Inequality in Health

Lecture XIII: Distributive Justice and Health

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Winter semester 2022-23

Outline

Recap of Last Lecture

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- Labor and health are characterised by **simultaneity**, i.e. health and labor supply are determined at the same time.
- There are four major strands in the literature of labour and health evaluating the relationship between health and income, occupation, unemployment, and retirement, respectively.
- Pierce and Schott (2020) estimate labour market .
- Exploiting a reform in Israel in 2004, Shai (2018) shows that an increase in retirement age is associated with adverse health effects.

Introduction

Introduction

- The interaction of **laws**, **institutions**, **policies** and **social norms** determines the distribution of economic benefits and impositions in a society.
- The structural framework determines the **(re)distribution of wealth** in an economy.
- **Theories of distributive justice** provide "guidelines" about which kind of structural framework (and distribution) is preferable.
- Challenge: to measure empirically and apply the theory!

Rawls (1971): A Theory of Justice I

- Aims at resolving the (supposed) conflict between **equality** and **freedom** (distributive justice).
- **Justice as fairness**: Justice is the most fundamental moral requirement in a society.
- Society planner should operate as if they were behind a **veil of ignorance**, without knowing their social status, position in society, personal abilities etc. (**original position**).
- Free, rational individuals would make **morally just** choices, i.e. choices not based on self- or class-interest.
- Socially just distribution of **primary goods** in a society:
  - **Natural** primary goods: e.g. intelligence, imagination, **health**.
  - **Social** primary goods: e.g. civil and political rights, liberty and opportunity, the social bases of self-respect.

Rawls (1971): A Theory of Justice II

- **Maximin principle**: decision rule to be used by rational individuals under uncertainty.
- It ranks alternatives by their worst possible outcomes: choose the alternative (A_i) with the **least worst outcome** (O_j), i.e. the alternative which worst outcome is superior to the worst outcome of the other alternatives:

Alternative	Outcome		
	O_1	O_2	O_3
A_1	50	0	60
A_2	-10	30	90
A_3	-20	10	20

- Planning decision should **maximize the welfare** of a society' **least-advantaged members**.

Egalitarianism

It is the greatest good to the greatest number of people which is the measure of right and wrong.

Jeremy Bentham (1748–1832)

- **Utilitarianism**: public policy should maximize total utility.
- Uncontested view of social welfare for more than two centuries.
- Largely unconcerned with **distributive** issues.
- **Egalitarianism** requires **equality** of some sort: people should get the same, or be treated the same, in some respect.
- Does not require ending *all* types of inequality.

Equality of Opportunity (EOp)

- Egalitarian theories emphasize the notion of **equality of opportunity** (**EOp**).
- Each person's prospects depend on their **initial stock of resources** plus **effort and behaviour**.
- Rawls (1971), Sen (1985), DWORKIN (1981), Cohen (1989) and Arneson (1989) present different views of equal opportunities.
- According to equality of opportunity, individual outcomes are determined by two types of variables:
  1. **Circumstances**
  2. **Effort**.

Circumstances and Effort

- **Circumstances**: matters that an individual could not have influenced or controlled.
  - Gender, early life environment, genetics...
- **Effort** belongs to the personal responsibility of individuals.
  - How hard one works, how long one studies etc.
- Egalitarian view: **justice** requires leveling the playing field by **equalizing opportunities**.
- Individual choices and their effects dictate the outcomes:
  1. **Compensation** principle: differences in outcomes due to **circumstances** are ethically unacceptable $\rightarrow$ should be compensated.
  2. **Reward** principle: differences in outcomes due to **effort** are ethically acceptable $\rightarrow$ do not justify redistribution.

Measuring Inequality of Opportunity

- Two main approaches to measure inequality of opportunity (IOp):
  1. **Ex-ante**:
     - There is equality of opportunity if the set of **opportunities** is the same for all.
     - Initial conditions are irrelevant.
  2. **Ex-post**:
     - Consider individuals with the same **choice characteristics**.
     - Inequality originating from different initial conditions must be compensated.
- They rely on competing definitions of EOp and embody the egalitarian ethical principles in different ways.

