

# Equality of Opportunities and Sustainable Development

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presentation based on joint work with Leonardo Gasparini, Matias Ciaschi, Joaquin Serrano, Sarah

McNamara, Melanie Arntz, Căcilia Lipowski, Ulrich Zierahn

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of Sustainability, Istanbul, May 2022

**ZEW**



# SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS



SUSTAINABLE DEVELOPMENT GOALS

## *Inequality*

if inequality is due to **effort**...

- most people would be more likely to accept it

if inequality is due to missing **opportunities**...

- most people would define it as unacceptable

# *Inequality* of living standards and opportunities



*Why do we care  
about equality of opportunities?*

*Why do we care  
about equality of opportunities?*

1. EQUITY ...
2. EFFICIENCY ...

## Equity ...

Inequality of opportunity

**...is not fair**

*“Since birth is not an act on the part of the one who is born, it cannot create any inequality (...)” (Kant, 1793)*

*“All human beings are born free and equal in dignity and rights.”  
(Article 1. Universal Declaration of Human Rights, 1948)*

## Equity ...

### Inequality of opportunity

**...is not fair**

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*“All human beings are born free and equal in dignity and rights.”  
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**...is it also inefficient ?**

→ **or are we facing a TRADE-OFF ?**

**how** much efficiency do we have to give up  
to obtain more equity?



# Equity ... Efficiency Trade-Off ?

**Economic theory suggests that...**

Inequality of opportunity

**...is detrimental for economic performance**

- inefficient human capital **accumulation** (Barro, 1991; Hanushek/Woessmann, 2008) and **allocation** (Galor/Tsiddon, 1997; Hassler/Mora, 2000) → *misallocation of talent*

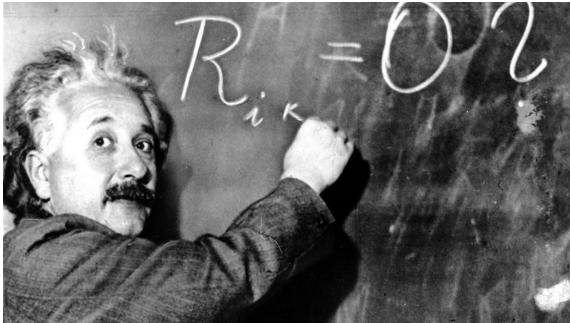
# Equity ... Efficiency Trade-Off ?

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How many *Einsteins* are we losing due to unequal opportunities?

# Social Mobility and Economic Performance

**We tested this hypothesis:**

**Social mobility** as indicator of equality of opportunities

① **“Social mobility and economic development”**

G.Neidhöfer, L.Gasparini, M.Ciaschi, J.Serrano  
(working paper available)

- geography of social mobility in Latin America
- test if higher mobility  $\Rightarrow$  economic development

② **“Intergenerational mobility and economic performance of European regions”**

S.McNamara, G.Neidhöfer  
(work in progress)

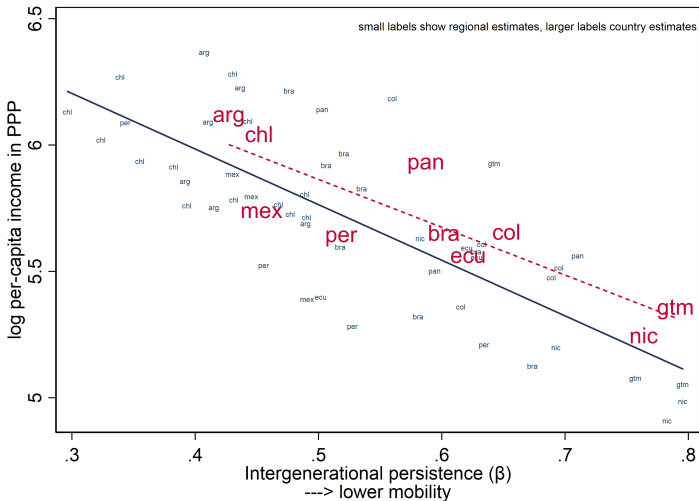
- geography of social mobility in Europe
- test if higher mobility  $\Rightarrow$  more innovation

## Contribution

- 1 Build **novel dataset** of (subnational) **region-year** observations for 10 Latin American countries / 31 European countries
  - **intergenerational education mobility** of cohorts (1940-89)
  - **development indicators** (1981-2018)
- 2 Geography of social mobility for Latin America / Europe
- 3 Novel way to **link cohort- and year-level** measures (measure mobility when it actually matters)
- 4 Test **social mobility**  $\Rightarrow$  **economic performance**

# Social Mobility and Economic Development

average over period 1981-2018



# Main Results

Dep.variable: log per-capita income |  $M = \log(\beta)$  (intergenerational persistence)

	(1)	(2)	(3)	(4)	(5)
M (w)	-1.506*** (0.243)	-2.012*** (0.268)	-2.032*** (0.216)	-1.967*** (0.228)	-2.645*** (0.303)
M (w) × Inequality (Gini)					-1.409*** (0.192)
<i>Controls</i>					
Inequality (Gini)	0.356** (0.158)	0.456*** (0.156)	0.498*** (0.167)	0.512*** (0.155)	-0.453*** (0.165)
Migrant share (w)		0.633*** (0.160)	0.680*** (0.159)	0.964*** (0.172)	0.0528 (0.148)
Average years of education (w)		0.528* (0.295)	0.704** (0.274)	-0.744** (0.288)	1.005*** (0.299)
Region and Time F.E.	X	X	X	X	X
Year level:					
- Population, Urban share	X	X	X	X	X
Initial conditions:					
- GDP p.c., Population, Temperature, Precipitation			X	X	X
Spillover effects				X	X
Observations	1368	1368	1368	1368	1368
Adjusted $R^2$	0.924	0.928	0.934	0.939	0.981

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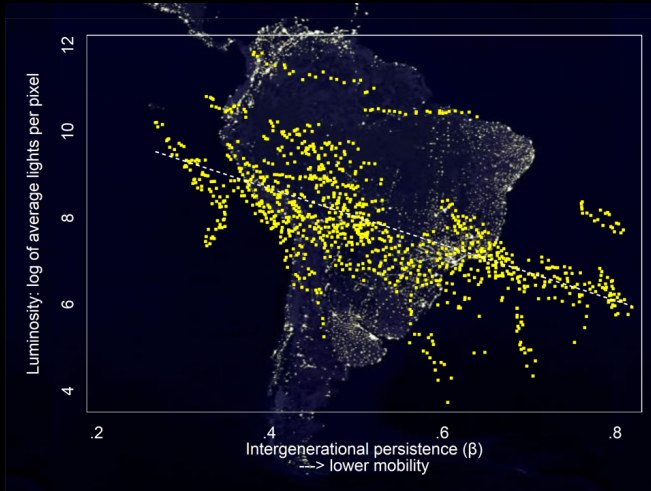
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Initial conditions:					
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# *Social mobility and...*

