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

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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
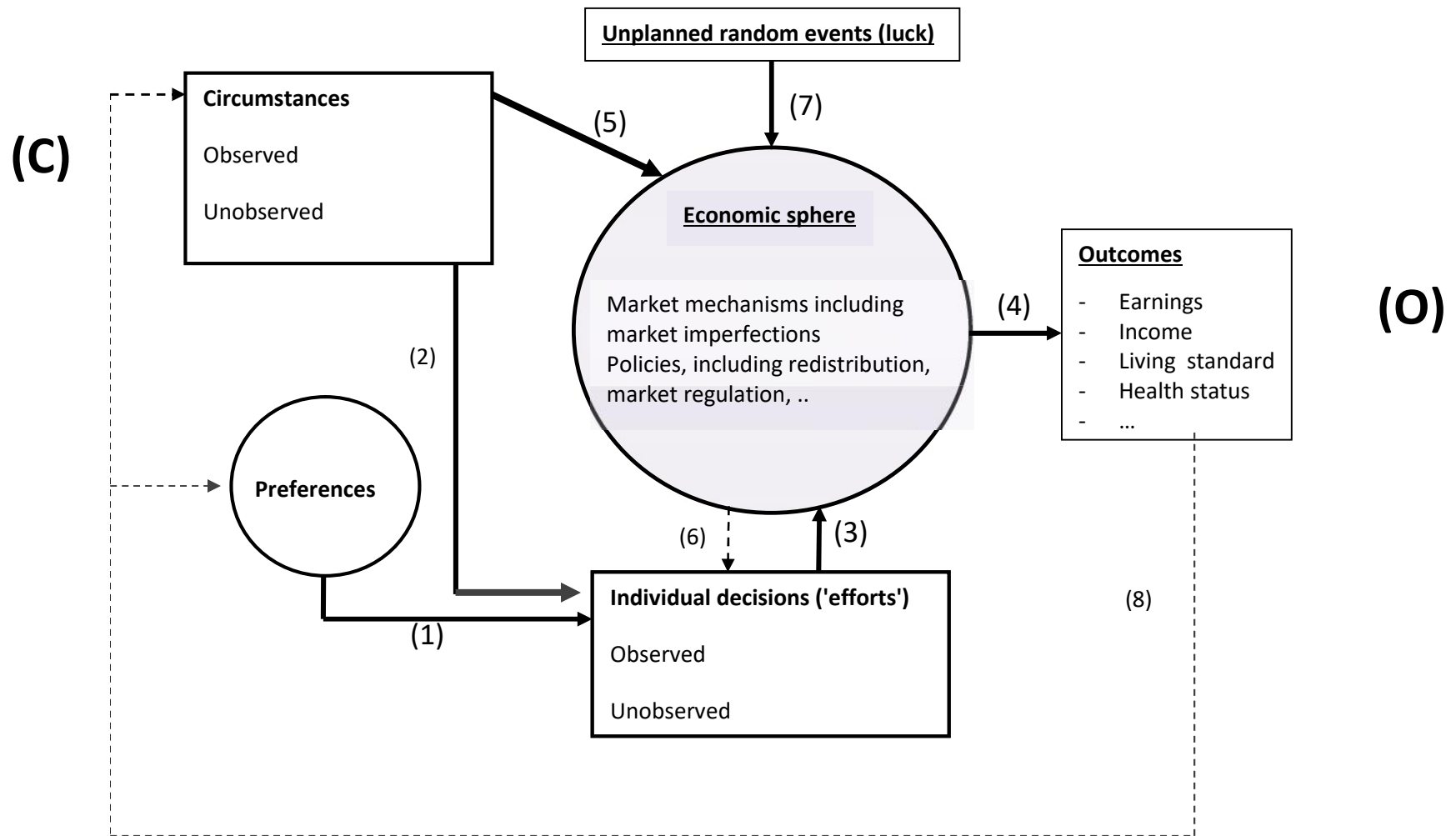
The logics of I_{opp} measurement

- 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:

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

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

- *Relative* inequality of opportunity =

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

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

Examples

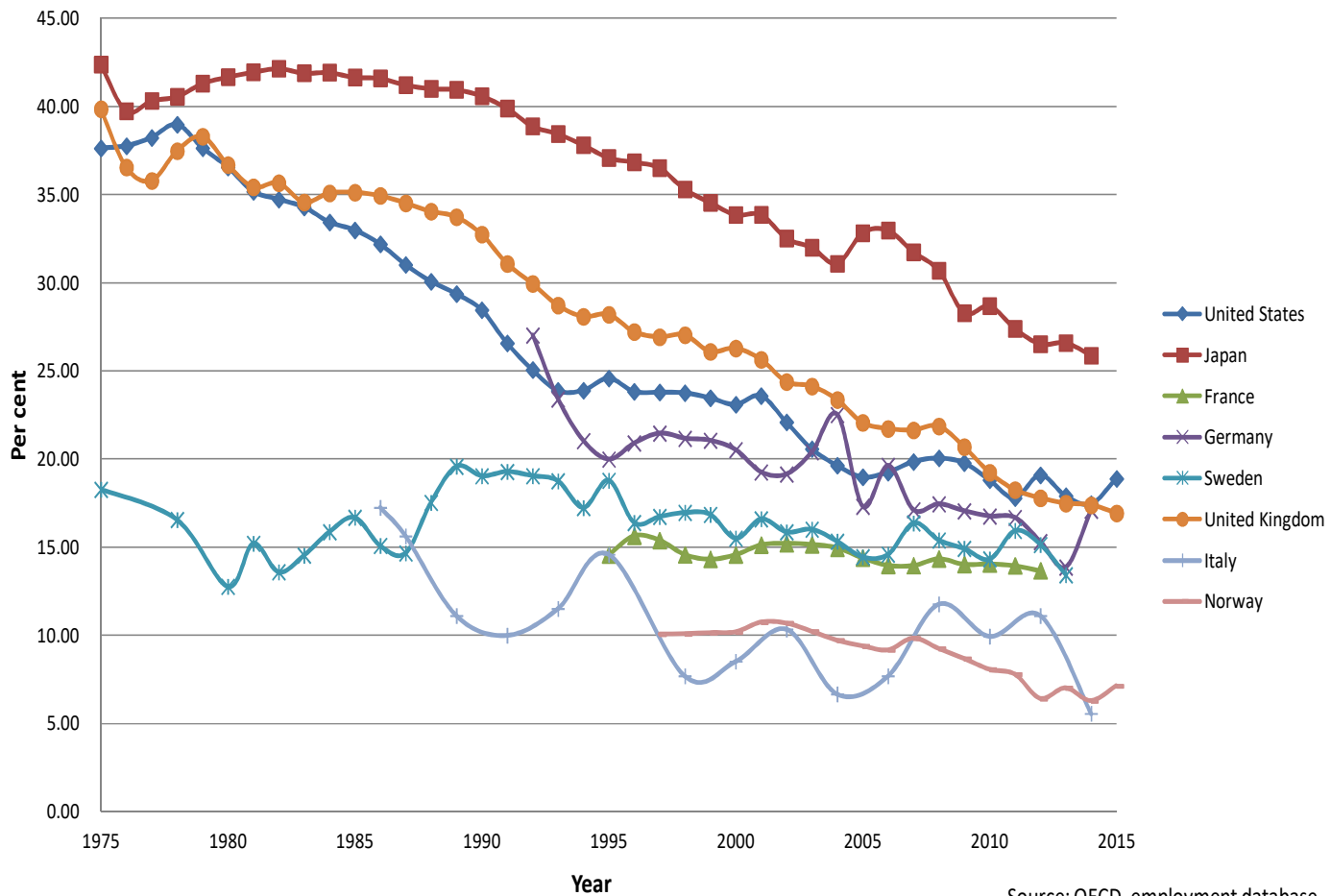- Case of 2 types – i.e. gender

- 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)

