

Gender stratification, social class at birth, and inequality of opportunity in Egypt

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The economics of stratification

- Stratification economics was born out of the contribution of American economists to the Black Radical Tradition. (The June 2022 issue of the *Journal of Economic Literature* has a symposium on race and economic literature)
- Darity (2005) argues that unless we assume that members of a marginalized group systematically make choices that leave the marginalized group worse off than the dominant group, these identity-based inequalities must be considered unfair.
- Seguino (2013) extends this idea of racial stratification to the sphere of gender inequality. She asserts that *gender justice* requires equal probabilities of achieving all potential outcomes in all identified social domains.
- Seguino's (2013) definition of gender (or other identity) justice is related to the philosophical argument of equality of opportunity.

- Roemer (1998) mathematically formalizes the philosophical idea of equality of opportunity as distinct from equality of outcome (income).
 - The inequality of opportunity approach splits inequalities into two broad categories: inequalities due to individual's responsible decisions (i.e., accountable effort), and inequalities due to the birth lottery (i.e., initial circumstances at birth).
- Roemer (1998) shows that if the conditional distribution of residual luck is the same for all initial circumstances, the equality of opportunity condition requires that the quantile function of outcomes, conditional on the initial circumstances, be the same for all potential combinations of initial circumstances.
- If we include group identity among the individual's initial circumstances, then Roemer's (1998) equal opportunity condition and Seguino's (2013) concept of gender (racial) justice are equivalent.

- To provide a framework for measuring intergroup identity inequalities related to identity-based stratification.
- Build the link between the literature on the measurement of inequality of opportunity and the literature on the economics of stratification.
- **What we do:** (1) Provide the measurement framework that distinguishes between inequalities due to identity-based stratification and those due to social class at birth and (2) apply this framework to study gender stratification in Egypt.
- **What we don't do:** It is not intended to develop a theoretical framework explaining the emergence of this identity-based stratification.

- Adapt the inequality measurement framework to allow for the decomposition of inequality of opportunity into a component due to identity-based social stratification and another component due to social class at birth.
- We propose a measurement framework that adapts Temkin's (1986) idea that inequality is an aggregation of the complaints of individuals relative to their counterparts with the same level of *merit*.

- We nest this view of inequality within the framework of Roemer's (1998) equal opportunity model by defining peers with the same level of *merit* as those with the same level of *responsible effort*.
 - This framework does not focus on individual outcomes but on the conditional distribution of outcomes related to individual initial circumstances, including identity.
- We develop the distributional properties that these indices should obey and derive dominance conditions related to these ethical views.
- Empirical application: The evolution of gender stratification and equality of opportunity in Egypt between 1998 and 2018.

Measurement framework: the model

- The initial circumstances of individuals are represented by a vector (a, x, g) :
 - a : age of the individual (related to the time of birth)
 - x : socioeconomic characteristics
 - g : identity group which can be either dominant (D) or marginalized (M)
- It is useful to define age cohorts: $c \in \mathcal{C}$.
- The income, y , is generated by a function which depends on the initial circumstances, (a, x, g) , the raw effort made by the individual, e_R , and the residual luck, ℓ .

$$y = \phi(e_R, a, x, g, \ell) \text{ with } \frac{\partial \phi(\cdot)}{\partial e_R} > 0$$

