# Schooling Inequality, Returns to Schooling and Earnings Inequality: Evidence from South Africa and Brazil

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# Overview of paper

- South Africa and Brazil have long had two of the highest levels of income inequality in the world.
- Education plays an important role in this inequality through two pathways:
  - 1. Education is highly unequal.
  - 2. There is a strong relationship between schooling and earnings.
- Issues considered in this paper:
  - What has happened to the distribution of education?
  - What has happened to returns to schooling?
  - How have these two factors affected earnings inequality?
  - How can we model the relationship theoretically, especially when returns are not constant across years of schooling?
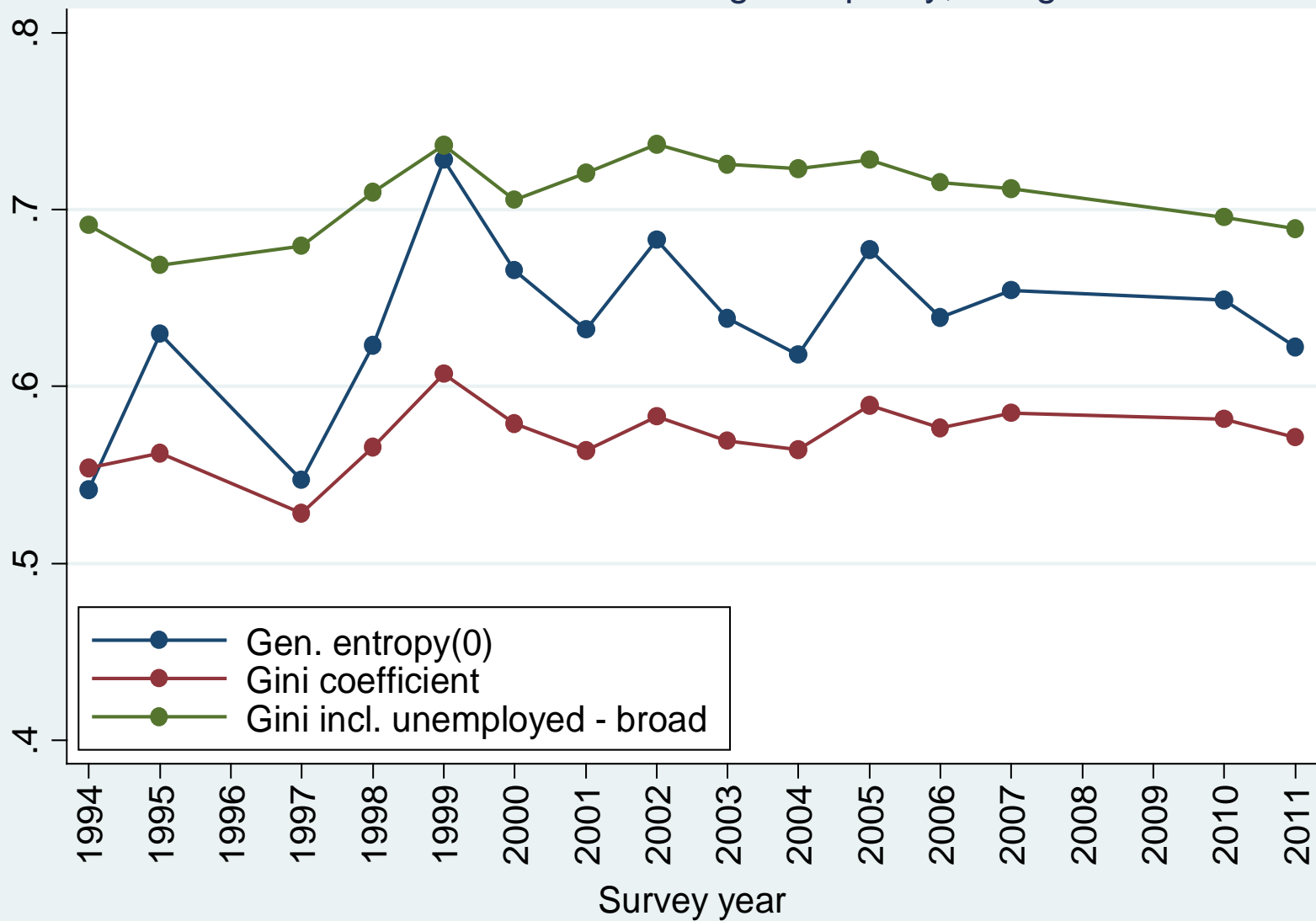
Mean, standard deviation and coefficient of variation of schooling
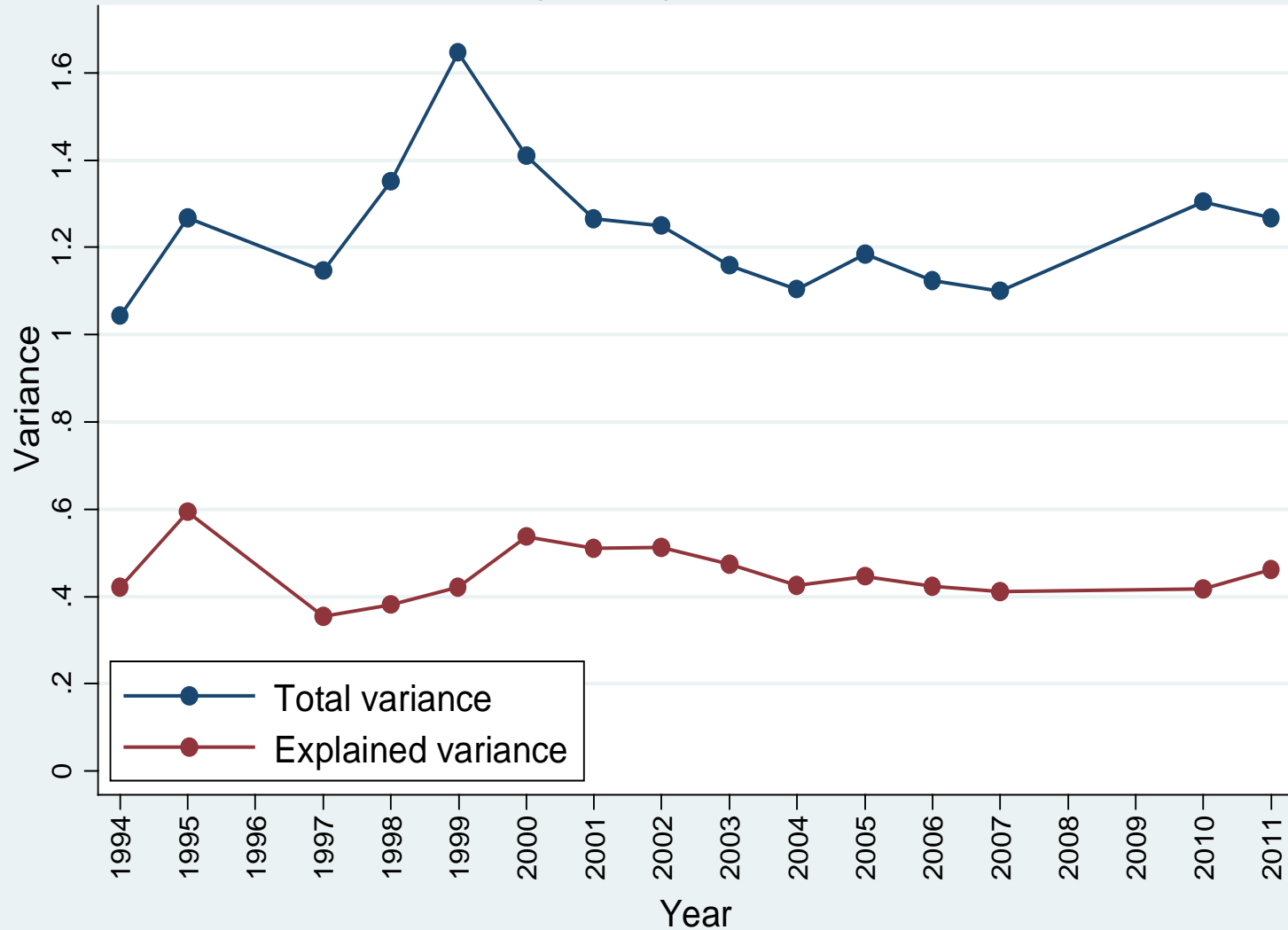South Africa population aged 25-60
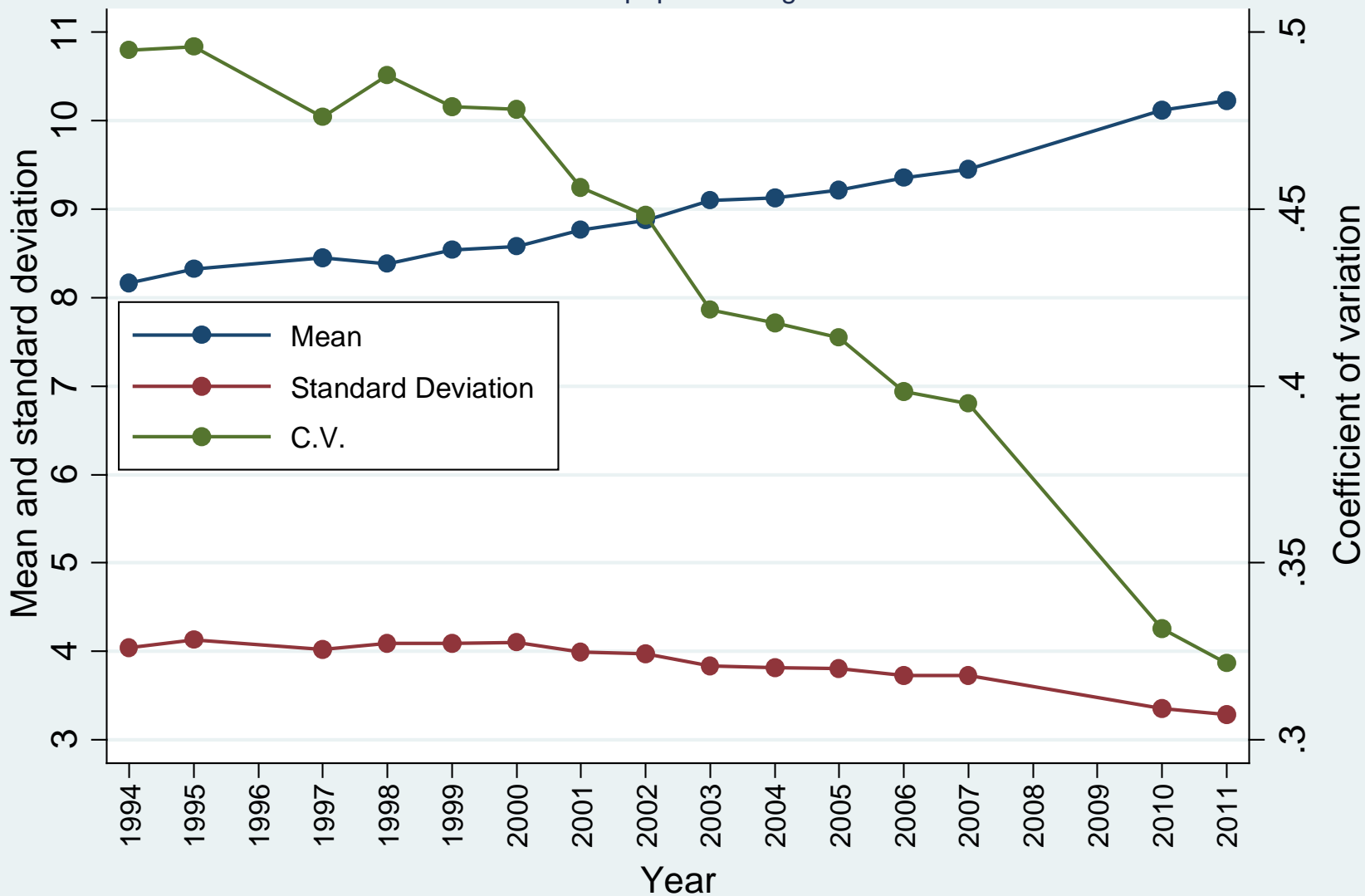
