Beyond GDP and beyond Gini:
the measurement of the inequality of opportunity

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IARIW-BOK conference, Seoul, April 2017

Inequality at center stage...
...but what inequality?

1. *Increasing "inequality"* as a major political debate in a number of countries

2. Two recent key suprise electoral results (Brexit, Trump election) broadly attributed to "*inequality"* (and globalization!)

3. What inequality are we talking about ?

   – France is a moderately unequal country, yet populism (left and right) are close to 50% of the votes, very much on an inequality platform

Inequality cannot be reduded to the Gini coefficient of equivalized disposable income

Other dimensions of inequality are crucial: the inequality of opportunity (i.e., access to income generating facilities)
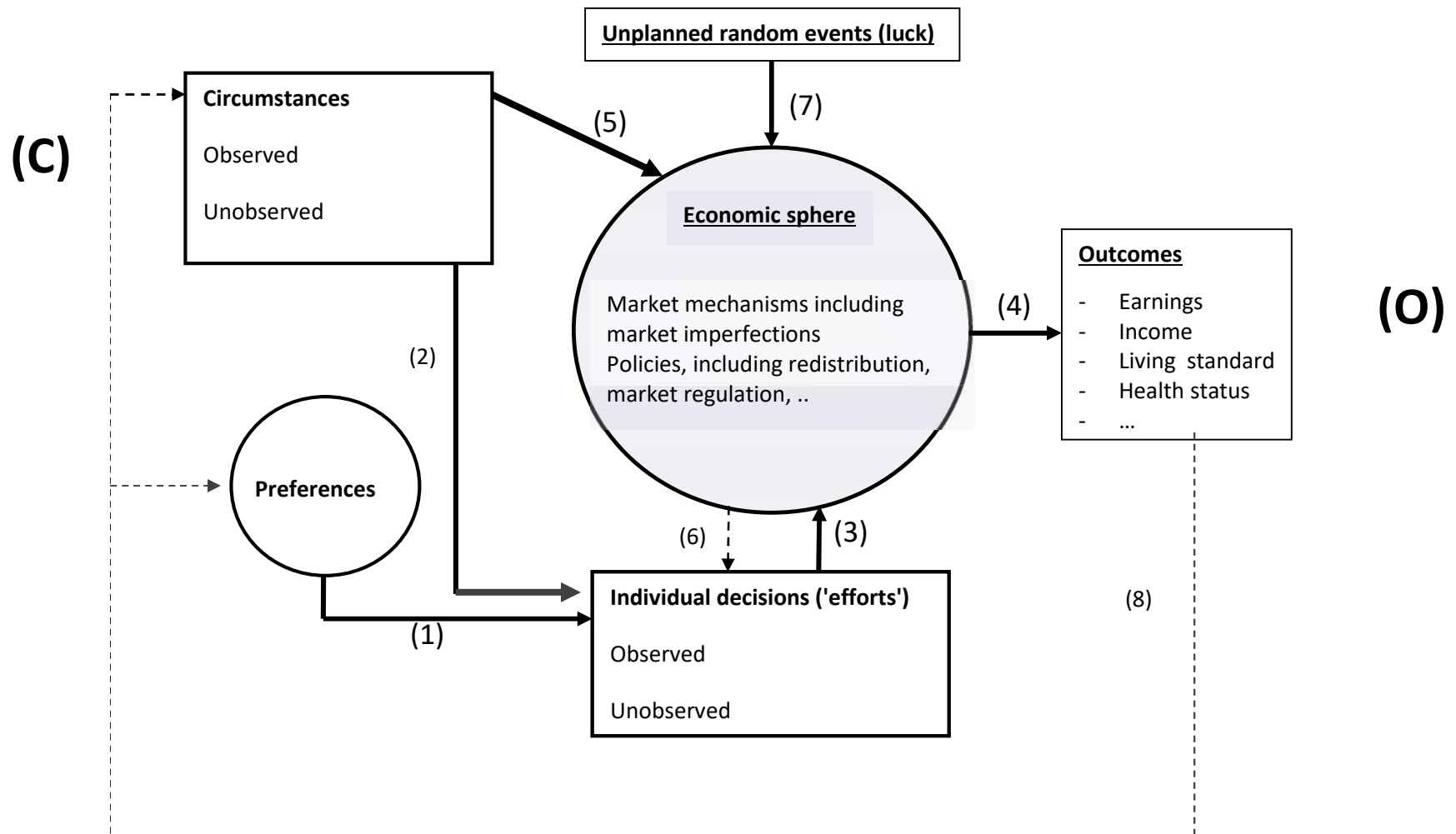
The importance of the inequality of opportunity

- Inequality of opportunities (I_{opp}) matters:
  - Per se (moral philosophy argument)
  - As a determinant of the inequality of outcomes
  - In a policy perspective
  - In a political perspective , through the perception people have of "inequality"
    - Example: the differentiated perception of social mobility: "Our childen will not do as well as we did"

- Crucial to monitor the inequality of opportunity at the same time as that of outcomes

- How to monitor I_{opp}? Measures and data requirements

Outline

1. The relationship between 'opportunities' and 'outcomes'
2. Outcome-based measures of I_{opp}
   - Non-parametric
     - Outcome means by type
     - Outcome distribution by type
     - Matrix representation
   - Parametric
     - Theoretical background
     - Intergenerational mobility elasticity (IGM)
     - Generalizing the IGM
     - Ingroducing cohort effects
3. Direct I_{opp} measures : the case of education
4. Conclusion

1. The relationship between individual circumstances, opportunities and outcomes

Unplanned random events (luck)

(C)

Circumstances

Observed

Unobserved

(5)

(7)

Economic sphere

Market mechanisms including market imperfections
Policies, including redistribution, market regulation, ..