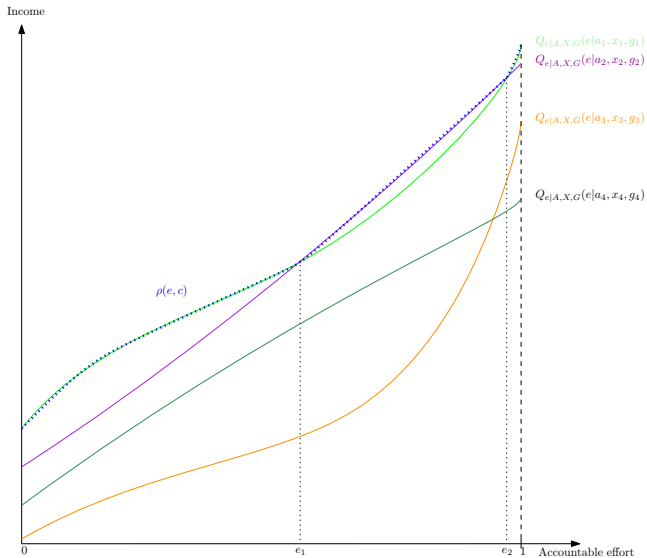
- Roemer (1998) argues that an individual's ability to produce raw effort, e_R , is also a function of initial circumstances (a, x, g) .
 - Level of effort for which the individual must bear responsibility (accountable effort) is given by $e = G_{E_R|A,X,G}(e_R|a, x, g)$.
 - Roemer (1998) shows that if $\ell \perp\!\!\!\perp A, X, G$, then the individual has the same rank in $G_{E_R|A,X,G}(e_R|a, x, g)$ as in $F_{Y|A,X,G}(y|a, x, g)$.
 - $e = F_{Y|A,X,G}(y|a, x, g)$.

- It is important to note that in an empirical application, one cannot identify the level of accountable effort, e_i , associated with one observation.
 - The observed income, y_i is a function of both the individual's unobserved level of accountable effort, e_i , and her unobserved realization of residual luck, ℓ_i .
- However, in an equality measurement framework, we are interested in the opportunity set that is offered to a person with initial conditions (a, x, g) .
 - This opportunity set is the quantile function $Q(e|A = a, X = x, G = g)$.
 - This mathematical object that can be estimated from the available data.

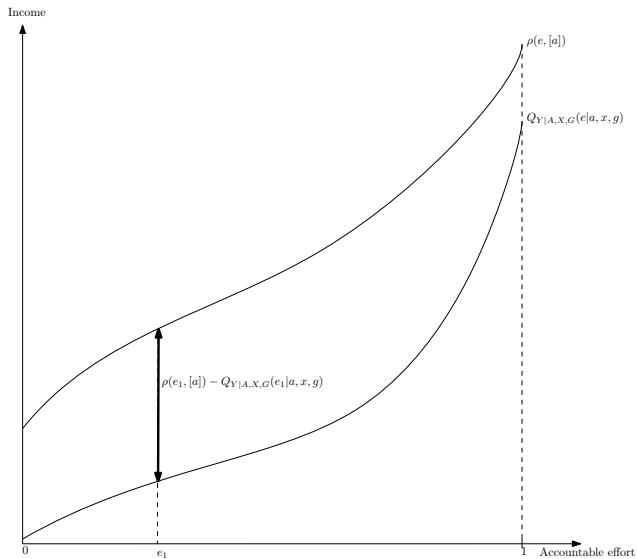
Measurement framework: what is inequality?

- The inequalities that are considered socially unfair, from an analyst's perspective taking an equal opportunity position, are the inequalities in the values of the conditional quantile function $Q_{Y|A,X,G}(e|a, x, g)$.
- The complaint of an individual, $\kappa(e, a, x, g)$, with initial circumstances (a, x, g) and an accountable effort level e is the relative difference between the reward to effort level e for individuals with initial circumstances (a, x, g) and the maximum reward to effort e for the age cohort $c = [a]$.
- The complaint of an individual, $\kappa(e, a, x, g)$, with initial circumstances (a, x, g) and an accountable effort level e is thus defined with respect to $\rho(e, c)$, the upper envelope of the different quantile functions corresponding to the age cohort $c = [a]$.