*other measures of development*



## Social mobility and...

*other measures of development*

Dep.variable: *in column title* |  $M = \log(\beta)$

**higher persistence** →

	Luminosity	Poverty	Employment	Formality	Water	Electricity
M (w)	-0.817*** (0.132)	2.518** (0.997)	-0.795*** (0.105)	-0.525** (0.206)	-0.786*** (0.172)	-0.192 (0.156)
Region and Country-Time F.E.	X	X	X	X	X	X
Year level controls	X	X	X	X	X	X
Cohort level controls	X	X	X	X	X	X
Initial conditions	X	X	X	X	X	X
Spillover effects	X	X	X	X	X	X
Observations	999	1368	1368	1223	1278	1128

Outcomes: **Luminosity** log average lights per pixel, **Poverty** line 2USD, **Employment**, **Formality**, **Literate** people able to write and read, (households with access to) **Water/Electricity**, houses made of **Precarious** materials, **Child Mortality** (<1 year old)

## Social Mobility in Latin America

- **Social mobility has been a driver of economic development in Latin America**
- **Inequality is particularly detrimental if paired with low levels of social mobility**

# Social Mobility in Europe



# Social mobility in Europe

## Primary Data

### ① European Social Survey

- estimate intergenerational mobility of education

### ② European Patent Office

- Patents, citation weighted patents in each region

### ③ Eurostat

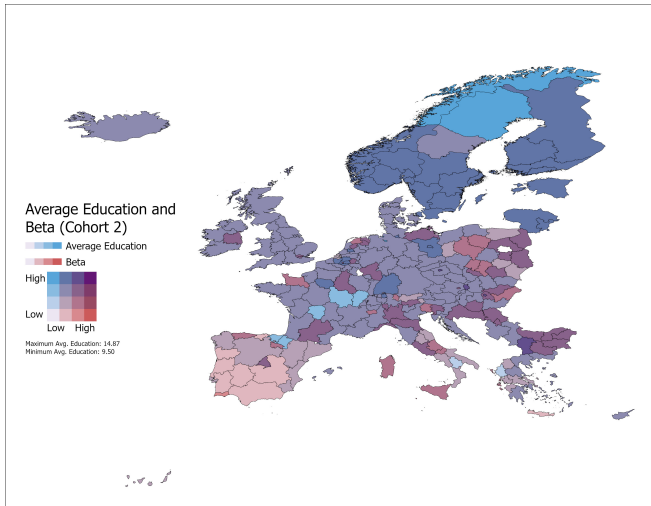
- Control variables (e.g. regional GDP, unemployment etc)

⇒ **Panel data set** including 101 NUTS1 (198 NUTS2) regions

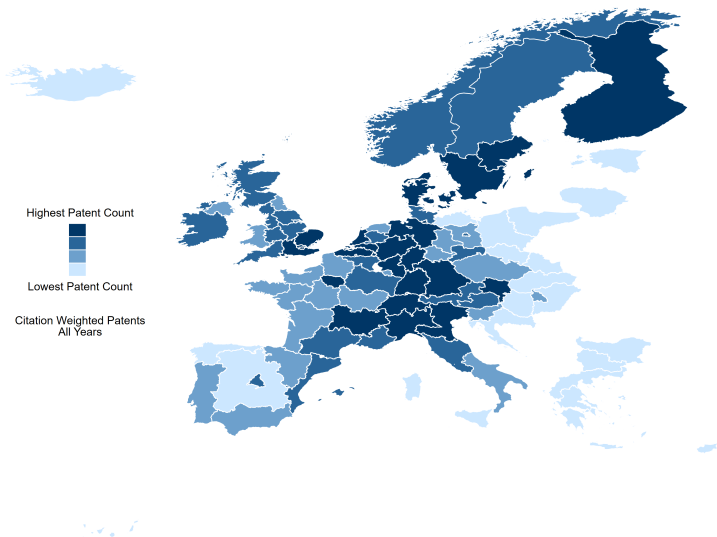
# Social mobility in Europe

## Average education vs. intergenerational persistence

(Cohort 1: 1940-59. Cohort 2: 1960-79.)



# Social mobility and innovation



# Social mobility and innovation

## Cohort-innovation profiles (using Bell et al., 2016, among others)

Figure A15 Panel A: Age Distribution of Patent Applicants in 2000  
Conditional on grant by 2012

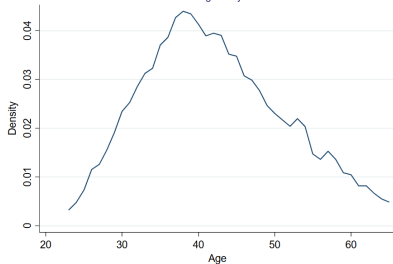
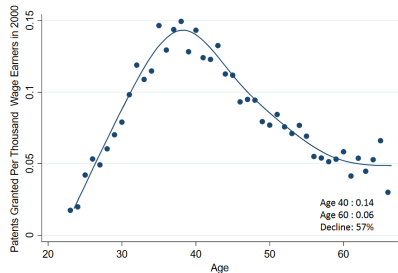


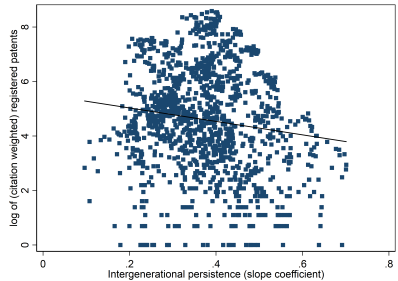
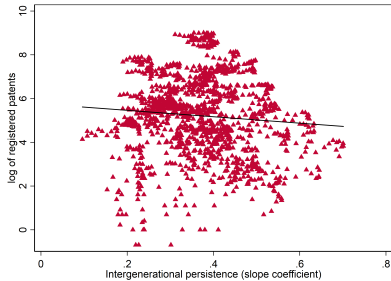
Figure A15 Panel C: Highly Cited (Top 5%) Patents per Wage Earner by Age in 2000