Ex-Ante and Ex-Post Approach

- **Ex-ante approach**
  - EOp: the **set of opportunities** is the same for all individuals, regardless of circumstances.
  - Groups/types: individuals with the same set of **circumstances**.
  - Considers inequality **between** types.
  - $\downarrow$ inequality **between** groups (i.e. individual opportunity sets) $\Rightarrow \downarrow$ IOp.
- **Ex-post approach**
  - EOp: all the individuals who exert the **same effort** have **the same outcome**.
  - Groups/types: individuals grouped according to their level of effort.
  - Differences between groups are ethically acceptable because they are due to different levels of **effort**.
  - $\downarrow$ inequality **within** groups $\Rightarrow \downarrow$ IOp.

Equality of Opportunity: Roemer's Formalization

Roemer's Model I

- Roemer (1998) divides the population into t **types**, $t \in \{1, \ldots, T\}$, given their characteristics or **circumstances** C.
- For each type t we want to **equalize opportunities** for a certain **outcome** u:

$$u^t = u^t(C, e, \varphi)$$

  where φ is a feasible **policy**, $\varphi \in \Phi$, and e is **effort**.
- Example:

  u individual's life expectancy
  t type
  C gender (circumstance)
  e measure of healthy lifestyle (exercising, healthy eating, not smoking...)
  φ allocation of medical care services to the population.

Roemer's Model II

- Define an individual's **relative effort level** π within their type.
- Policy φ determines the resources available to each effort/type combination: $\varphi^t(\pi)$.
- $\nu^t\left(\varphi^t, \pi\right)$: **indirect outcome function**, i.e. the level of u for individuals of type t at the effort centile π^{th} of the effort distribution when the policy is φ.
- ν^t gives the **advantage** of type t for relative effort centile π.
- Strict equality of opportunity would require:

$$\nu^t\left(\varphi^t, \pi\right) = \nu^{t'}\left(\varphi^{t'}, \pi\right) \ \forall \pi, t \neq t'$$

(generally not feasible).

Roemer's Algorithm

- Roemer suggests maximizing the advantage of the **worst-off type** within each effort quantile.
- The **best policy** maximizes

$$\min_t \nu^t \left(\varphi^t, \pi\right).$$

- For a certain effort quantile π, we get the objective:

$$\max_{\varphi} \min_t \nu^t \left(\varphi^t, \pi\right).$$

- Since each effort quantile of the population has the same size, the equal-opportunity policy φ^{EOp} is:

$$\varphi^{EOp} = \max_{\varphi} \int_0^1 \min_t \nu^t \left(\varphi^t, \pi\right) \, \mathrm{d}\pi.$$

