Equality of opportunity: Theory and Evidence

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This presentation is based on our chapter (of the same title) forthcoming in Adler and Fleurbaey (eds.), *Oxford Handbook of Well-Being and Public Policy (also available as World Bank PRWP 7217)*

Outline

1. Motivation and the philosophical background
2. Economic models of equality of opportunity
3. Measuring inequality of opportunity
4. Empirical applications
5. Extensions
6. Conclusions

1. Motivation

"We know that equality of individual ability has never existed and never will, but we do insist that equality of opportunity still must be sought"

(Franklin D. Roosevelt, second inaugural address, 20 January 1937)

"The rise in inequality in the United States over the last three decades has reached the point that inequality in incomes is causing an unhealthy division in opportunities, and is a threat to our economic growth"

(Alan Krueger, Center for American Progress, 12 January 2012)

If these concepts matter for policy, can they be rigorously defined and measured?

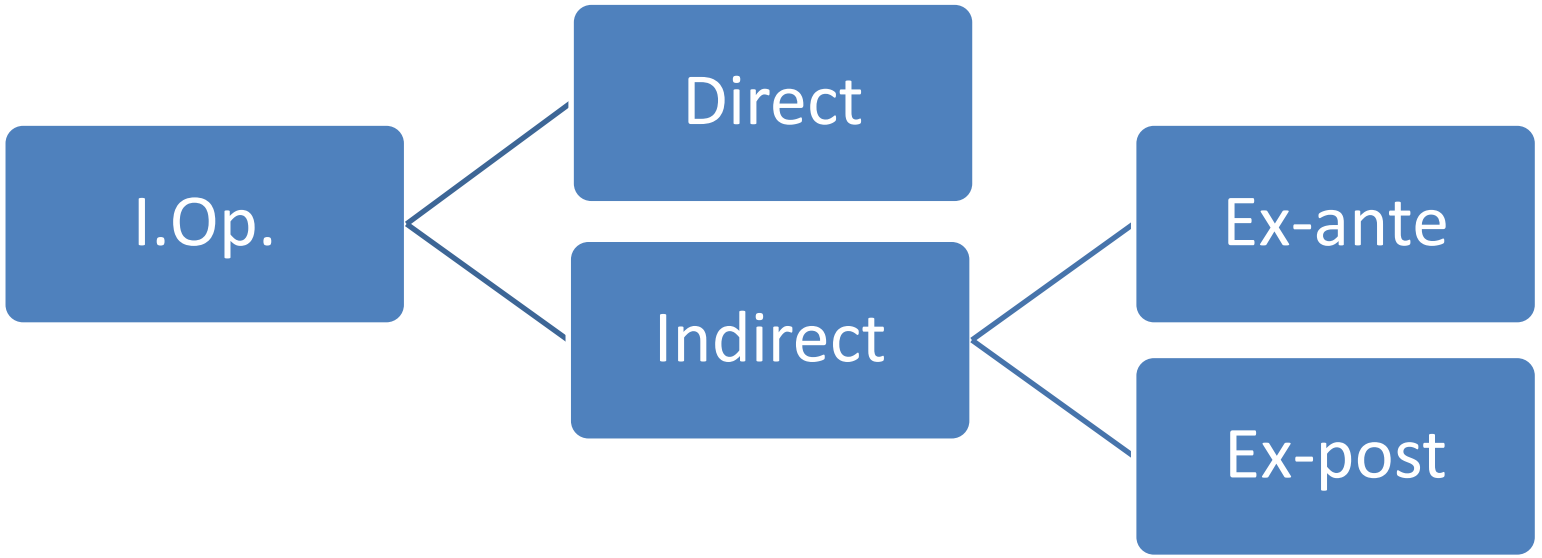
1. Philosophical background

Enriching the information basis for the assessment of social justice

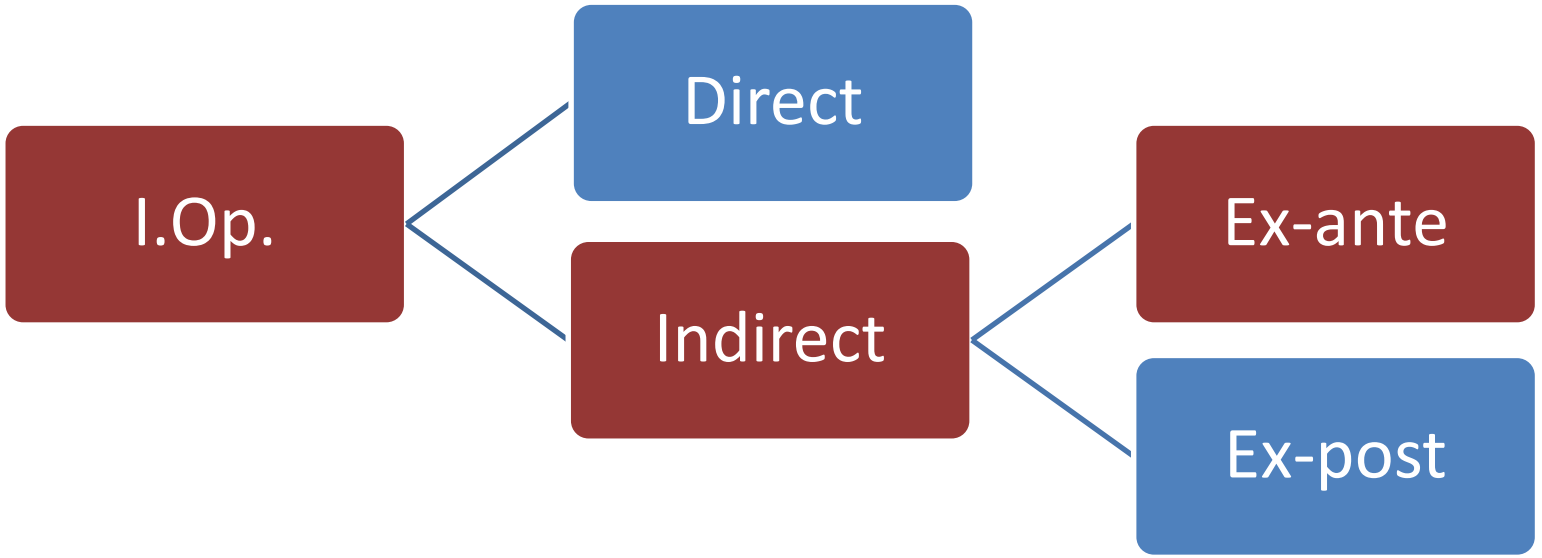
- John Rawls (1971): *A Theory of Justice* (Harvard University Press)
- Amartya Sen (1980): "Equality of what?" in McMurrin (ed.), *The Tanner Lectures on Human Values*
- Ronald Dworkin (1981): "What is Equality? Part 1: Equality of Welfare; Part 2: Equality of Resources", *Philos. Public Affairs*, **10**, pp.185-246; 283-345.
- Richard Arneson (1989): "Equality of Opportunity for Welfare", *Philosophical Studies*, **56**, pp.77-93.
- Gerald Cohen (1989): "On the Currency of Egalitarian Justice", *Ethics*, **99**, pp.906-944.