# Social mobility and innovation

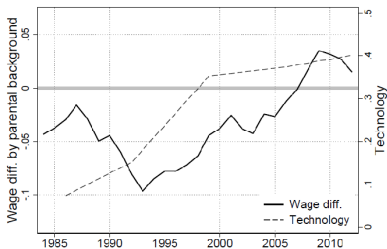
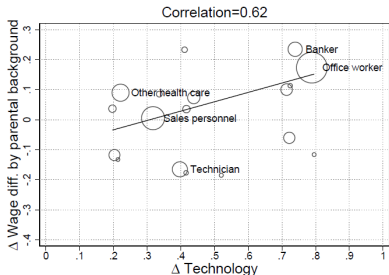
## Preliminary results



- regions with lower equality of opportunity have lower innovation potential

# Technological change and equality of opportunities

## Technological progress further improves equality of opportunities



Arntz/Lipowski/Neidhöfer/Zierahn (2022). “Computers as Stepping Stones? Technological Change and Equality of Labor Market Opportunities.”

## Conclusions

- **Social mobility is a driver of economic performance**

### **Policy implication**

- there is **no equity-efficiency trade-off**, rather the opposite
- intervention that increases opportunities, but causes inefficiencies in the short-run, may still be **efficient in the long-run**

⇒ **Striving for equality of opportunities is a sustainable goal**

***Thank you for your attention!***  
***Your comments are very welcome!***



# APPENDIX

## Intergenerational mobility measures

**Transition probabilities**

The probability of upward mobility

$$UM = \text{Prob}(y^c \geq s | y^p < s) \quad (1)$$

and the probability of top persistence

$$TP = \text{Prob}(y^c \geq s | y^p \geq s) \quad (2)$$

**Relative risk**

$$RR = \ln\left(\frac{TP}{UM}\right) \quad (3)$$

**Slope coefficient and intergenerational correlations**

$$y^c = \alpha + \beta \cdot y^p + \gamma X + \epsilon \quad (4)$$

$$\rho = \beta \frac{\sigma^p}{\sigma^c} \quad (5)$$

# Absolute Mobility

Dep.variable: log per-capita income |  $M = UM$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
M (w)	1.137*** (0.0330)	0.788*** (0.220)	0.916*** (0.218)	1.215*** (0.145)	1.506*** (0.150)	3.335*** (0.514)	1.706*** (0.207)
M (w) × M (w)						0.839*** (0.204)	
M (w) × Inequality (Gini)							0.433 (0.301)
Urban Population			-0.0790 (0.117)	-0.271** (0.125)	-0.184 (0.117)	0.0108 (0.126)	-0.228* (0.119)
Population			1.587*** (0.592)	1.416** (0.606)	0.998* (0.599)	1.651** (0.666)	0.953* (0.577)
Population × Population			-0.0547*** (0.0208)	-0.0495** (0.0209)	-0.0361* (0.0208)	-0.0600** (0.0233)	-0.0340* (0.0200)
Inequality (Gini)			0.520*** (0.175)	0.594*** (0.160)	0.698*** (0.166)	0.682*** (0.166)	1.156*** (0.369)
Migrant share (w)				0.264 (0.173)	0.750*** (0.152)	0.598*** (0.144)	0.769*** (0.146)
Variance of education (w)				0.0159 (0.228)	-0.210 (0.239)	0.809*** (0.269)	-0.321 (0.249)
Average years of education (w)				0.764* (0.388)	0.530 (0.351)	0.717** (0.353)	0.649* (0.365)
GDPpc (w)					0.217*** (0.0657)	0.185*** (0.0590)	0.205*** (0.0641)
Population 1940-89 (w)					-1.146*** (0.402)	-1.131*** (0.409)	-1.050*** (0.396)
Population 1940-89 (w) × Population 1940-89 (w)					0.0410*** (0.0126)	0.0444*** (0.0133)	0.0368*** (0.0124)
Temperature 1940-89 (w)					1.069*** (0.339)	0.724** (0.345)	1.105*** (0.337)
Temperature 1940-89 (w) × Temperature 1940-89 (w)					-0.0394*** (0.00938)	-0.0313*** (0.00920)	-0.0401*** (0.00925)
Precipitation 1940-89 (w)					-0.153** (0.0615)	-0.128** (0.0539)	-0.149** (0.0615)
Precipitation 1940-89 (w) × Precipitation 1940-89 (w)					0.00390* (0.00219)	0.00307 (0.00197)	0.00403* (0.00219)
Constant	6.551*** (0.0590)	6.231*** (0.276)	-4.655 (4.236)	-4.426 (4.825)	0.992 (5.347)	-3.184 (5.732)	0.590 (5.314)
Country	Yes	No	No	No	No	No	No

# Relative Mobility

Dep.variable: log per-capita income |  $M = RR$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
M (w)	-1.050*** (0.0305)	-1.072*** (0.171)	-1.110*** (0.176)	-1.193*** (0.120)	-1.079*** (0.104)	-2.785*** (0.564)	-1.293*** (0.200)
M (w) × M (w)						0.705*** (0.208)	
M (w) × Inequality (Gini)							-0.419 (0.314)
Urban Population			-0.0105 (0.121)	-0.203 (0.131)	-0.142 (0.126)	-0.00557 (0.127)	-0.190 (0.124)
Population			0.463 (0.608)	0.802 (0.611)	0.677 (0.627)	1.034 (0.691)	0.666 (0.608)
Population × Population			-0.0192 (0.0213)	-0.0306 (0.0214)	-0.0263 (0.0219)	-0.0402* (0.0243)	-0.0254 (0.0212)
Inequality (Gini)			0.539*** (0.176)	0.586*** (0.161)	0.679*** (0.169)	0.703*** (0.171)	1.062*** (0.332)
Migrant share (w)				0.296* (0.161)	0.582*** (0.144)	0.382*** (0.140)	0.612*** (0.139)
Variance of education (w)				-0.275 (0.227)	-0.556** (0.257)	0.0475 (0.244)	-0.627** (0.261)
Average years of education (w)				0.968*** (0.356)	1.270*** (0.374)	1.064*** (0.351)	1.322*** (0.376)
GDPpc (w)					0.200*** (0.0614)	0.221*** (0.0601)	0.189*** (0.0596)
Population 1940-89 (w)					-0.499 (0.393)	-0.419 (0.391)	-0.430 (0.389)
Population 1940-89 (w) × Population 1940-89 (w)					0.0136 (0.0120)	0.0126 (0.0121)	0.0108 (0.0119)
Temperature 1940-89 (w)					0.812** (0.357)	0.569 (0.363)	0.875** (0.359)
Temperature 1940-89 (w) × Temperature 1940-89 (w)					-0.0326*** (0.00994)	-0.0258*** (0.00991)	-0.0341*** (0.00983)
Precipitation 1940-89 (w)					-0.279*** (0.0674)	-0.302*** (0.0664)	-0.265*** (0.0674)
Precipitation 1940-89 (w) × Precipitation 1940-89 (w)					0.00650*** (0.00239)	0.00678*** (0.00232)	0.00636*** (0.00236)
Constant	6.216*** (0.0513)	6.392*** (0.181)	4.303 (4.411)	0.663 (4.597)	2.086 (5.622)	0.669 (5.936)	1.244 (5.709)
Country	Yes	No	No	No	No	No	No
Region	No	Yes	Yes	Yes	Yes	Yes	Yes