Legend:
- 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)
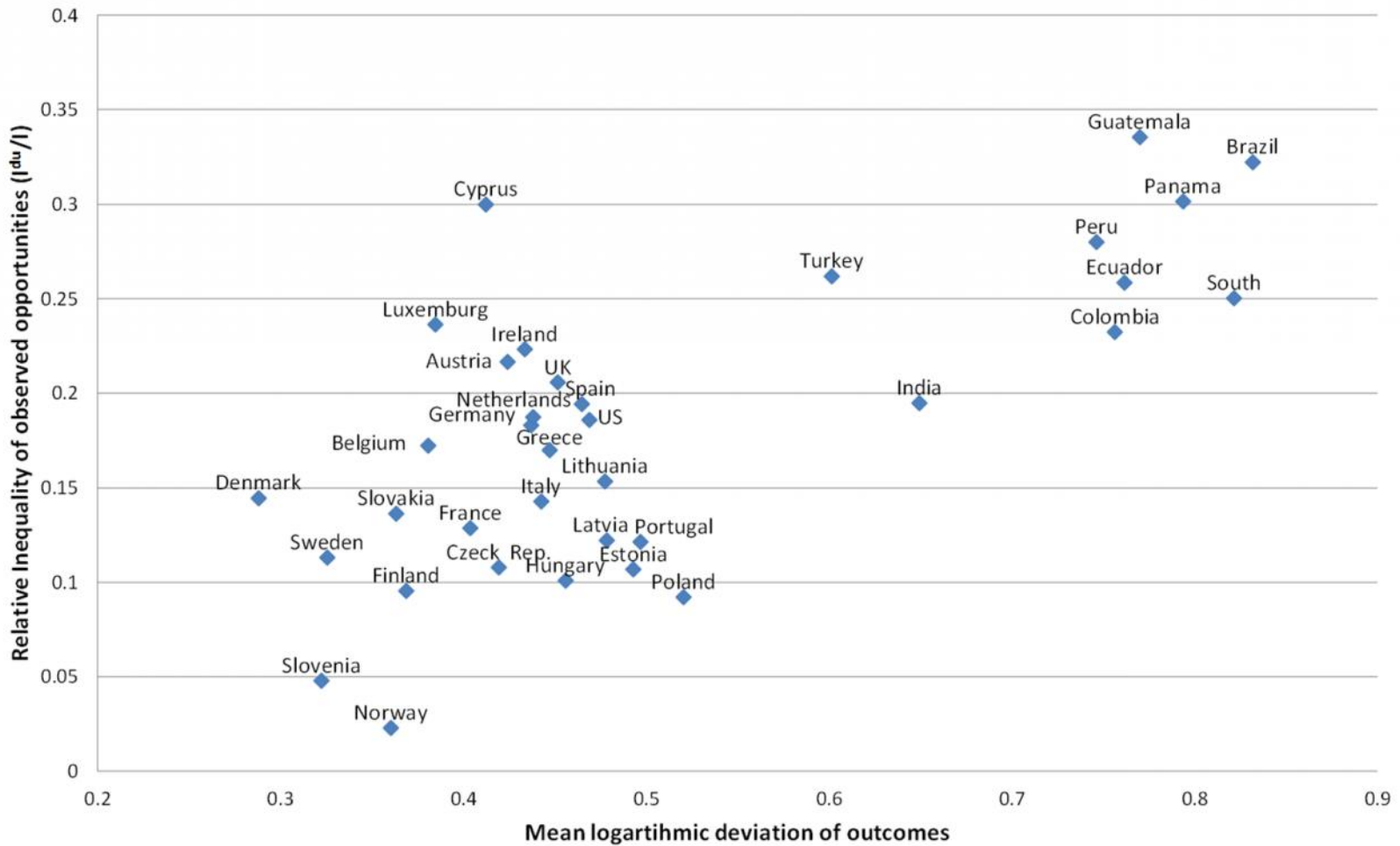
Non-parametric measures

ii. Measure based on the outcome *distribution* by 'types' (Roemer)