This approach "… performs for egalitarianism the considerable service of incorporating within it the most powerful idea in the arsenal of the anti-egalitarian right: the idea of choice and responsibility" (Cohen, 1989, p.993)

2. Economic models



2. Economic models



2. Economic models

- Indirect approaches
  - Consequentialist and more structural in nature: inferences about equality or inequality of opportunity are made on the basis of (observed) joint distributions of circumstances and outcomes
  - Build primarily on the Arneson / Cohen "control view" of equality of opportunity.

- Two central principles:
  - Principle of compensation: outcome differences due to factors beyond an individual's responsibility ("circumstances") are unfair, and should be compensated
  - Principle of reward: outcome differences due to the individual responsibility ("efforts") are ethically legitimate, and should be preserved

2. Economic models

- Let each and every individual be fully characterized by the triple *(x, C, e),* and

$$C \in \Omega$$

$$e \in \Theta$$

$$x = g(C, e)$$

$$\boldsymbol{g}: \boldsymbol{\Omega} \times \boldsymbol{\Theta} \Rightarrow \mathbb{R}$$

2. Economic models

- Let all elements of the vector ***C***, as well as *e*, be discrete.
- Let $x_{ij} = g(Ci, ej)$
- Let a *type* consist of all individuals with identical circumstances
- Let a *tranch* consist of all individuals with identical effort levels
- Let there be *n* types and *m* tranches
- Then the population can be represented by the *n x m* matrix $[X_{ij}]$ below.
- To $[X_{ij}]$, let there be associated another *n x m* matrix $[P_{ij}]$, whose elements p_{ij} denote the proportion of the total population with circumstances C_i and effort level e_j.

2. Economic models

Table 1

	e_1	e_2	e_3	…	e_m
C_1	x_{11}	x_{12}	x_{13}	…	x_{1m}
C_2	x_{21}	x_{22}	x_{23}	…	x_{2m}
C_3	x_{31}	x_{32}	x_{33}	…	x_{3m}
…	…	…	…	…	…
C_n	x_{n1}	x_{n2}	x_{n3}	…	x_{nm}

2. Economic models

A tranch

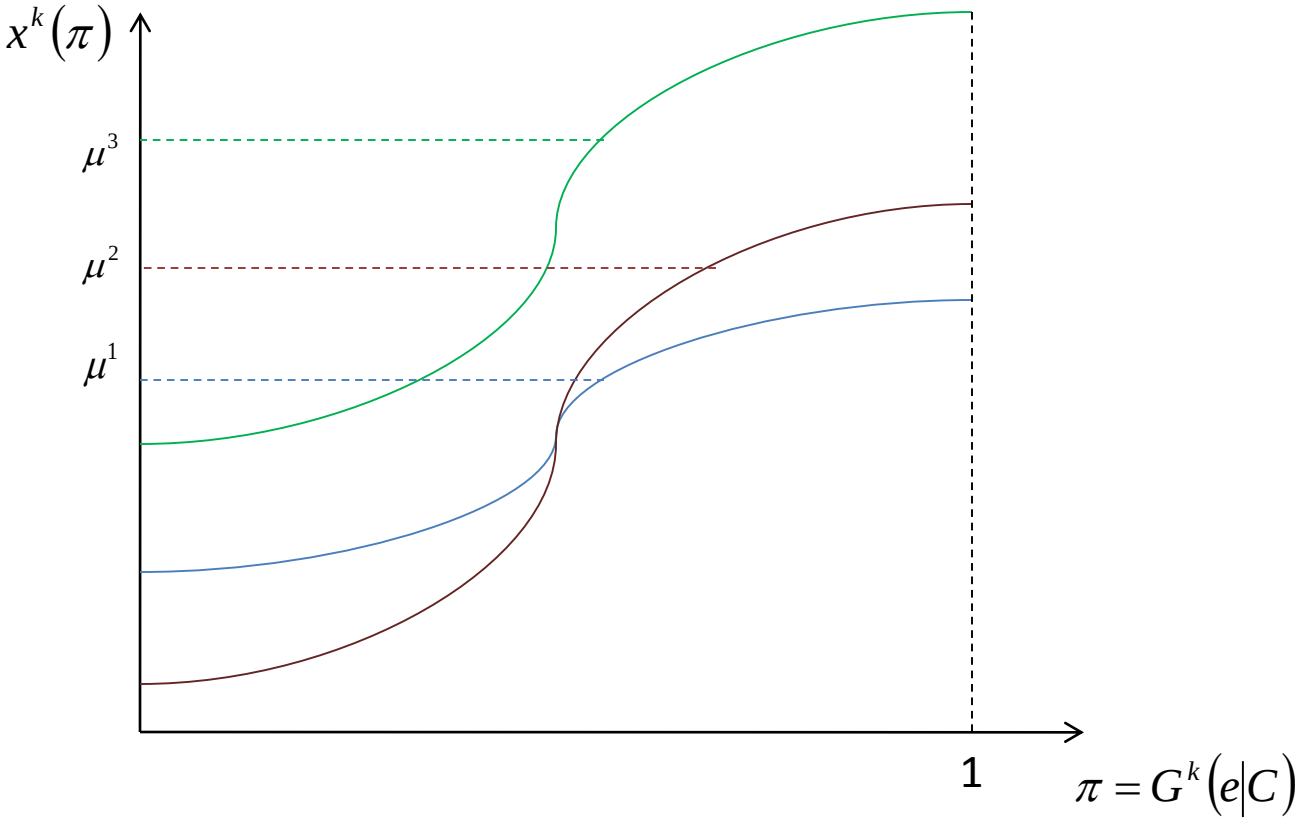
Table 1

A type

	e_1	e_2	e_3	…	e_m
C_1	x_{11}	x_{12}	x_{13}	…	x_{1m}
C_2	x_{21}	x_{22}	x_{23}	…	x_{2m}
C_3	x_{31}	x_{32}	x_{33}	…	x_{3m}
…	…	…	…	…	…
C_n	x_{n1}	x_{n2}	x_{n3}	…	x_{nm}

2. Economic models

When effort is continuous



2. Economic models

- Two central principles:
  - Principle of compensation: outcome differences due to factors beyond an individual's responsibility (circumstances) are unfair, and should be compensated
    - Ex-ante (van de Gaer, 1993): Eliminate inequality across types before effort is realized, by equating values of opportunity sets (defined in terms of the distribution of x conditional on C).
    - Ex-post (Roemer, 1993): Eliminate inequality across types after effort is realized, by eliminating inequality among people exerting the same degree of effort. (i.e. eliminate inequality within tranches).
  - Principle of reward: outcome differences due to the individual choices or responsibility ("efforts") are ethically legitimate, and should be preserved
    - Liberal reward
    - Utilitarian reward