The Equality of Opportunity Objective

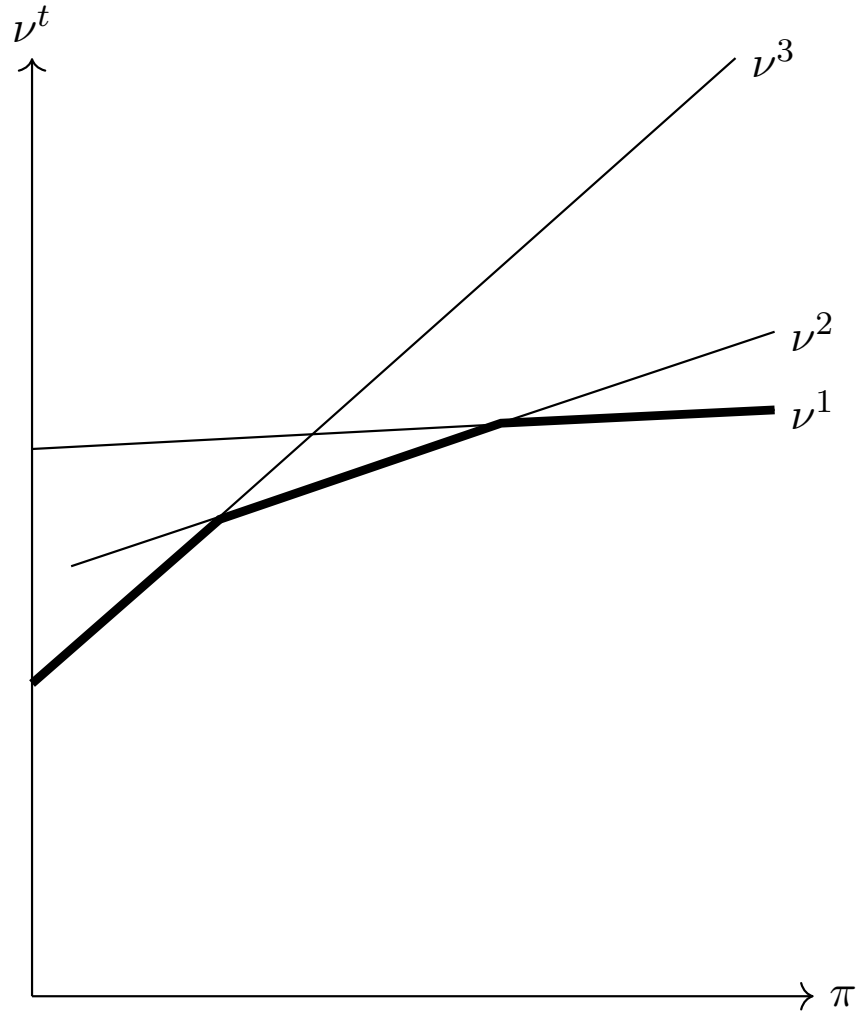

Figure 1. Illustration of the EOp objective for advantage ν^t, $t \in 1, 2, 3$. Source: Roemer (2002).

Criticism and Extensions

- Roemer combines **utilitarianism** (effort levels enter additively) and **Rawls' maximin principle** (maximize for worst-off type).
- Both theoretical and practical issues arise.
- Hild and Voorhoeve (2001, 2004): statistical solution **infeasible**.
  - All events, including human choices, are caused by **prior events** $\Rightarrow$ responsibility might make sense instrumentally, but not normatively.
  - Effort is determined by **beliefs** and **preferences**, which are influenced by factors beyond individual's control.
- Kolm (2001): conflict with competitive **market rules**.
  - Implies changes of free-market mechanisms.
  - Algorithm feasible only in a social market economy where equilibrium prices can be predicted in advance.
- Calsamiglia (2009): In reality, not one single policymaker, but many, whose decisions interact.

Empirical Implementation

Identification

- **Parameters** not necessarily **stable**.
  - Observed correlation between the instrumental policy (e.g. public spending) and the ex post outcomes (e.g. incomes) does not give evidence on the **effects** of the policy.
  - Applying EOp rule might **change** spending needed to equalize effort.
- Issues about **endogeneity**:
  - **Reverse causality**: When outcomes are equalized across effort-types, the total amount of effort may decrease.
  - **Omitted variables**: A third variable may affect both instrument and advantage. Example: both tax/transfer scheme and the outcome are influenced by living conditions.
  - **Unobserved heterogeneity**: If at each level of effort the policy rule alters individuals' outcome across types in ways we do not fully observe.

Unobserved Circumstances

- We only observe a **subset** of circumstances $\Rightarrow$ measured IOp is a **lower bound**.
- Example: cognitive abilities (rarely observed) are **genetically** determined.
  - Correlated to **parental profession** to some extent.
  - But some variation in the ability variable remains unexplained.
  - True inequality larger than the apparent inequality.
- Lower bound interpretation holds even if observed & omitted circumstances are **negatively** correlated (R^2).
- **Ex post** evaluation: problem smaller – the EOp notion is also valid for a subset of circumstance parameters.
- If inequality measurements across different dimensions of circumstances are similar, more likely that the same holds for the universe of circumstances.

Measuring Inequality of Opportunity in Health

Measuring Inequality of Opportunity

- Once established that there is inequality of opportunity, we also want to **measure** it.
- We consider two alternative approaches:

1. The **Gini-opportunity coefficient** GO measures health inequality between social types (Lefranc et al., 2008).
2. The **conditional equality** approach does not rely on a (subjective) definition of types (Fleurbaey and Schokkaert, 2009).

Introduction

- For population type i, with population share p_i, mean μ_i and within-type Gini coefficient G_i, consider the area under the generalised Lorenz curve:

$$\mu_i(1 - G_i)$$

- It describes the **opportunity set** of type i.
- It is also known as the *Gini social evaluation function* (Sen, 1974).
- μ_i can be interpreted as a **return** component, equal to the average value of health.
- $(1 - G_i)$ represents a **risk** component, that depends on within-type inequality.

