#### Inequality and Personal Responsibility: Inequality of opportunity from concept to measurement

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This lecture is based in part on my chapter with Vito Peragine, "Individual Responsibility and Equality of Opportunity" (Ch. 25) in Adler and Fleurbaey (eds.), 2016, Oxford Handbook of Well-Being and Public Policy.

## Outline

#### 1. Equality of opportunity: Motivation and background

- 2. Economic models of equality of opportunity
- 3. Measuring inequality of opportunity
- 4. Empirical applications
  - i. 'Basic' between-types approach
  - ii. 'Enhanced' between-types approach
- 5. Extensions: IGM, poverty, and development
- 6. Conclusions

## 1. Motivation

"We know that equality of individual ability has never existed and never will, but we do insist that <u>equality of opportunity</u> 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 <u>unhealthy division in opportunities</u>, 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)

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#### **Indirect approaches**

- 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
  - <u>Principle of reward</u>: outcome differences due to individual responsibility factors ("efforts") are ethically legitimate, and should be preserved
- 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

#### A simple "canonical" model

- Let each and every individual be fully characterized by the triple (x, C, e).
- Let all elements of the vector *C*, as well as *e*, be discrete.
- Let  $x_{ij} = g(C_i, e_j)$
- 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  $n \times m$  matrix  $[X_{ij}]$  below.
- To  $[X_{ij}]$ , let there be associated another  $n \times m$  matrix  $[P_{ij}]$ , whose elements  $p_{ij}$  denote the proportion of the total population with circumstances  $C_i$  and effort level  $e_i$ .

	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	•••	em
<b>C</b> <sub>1</sub>	X11	X12	X13	•••	x <sub>1m</sub>
C <sub>2</sub>	X21	X22	X23	• • •	X <sub>2m</sub>
C <sub>3</sub>	X31	X32	X33	• • •	X <sub>3m</sub>
•••	• • •	• • •	•••	• • •	•••
Cn	X <sub>n1</sub>	X <sub>n2</sub>	X <sub>n</sub> 3	• • •	X <sub>nm</sub>

#### Table 1



When effort is continuous



- Back to the 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 <u>before</u> 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 <u>after</u> 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
    - Etc.

- 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.
- Variations of this framework have been used to propose:
  - i. Social orderings and allocation rules
    - When feasible resource transfers are introduced in the model
  - ii. Measures of inequality of opportunity

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



 $\min_{i}(\mu_{1},\ldots,\mu_{n})$ 

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



Allocation rules: (iii) Conditional equality (seeks a compromise between ex-post compensation – satisfied only for a reference effort level - and reward.



See Fleurbaey (2008).

Allocation rules: (iv) Egalitarian equivalence (seeks a compromise between ex-post compensation and reward – satisfied only for a reference type).



See Pazner and Schmeidler (1978), and Fleurbaey (2008).

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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  $[\widetilde{X}_{ij}]$  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  $[\widetilde{X}_{ij}]$ .

Precisely what constitutes unfair inequality depends on which version of the compensation principle is chosen, and on which compromise between that and the reward principle is adopted. Different indices have been proposed, corresponding to the four allocation rules discussed above (and more).

Approaches	Welfare criteria and allocation rules	Inequality measures
Ex ante	Min of means	Between types
	Conditional equality	Direct unfairness
Ex post	Mean of mins	Within tranches
	Egalitarian equivalence	Fairness gap

 Table 6: Welfare criteria, allocation rules and inequality measures

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 Table 6: Welfare criteria, allocation rules and inequality measures

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

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

	e1	e2	e3
C1	$\mu_{ m l}$	$\mu_{\!1}$	$\mu_{1}$
C2	$\mu_2$	$\mu_2$	$\mu_2$
C3	$\mu_3$	$\mu_3$	$\mu_3$

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

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- Empirical applications exist of all four indirect approaches mentioned above (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 <u>lower-bound</u> <u>measures</u>. Using a slightly different notation:

- IOL: 
$$\theta_a = I(\tilde{x}_{BT})$$
 IOR:  $\theta_r = \frac{I(\tilde{x}_{BT})}{I(x)}$ 