2. Economic models

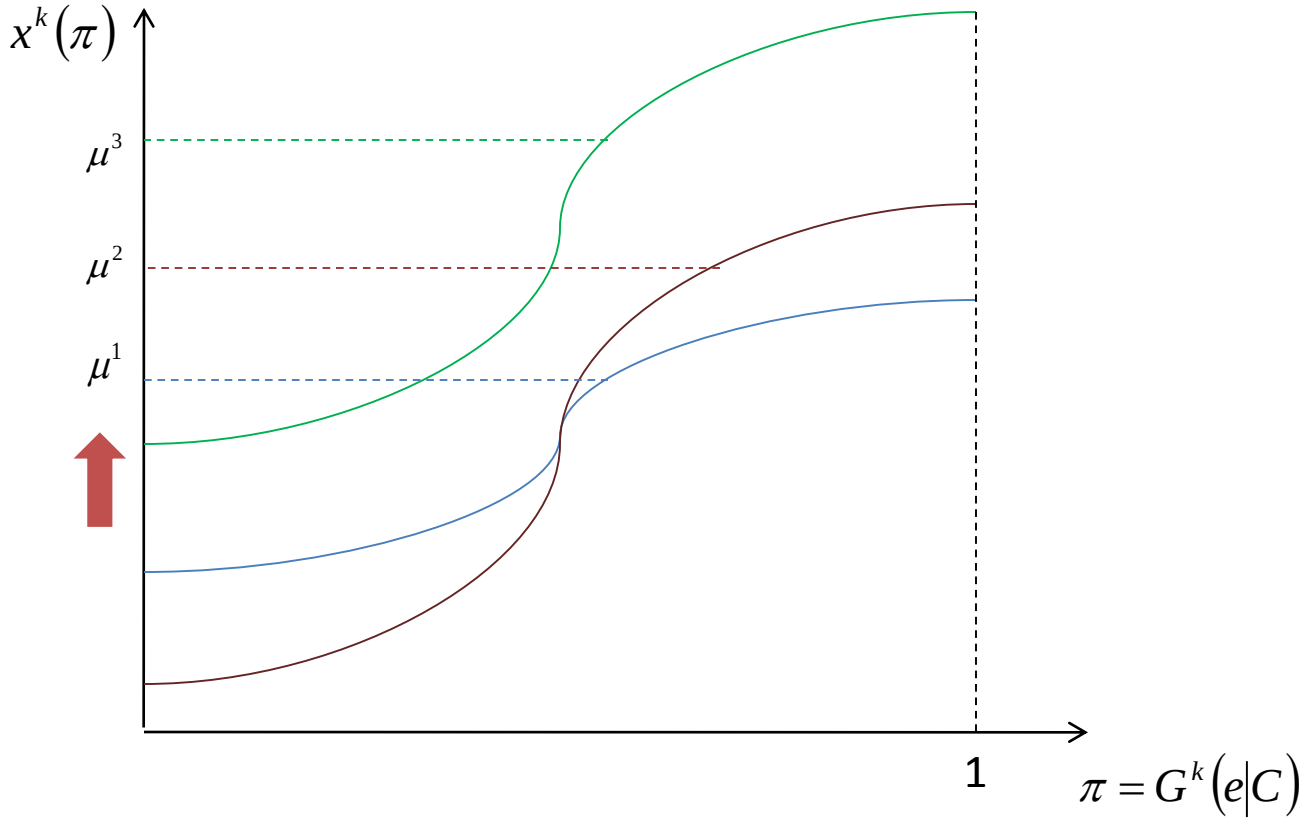
- Variations of this framework have been used to propose:
  i. Social orderings and allocation rules
  ii. Measures of inequality of opportunity

- Key results (Fleurbaey and Peragine, 2013):

  1. In general, the ex-ante and ex-post compensation principles are inconsistent
  2. In general, the ex-post compensation principle is inconsistent with reward principles
  3. The ex-ante compensation principle and the reward principles are consistent.

2. Economic models

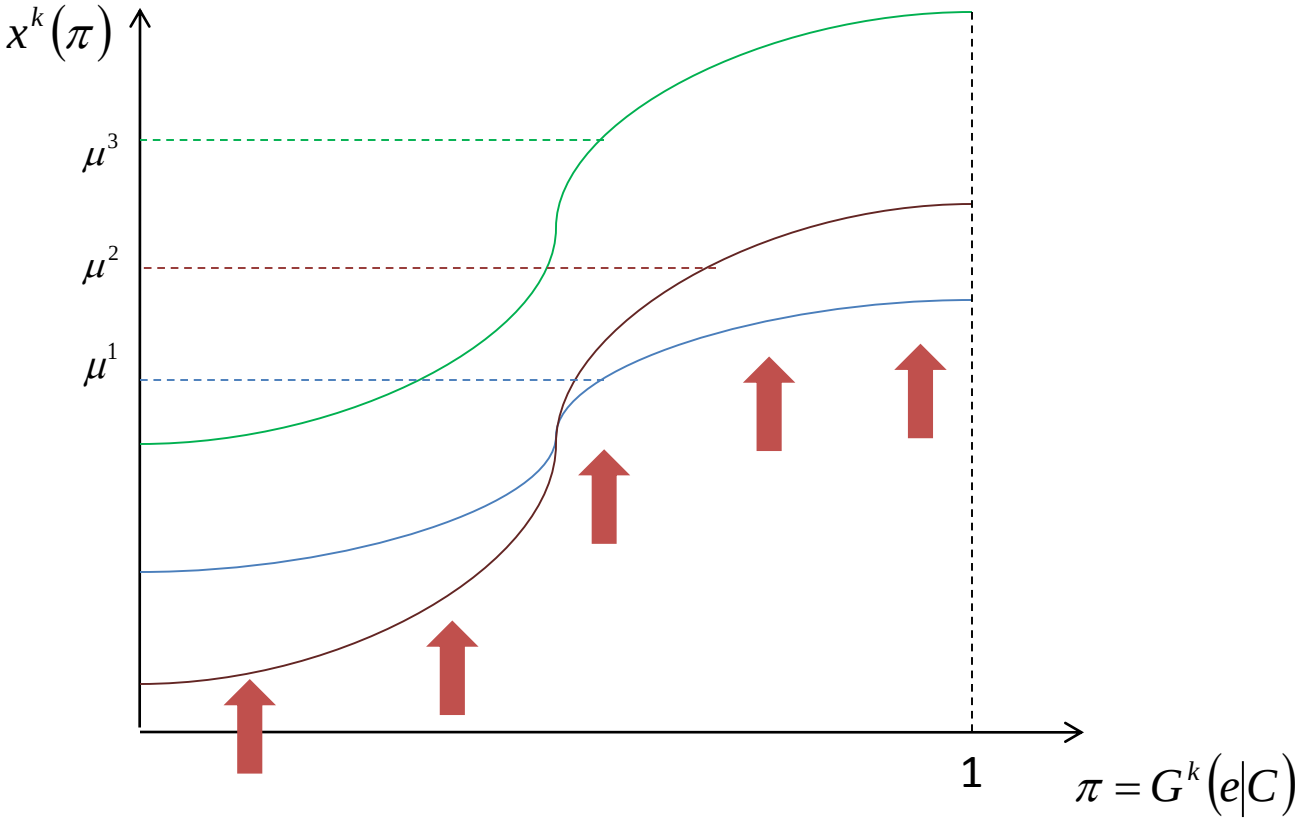
Allocation rules: (i) van de Gaer's "min of means" (satisfies ex-ante compensation and reward)