- 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:
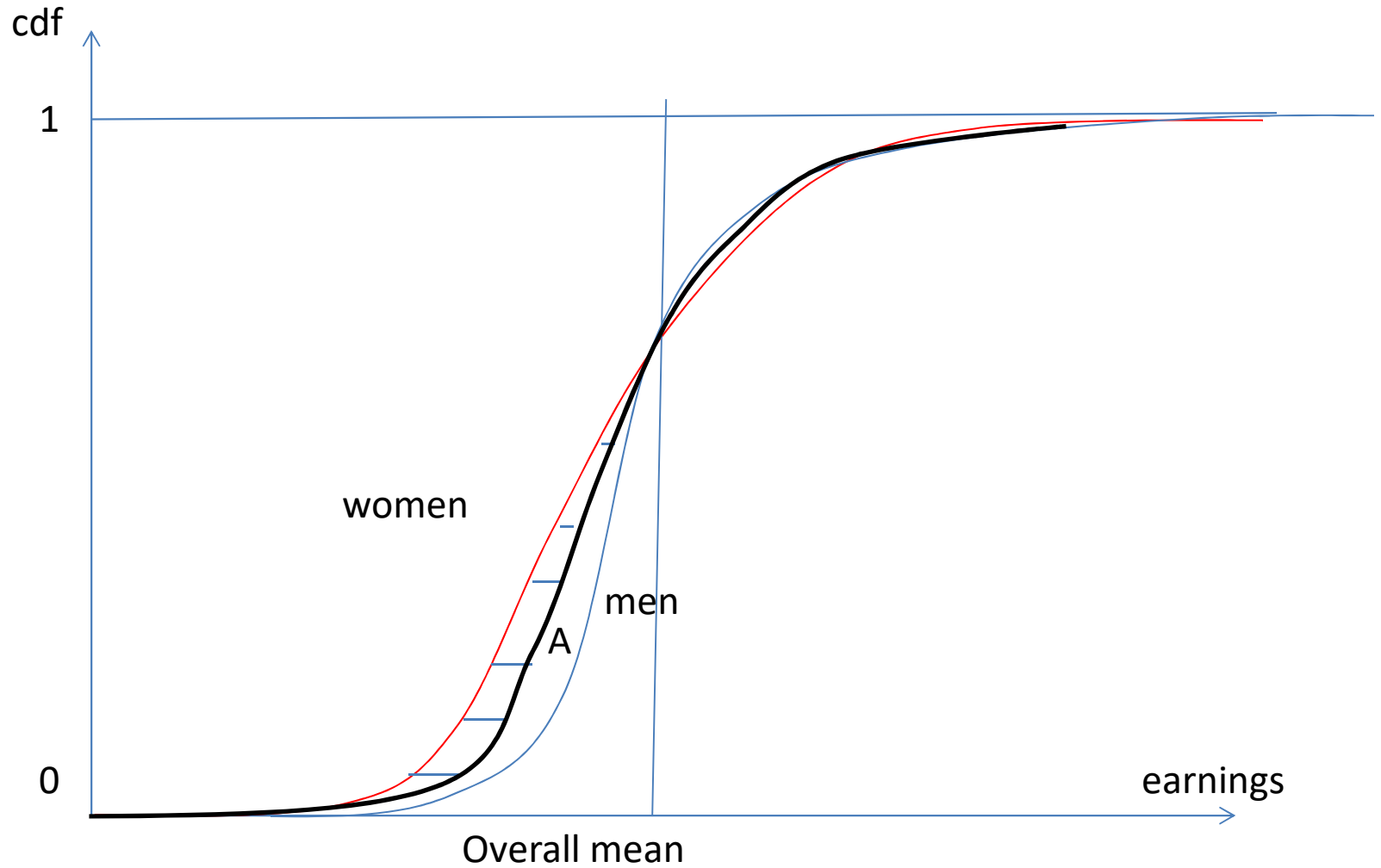
$$\int_{0}^{1} [\overline{q}(f) - Min_t \, q_t(f)] df$$