- In practice, IOL and IOR can be estimated either non-parametrically or parametrically:
  - Estimate  $x = C\psi + \varepsilon$  and compute  $\widetilde{x}_i = C_i \hat{\psi}$

	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	semiparamet ric	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





Source: Brunori et al. (2015)

Inequalities of outcome and opportunity: strong correlation



Source: Brunori, Ferreira, Peragine (2015)



Inequalities of outcome and opportunity: strong correlation

Source : Brunori, Ferreira, Peragine (2015)



Source: Corak (2012)

Figure 5: Inequality of opportunity and intergenerational mobility



Note: Estimates come from different studies and are not strictly comparable. Source: Brunori et al. (2013)

Figure 6: Inequality of opportunity and the intergenerational correlation of education



Note: Estimates come from different studies and are not strictly comparable. Source: Brunori et al. (2013)

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- 'Enhanced' between-types approach: looking for upper-bound estimates (Niehues and Peichl, SCW 2014)
- Two-stage estimator using panel data:
  - i. Estimate  $\ln w_{it} = \beta E_{it} + c_i + u_t + \varepsilon_{it}$
  - ii. Back in cross-section, estimate  $\ln w_{is} = \varphi \hat{c}_i + v_{it}$

Construct  $\tilde{\mu}^{UB} = \exp(\hat{\varphi}\hat{c}_i + \sigma^2/2)$ 

Application to Germany (SOEP) and the US (PSID), for both current and permanent incomes

 'Enhanced' between-types approach: looking for upper-bound estimates (Niehues and Peichl, SCW 2014)



Figure 2: IOp shares in outcome inequality

Source: Own calculations based on SOEP and PSID. The two graphs on the top ustrate IOp shares in annual incomes (2009 for Germany, 2007 for the US); the graph at the bottom IOp shares in permanent incomes.

- 1. 'Enhanced' between-types approach: enlarging the circumstance set through admitting an "age of consent" (Hufe, Peichl, Roemer and Ungerer; 2015)
  - Use National Longitudinal Survey of Youth (NLSY -79) for the US and British Cohort Study (BCS – 70) for the UK



1. Hufe, Peichl, Roemer and Ungerer (2015) find that the lower-bound IOR can be as high as 45% in the US and 31% in the UK when using this extended circumstance set.

Figure 2: IOp with varying circumstance sets (NLSY79), comparable sample, average income



Note: The overall bar yields the extent of outcome inequality IO. The black colored share of each bar yields inequality attributed to circumstances, i.e. the lower bound absolute measure of inequality of opportunity IOp. The residual gray colored share of each bar can be interpreted as an upper bound measure of inequality attributed to differential efforts. The white labels at the bottom of each bar indicate the share of IOp in IO, i.e. the relative measure of inequality of opportunity r.

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## 5. Extensions: IOp and mobility

 Inter-generational mobility (IGM) is typically measured by origin-independence measures of mobility, such as the complement of the correlation coefficient.

$$M(Y_0, Y_1) = 1 - \rho_{y_0 y_1}$$

• Which is the complement to the square root of the R<sup>2</sup> in the old Galtonian regression:

$$y_t = \beta y_{t-1} + \varepsilon_t$$

 β itself is often used as an inverse measure of mobility. If incomes are in logs, β is the IGE.

#### 5. Notice the isomorphism

• IGM: 
$$y_t = \beta y_{t-1} + \varepsilon_t$$
 R<sup>2</sup>

• IOp: 
$$y = C\psi + \varepsilon$$
  $IOR = \frac{I(\tilde{\mu}_i)}{I(y)}$ 

 $( \ldots )$ 

- Inequality of opportunity (at least in the between-types approach) is very close to origin-independent measures of IGM.
  - Difference: more circumstances
  - Omitted variables: IOp is explicitly a lower-bound measure. And explicitly not a causal estimate for any individual circumstance

#### 5. **Extensions:** Poverty in opportunities...

Poverty in the counterfactual unfair distribution  $[\widetilde{X}_{ij}]$ :