$$\min_i(\mu_1, \ldots, \mu_n)$$

2. Economic models

Allocation rules: (ii) Roemer's "mean of mins" (satisfies ex-post compensation)



$$\left(\frac{1}{m}\sum_{j=1}^{m} \min_i (x_{1j}, \ldots, x_{nj})\right)$$

3. Measuring inequality of opportunity

In essence, the measurement of inequality of opportunity can be thought of as a two-step procedure: first, the actual distribution $[X_{ij}]$ is transformed into a counterfactual distribution $[\widetilde{\boldsymbol{X}}_{ij}]$ that reflects *only and fully* the unfair inequality in $[X_{ij}]$, while all the fair inequality is removed. In the second step, a measure of inequality is applied to $[\widetilde{\boldsymbol{X}}_{ij}]$.

3. Measuring inequality of opportunity

Between types ***(*** $\tilde{X}_{BT}$ ***)****: For all* $j \in \{1,...,m\}$ *and for all* $i \in \{1,...,n\}$, $\tilde{x}_{ij} = \mu_i$.

Table 2: Between-types inequality *(n=m=3)*

	e1	e2	e3
C1	μ_1	μ_1	μ_1
C2	μ_2	μ_2	μ_2
C3	μ_3	μ_3	μ_3

Draws on the min of means approach. Satisfies ex-ante compensation and reward.

3. Measuring inequality of opportunity

Within tranches ***($\tilde{X}_{WTR}$)***: *For all* $j \in \{1,\ldots,m\}$ *and for all* $i \in \{1,\ldots,n\}$, $\tilde{x}_{i,j} = g(c_i, e_j)/\nu_j$.

Table 4: Within tranches inequality *(n=m=3)*

	e1	e2	e3
C1	$x_{11}/\ \nu_1$	$x_{12}/\ \nu_2$	$x_{13}/\ \nu_3$
C2	$x_{21}/\ \nu_1$	$x_{22}/\ \nu_2$	$x_{23}/\ \nu_3$
C3	$x_{31}/\ \nu_1$	$x_{32}/\ \nu_2$	$x_{33}/\ \nu_3$

Draws on the mean of mins approach. Satisfies ex-post compensation everywhere, but not the reward principle.

3. Measuring inequality of opportunity

Direct unfairness ***($\tilde{X}_{DU}$)****: take* $\tilde{e}$ *as the reference effort. Then* $\tilde{x}_{ij} = g(c_i, \tilde{e})$, $\forall i \in \{1, ..., n\}$ *and* $\forall j \in \{1, ..., m\}$.

Table 3: Direct unfairness (with $\tilde{e}$=1 and n=m=3)

	e1	e2	e3
C1	x_{11}	x_{11}	x_{11}
C2	x_{21}	x_{21}	x_{21}
C3	x_{31}	x_{31}	x_{31}

Draws on the conditional equality compromise. Satisfies ex-ante compensation and reward; and ex-post compensation only for Tranch 1.

3. Measuring inequality of opportunity

Fairness gap ($\tilde{X}_{FG}$)*: take* $\tilde{c}$ *as the reference circumstance. Then let* $\tilde{x}_{i,j} = g(c_i, e_j) / g(\tilde{c}, e_j)$, $\forall i \in \{1,...,n\}$ *and* $\forall j \in \{1,...,m\}$.

Table 5: Fairness gap (with $\tilde{c}$=1 and n=m=3)

	e1	e2	e3
C1	1	1	1
C2	x_{21}/ x_{11}	x_{22}/ x_{12}	x_{23}/x_{13}
C3	x_{31}/ x_{11}	x_{32}/ x_{12}	x_{33}/x_{13}

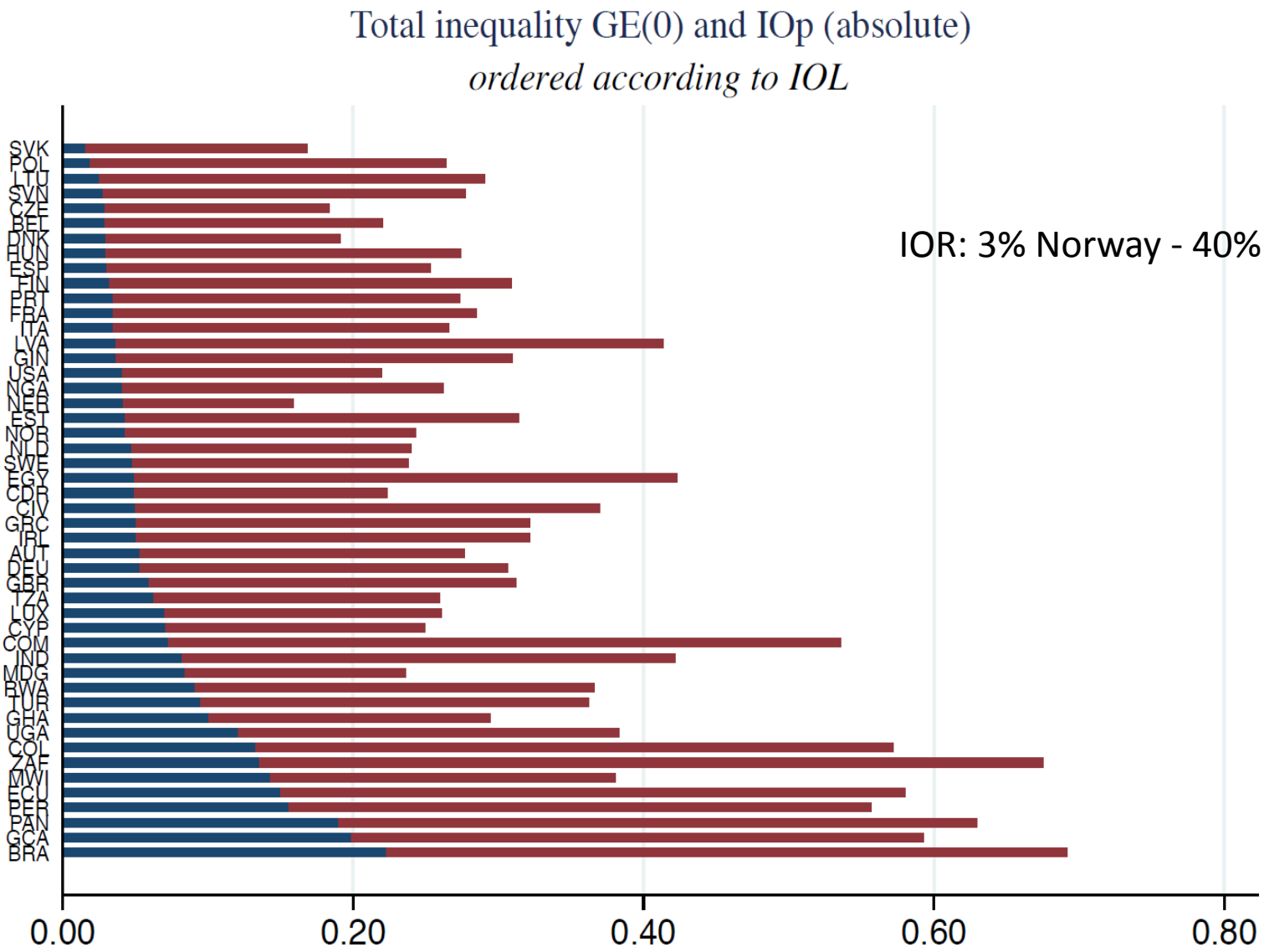
Draws on the egalitarian equivalence compromise. Satisfies ex-post compensation everywhere, but liberal reward only for Type 1.