(2)

Preferences

(4)

Outcomes
- Earnings
- Income
- Living standard
- Health status
- …

(O)

(6)

(3)

Individual decisions ('efforts')

Observed

Unobserved

(1)

(8)

The logics of I_{opp} measurement

- I_{opp} based on inequality of the distribution of circumstances, or some particular dimension of **(C)**

- I_{opp} based on impact of the distribution of **(C)** on the distribution of a component of **(O)**

  - I_{opp} depends on the set of circumstances in **(C)** and the component of **(O)** being considered

  - Inequality in **(O)** as a 'metric' of I_{opp}

Note : I_{opp} will differ according to the component of (O) being considered (earnings, income, … happiness)

2. Outcome-based measures of I_{opp}
a) Non-parametric measures

i. <u>Measure based on outcome *means* by 'types'</u>

- 'Type' = individuals facing a given set of circusmtances

- Example: *'female, born in rural area of region X, from uneducated but wealthy parents'*

- Define the virtual outcome distribution where all individuals with a given type get the mean outcome of that type:

Type	Mean outcome	Number of people
1	m1	n1
2	m2	n2
etc..		

Measures based on outcome means by type

- *Absolute* I_{opp} = inequality measure of outcomes in the virtual distribution:

  $I_{opp} = \textbf{\textit{I}}^{\textbf{O}} = I(m_1: n_1\ times;\ m_2: n_2\ times;\ \ldots\ldots;\ m_N: n_N\ times)$

- Inequality measure $I(\ )$ may be Gini, Theil, Log variance, …

- *Relative* inequality of opportunity =

  Absolute inequality of opportunity, $\textbf{\textit{I}}^{\textbf{O}}$/actual inequality of outcomes

- $\textbf{\textit{I}}^{\textbf{O}} =$ Familiar *between group inequality component* of total outcome inequality in a partition of the population
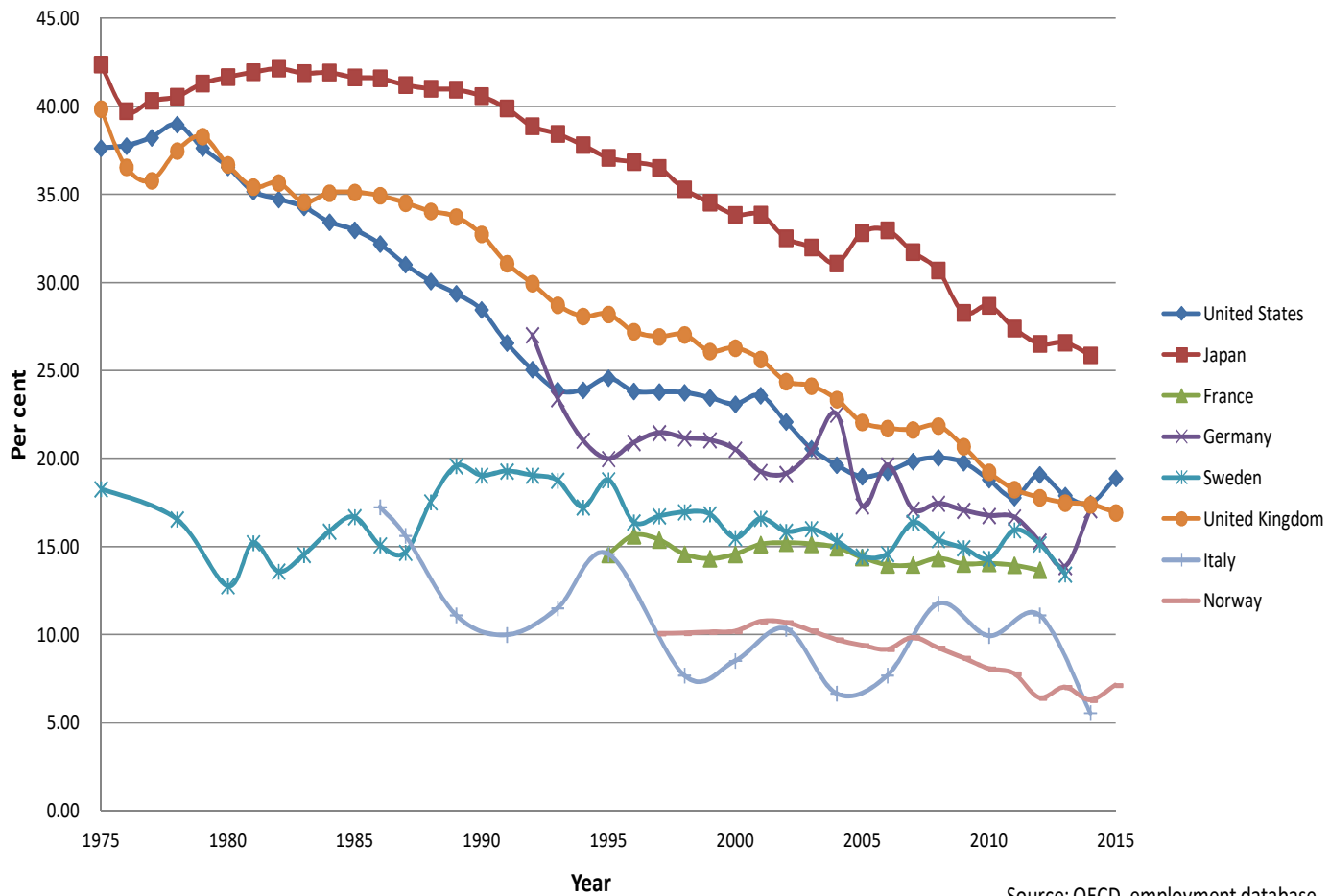
Examples