Definition

- The **Gini-opportunity coefficient** GO is:

$$GO = \frac{1}{\mu} \sum_{i=1}^{k} \sum_{j>i} p_i p_j \left[\mu_j (1 - G_j) - \mu_i (1 - G_i) \right]$$

- GO is an extension of the generic Gini coefficient G.
- $0 \leq GO \leq 1$; $GO \leq G$.
- GO increases with the number of types.

Example: Gini Opportunity Coefficient

Table 1. Gini Opportunity coefficient (GO) and its components under different scenarios.

	Group									μ	GO
	Poor			Middle			Rich				
	Pop. size	μ	Gini	Pop. size	μ	Gini	Pop. size	μ	Gini		
Baseline	3,000	11	.103	3,000	12	.0939	3,000	13	.087	12	.0202
Variance pro-rich	3,000	11	.103	3,000	12	.0939	3,000	13	.0434	12	.0299
Variance pro-poor	3,000	11	.0513	3,000	12	.0939	3,000	13	.0868	12	.0097
Difference in means (poor further apart)	3,000	10	.113	3,000	12	.0939	3,000	14	.0806	12	.0401
More rich and poor in population	5,000	11	.102	3,000	12	.0949	5,000	13	.0868	12	.0213
More middle class in population	2,000	11	.103	3,000	12	.0946	2,000	13	.0882	12	.0183

Properties

1. **Within-type anonymity**: Invariance to any permutation of two individuals of similar circumstances C.
2. **Between-type Pigou-Dalton transfer principle**. Consider two types i and j where $C_j \succ_{SSD} C_i$. The index decreases if there is a transfer from a j-type to a i-type individual such that:
   - In the **ex ante** distribution, the j-type individual is richer than the i-type individual.
   - In the **ex post** distribution, the j-type individual is poorer than the i-type individual.
3. **Normalization**. If the cumulative distribution functions are identical for all C, the index must equal zero.
4. **Principle of Population**. Invariance to replication of population.
5. **Scale Invariance**. Invariance to a multiplication of all incomes by a positive scalar.

Decomposition I

- GO can be decomposed:

$$GO = \overbrace{\frac{1}{\mu}\sum_{i=1}^{k}\sum_{j>i} p_i p_j \left(\mu_j - \mu_i\right)}^{GO_{pt}} + \overbrace{\sum_{i=1}^{k}\sum_{j>i} p_i p_j \mu \left(G_i - G_j\right)}^{GO_{pr}}$$
$$+ \frac{1}{\mu}\sum_{i=1}^{k}\sum_{j>i} p_i p_j \left(G_i\left(\mu_i - \mu\right) - G_j\left(\mu_j - \mu\right)\right)$$

1. A **return** component, expressing the value of the GO when **within-type inequality** is removed:

$$GO_{pt} = \frac{1}{\mu}\sum_{i=1}^{k}\sum_{j>i} p_i p_j \left(\mu_j - \mu_i\right).$$

Decomposition II

1. A **risk** component, representing the value of GO when **between-type inequality** is removed:

$$GO_{pr} = \sum_{i=1}^{k} \sum_{j>i} p_i p_j \mu \left(G_i - G_j \right).$$

2. A **residual**, given by the **interaction** between return and risk components:

$$residual = \frac{1}{\mu} \sum_{i=1}^{k} \sum_{j>i} p_i p_j \left(G_i \left(\mu_i - \mu \right) - G_j \left(\mu_j - \mu \right) \right).$$

- In general $GO_{pt} > 0$.
- $GO_{pr} > 0$ if, on average, the top types are **less risky** than the bottom types.
- **Potential shortcoming**: interaction term can be large and it is difficult to interpret.

Alternative Approach

- The computation of the Gini-opportunity coefficient relies on the definition of "types".
- In some cases, dividing the population into types does not make much sense or might be difficult to justify citep[a critique of][]roemer2002equality.
- But if we treat each individual as a type, by construction the Gini-opportunity coefficient is equal to the Gini coefficient.
- **Conditional equality** approach does not require defining types.
- To standardize health h by circumstances C, run the **regression**

$$h_i = \alpha + \beta C_i + \epsilon_i$$

and compute

$$\hat{h}_i = \hat{\beta} C_i = h_i - \epsilon_i$$

- The **Gini coefficient** for $\hat{h}_i$ measures the overall health inequality due to circumstances, i. e. inequality of opportunity.