Mean, standard deviation and coefficient of variation of schooling
Brazil population aged 25-60
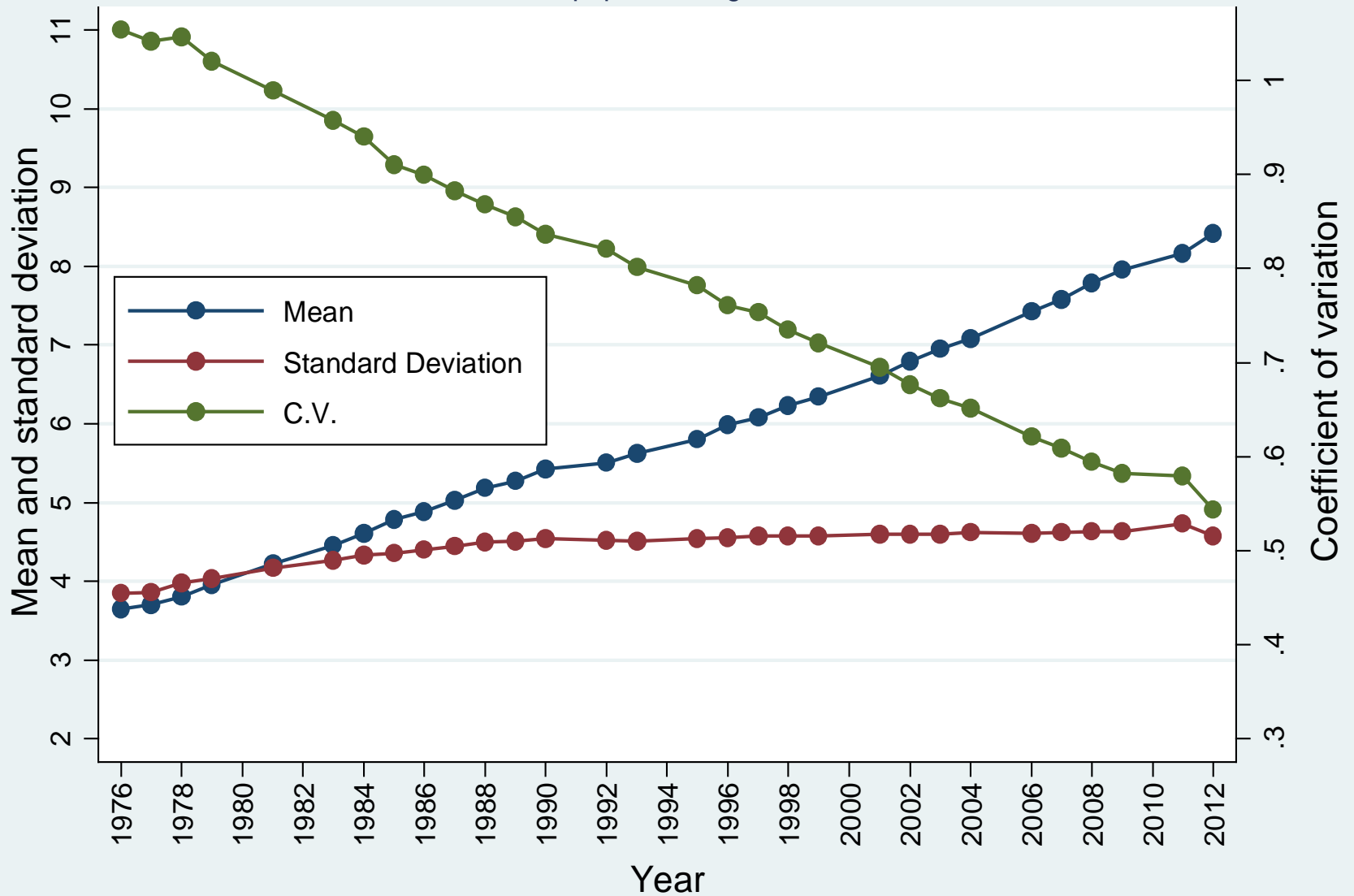
South Africa: Measures of earnings inequality, all aged 25-60
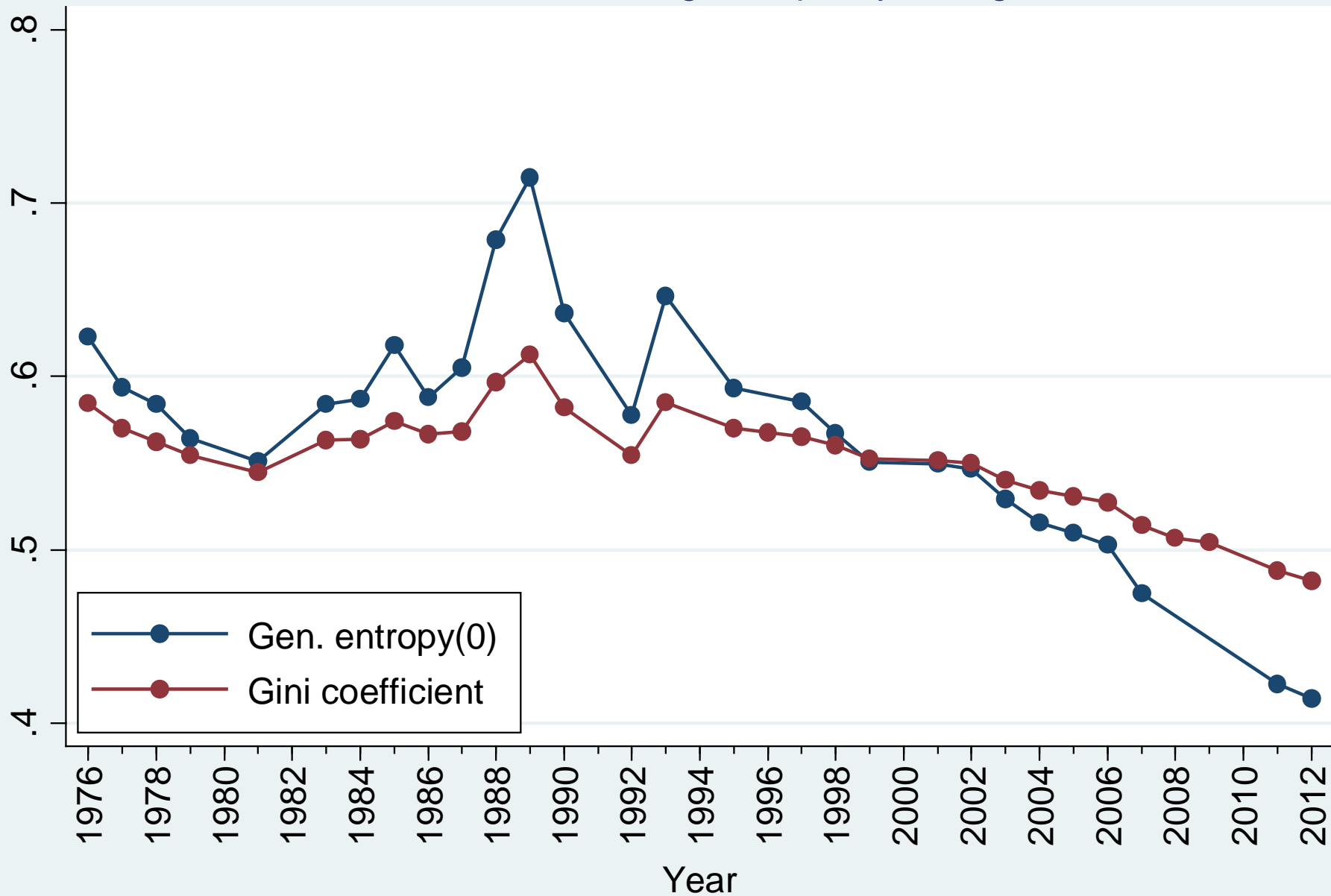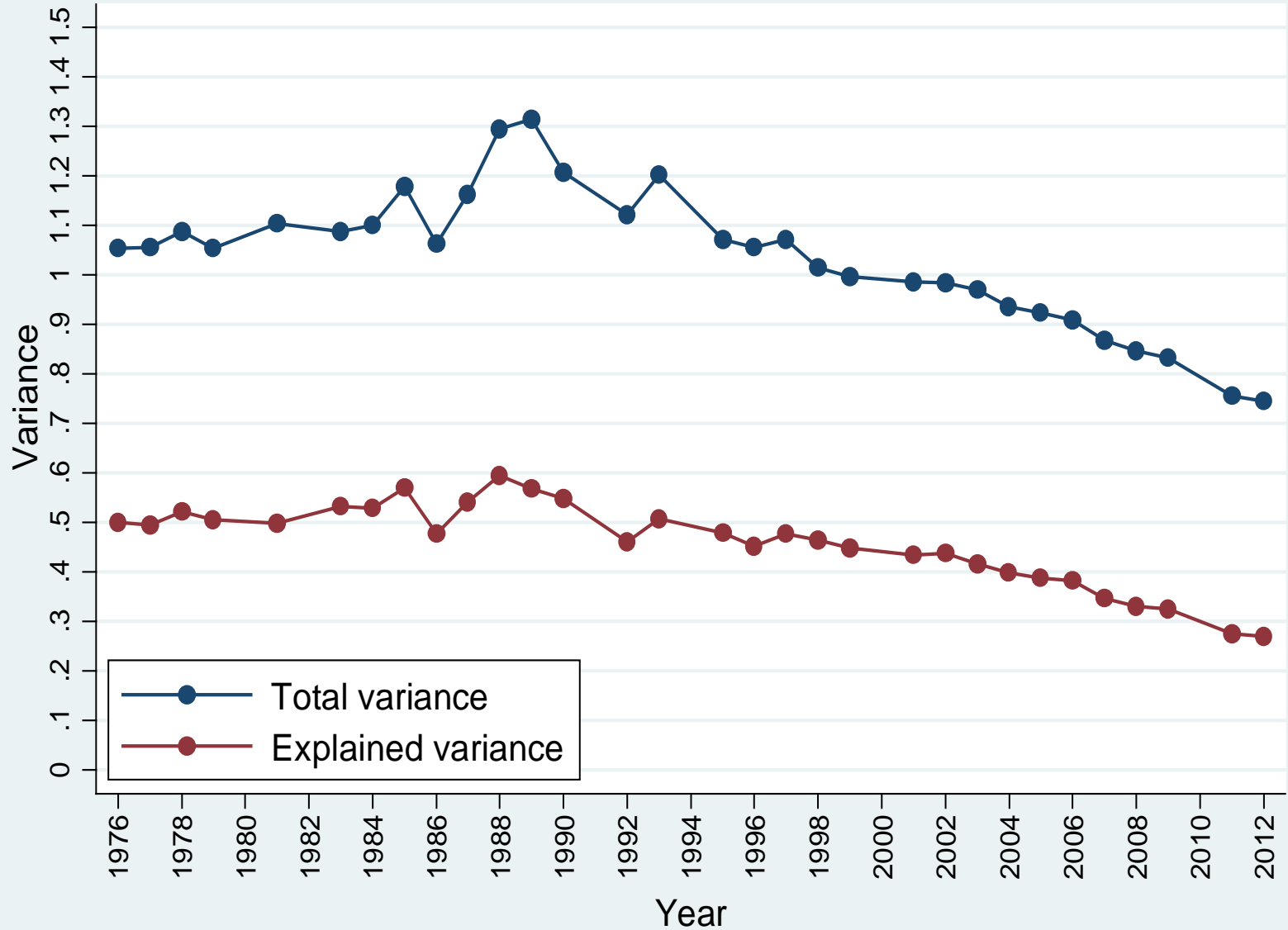
Variance of log earnings, South Africa 1994-2011