- Case of 2 types – i.e. gender

- Outcome = earnings

I_{opp}:

- Absolute gap = Male mean earnings - Female mean earnings
- Relative gap = Absolute gap / male (female) earnings

**Figure 7. Gender wage gap in selected countries: 1975-2015**
Percentage gap between median men and women earnings w.r.t. median mean earnings
(full-time workers)

United States
Japan
France
Germany
Sweden
United Kingdom
Italy
Norway

Source: OECD, employment database

Examples

- Types defined by: gender, education, region of birth, …
- Outcome = earnings/household income per capita

- I_{opp} Between type inequality, mean logarithmic deviation

- Various countries

Figure 6. Inequality of outcomes and share due to observed dimensions of the inequality of opportunity: selected countries circa 2005 (Inequality measure = Mean logarithmic deviation)

Brunori, Ferreira, Peragine (2013)
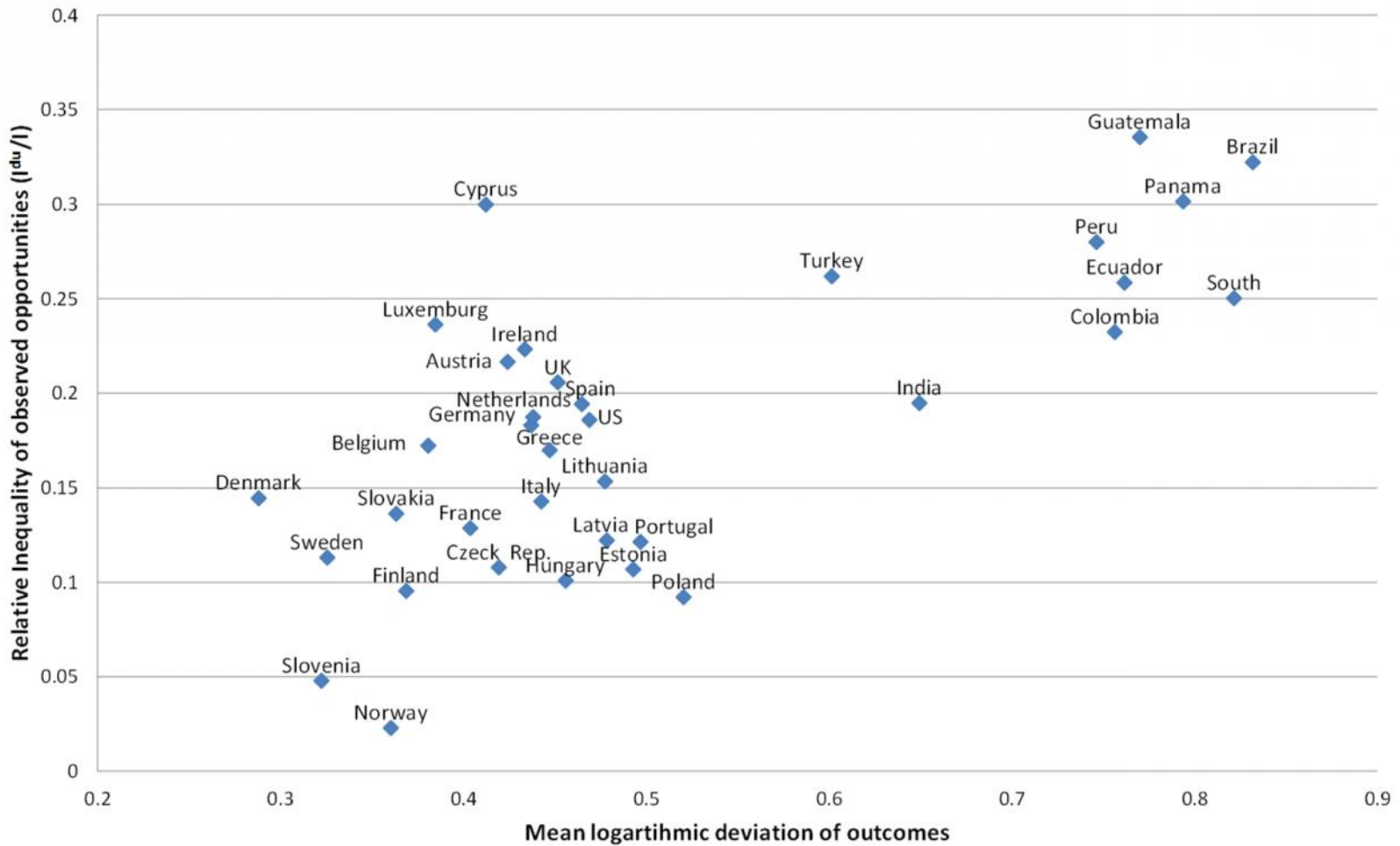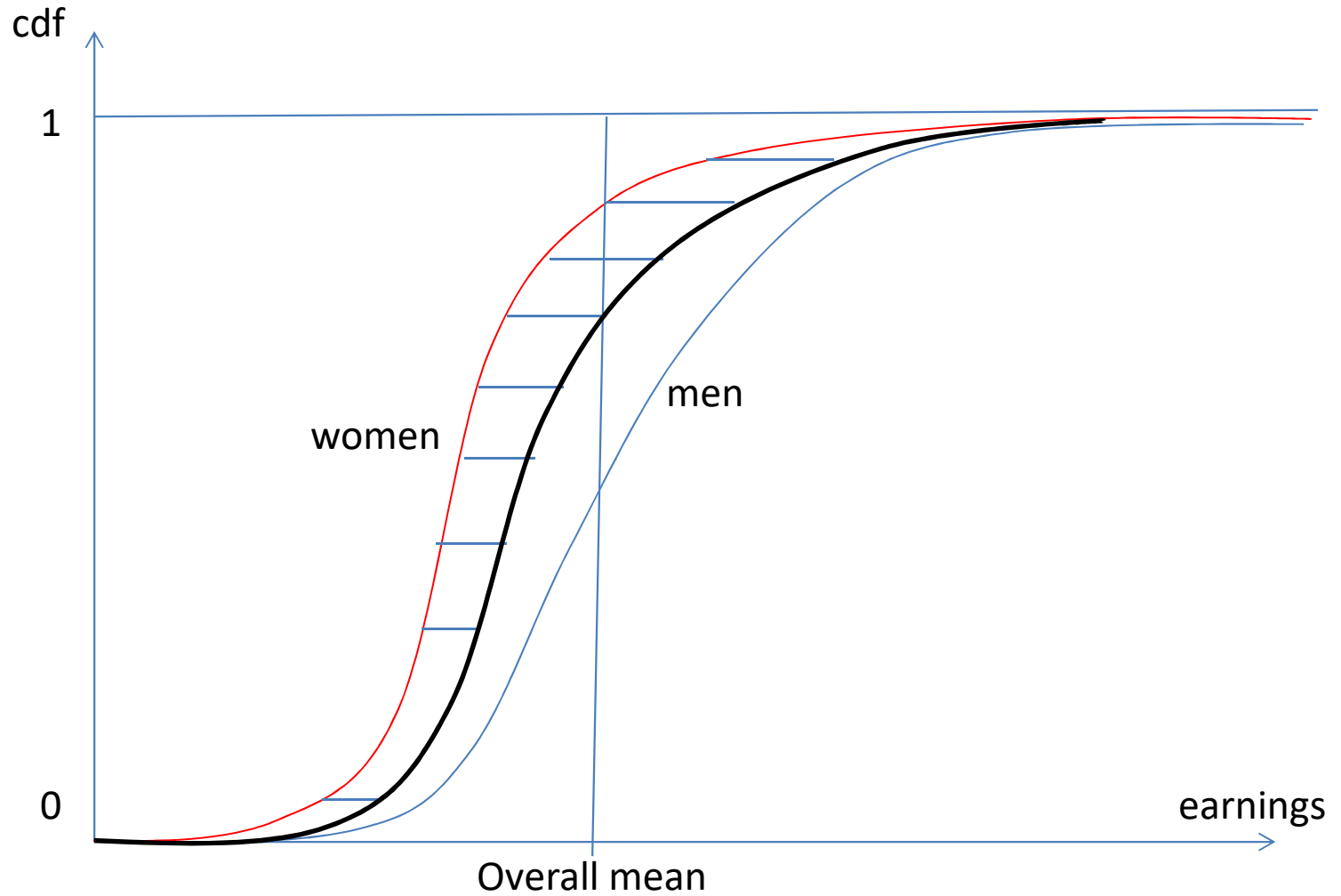
Non-parametric measures