Empirical Applications

Normative Evaluation of Education

- Jones et al. (2014) analyze empirically the effect of educational policy on inequality of opportunity in health.
- They consider several health outcomes such as Self-Assessed Health (**SAH**) and mental health
- The authors exploit an educational reform in England and Wales in the 1960s, changing from an early tracking to a selective system.
- Results: opportunity-enhancing effects of reform only modest in terms of adult health

Data

- Data used: the UK *National Child Development Study* (**NCDS**), waves 1-7.
  - Longitudinal study of 17,000 individuals born in the UK in 1958, followed from birth until age 46.
  - Information on parents also available.
- **Health** outcome measure: SAH at age 46, disability at age 46, mental health at age 42.
- **Circumstances**:
  - **Parental socioeconomic background**
  - **Political tone of local area**: Labour vs. Conservative
  - **Cognitive ability** during childhood
- **Effort**:
  - Health-related **lifestyle** in adulthood (cigarette smoking).
  - **Educational attainment**.

Channels

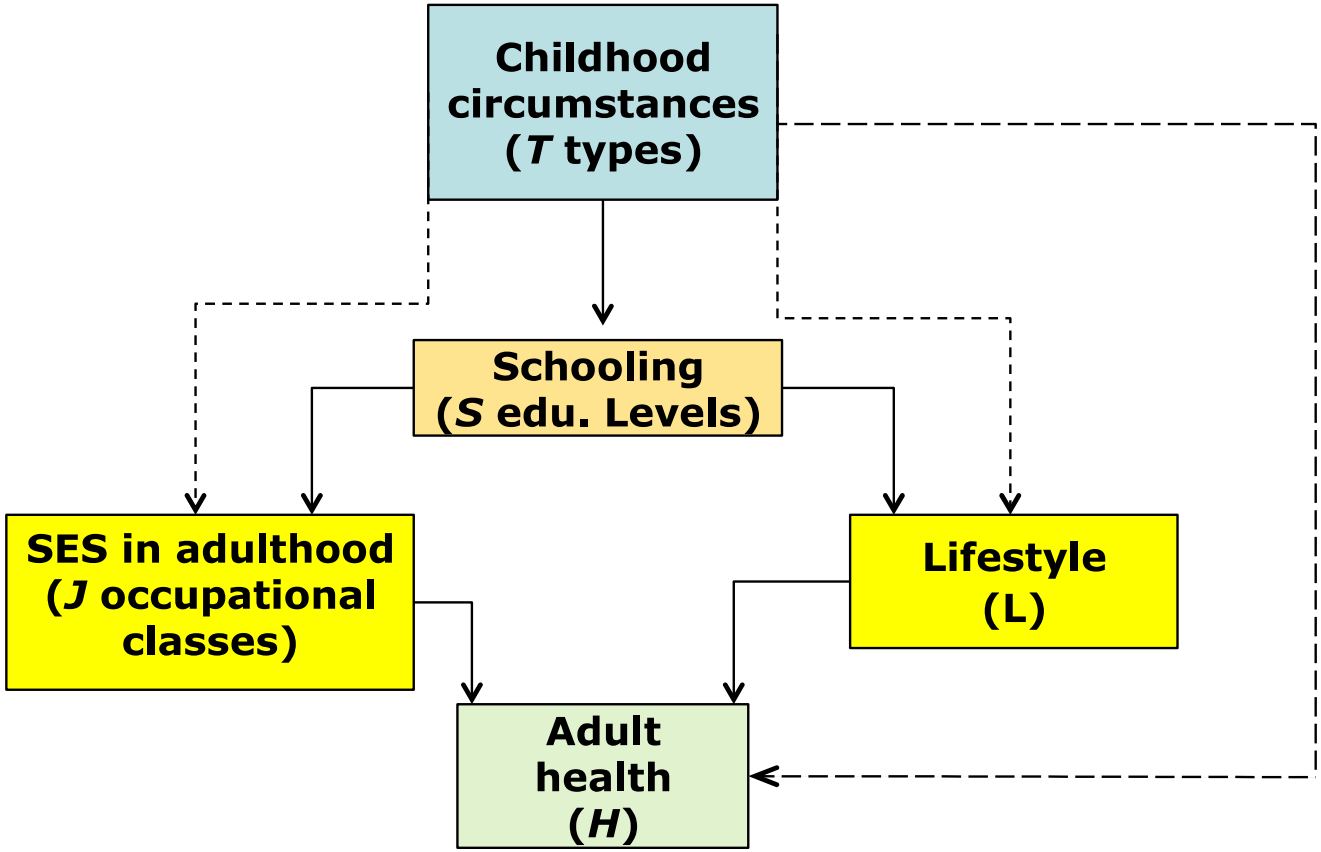

Figure 2. Conceptual Framework. Source: Jones et al. (2014).

Inequality of Opportunity

Table 4 Selective system—dissimilarity indices for the probability of reporting good or excellent health (age 46) and different levels of educational qualifications, by circumstance

Self-assessed health			Educational qualifications			
Parental SES	Ability	Cons. area		Parental SES	Ability	Cons. area
0.05	0.08	0.06	Threshold			
			O-Levels	0.13	0.21	0.11
			A-Levels	0.06	0.10	0.01
			Higher education	0.03	0.06	0.005

Table 5 Comprehensive system—dissimilarity indices for the probability of reporting good or excellent health (age 46) and different levels of educational qualifications, by circumstance

Self-assessed health			Educational qualifications			
Parental SES	Ability	Cons. area		Parental SES	Ability	Cons. area
0.05	0.05	0.07	Threshold			