The upper envelope, $\rho(e, c)$



Defining the complaint at an accountable effort level e_1



Inequality of opportunity index

- The overall complaint associated with the initial circumstances (a, x, g) can be defined as a weighted sum

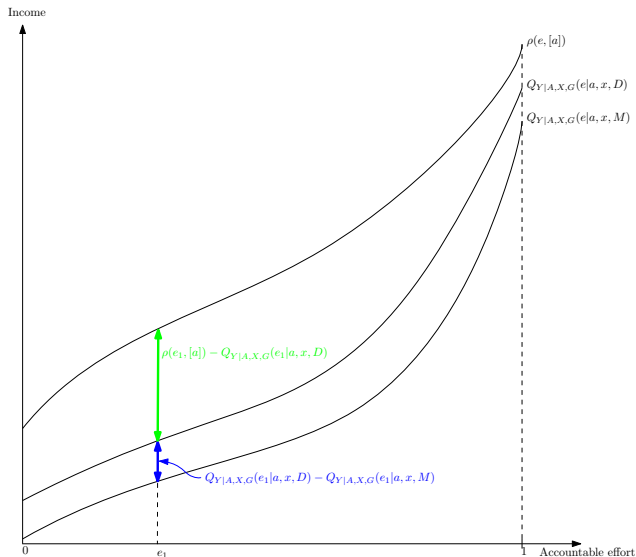
$$\tilde{\kappa}(a, x, g) = \int_0^1 \omega(e) \kappa(e, a, x, g) de,$$

- $\omega(e)$ is a social weight function related to complaints associated with an effort level e .
 - $\omega(e) \geq 0$ for all $e \in [0, 1]$
 - $\int_0^1 \omega(e) de = 1$
- An index of inequality of opportunity can thus be defined as an average of these complaints in the population

$$I(F_{Y,A,X,G}) = E[\tilde{\kappa}(a, x, g)] = \sum_{g \in \{D, M\}} Pr[G = g] \int_{\mathcal{X}} \tilde{\kappa}(a, x, g) dF_{A,X|G}(a, x|g).$$

- Ω := set of all opportunity inequality indices satisfying the above conditions.

Decomposition at an accountable effort level e_1



- An index of inequality of opportunity can be decomposed as:

$$I(F_{Y,A,X,G}) = I^{Strat}(F_{Y,A,X,G}) + I^{Class}(F_{Y,A,X,G})$$

- The contribution of identity-based stratification is given by

$$I^{Strat}(F_{Y,A,X,G}) = E[\tilde{\kappa}^{Strat}(a, x, g)]$$

- The contribution of social class at birth is given by

$$I^{Class}(F_{Y,A,X,G}) = E[\tilde{\kappa}^{Class}(a, x, g)]$$

- The complaint incidence contribution is given by

$$CI(e, F_{Y,A,X,G}) = E[\kappa(e, a, x, g) | E = e]$$

- The complaint incidence contribution due to stratification is given by

$$CI^{Strat}(e, F_{Y,A,X,G}) = E[\kappa^{Strat}(e, a, x, g) | E = e]$$

- The complaint incidence contribution due to social class at birth is given by

$$CI^{Class}(e, F_{Y,A,X,G}) = E[\kappa^{Class}(e, a, x, g) | E = e]$$

Theorem

$\Delta I(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1) \leq 0$ for all indices $I(\cdot) \in \Omega$ if and only if

$$CI(e, F_{Y,A,X,G}^1) - CI(e, F_{Y,A,X,G}^0) \leq 0 \quad \forall e \in [0, 1].$$

- We can derive similar results for $\Delta I^{Strat}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ and $\Delta I^{Class}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ using CI^{Strat} and CI^{Class} .

- There are two possible avenues for introducing additional ethical principles
- **Pro-poor view:** The analyst has a greater aversion to complaints at the lower end of the distribution of accountable effort.
 - The weight function $\omega(e)$ is then non-increasing.
 - $\Omega_P \subset \Omega$ is the set of all pro-poor opportunity inequality indices.
- **Meritocratic view:** The analyst has more aversion to complaints at the top of the accountable effort distribution
 - The weight function $\omega(e)$ is then non-decreasing.
 - $\Omega_M \subset \Omega$ is the set of all inequality indices of meritocratic opportunities.

- The pro-poor complaint concentration contribution is given by

$$CC_p(e, F_{Y,A,X,G}) = \int_0^e CI(s, F_{Y,A,X,G}) ds.$$

- $CC_p^{Strat}(e, F_{Y,A,X,G})$ and $CC_p^{Class}(e, F_{Y,A,X,G})$ are defined analogously.