ii.   <u>Measure based on the outcome *distribution* by 'types' (Roemer)</u>

- Instead of measuring difference in outcome means across types, compare outcome quantiles

- I_{opp} based on aggregation of 'quantile gaps'

- Based on Roemer's criteria, I_{opp} could be defined as:
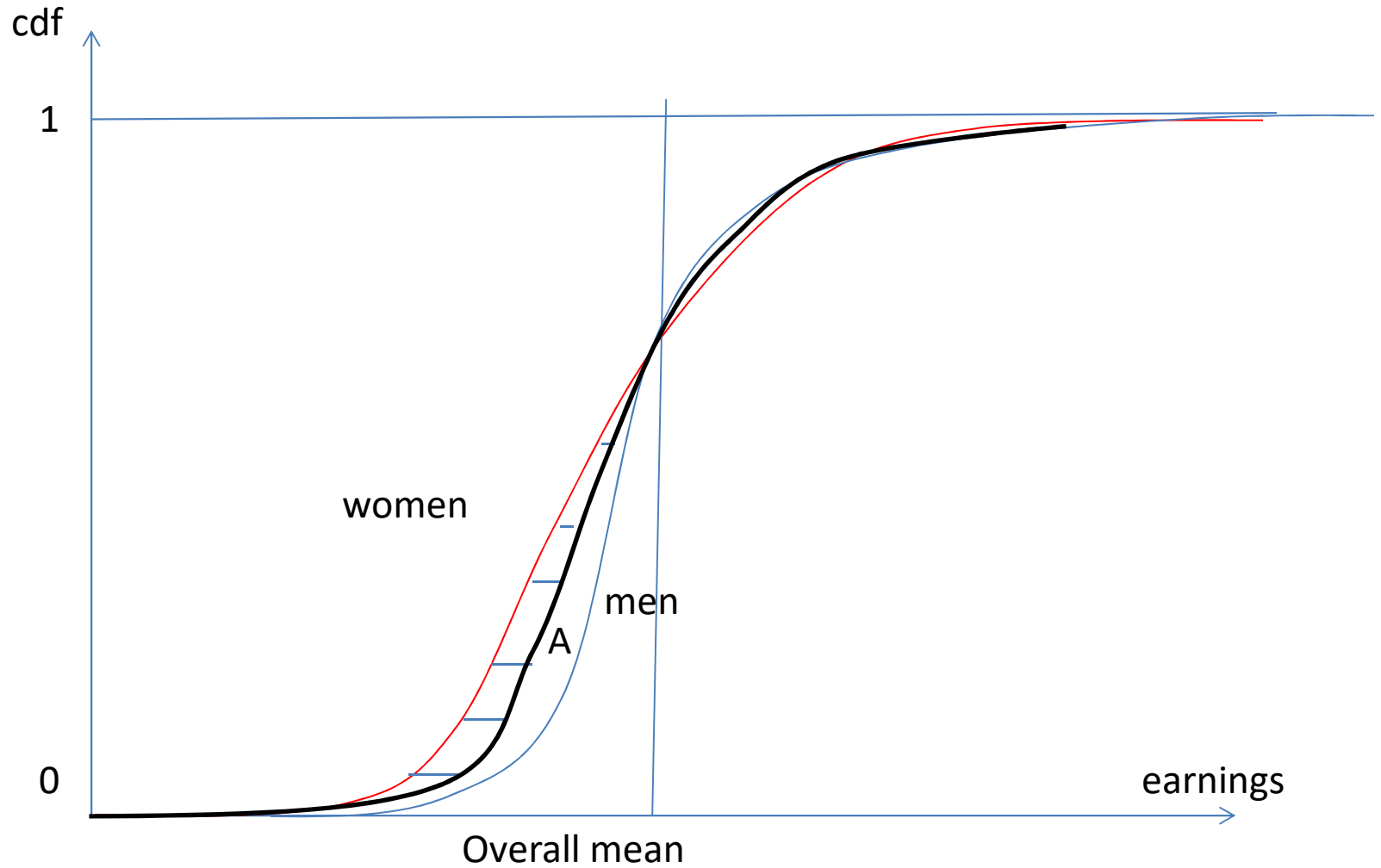
$$\int_{0}^{1} [\overline{q}(f) - Min_t\, q_t(f)]\, df$$