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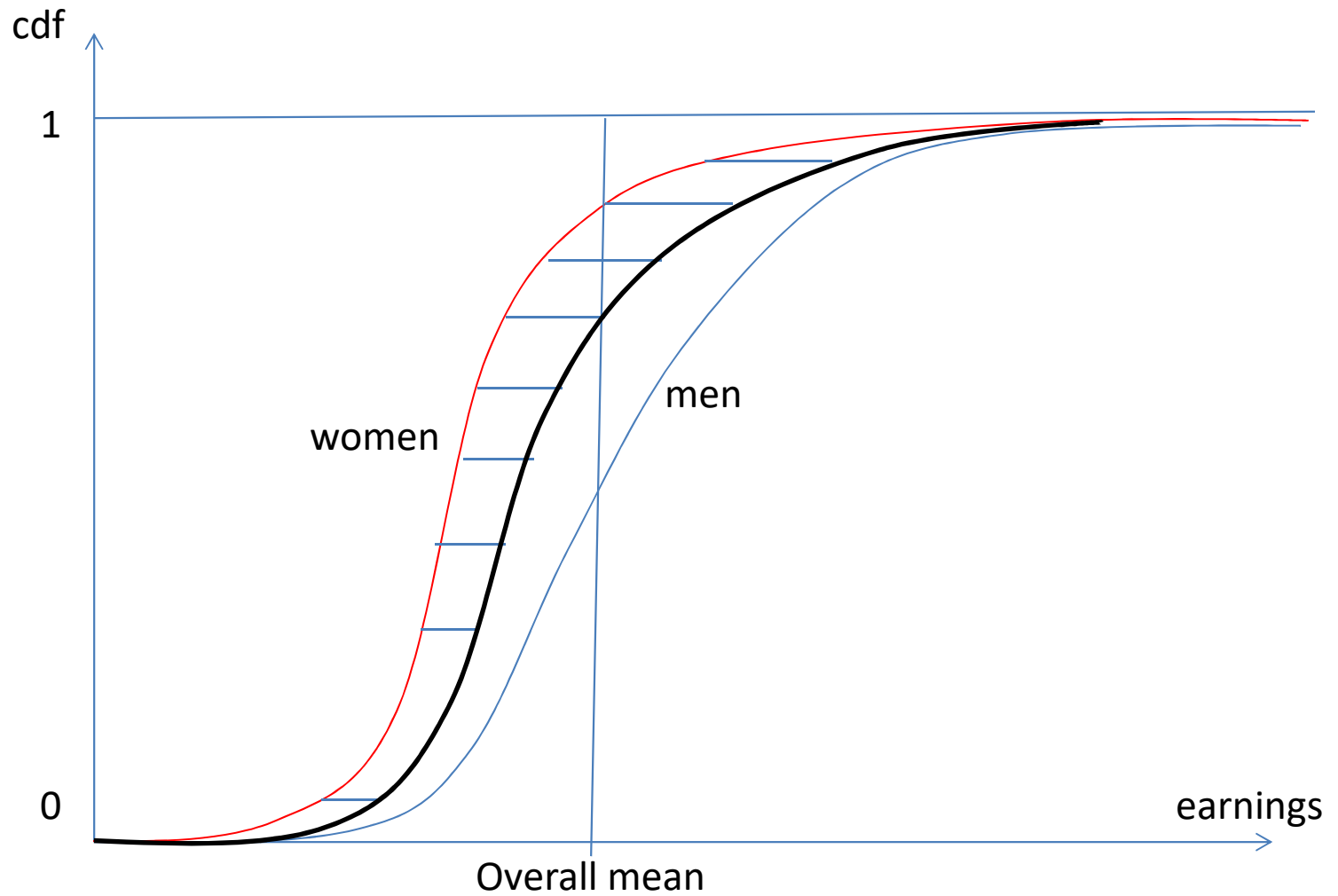
Case of crossing cdf
I_{opp} = area between enveloppe of cdf and mean cdf