- The meritocratic complaint concentration contribution is given by

$$CC_m(e, F_{Y,A,X,G}) = \int_e^1 CI(s, F_{Y,A,X,G}) ds.$$

- $CC_m^{Strat}(e, F_{Y,A,X,G})$ and $CC_m^{Class}(e, F_{Y,A,X,G})$ are defined analogously.

Theorem

$\Delta I(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1) \leq 0$ for all indices $I(\cdot) \in \Omega_P$ if and only if

$$CC_p(e, F_{Y,A,X,G}^1) - CC_p(e, F_{Y,A,X,G}^0) \leq 0 \quad \forall e \in [0, 1].$$

- We can derive similar results for $\Delta I^{Strat}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ and $\Delta I^{Class}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ using CC_p^{Strat} and CC_p^{Class} .

Theorem

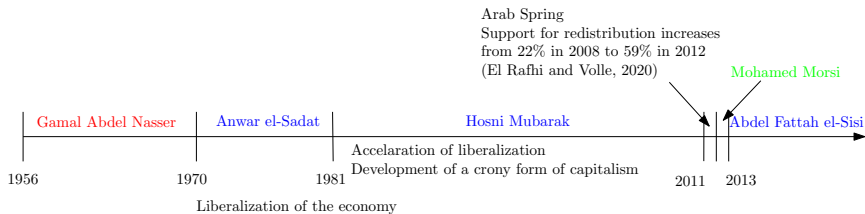
$\Delta I(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1) \leq 0$ for all indices $I(\cdot) \in \Omega_M$ if and only if

$$CC_m(e, F_{Y,A,X,G}^1) - CC_m(e, F_{Y,A,X,G}^0) \leq 0 \quad \forall e \in [0, 1].$$

- We can derive similar results for $\Delta I^{Strat}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ and $\Delta I^{Class}(F_{Y,A,X,G}^0, F_{Y,A,X,G}^1)$ using CC_m^{Strat} and CC_m^{Class} .

- The estimation approach we use in this paper is a distributional regression model à la Chernozhukov, Fernandez-Vál, and Melly (2013).
- Chernozhukov, Fernandez-Vál, and Melly (2013) have shown the validity of the exchangeable bootstrap for the model, its counterfactual and their smooth functionals, including Kolmogorov-Smirnov type of statistics.
- We adopt a testing procedure that builds on Schechtman, Shelef, Yitzhaki, and Zitikis (2008) and Khaled, Makdissi, and Yazbeck (2018). This testing procedure uses a directional version of a testing statistics akin to the Kolmogorov-Smirnov statistics.

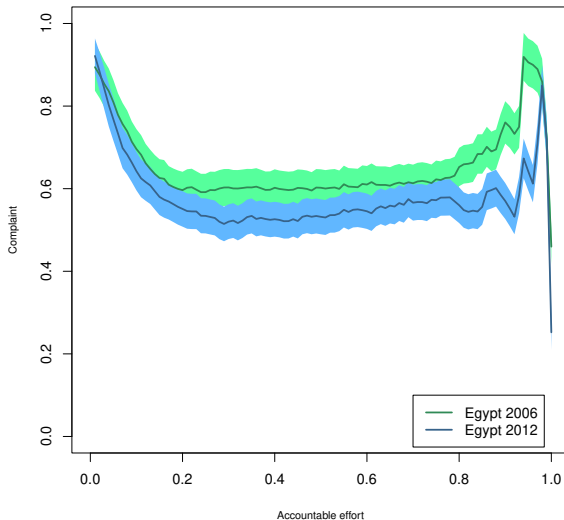
Egyptian context



- Our goal is to study the evolution of inequality of opportunity in Egypt. We also want to decompose this evolution into a component due to gender stratification and another due to social class at birth.
- We use the 1998, 2006, 2012, and 2018 cycles of the Egypt Labor Market Panel Survey (ELMPS).
- **Outcome variable:** labor income
- **Initial circumstances:** education of both parents, type of employment of the father, region of birth, year of birth (age), gender.