with $q_t(\pi)$ = quantile of order π for type t

Case of non-crossing cdf and two types: I_{opp} = area between upper cdf and mean cdf

cdf

1

0

women

men

Overall mean

earnings

Case of crossing cdf
I_{opp} = area between enveloppe of cdf and mean cdf

cdf

1

women

men

A

0

earnings

Overall mean

Non-parametric measures

iii.   <u>Matrix representation</u>

Mostly used for inter(-intra) generational mobility

- *'Types'* = brackets of parental income/earnings /education

- *Outcome* = brackets of present generation distribution of income/earnings/wealth

- I_{opp} = measures based on the correponding matrix (Huge literature on them + dominance criteria)

Matrix representation of the distribution of opportunities (intergenerational mobility case)

Figure 3. Earnings intergenerational transition matrix (P)

Fathers \ Sons	Y_1	Y_2	Y_3	...	Y_N	Total
Y_1	P_{11}	P_{12}	P_{13}		P_{1N}	$P_{1.}$
Y_2	P_{21}	P_{22}	P_{23}		P_{2N}	$P_{2.}$
Y_3	P_{31}	P_{32}	P_{33}		P_{3N}	$P_{3.}$
...	...	...	...	...	...	...
Y_N	P_{N1}	P_{N2}	P_{N3}		P_{NN}	$P_{N.}$
Total	$P_{.1}$	$P_{.2}$	$P_{.3}$	...	$P_{.N}$	1

b) Parametric measures
i) Theoretical background

- Canonical model

$$y_i = f(C_i, e_i) + u_i \quad (1)$$

with C = 'circumstances', 'e' = efforts and u = unobserved circumstances and efforts

- Inequality of opportunity: _direct unfairness_

$$I^{O,du}(\tilde{e}) = I(\tilde{y}.); \quad \tilde{y}_i = f(C_i, \tilde{e}) + u_i \qquad \text{close to } I^O \text{ above}$$

- Inequality of opportunity : _Fairness gap_

$$I^{O,fg}(\tilde{C}) = I(y.) - I(y_i^{norm}(\tilde{C})); \quad y_i^{norm}(\tilde{C}) = f(\tilde{C}, e_i) + u_i$$