cdf

1

0

women

men

A

earnings

Overall mean

Non-parametric measures

iii. Matrix representation

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

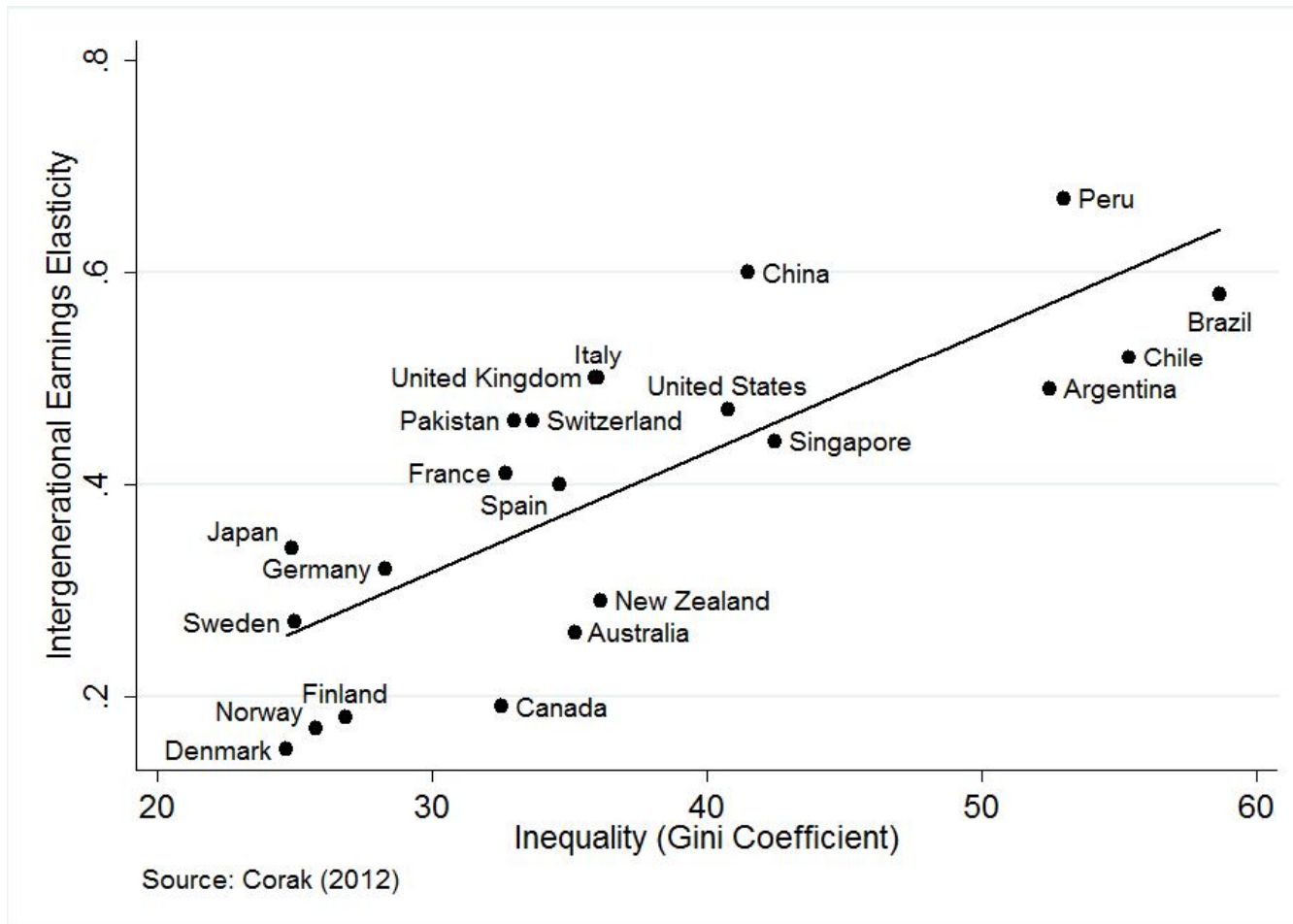$$Ln\ y_i = \Gamma + \chi . Ln\ y_{iF} + u_i \qquad y_{iF} = \text{income of father}$$