- The ELMPS has an explicit question about the individual's main work activity that includes a category of unpaid family worker. Women make up the majority of these workers who have a wage of 0.
- Labor economists studying the labor market in Egypt introduced the idea of an extended definition of employment that includes these unpaid employment activities (see Assaad and Kraft, 2015; Nazier and Ramadan, 2018). Since we are interested in stratification, this modeling choice allows us to include women in our analysis.
- We avoid modeling labor market participation in the 0s of our model because unemployment in Egypt is primarily a phenomenon of the privileged (Assaad, Krafft, Roemer, and Salehi-Isfahani, 2018).
- Including individuals who are not in the labor force and have zero labor income may distort the picture of inequality of opportunity for this developing country.

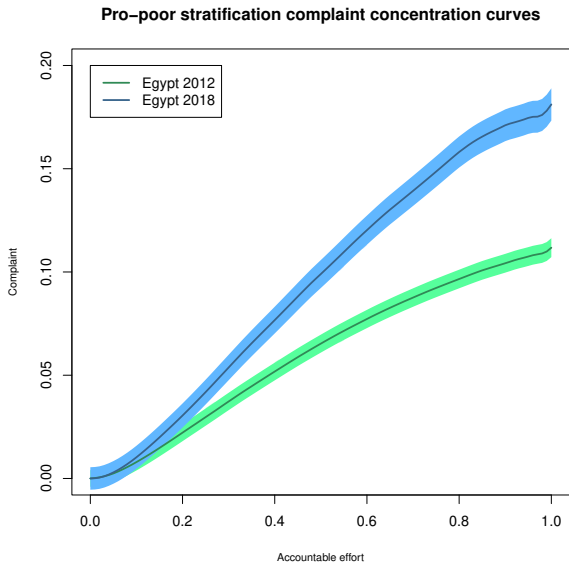
Complaint incidence curves



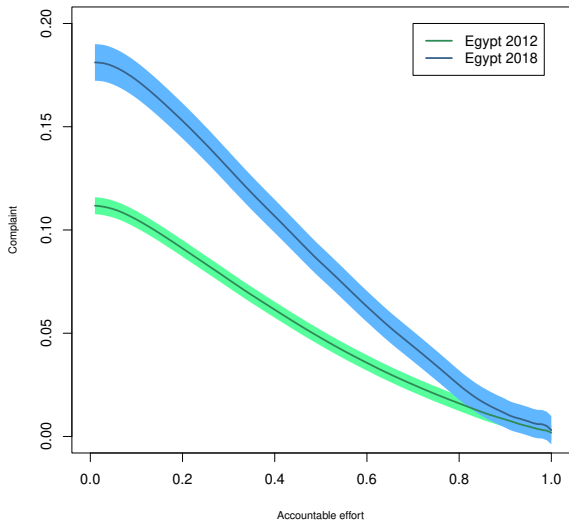
Changes in inequality of opportunity

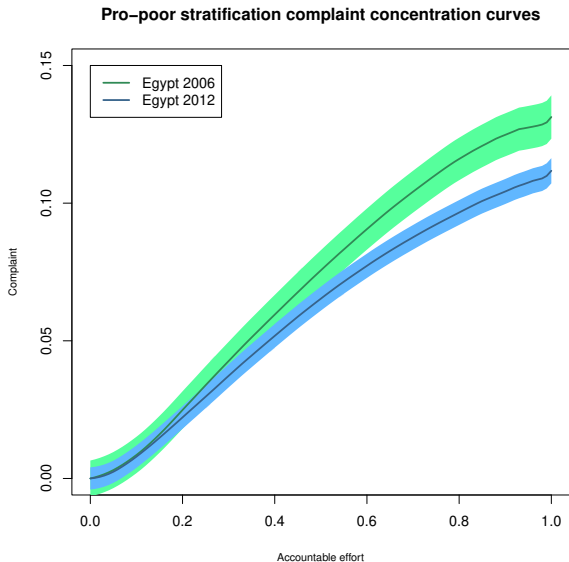
	2018	2012	2006	1998
2018	-	ND	Ω_P^{***} and Ω_M^{***}	Ω_P^{***} and Ω_M^{***}
2012	ND	-	Ω^{***}	Ω^{**} , Ω_P^{***} , and Ω_M^{***}
2006			-	ND
1998			ND	-

- The year in row dominates the year in column for the indicated index set.
- Year 1 dominates Year 2 means that there is less inequality of opportunity in Year 1 than in Year 2.