			O-Levels	0.12	0.20	0.11
			A-Levels	0.04	0.07	0.009
			Higher education	0.02	0.04	0.003

Conclusion

- Modest variation in health outcomes across policy regimes
- Comparative performance of systems mixed
- Evidence of inequality of opportunity in health
- Different channels: educational system, SES, adult lifestyles

Decomposition of Inequality

- In a recent study, Carrieri and Jones (2018) propose a further technique to decompose a Gini index for a measure of health.
- The index is decomposed into four groups:
  1. direct contribution of circumstances (2),
  2. indirect contribution of circumstances (3),
  3. effort (4), and
  4. residual factors (5).
- In an empirical application using English data, the authors show that circumstances are the main determinants of health inequality.

Gini Decomposition

- Considering health H_i to be a function of effort E_i only within each circumstance group τ, we can write:

$$H_i = \alpha_\tau + \beta_\tau E_i + u_i^\tau \tag{1}$$

- Defining $B_i = \beta_\tau E_i$ and R_i as relative rank, we can decompose the Gini index as:

$$G = \left(\frac{2}{N\overline{H}}\right) \sum_\tau \sum_{i \in \tau} (\alpha_\tau - \overline{\alpha}) \left(R_i + \frac{1}{2}\right) \tag{2}$$

$$+ \left(\frac{2}{N\overline{H}}\right) \sum_\tau \sum_{i \in \tau} (B_\tau - \overline{B}) \left(R_i + \frac{1}{2}\right) \tag{3}$$

$$+ \left(\frac{2}{N\overline{H}}\right) \sum_\tau \sum_{i \in \tau} (B_i - \overline{B}_\tau) \left(R_i + \frac{1}{2}\right) \tag{4}$$

$$+ \left(\frac{2}{N\overline{H}}\right) \sum_\tau \sum_{i \in \tau} u_i^\tau \left(R_i + \frac{1}{2}\right) \tag{5}$$

Data

- Data used: 10 waves of the Health Survey for England (HSE), 2003–2012
- Health outcomes:
  - Cholesterol
  - Glycated haemoglobin
  - Fibrinogen
  - Ill-health index (first principal components of biomarkers)
- Circumstances:
  - Birth cohort
  - Gender
  - Education
  - Deprived neighborhood
- Effort:
  - Smoking
  - Alcohol consumption
  - Dietary choices