# Correlation coefficient

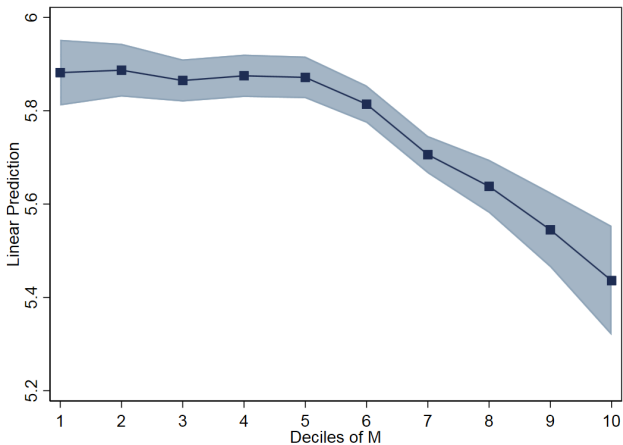
Dep.variable: log per-capita income |  $M = RR$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
M (w)	-0.173* (0.0881)	-0.260 (0.229)	-0.348 (0.238)	-0.724*** (0.204)	-0.538** (0.208)	0.167 (1.268)	-1.018** (0.468)
M (w) × M (w)						0.437 (0.779)	
M (w) × Inequality (Gini)							-0.649 (0.557)
Urban Population			0.00494 (0.119)	-0.163 (0.131)	-0.164 (0.128)	-0.158 (0.126)	-0.183 (0.123)
Population			0.291 (0.702)	0.764 (0.708)	0.738 (0.756)	0.781 (0.757)	0.769 (0.749)
Population × Population			-0.0108 (0.0243)	-0.0277 (0.0242)	-0.0276 (0.0258)	-0.0291 (0.0258)	-0.0285 (0.0256)
Inequality (Gini)			0.529*** (0.179)	0.640*** (0.159)	0.688*** (0.168)	0.692*** (0.170)	0.210 (0.457)
Migrant share (w)				0.447** (0.176)	0.669*** (0.145)	0.678*** (0.152)	0.650*** (0.147)
Variance of education (w)				-0.665*** (0.248)	-1.060*** (0.295)	-1.077*** (0.296)	-1.067*** (0.295)
Average years of education (w)				2.262*** (0.401)	2.454*** (0.420)	2.447*** (0.417)	2.490*** (0.419)
GDPpc (w)					0.294*** (0.0793)	0.297*** (0.0795)	0.293*** (0.0786)
Population 1940-89 (w)					-0.0294 (0.406)	-0.0566 (0.419)	0.0870 (0.430)
Population 1940-89 (w) × Population 1940-89 (w)					-0.00498 (0.0139)	-0.00395 (0.0144)	-0.00913 (0.0145)
Temperature 1940-89 (w)					0.305 (0.358)	0.299 (0.357)	0.356 (0.361)
Temperature 1940-89 (w) × Temperature 1940-89 (w)					-0.0188* (0.0101)	-0.0188* (0.0101)	-0.0198* (0.0101)
Precipitation 1940-89 (w)					-0.319*** (0.0743)	-0.331*** (0.0807)	-0.300*** (0.0762)
Precipitation 1940-89 (w) × Precipitation 1940-89 (w)					0.00511** (0.00226)	0.00537** (0.00240)	0.00477** (0.00230)
Constant	4.914*** (0.0800)	5.080*** (0.181)	3.504 (5.082)	-2.836 (5.344)	0.322 (6.610)	0.674 (6.683)	-1.871 (7.143)

# Non-linearities

Dep.variable: log per-capita income |  $M = \log(\beta)$

**higher persistence** →



## Social Mobility and Economic Development

Human Capital Accumulation or Allocation ?

## Accumulation or Allocation

	(1)	(2)	(3)	(4)
Upward Mobility (w)	1.716*** (0.211)			1.514*** (0.150)
Top Persistence (w)		1.812*** (0.414)	0.423 (0.274)	-0.0887 (0.241)
Average years of education (w)			2.369*** (0.389)	0.546 (0.340)
Region and Time FE	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes
Observations	1363	1363	1363	1363

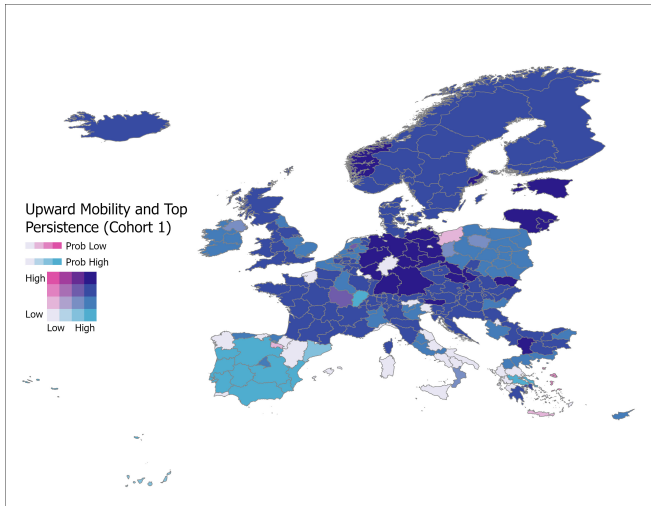
TP = (Probability to complete secondary | High educated parents)