Explained variance based on regression with schooling dummies plus age and age squared.

Brazil: Measures of earnings inequality, all aged 25-60

Variance of log earnings, Brazil 1976-2012

# Theoretical background on relationship between schooling inequality and income inequality

$$y_i = \alpha + \beta S_i + u_i$$

Again, the variance of log earnings, $V(\log y)$, a standard mean-invariant measure of earnings inequality, is:

$$V(y) = \beta^2 V(S) + V(u)$$

- Increases in returns to schooling will increase earnings inequality.
- Possible to have decreases in schooling inequality but no decrease and maybe an increase in earnings inequality.

But returns are not typically constant across years of schooling.

# Schooling inequality and income inequality

What if we have a much more general relationship between schooling and earnings, with $j$ schooling dummies:

$$y_i \equiv log(Y_i) = \alpha + \sum_j \beta S_{ij} + u_i$$

The variance of log earnings is now:

$$V(y) = \sum_j \beta_j{}^2 V(S_j) + V(u) - \sum_j \sum_k p_j \beta_j p_k \beta_k$$

# Schooling inequality and income inequality

What if we increase returns at one schooling level:

$$\frac{\partial V(y)}{\partial \beta_1} = 2p_1 [\bar{y}_1 - \bar{y}]$$

- Inequality decreases if the schooling level has earnings below mean log earnings.
- Inequality increases if the schooling level has earnings above mean log earnings.
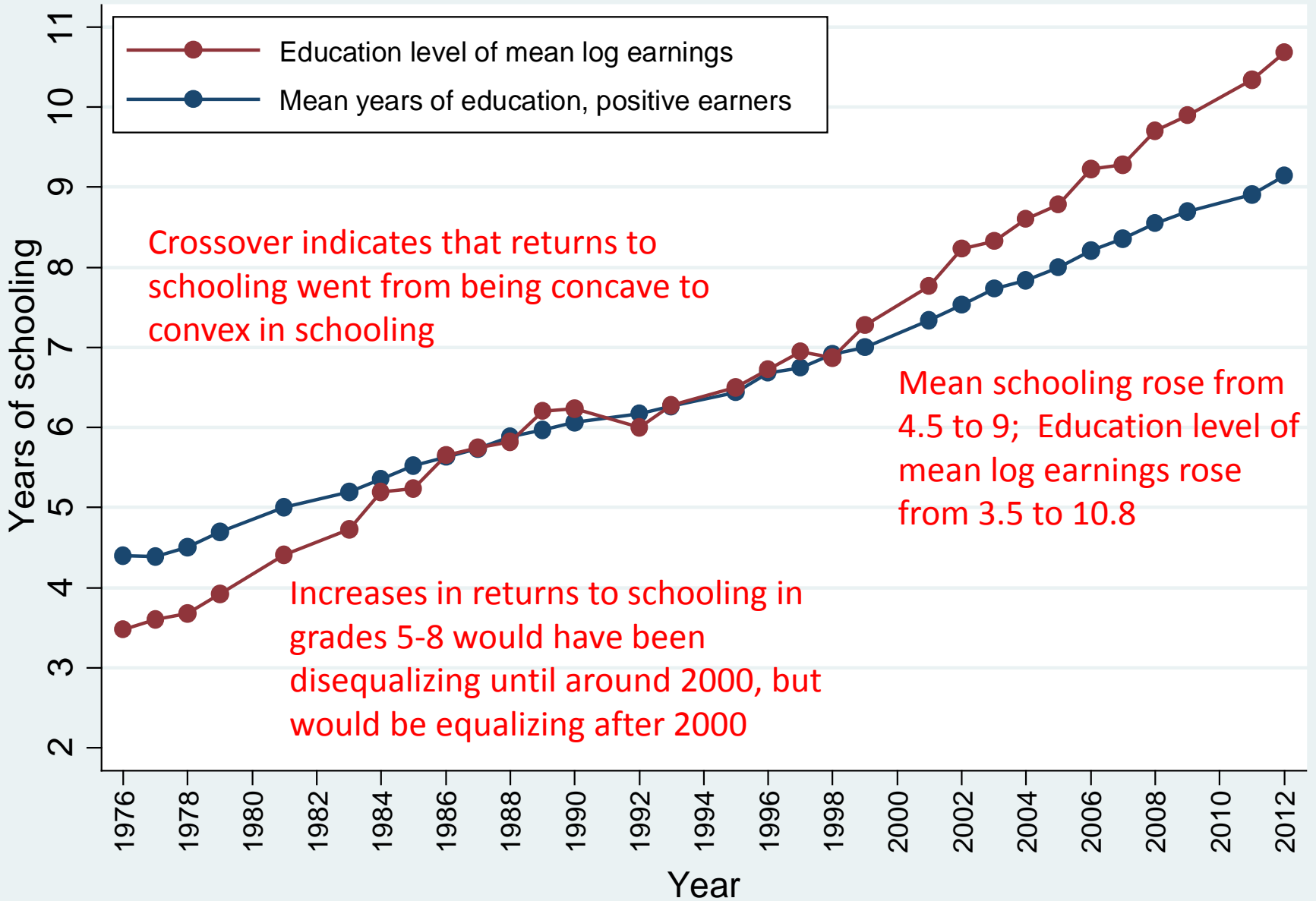- Magnitude of change depends on distance from mean and size of group.