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

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

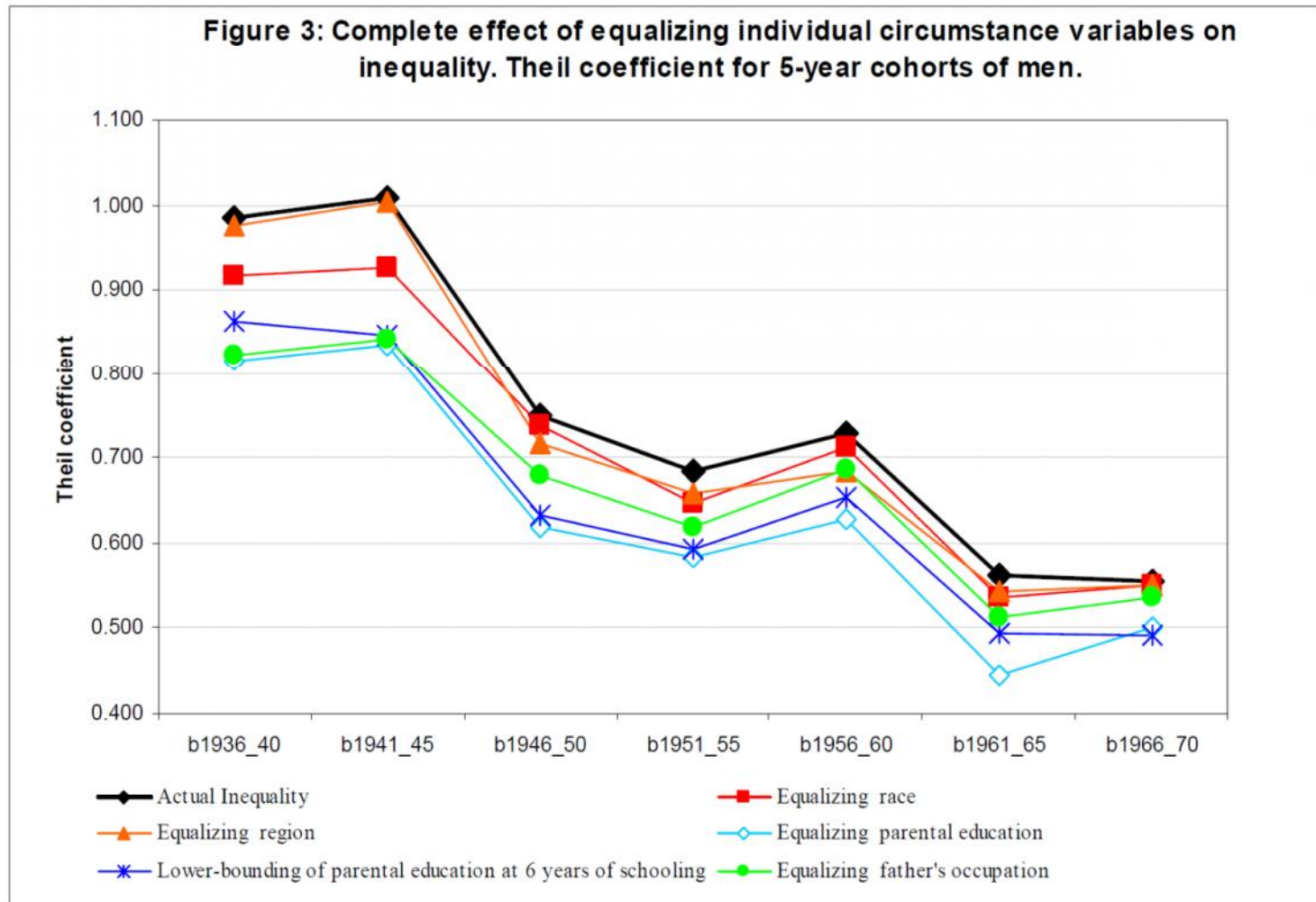where Z = all circumstances to be taken into account:

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

Or:

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

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

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)