UM = (Probability to complete secondary | Low educated parents)

# Social mobility in Europe

## Upward mobility vs. Top persistence (Secondary Education)

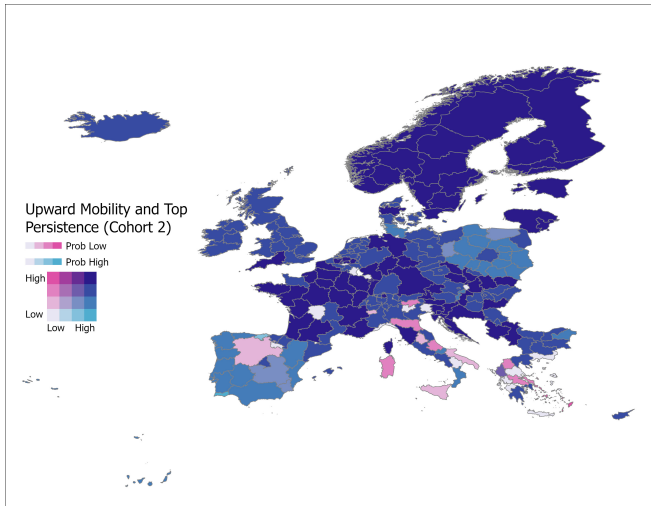
(Cohort 1: 1940-59. Cohort 2: 1960-79.)



# Social mobility in Europe

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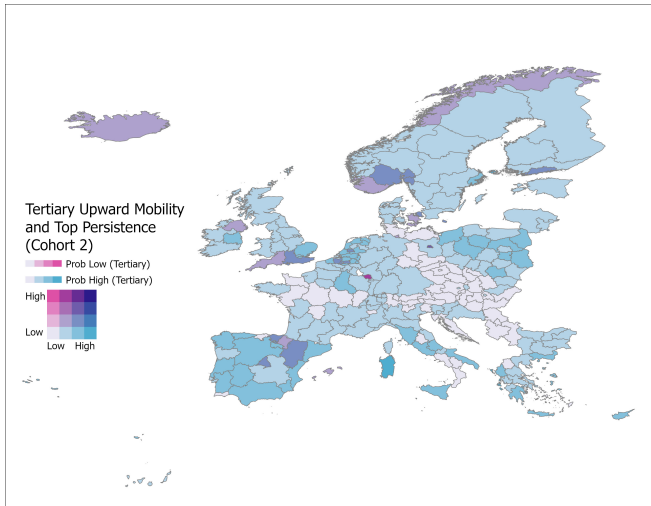
(Cohort 1: 1940-59. Cohort 2: 1960-79.)



# Social mobility in Europe

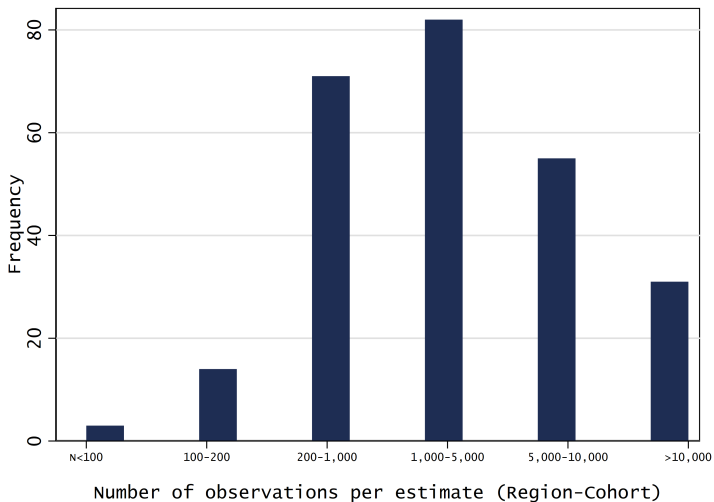
## Upward mobility vs. Top persistence (Tertiary Education)

(Cohort 1: 1940-59. Cohort 2: 1960-79.)



# Data

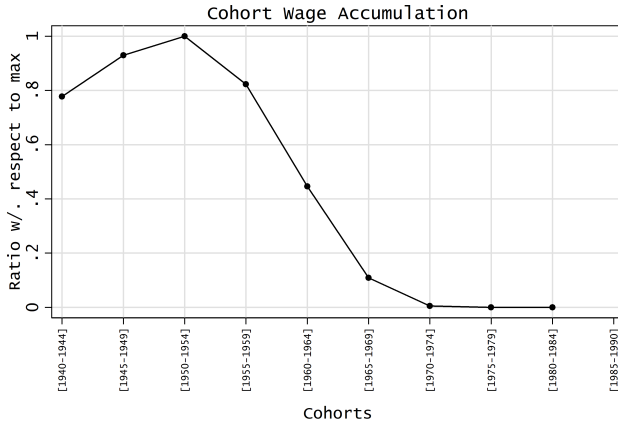
## Intergenerational mobility estimates





# Weight-Structure

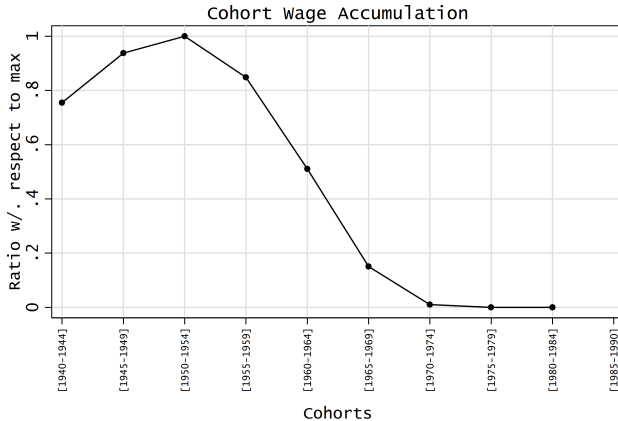
## Brazil



Source: PNAD-1981, own estimates.