Close to R² of OLS on (1) log-linear

Ambiguous status of 'residual' u

Parametric measures
ii) Intergenerational mobility, IGM

Model

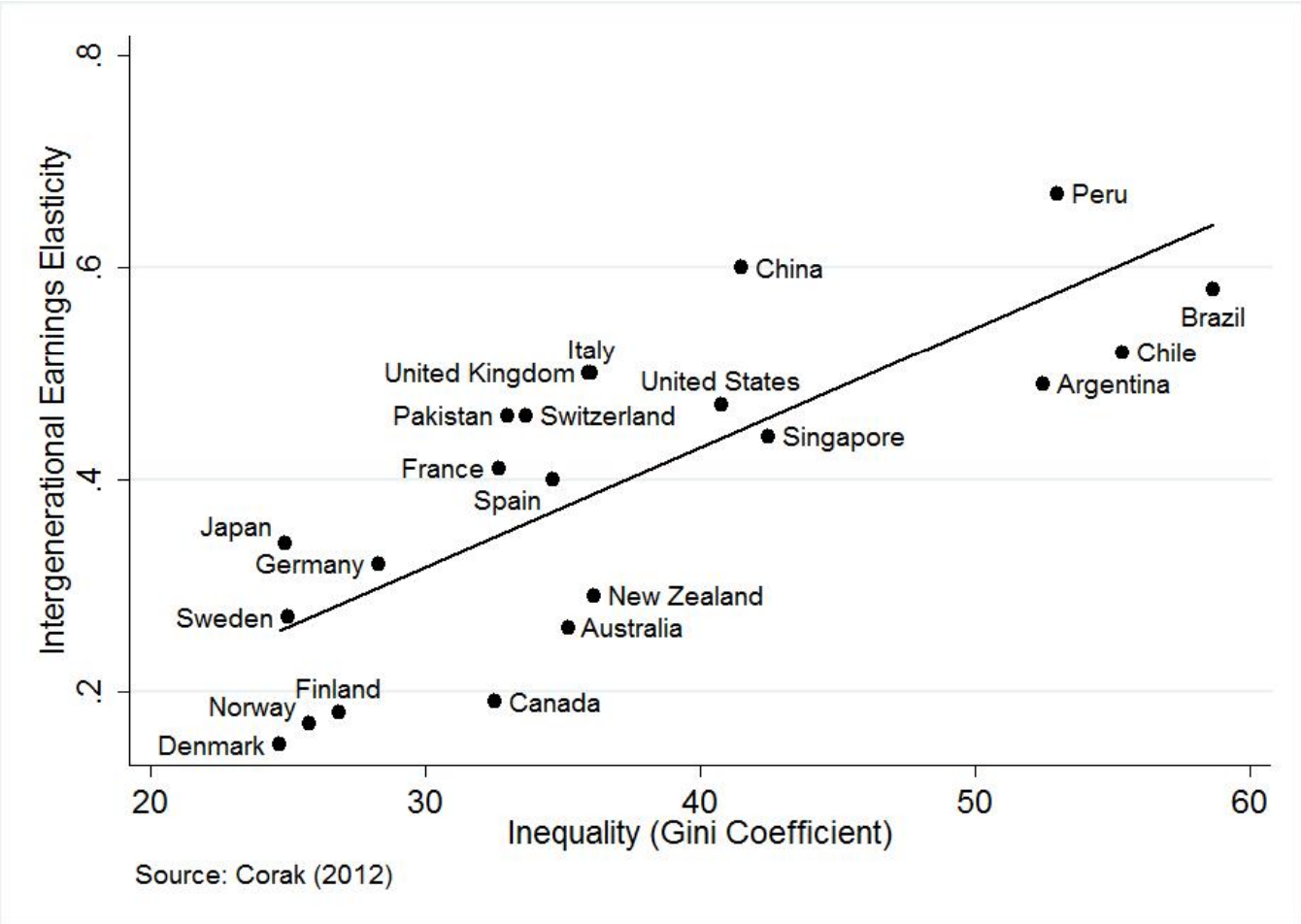$$Ln\ y_i = \Gamma + \chi . Ln\ y_{iF} + u_i \qquad y_{iF} = \text{income of father}$$

IGE = intergenerational elasticity = $\hat{\chi}$

$$I^{o,fg} = R^2 = \hat{\chi} . \frac{\dagger^2_y}{\dagger^2_{y_F}}$$

I_{opp} = IGE if the variance of the (log) earnings does not change across generations

But, why considering the earnings of parents as the only circumstance affecting the earnings of children?

Illustration: the Great Gasby curve

Source: Corak (2012)

Parametric measures
iii) Generalizing the IGM model

$$Ln\ y_i = \mathsf{S}.Z_i + u_i \quad \text{(2)}$$

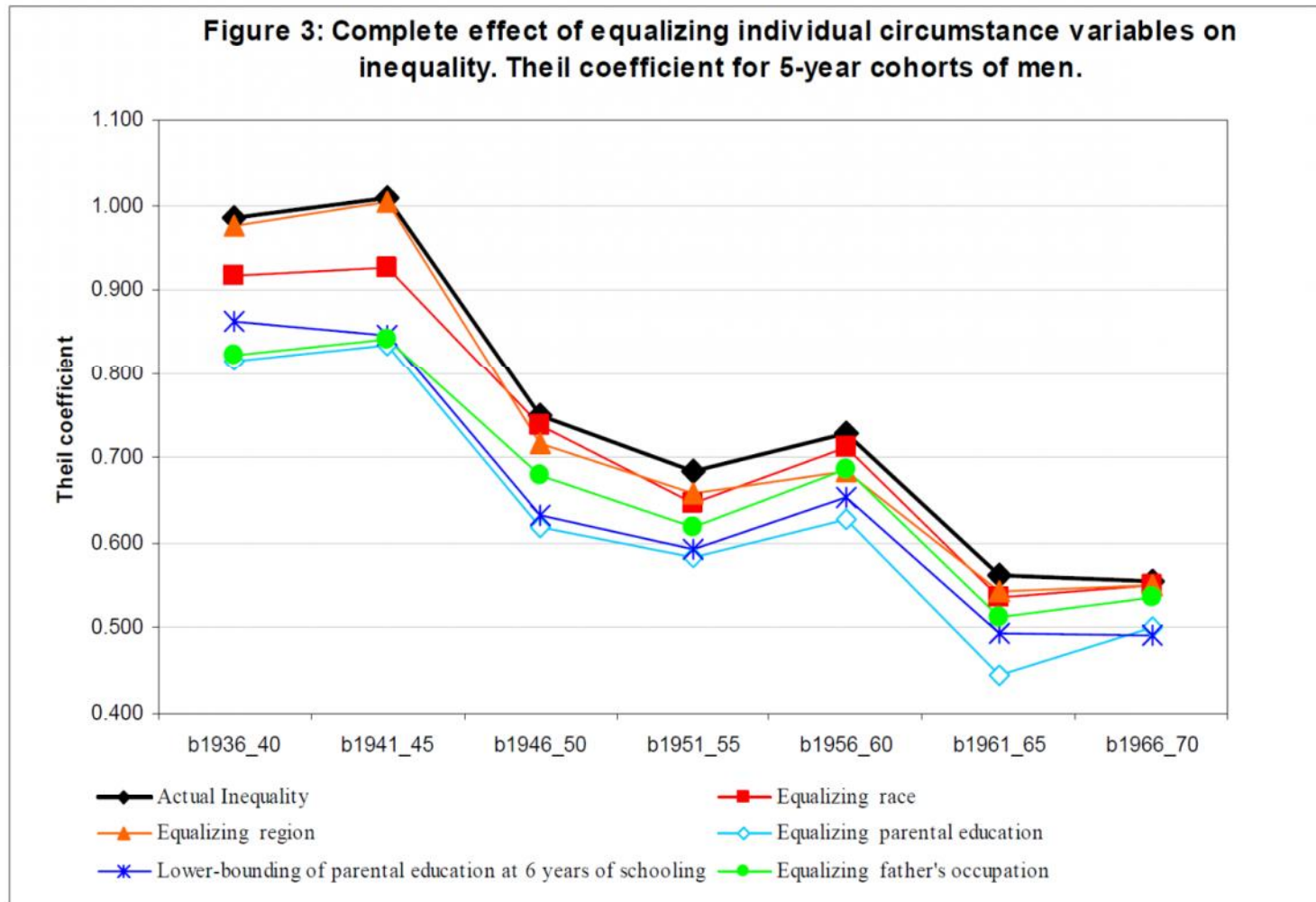where Z = all circumstances to be taken into account:

$$I^{o,fg} = R^2$$

Or:

$$I^{O,fg} = I(y_.) - I(y_i^{norm}(\overline{Z}));\ Log\ y_i^{norm}(\overline{Z}) = \mathsf{S}.\overline{Z} + u_i$$

$$I^{O,du} = I(\tilde{y}_i);\ Log\ \tilde{y}_i = \mathsf{S}.Z_i$$

Note: Model (2) identical to model (1) (IGM) when y_{iF} is instrumented by Z (as in Aronsson and Mazumder, 2008)

Example: See Brunori, Ferreira, Peragine (2013)

Generalized IGM and cohort analysis

Figure 3: Complete effect of equalizing individual circumstance variables on inequality. Theil coefficient for 5-year cohorts of men.

From Bourguignon, Ferreira, Menendez (2007)

Cohort analysis

- Distinguishing cohorts in regression analysis is essential as inequality of opportunities are likely to be age/cohort dependent

- Estimating model (2) at regular time intervalls should allow to monitor I_{opp} over time.

A remark on gender gap

General model (2)

$$Ln\ y_i = r.G_i + s.Z_i + u_i$$

with G = gender dummy (1 = male; 0 = female) and Z = personal characteristics (education, parental background, …)

α = Residual gap (once full gap corrected for gender differences in Z) and differs from 'total wage gap'

Yet, it is the total gap that matters (if focusing on gender)

Note: to what extent should Z include variables like working time or job experience ?