Main Results

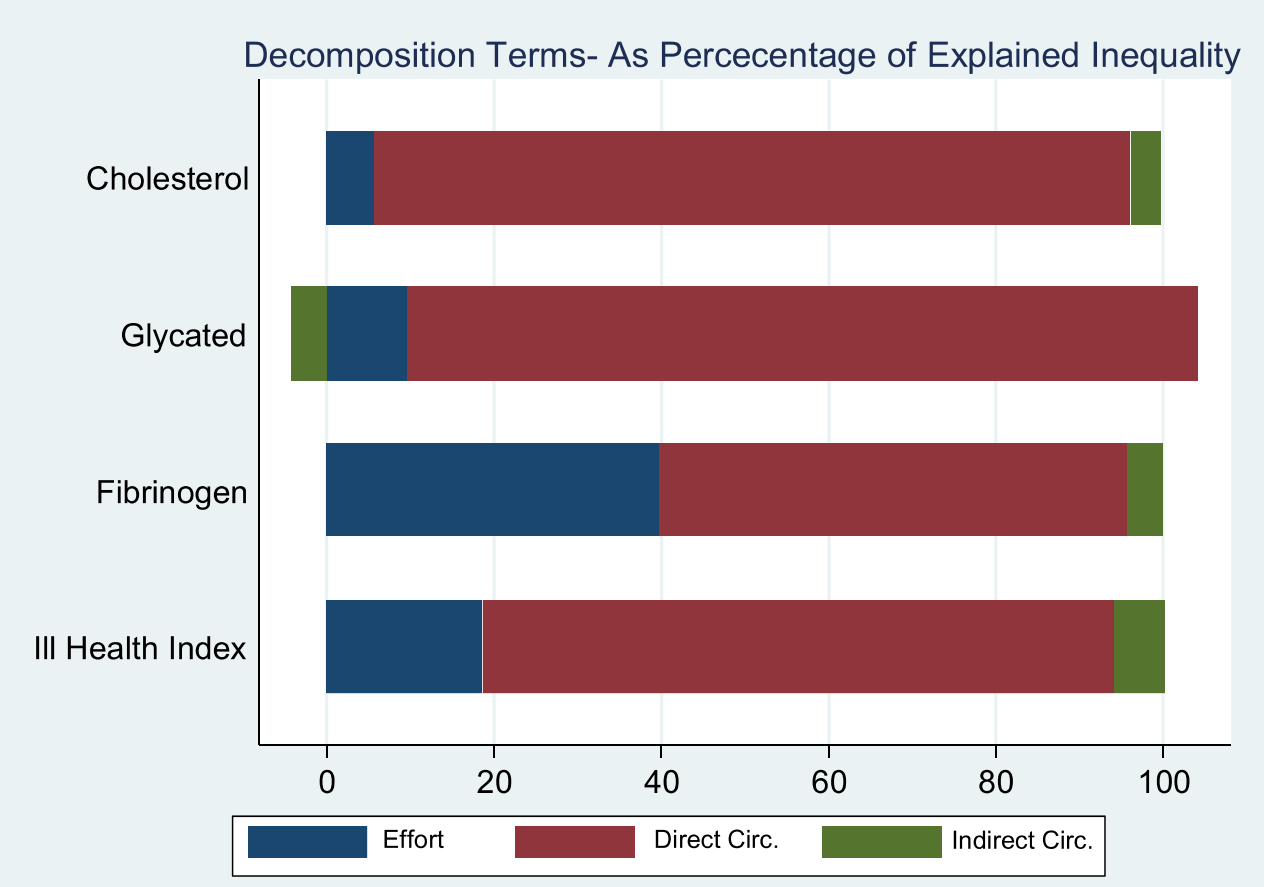

Figure 3. Decomposition results–Gini index.

Source: Carrieri and Jones (2018).

Conclusion

- EOp far from being reached in England.
- Circumstances explain 56%–95% of total inequality.
- Possibility to decrease inequalities through higher individual effort limited.
- However, individuals still empowered to reduce risks for some specific diseases.

Summary and Conclusions

Summary and Conclusions

- Following Rawls (1971) several thinkers have developed **egalitarian** theories of distributive justice.
- Equality of Opportunity requires a distinction between **circumstances** and **choices**.
- Sources of **unfair** inequalities are ethically unacceptable and should be tackled, whereas sources of **fair** inequalities, depending on individuals' effort, are usually considered acceptable.
- One method to measure inequality of opportunity is the **Gini-opportunity coefficient**, that might be decomposed into a return component, a risk component and a residual.
- Recent work by Jones et al. (2014); Carrieri and Jones (2018) suggests that inequality of opportunity has a direct and relevant effect on the total observed health inequality.

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