# Weight-Structure

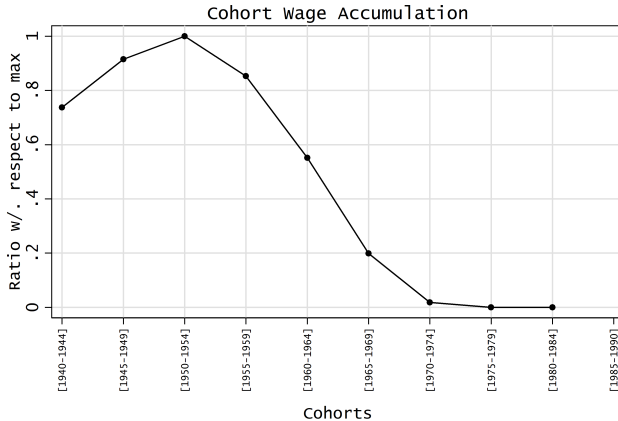
## Brazil



Source: PNAD-1982, own estimates.

# Weight-Structure

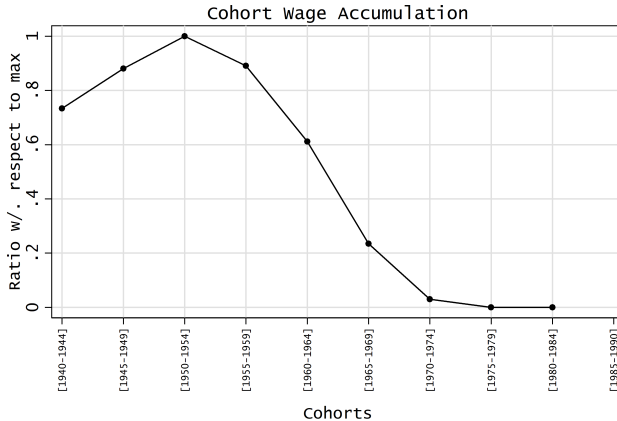
## Brazil



Source: PNAD-1983, own estimates.

# Weight-Structure

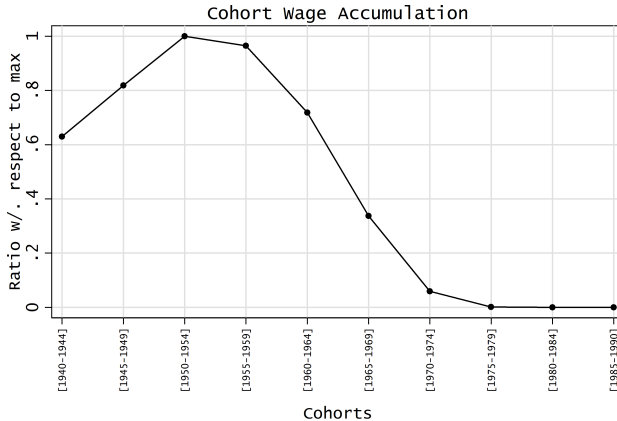
## Brazil



Source: PNAD-1984, own estimates.

# Weight-Structure

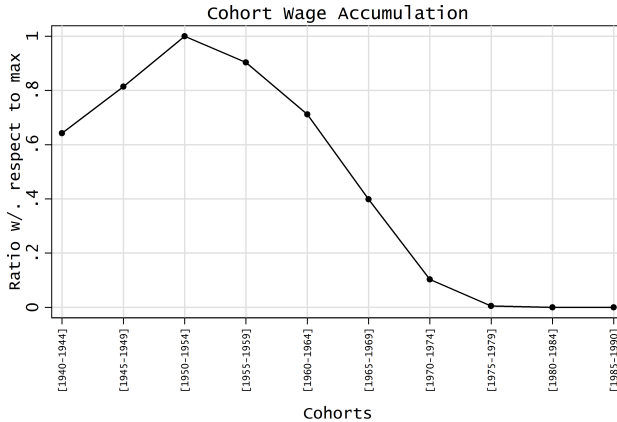
## Brazil



Source: PNAD-1985, own estimates.

# Weight-Structure

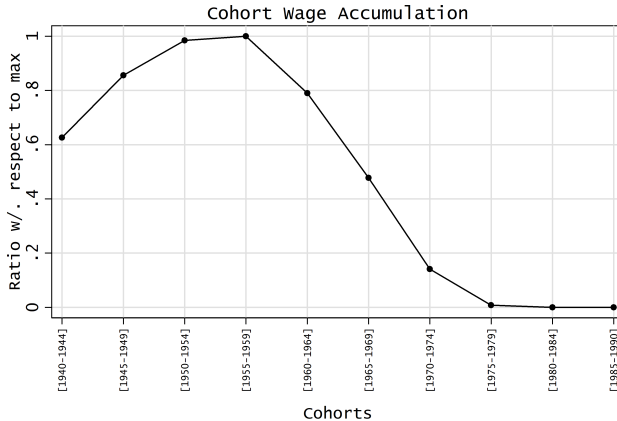
## Brazil



Source: PNAD-1986, own estimates.

# Weight-Structure

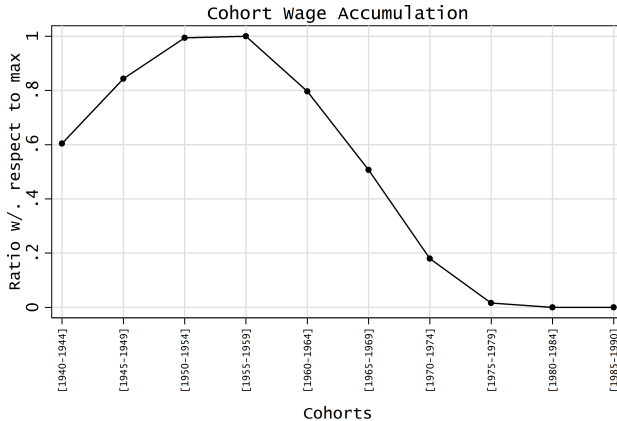
## Brazil



Source: PNAD-1987, own estimates.

# Weight-Structure

## Brazil

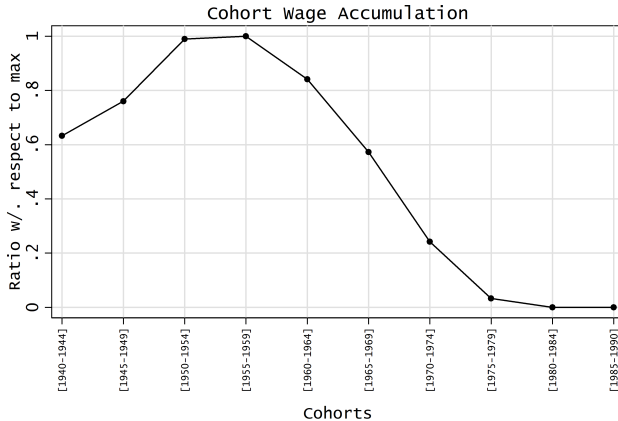


Source: PNAD-1988, own estimates.