4. Empirical applications

- We are not aware of any empirical applications of the direct approach.
- Empirical applications exist of all four indirect approaches reviewed in the paper (e.g. Almas et al., 2011; Checchi and Peragine, 2010; Devooght, 2008)
- Only the between-types approach - $I(\tilde{x}_{BT})$ - has been applied sufficiently widely so as to permit international comparisons.
  - 51 countries from 8 papers.
- There are two versions of this index, both of which yield lower-bound measures. Using a slightly different notation:
- IOL: $\theta_a = I(\tilde{x}_{BT})$
- IOR: $\theta_r = \frac{I(\tilde{x}_{BT})}{I(x)}$

	References	Countries	Data sources	Outcome	Method	Circumstances	Number of types
1	Checchi, Peragine, Serlenga (2015)	Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, Greece, Hungary, Ireland, Iceland, Italy, Lithuania, Luxemburg, Latvia, Netherlands, Norway, Poland, Portugal , Sweden, Slovenia, Slovakia, United Kingdom, Bulgaria, Switzerland, Malta, Romania (Europe: 29)	EU-Silc 2005 and 2011	post-tax individual equivalent incomes	Parametric and non parametric	The same set: parental education, parental occupation, gender, nationality, age	144
2	Brunori, Palmisano, Peragine (2015)	Comoros, Democratic Republic of Congo, Ghana, Guinea, Madagascar, Malawi, Niger, Nigeria, Rwanda, Tanzania, and Uganda (Africa: 11)	Living Standard Measurement Surveys (LSMS), designed by the World Bank , for Malawi, Niger, Nigeria, Tanzania,Uganda. EIM for Comoros, GLSS for Ghana, EIBEP for Guinea, EPM for Madagascar, EICV for Rwanda.	per capita consumption	parametric	Different sets: father's occupation and education, region of birth, ethnicity	From 20 (Nigeria) to 64 (Malawi)
3	Ferreira and Gignoux (2011)	Brazil, Colombia, Ecuador, Guatemala, Panama, Peru	Brazil, PNAD 1996; Colombia, ECV 2003; Ecuador ECV 2006; Guatemala, ENCOVI 2000; Panama, ENV 2003; Peru, ENAHO 2001	household per capita income	parametric	Different sets: gender, ethnicity, parental education, father's occupation, region of birth.	108 (Peru 54)
4	Ferreira, Gignoux, Aran (2011)	Turkey	TDHS 2003-2004 and HBS 2003	imputed per capita consumption	parametric	urban/rural, region of birth, parental education, mother tongue, number of sibling	768
5	Hassine (2012)	Egypt	ELMPS 2006	total monthly earning	non parametric	gender, father's education, mother's education, father's occupation, region of birth.	72
6	Piraino (2012)	South Africa	NIDS 2008-2010	Individual gross income	parametric	race, father's education	24
7	Pistolesi (2009)	US	PSID 2001	individual annual earnings	semiparametric	age, parental education, father's occupation, ethnicity, region of birth	7,680
8	Singh (2011)	India	IHDS 2004–2005	household per capita earnings	parametric	father's education and occupation, caste, religion, location	108