# Schooling inequality and income inequality

What if we shift population from group 1 to group 2:
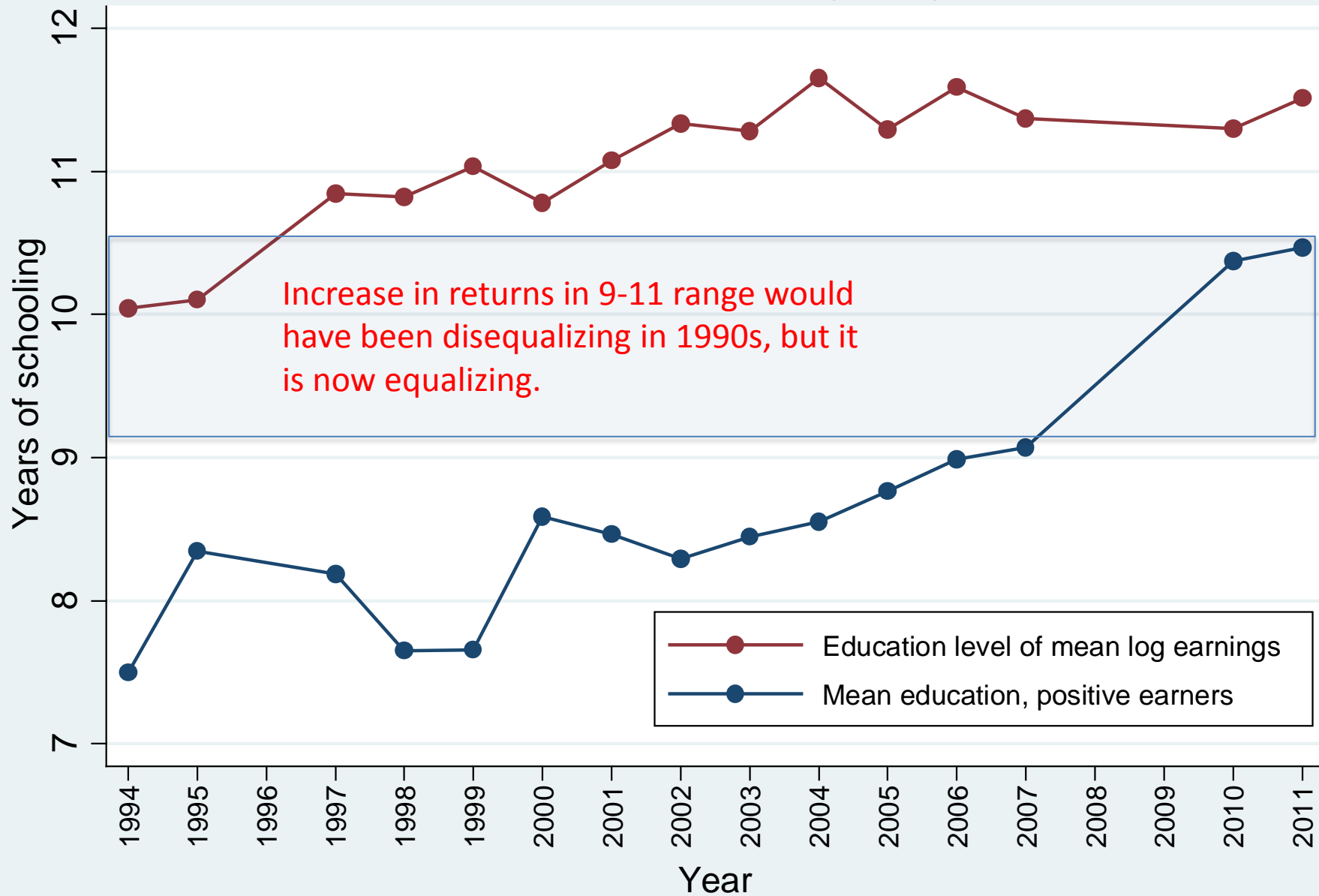
$$\frac{\partial V(y)}{\partial p_1} = (\bar{y}_1 - \bar{y})^2 - (\bar{y}_2 - \bar{y})^2$$

