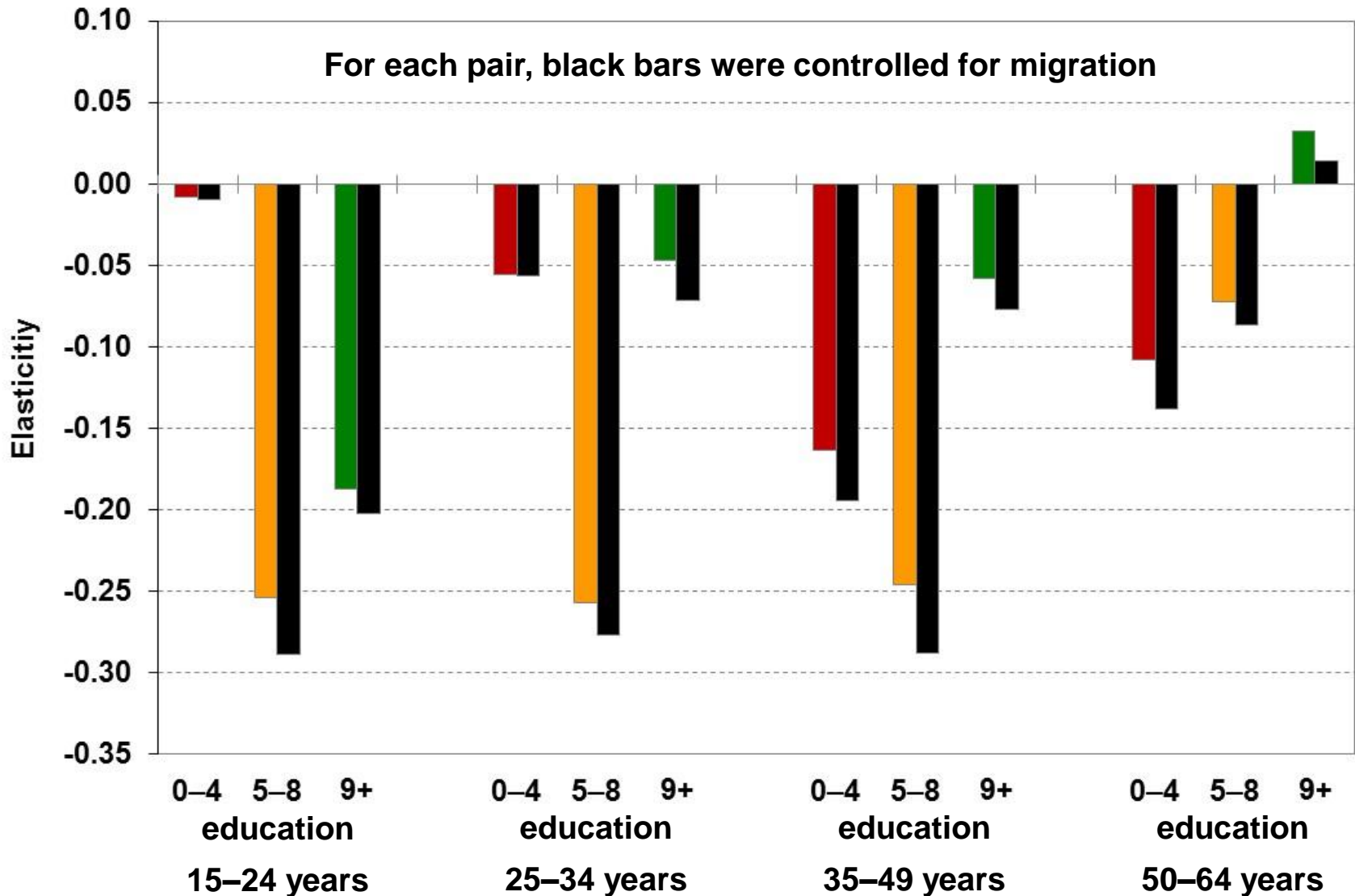
Migration \longleftrightarrow Earnings

- In-migration increases competition and affects earnings.
- Availability of jobs and income levels influence migration.
- An exogenous measure of migration was estimated.
- Data on municipality of residence five years before the census (1991 and 2000) was used.
- Submitted for publication in ***Space Populations Societies***.

New results, controlling for migration

- The new exogenous measures of migration were included in the models as independent variables.
- In general, the coefficients of group proportions (P_{11} – P_{43}) became more negative than the previous estimates.
- **A strategy was developed to compare previous results with new results:**
 - Coefficients of male proportions in age-education groups were multiplied by the national distribution in 2000.

Estimated elasticities of proportions in age-education groups (P_{11} – P_{43}), 2000



Final considerations

- **In line with previous studies:** larger cohort-education size generally depresses earnings.
- **Cohort size matters:** negative effects on earnings are greater for workers under age 50.
- **Education matters:** greatest impact on middle group (5–8).
- **Men with low education:** these groups are decreasing over time, but their earnings are not increasing.
- **Time:** effects are becoming less negative over the years.
- **Control for migration:** influence of cohort size is stronger.
- **Compositional approach:** can be applied to future studies about socioeconomic outcomes in developing countries.

Implications

- **Reduction in economic inequality:**
 - **More better-educated men:** negative impacts reduced differentials in relation to lower-educated men.
 - **Fewer younger men:** smaller negative impacts on their earnings prevented greater disparities in relation to older men.
 - **More employed females:** negative impacts on male earnings decreased gender gap.
- **Public policies:**
 - **Demand for education:** improve educational levels in areas that still have large proportions of the population with low-education.
 - **Female employment:** stimulate further increases.

Research papers

- Published:
 - ***Demographic Research*** (2013)
Main models
 - ***Population Research & Policy Review*** (2012)
Decomposition of effects
 - ***Bulletin of Latin American Research*** (2012)
Projection exercise
- Accepted:
 - ***Poverty & Public Policy*** (2013)
Models with women
- Submitted:
 - ***Space Populations Societies***
Models with migration
 - ***Social Forces***
Effects of race and increasing proportion of Protestants

Research agenda

- **2010 Brazilian Census:** make data compatible with the 502 micro-regions.
- **Other countries (IPUMS-International):** India, Indonesia, South Africa, Mexico, Chile, and Argentina.
- **Include women in both sides of equation:** instrumental variables will predict distribution of female workers.
- **Models by sectors:** estimate impacts of composition on earnings of workers with:
 - Formal employment.
 - Informal employment.
 - Self-employment.