4. Empirical applications

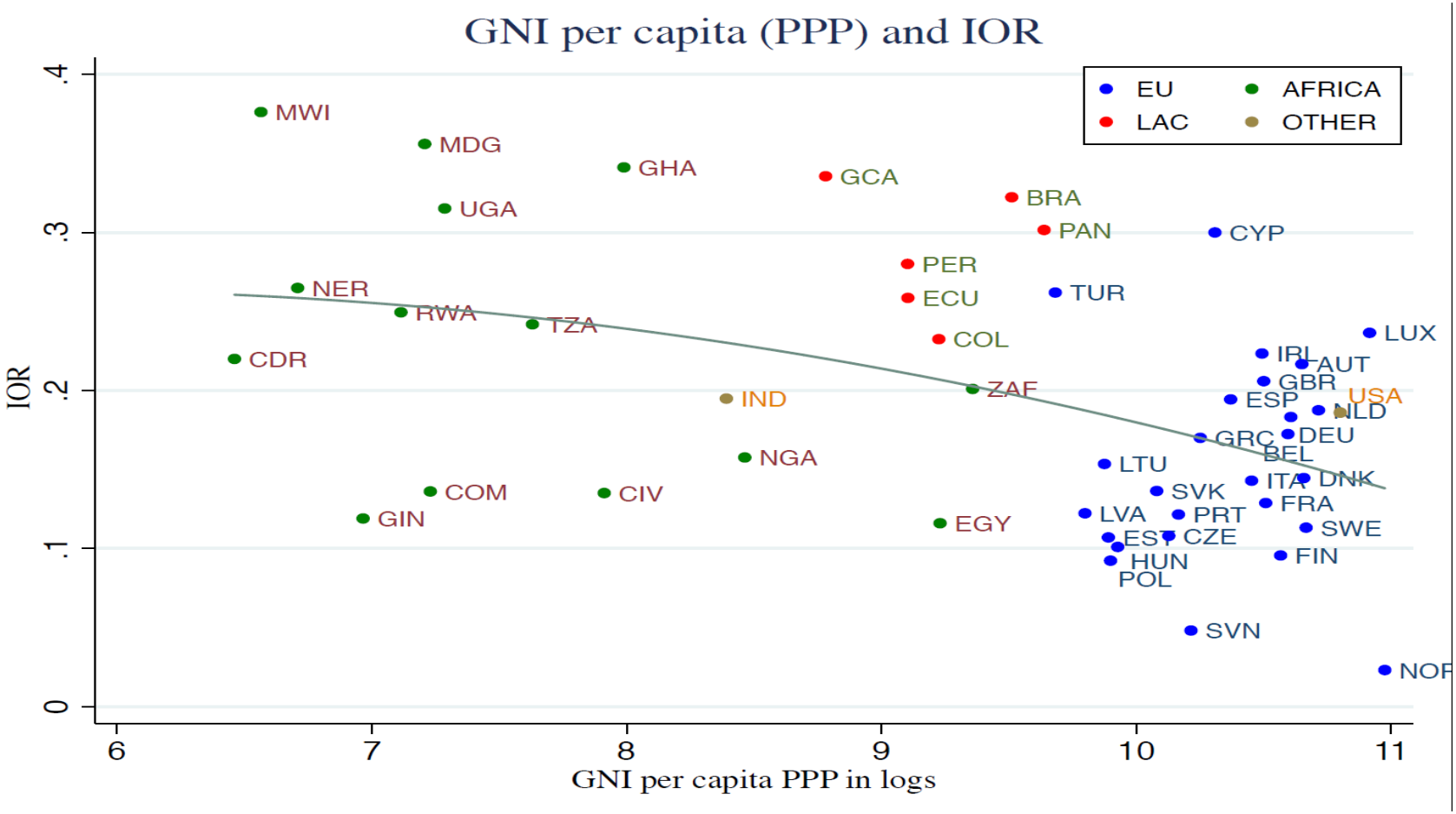


IOR: 3% Norway - 40% Malawi

Source: Brunori, Ferreira, Peragine (2015)

4. Empirical applications

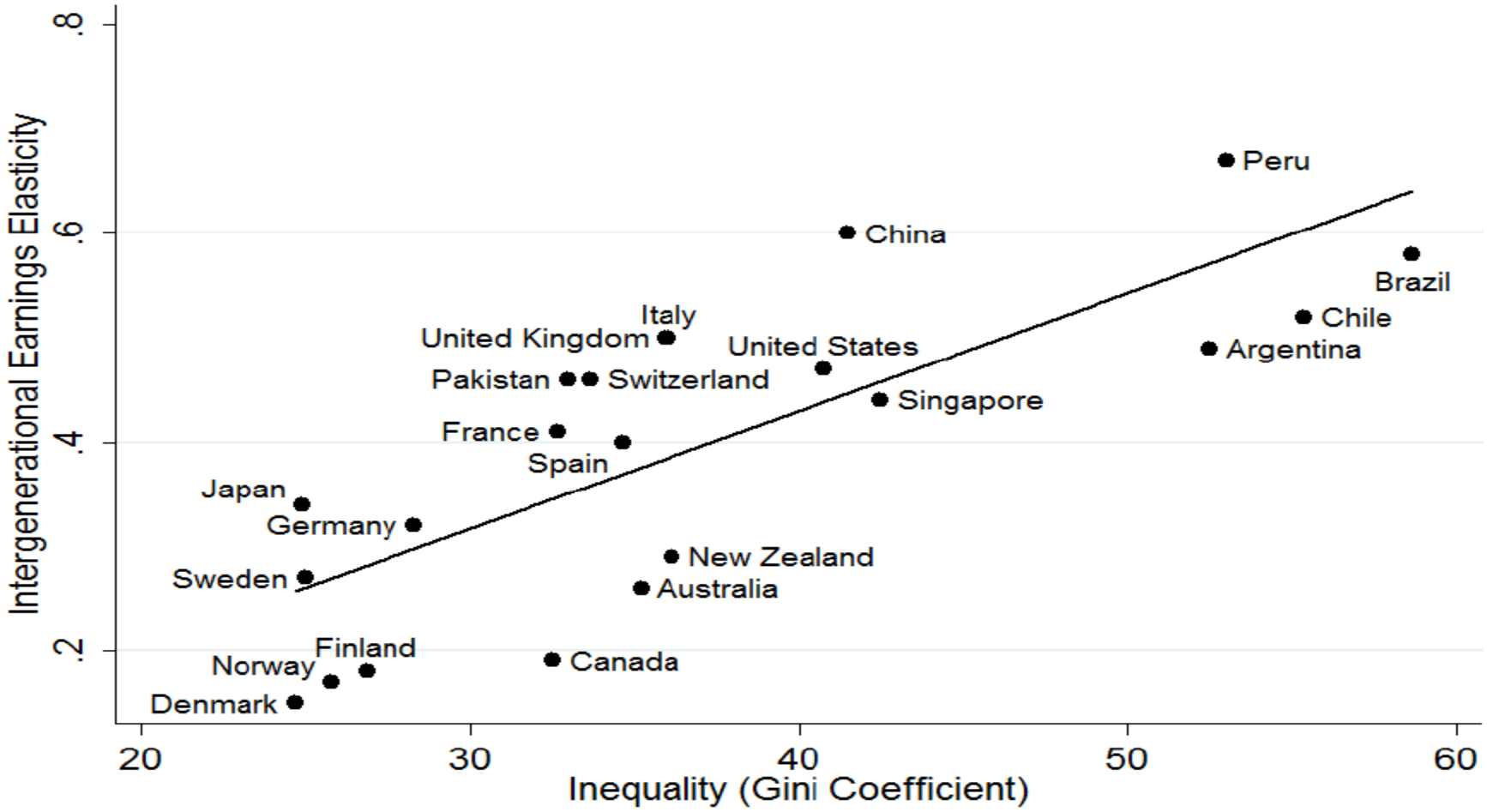
Inequality of opportunity: declining with 'development'?



Source : Brunori, Ferreira, Peragine (2015)