- Now the effect depends on whether we move people toward the mean, in either direction.
- If group 1 is closer to mean, increase in its size will decrease inequality.
- These results are for variance of log earnings, but similar results will hold for any measure of inequality.
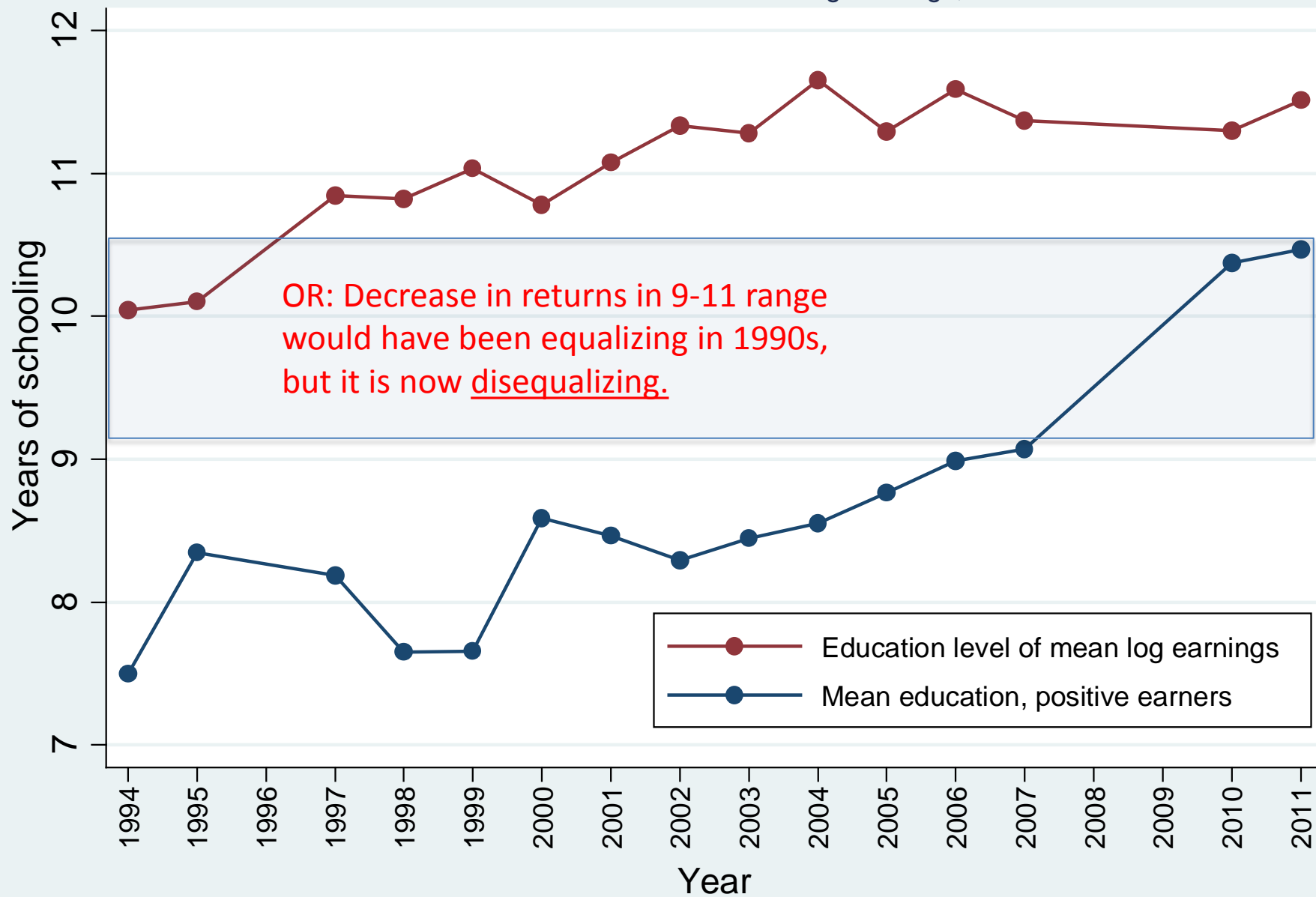
Mean education and education of mean log earnings, Brazil 1976-2012

Mean education and education of mean log earnings, SA 1994-2011

Increase in returns in 9-11 range would have been disequalizing in 1990s, but it is now equalizing.

Legend:
- Education level of mean log earnings
- Mean education, positive earners

Y-axis: Years of schooling

X-axis: Year

Mean education and education of mean log earnings, SA 1994-2011

OR: Decrease in returns in 9-11 range
would have been equalizing in 1990s,
but it is now disequalizing.

Education level of mean log earnings
Mean education, positive earners

Average returns to schooling in schooling groups, South Africa 1994-2011

Declines in returns to Inc. Sec. in 2000s – these are now disequalizing.
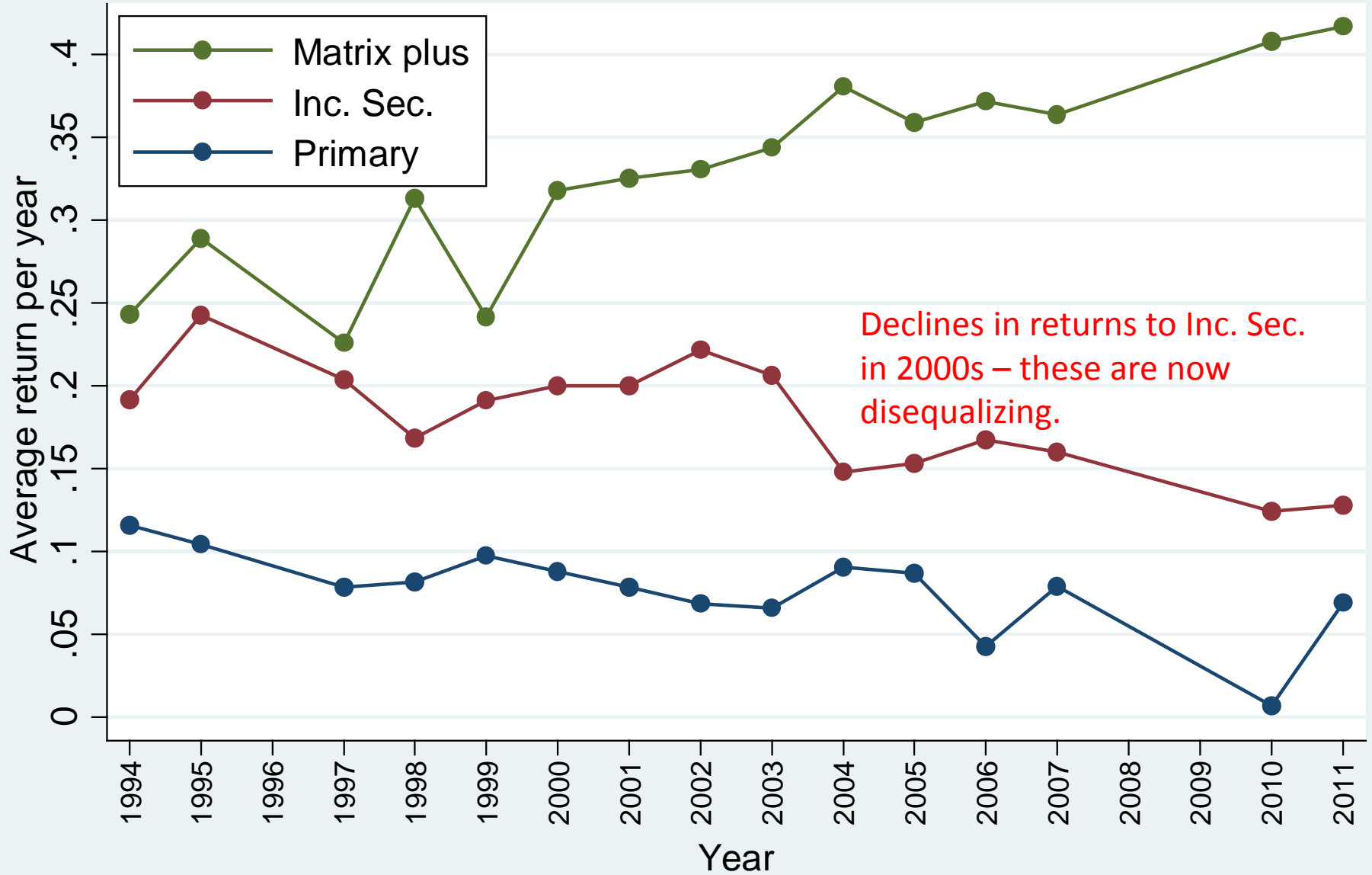
Weighted average of marginal returns to each year of schooling in schooling range