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

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
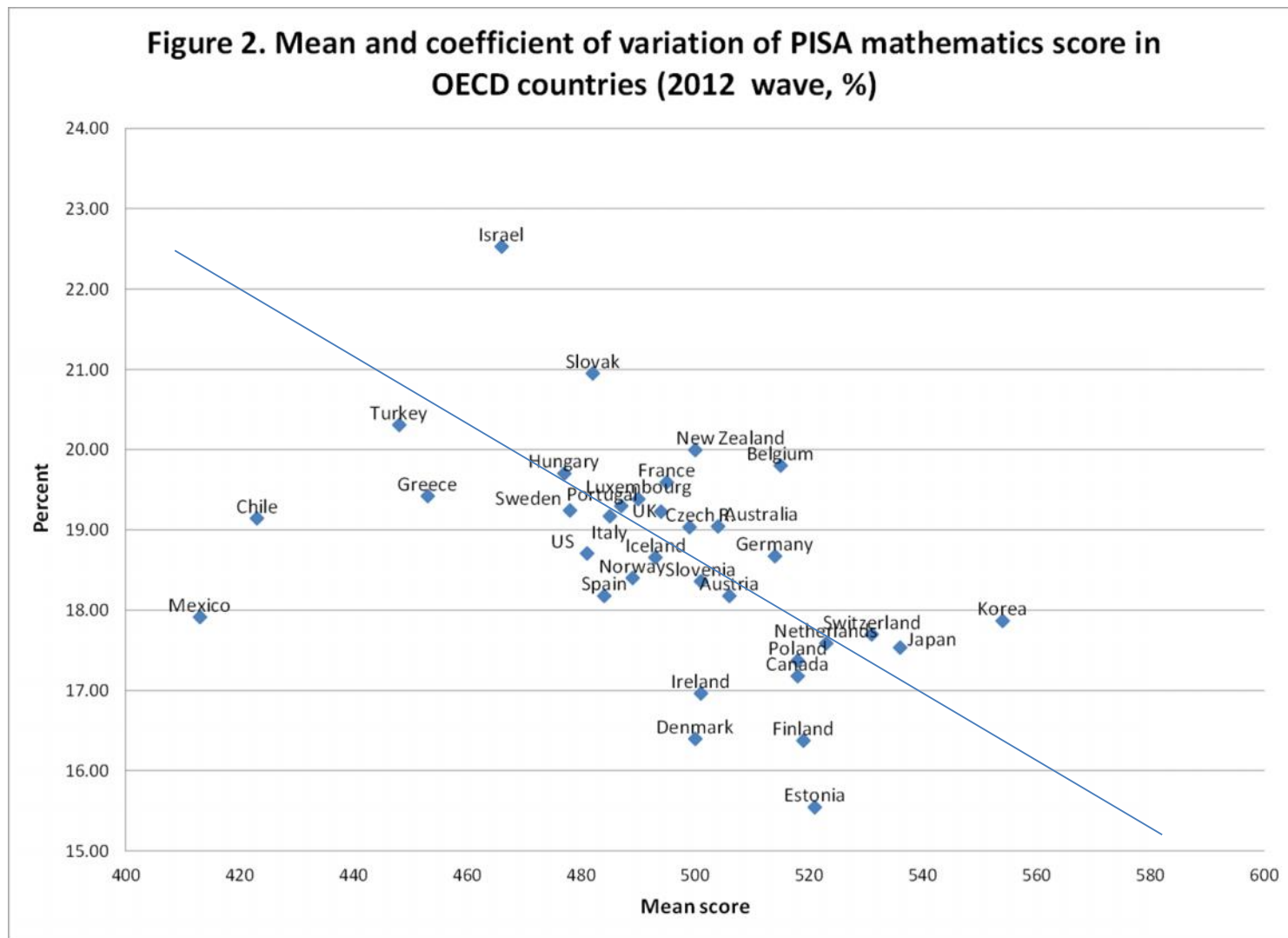Source: Weichselbaumer and Winter-Ebmer (2005)

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