• Define an opportunity profile:

$$\Pi^* = \{T_1, T_2, ..., T_K\} \mid \mu^1 \le \mu^2 \le ... \le \mu^K$$

• And an opportunity-deprivation profile:

$$\Pi_{\pi}^{*} = \left\{ T_{1}, T_{2}, \dots, T_{j}, \dots, T_{J} \right\} \mid \mu^{1} \le \mu^{2} \le \dots \le \mu^{J} ; \ \mu^{J} < \mu^{k}, \forall k > J ; \text{ and } \sum_{j=1}^{J-1} N_{j} \le \pi N \le \sum_{j=1}^{J} N_{j}$$

#### 5. **Extensions:** Poverty in opportunities...

#### The Brazilian profile, by income per capita

Brazil's "opportunity-deprivation profile" in 1996: six poorest "social types" (adding up to 10% of the population), defined by pre-determined background characteristics.

Ethnicity	Father's occupation	Father's education	Mother's education	Place of birth	Estimated population	Share of national population	Mean advantage (HPCY)	Ratio of overall mean
black and mix-raced	agricultural worker	none or unknown	none or unknown	Nordeste or North	2,276,662	0.06776	105.9	0.261
black and mix-raced	agricultural worker	Upper primary (5) or more	none or unknown	Sao Paulo or Federal District	1,417	0.00004	116.5	0.287
black and mix-raced	agricultural worker	none or unknown	lower primary	Nordeste or North	313,664	0.00934	136.6	0.337
black and mix-raced	agricultural worker	Lower primary	none or unknown	Nordeste or North	352,729	0.01050	136.9	0.338
black and mix-raced	agricultural worker	Upper primary (5) or more	none or unknown	Nordeste or North	7,564	0.00023	144.2	0.355
black and mix-raced	Other	none or unknown	none or unknown	Nordeste or North	2,063,415	0.06141	144.5	0.356

Source: Ferreira and Gignoux (2011)

The purpose of (outcome) inequality-sensitive poverty measures is to distinguish between poverty in distributions such as B and C.

(z=5)	Α	В	С	D
I	9	9	9	9
П	8	8	8	8
III	7	7	7	7
IV	6	7	7	7
V	4	3	4	4
VI	3	3	3	3
VII	2	2	1	1
VIII	1	1	1	1
FGT (0)	0.5	0.5	0.5	0.5
FGT (1)	0.25	0.275	0.275	0.275
FGT (2)	0.15	0.165	0.185	0.185

The purpose of (opportunity) inequality-sensitive poverty measures would be to distinguish between poverty in distributions such as C and D.

(z=5)	Α	В	С	D
I	9	9	9	9
II	8	8	8	8
III	7	7	7	7
IV	6	7	7	7
V	4	3	4	4
VI	3	3	3	3
VII	2	2	1	1
VIII	1	1	1	1
FGT (0)	0.5	0.5	0.5	0.5
FGT (1)	0.25	0.275	0.275	0.275
FGT (2)	0.15	0.165	0.185	0.185

- Should there be a poverty measure that is sensitive to I. Op., in the same way as FGT(2) or the Sen Index are sensitive to outcome inequality?
  - Brunori, Ferreira, Lugo and Peragine (2013)
  - Anonymity axiom restricted to within types
  - Transfer axiom replaced by separate inequality aversion axioms within and across types.
  - Tension between IOA and IAW is resolved by introducing a hierarchy:

$$P_{FGT}\left(F,z,\mathcal{T}\right) = \frac{1}{n}\sum_{i=1}^{n}q_{i}^{F}\left(n+1-rk(i)\right)\int_{0}^{z}\left(\frac{z-x}{z}\right)^{\alpha}f_{i}\left(x\right)dx$$

• Poverty <u>levels</u> across eighteen European countries: standard headcount against opportunity-sensitive headcount



#### 5. Extensions: Development objectives

• What is the policy objective for opportunity egalitarians?

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

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

• 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 of the I. Op. literature:
  - Changing the space in which fairness judgments are made
  - Incorporating respect for personal responsibility into an egalitarian framework
  - Operationalizing the measurement of these informationally richer concepts in a simple and intuitive way
- Limitations
  - Robustness
    - Too many alternative approaches?
  - Accuracy
    - Narrowing the range between lower and upper bounds
    - Better measures of both circumstances and efforts are needed!
  - Dimensionality
    - Is  $x_{ij}$  a vector? Things get more complicated...