# Other measures of inequality

- Deriving simple analytical results for other measures of inequality (Gini, etc.) will in general not be this simple.
- We can easily generate the answer for a given population and a given inequality measure, however, by simulating small perturbations in the returns to schooling at each level of schooling.
- We can find the cutoff that divides equalizing from disequalizing increases in returns to schooling (in practice this may not always be a single crossing).

Increases in returns to schooling at grade 10 would have been disequalizing in 1994, but they would be equalizing in 2011.

Increases in returns to "grade 15" are more disequalizing in 2011 than they were in 1994
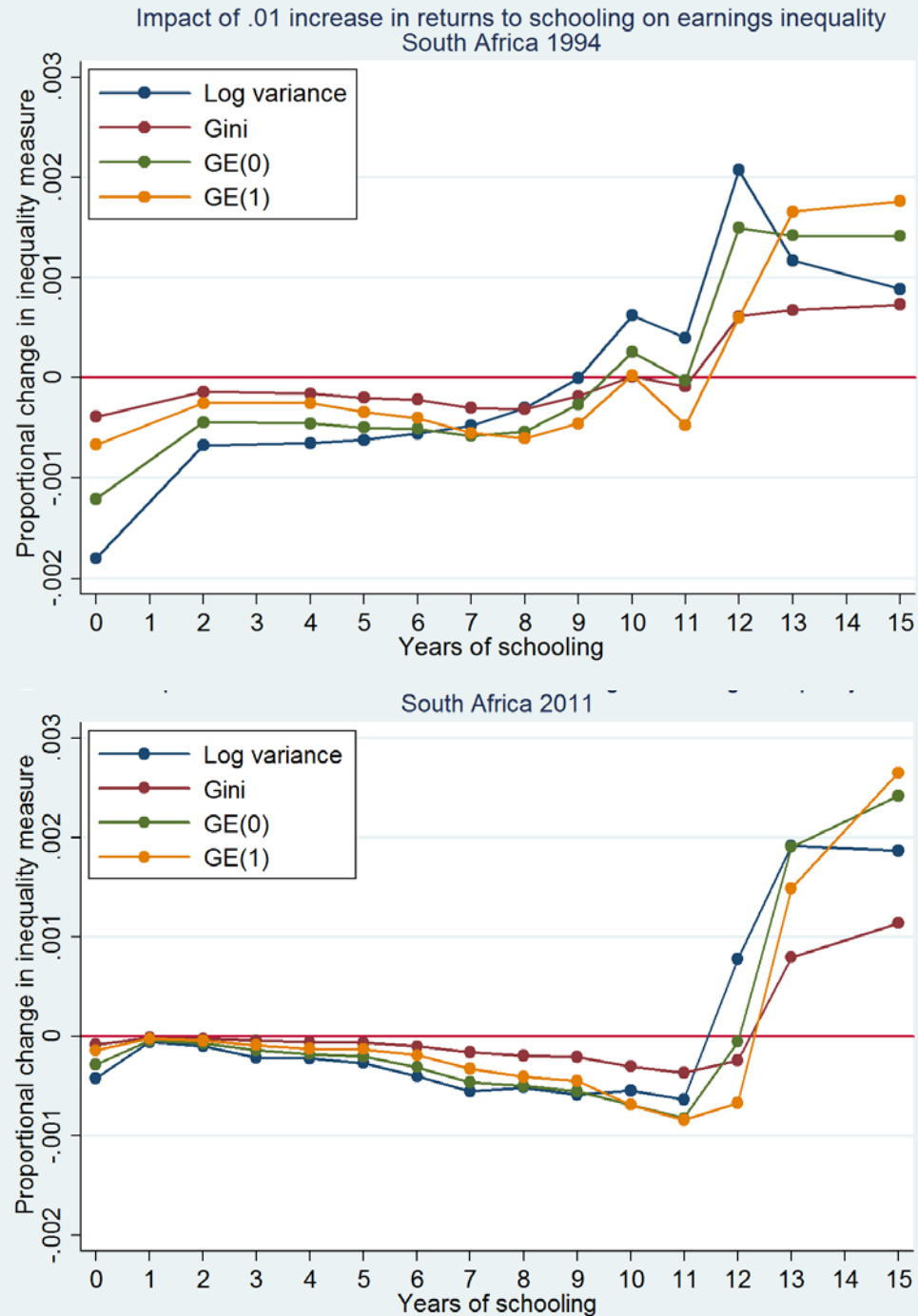
# Conclusions

- Schooling inequality declined substantially over time in both South Africa and Brazil:
  - This did not lead to declines in earnings inequality in South Africa.
  - Declining schooling inequality did eventually translate into declining earnings inequality in Brazil.
- Returns to schooling changed across schooling distribution:
  - Returns to schooling increased at high levels of schooling in South Africa, declined at low and intermediate levels of schooling.
  - Brazil had smaller increase in returns to schooling at top of schooling distribution.
- Impact of changes in returns depends on level of schooling corresponding to mean log earnings:
  - Increasing returns in "middle" of distribution would have been disequalizing in past, but are now equalizing
  - Decreasing returns in "middle" of schooling distribution have contributed to rising inequality in South Africa, compounding impact of rising returns at high levels of schooling.