# Weight-Structure

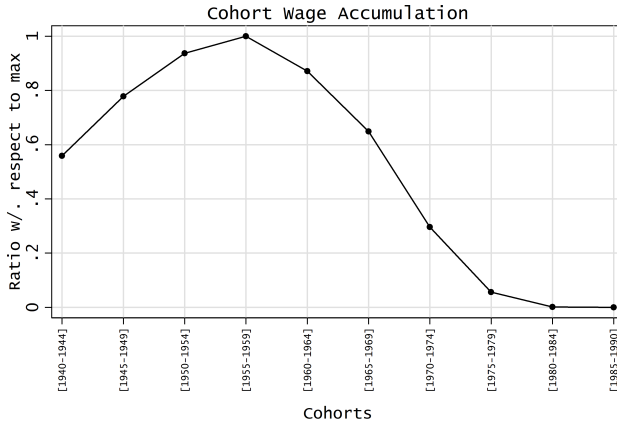
## Brazil



Source: PNAD-1989, own estimates.

# Weight-Structure

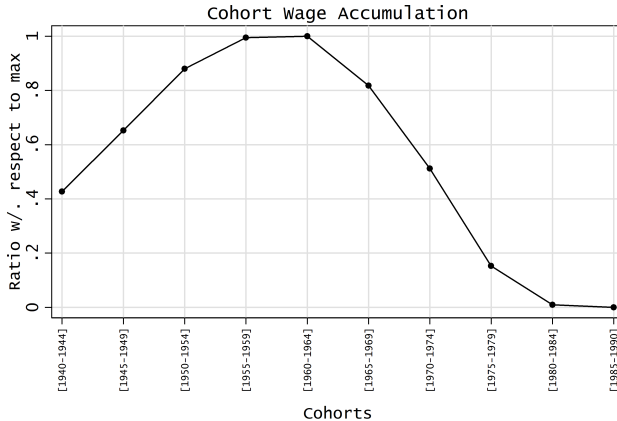
## Brazil



Source: PNAD-1990, own estimates.

# Weight-Structure

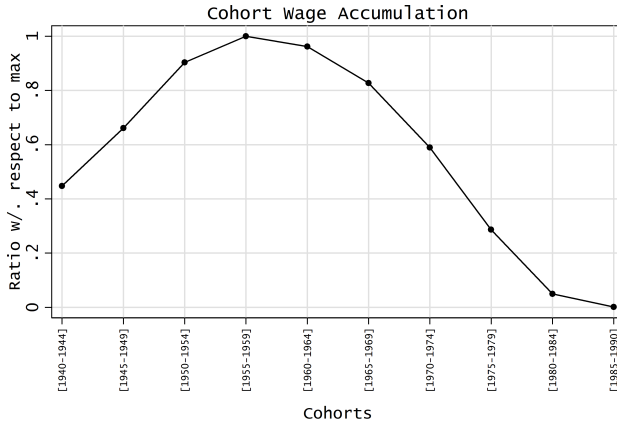
## Brazil



Source: PNAD-1992, own estimates.

# Weight-Structure

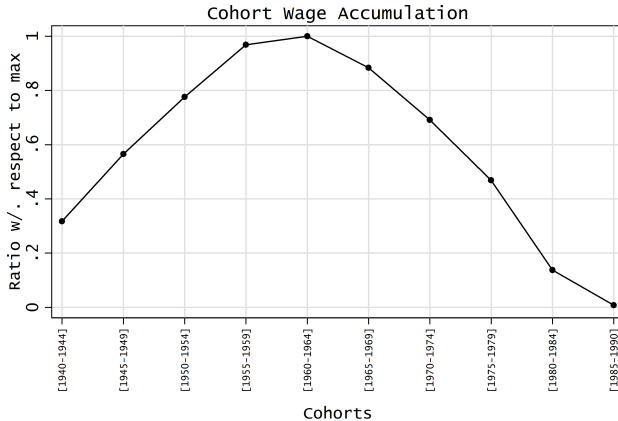
## Brazil



Source: PNAD-1995, own estimates.

# Weight-Structure

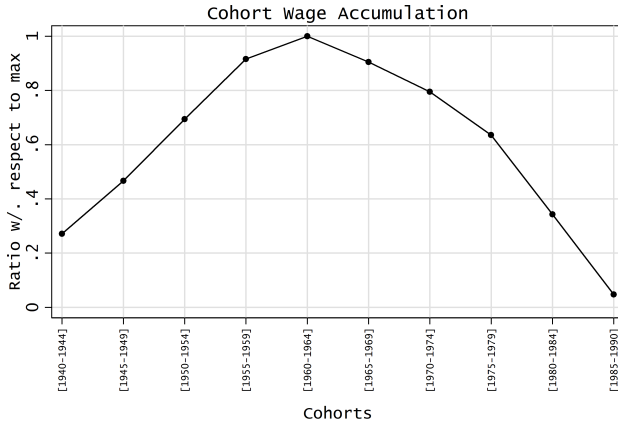
## Brazil



Source: PNAD-1998, own estimates.

# Weight-Structure

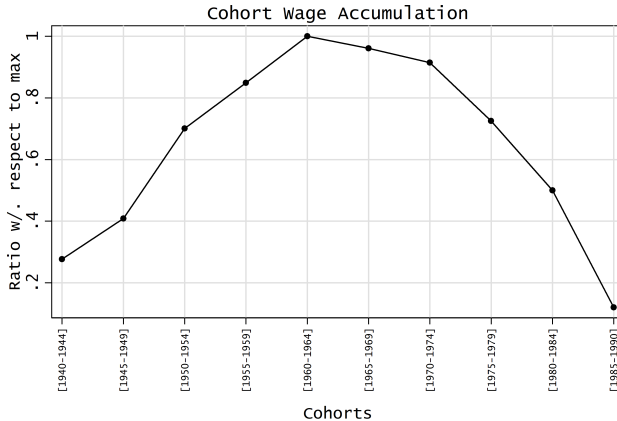
## Brazil



Source: PNAD-2001, own estimates.