4. Empirical applications

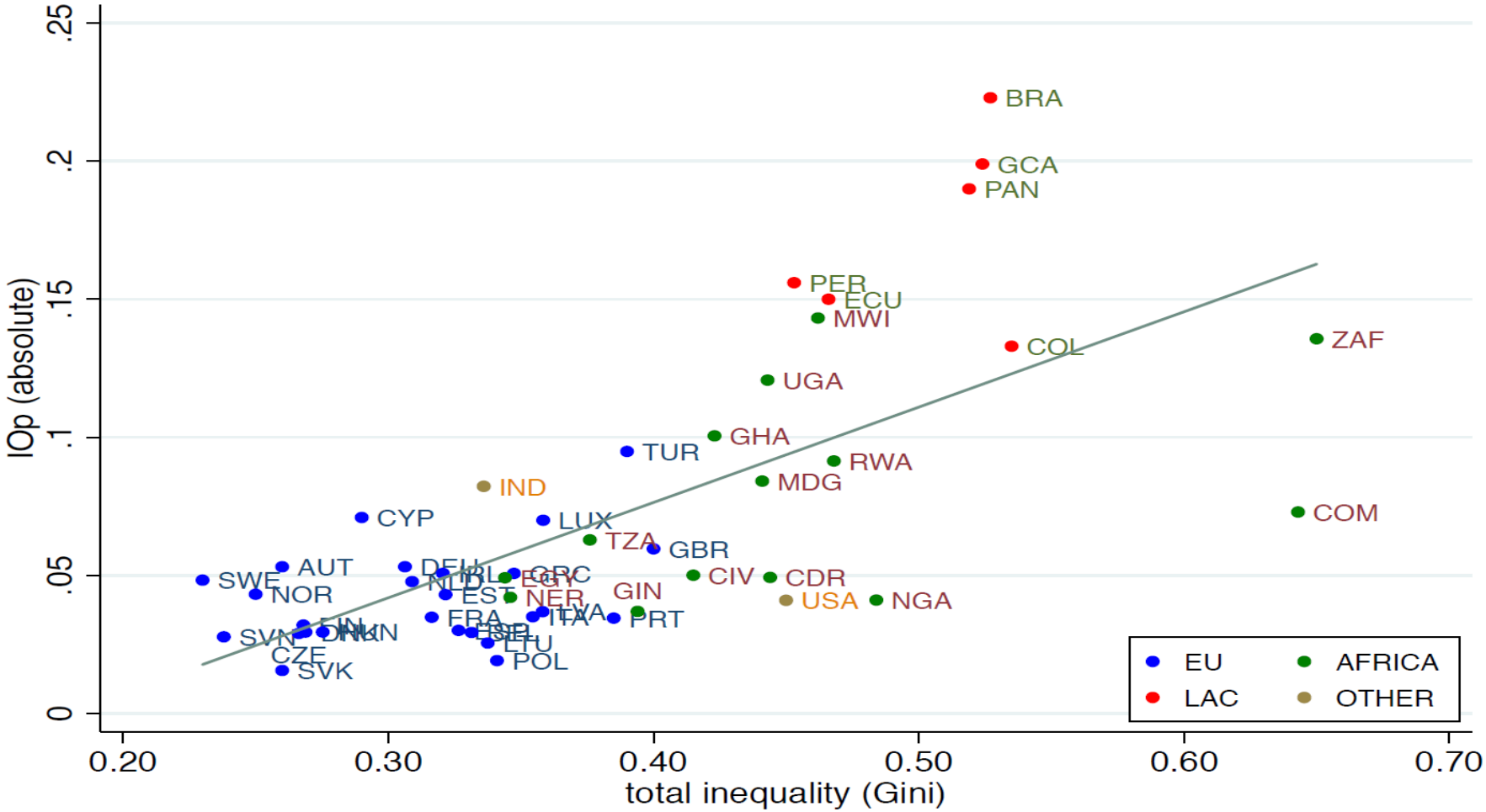
The Great Gatsby Curve



Source: Corak (2012)

4. Empirical applications

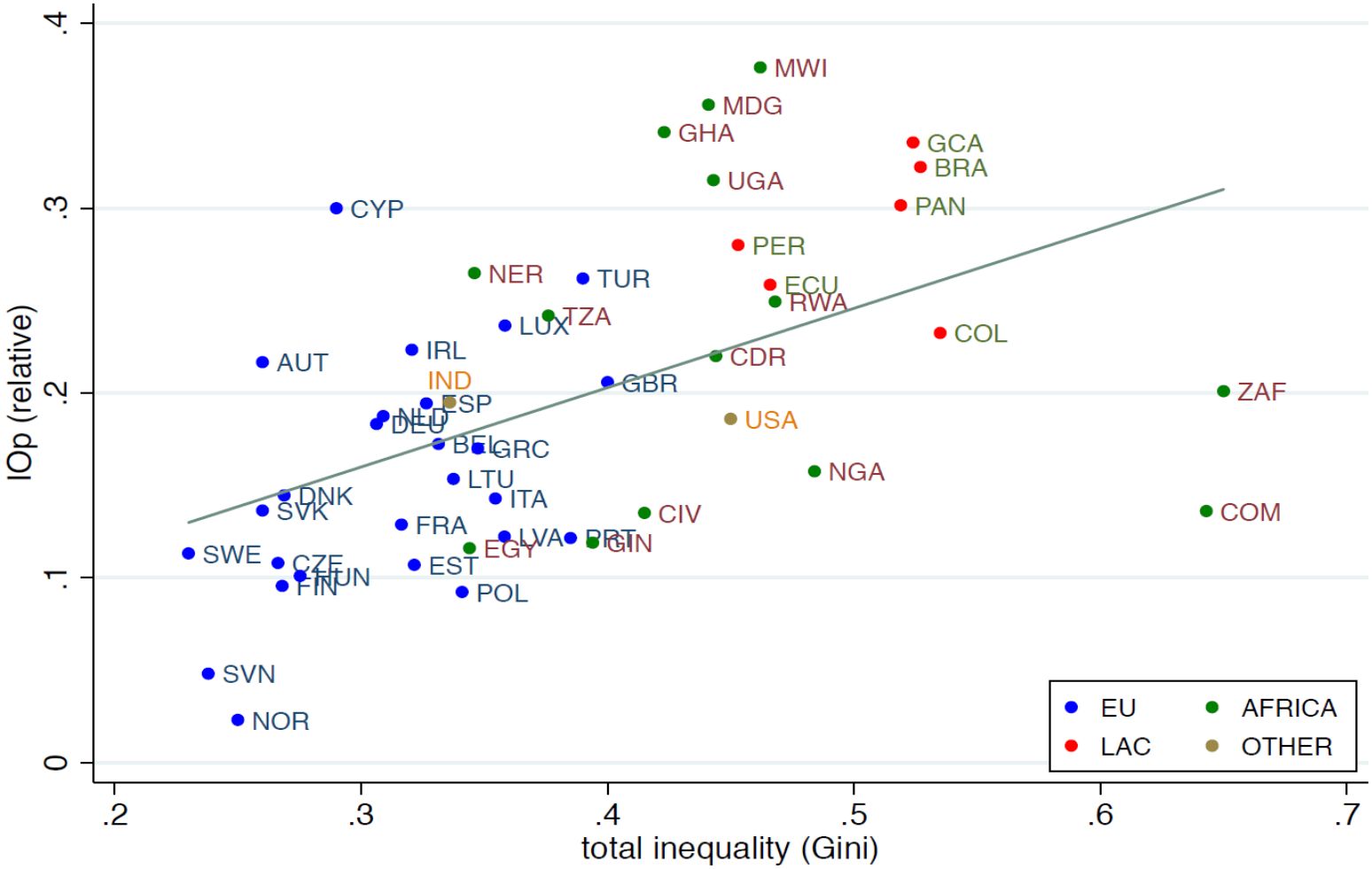
Inequalities of outcome and opportunity: strong correlation



Source: Brunori, Ferreira, Peragine (2015)

4. Empirical applications

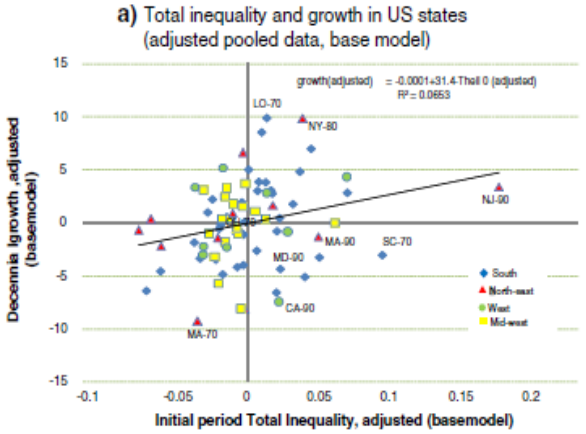
Inequalities of outcome and opportunity: strong correlation