Figure 8. Gender wage gap and residual wage gap in a meta-analysis of the wage gap decomposition literature
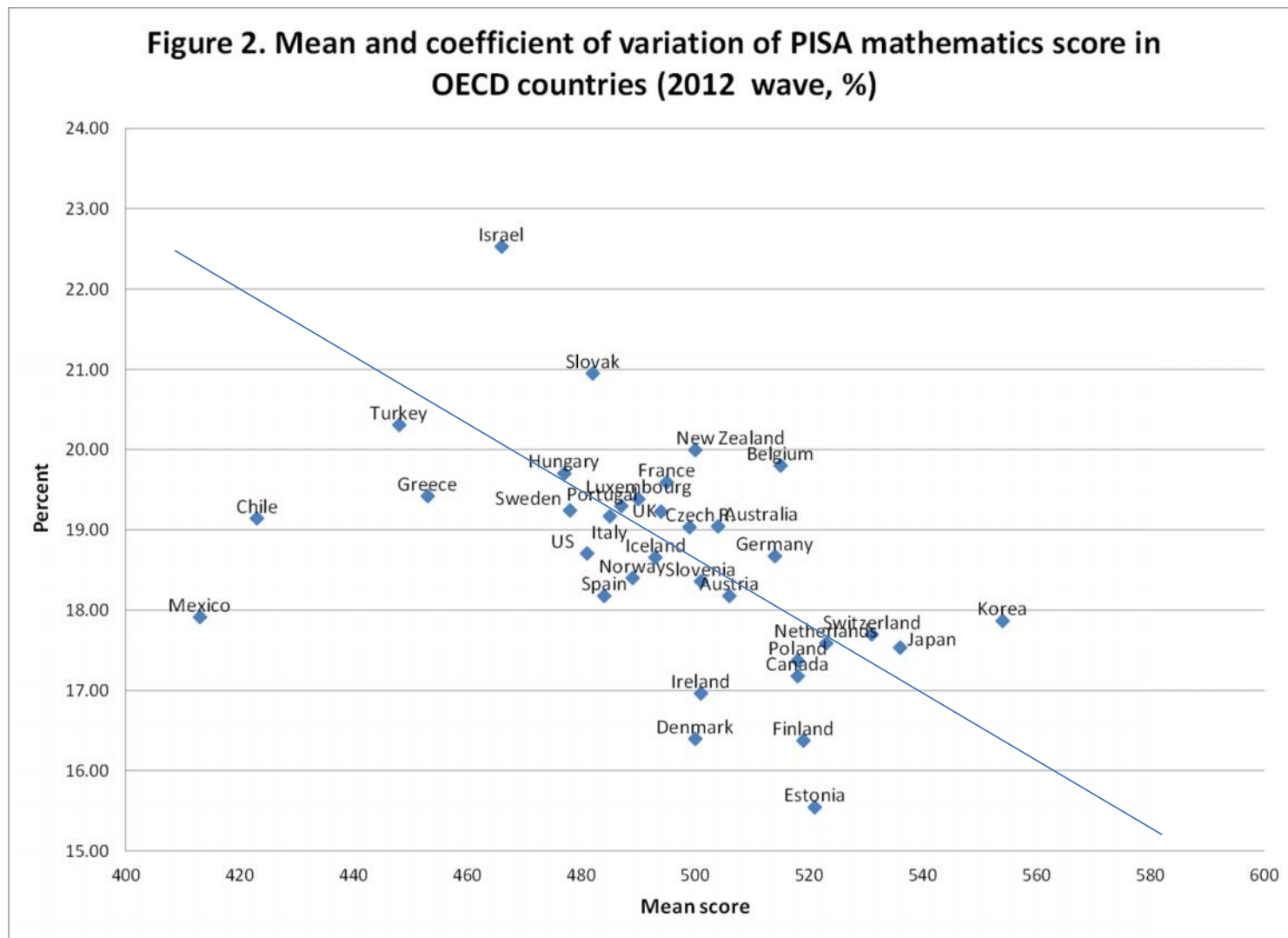Source: Weichselbaumer and Winter-Ebmer (2005)
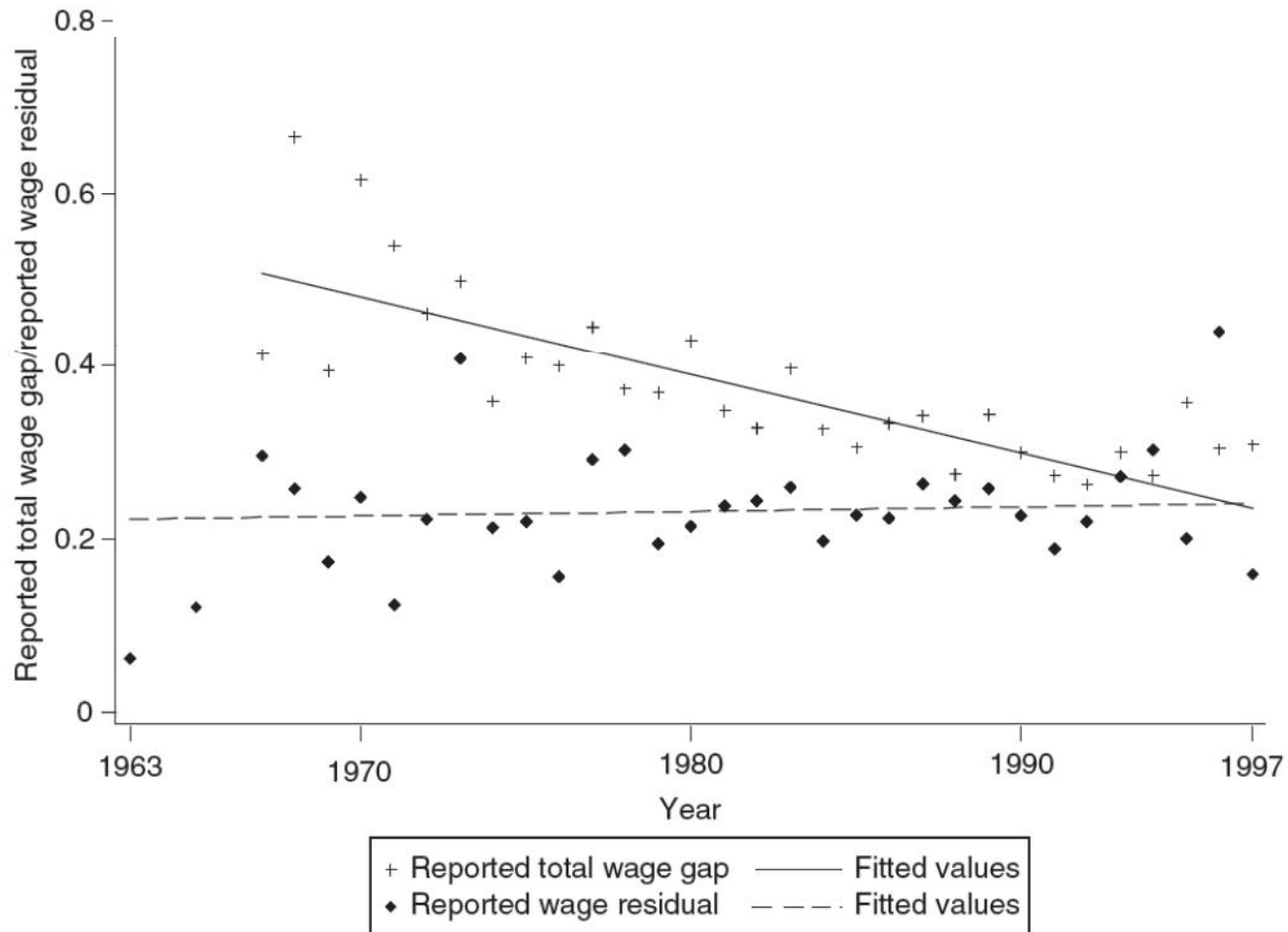
3) Direct measure of the inequality of opportunity

$y = f(C,e) + u$

- Measure directly the inequality of opportunity on C rather than through the effect of C on y

- Case of *educational achievement*: inequality measured by inequality of test scores PISA types

- Question: weight of that component of C in y? (less than 5% in Murnane, 2000)

- Educational as a circumstance or an oucome, explained by other circumstances

Inequality of Pisa scores

Figure 2. Mean and coefficient of variation of PISA mathematics score in OECD countries (2012 wave, %)

4. Conclusions

- Monitoring of the inequality of outcome (income, earning, wealth) *needs to be complemented* by that of opportunity

- Monitoring the inequality of opportunity = *monitoring of SOME observed circumstances* and/or their effect on the inequality of outcomes

- Even though a lower bound of the actual inequality of opportunity – which cannot be evaluated anyhow- monitoring it would respond to strong social demand

- Social mobility (IGM) as only one of components of the I_{opp} although possibly an important one

Priority statistics to monitor the inequality of opportunity

- The inequality of economic outcomes (earnings, income) arising from parental background and its share in total inequality of outcome.

- Variance analysis of scores in PISA and possibly surveys at younger ages

- (Gender (ethnic) inequality in employment and earnings)

THANK YOU