# Weight-Structure

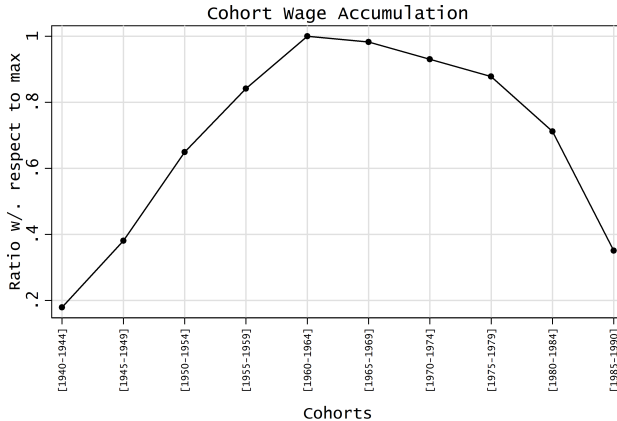
## Brazil



Source: PNAD-2003, own estimates.

# Weight-Structure

## Brazil

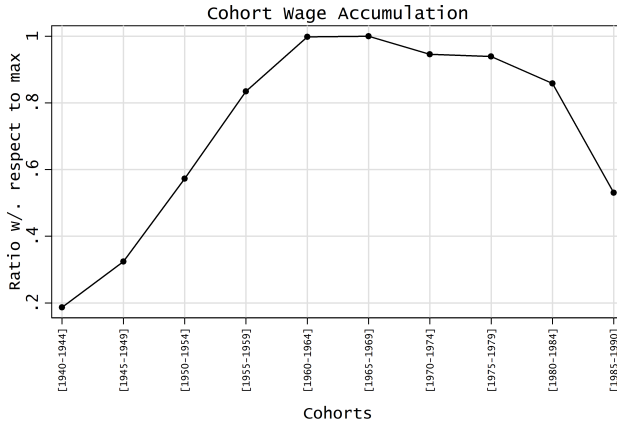


Source: PNAD-2006, own estimates.



# Weight-Structure

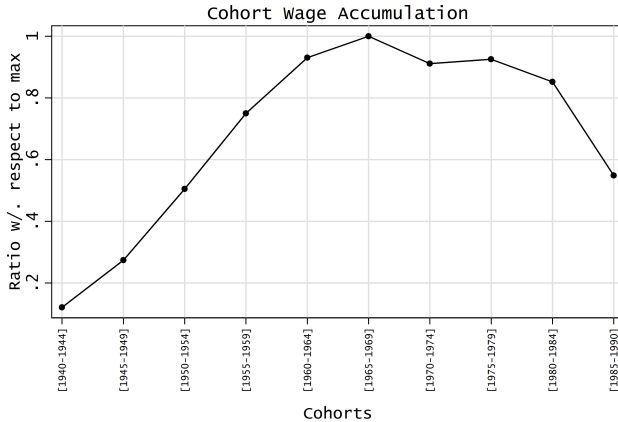
## Brazil



Source: PNAD-2008, own estimates.

# Weight-Structure

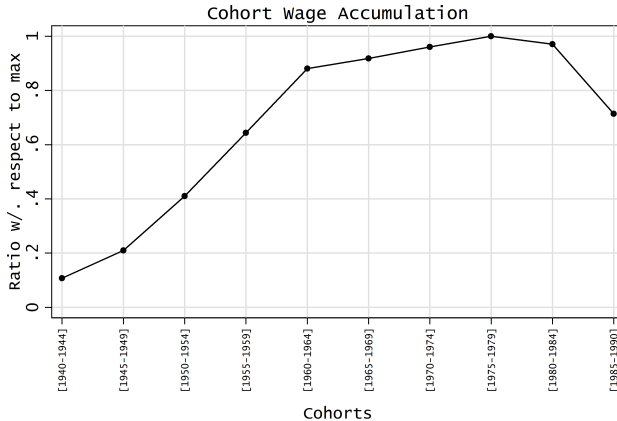
## Brazil



Source: PNAD-2009, own estimates.

# Weight-Structure

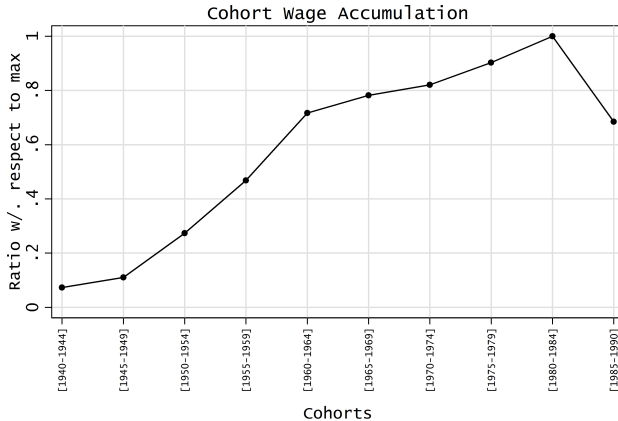
## Brazil



Source: PNAD-2012, own estimates.

# Weight-Structure

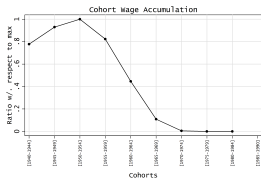
## Brazil



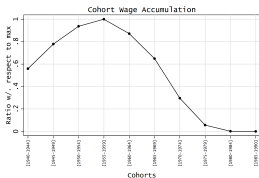
Source: PNAD-2015, own estimates.

# Weight-Structure

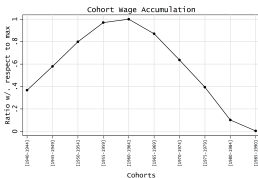
## Brazil



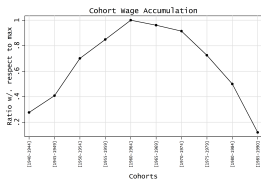
Source: PNAD-1961, own estimates.



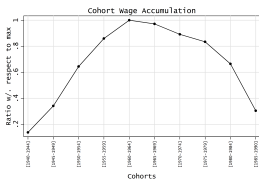
Source: PNAD-1980, own estimates.



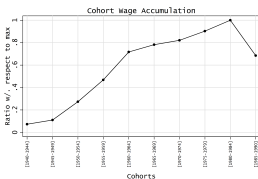
Source: PNAD-1997, own estimates.



Source: PNAD-2003, own estimates.



Source: PNAD-2007, own estimates.



Source: PNAD-2015, own estimates.