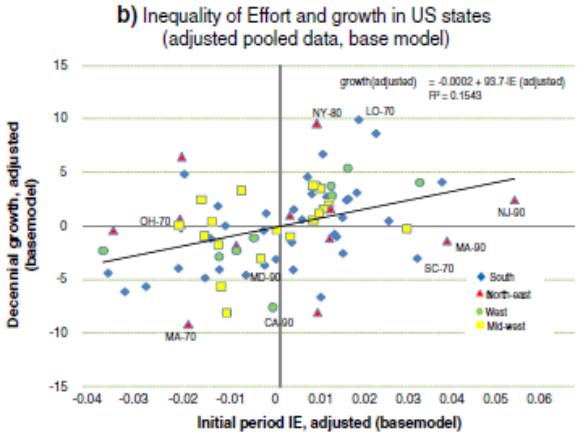


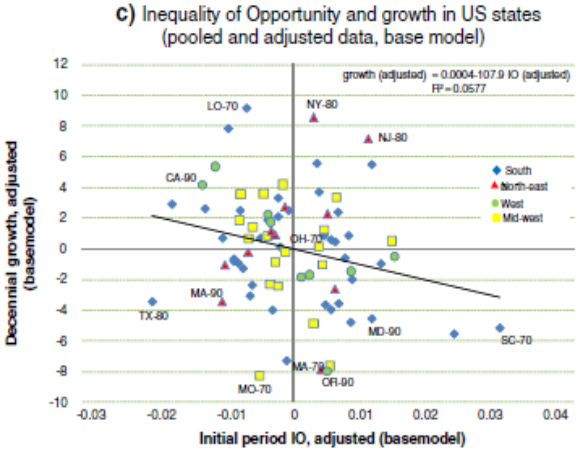
Source : Brunori, Ferreira, Peragine (2015)

4. Empirical applications

- More causal analysis:
- I.Op. as both independent and dependent variable:
  - the relationship between I.Op and economic growth (e.g. Marrero and Rodriguez, 2013; FLLO, 2014)
  - The impact of a CCT (Progresa) on I.Op. (van de Gaer et al. 2014)
- Key challenge: comparable data on advantages and circumstances







5. Extensions: Development objectives

- What is the policy objective for opportunity egalitarians?

$$Max_{\phi \in \Phi} min_i \int_t^{\infty} e^{\delta(t-s)} \mu_{i,s} ds$$

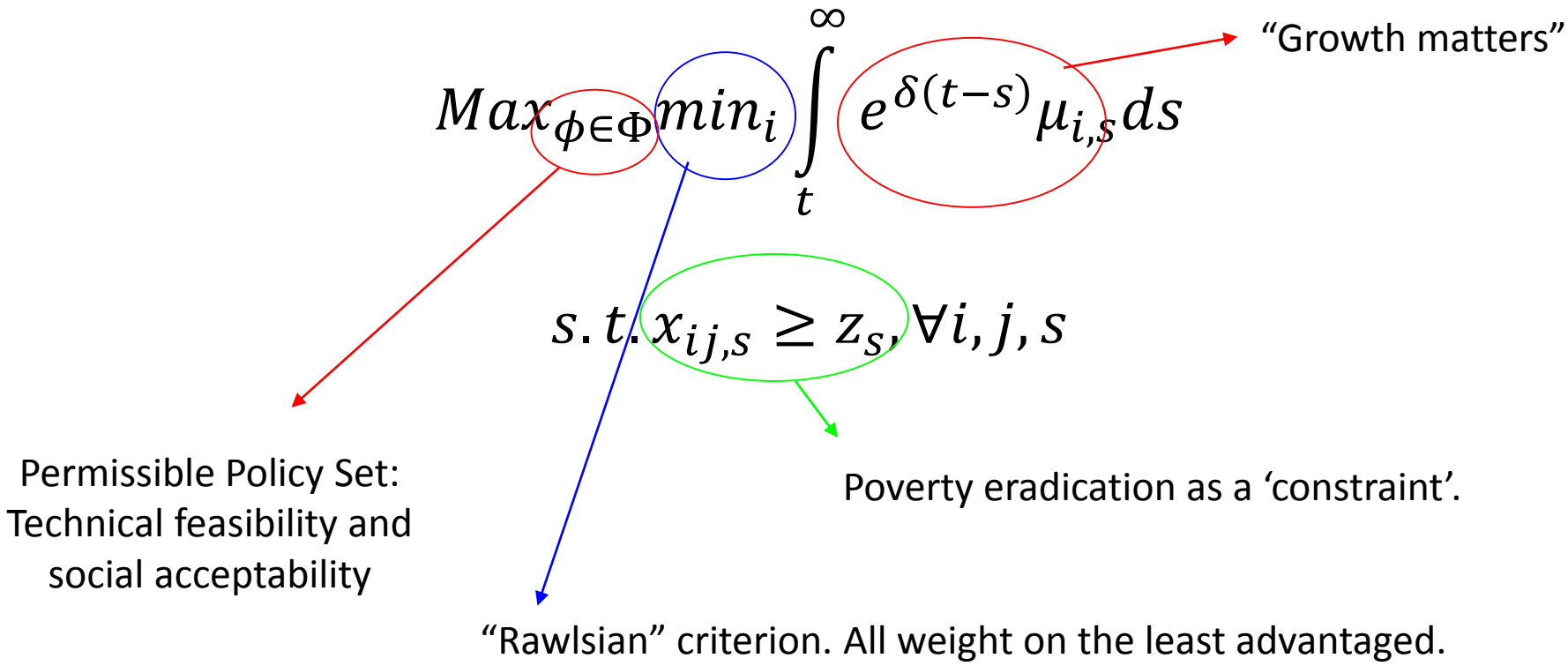
$$s.t. x_{ij,s} \geq z_s, \forall i, j, s$$

- The choice of policies from a feasible set so as to maximize the future stream of 'advantage' for the most disadvantaged type, subject to a no-deprivation constraint and to a policy acceptability constraint.

Source: Bourguignon, Ferreira and Walton, JEI 2007.

5. Extensions: Development objectives

- 'Deconstructing' the equitable development policy problem:



Source: Bourguignon, Ferreira and Walton, JEI 2007.

6. Conclusions

- Achievements:
  - Changing the space in which fairness judgments are made
  - Incorporating respect for individual responsibility into an egalitarian framework
- Limitations
  - Robustness
    - Too many alternative approaches?
  - Accuracy
    - How low are the lower-bounds?
      - Nieheuss and Peichl (2014)
  - Dimensionality
    - Is x_{ij} a vector? Things get more complicated…