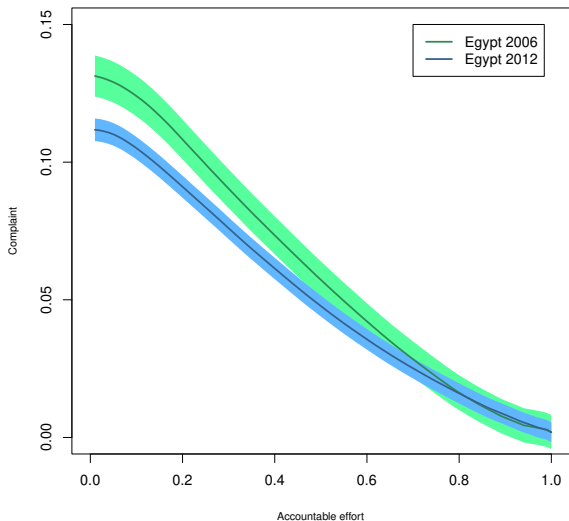


Meritocratic stratification complaint concentration curves



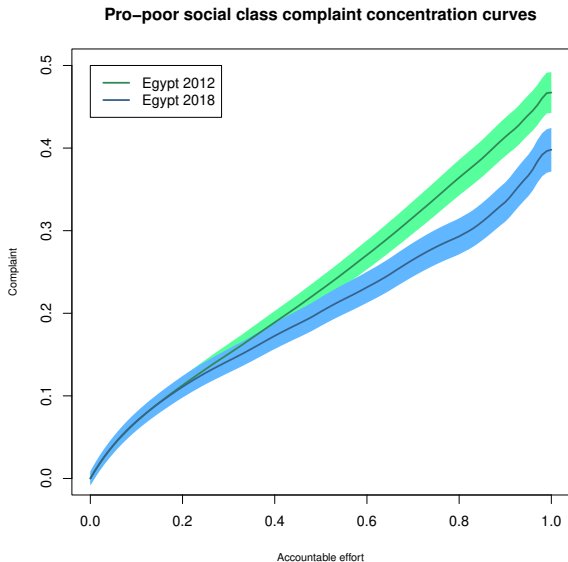


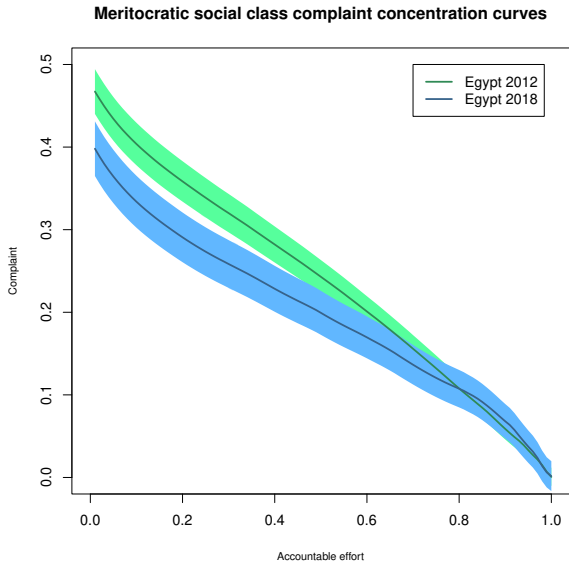
Meritocratic stratification complaint concentration curves



Stratification Dominance				
	2018	2012	2006	1998
2018	-			
2012	Ω_P^{***} and Ω_M^{***}	-	Ω_P^{**} and Ω_M^{**}	Ω_P^{**} and Ω_M^{**}
2006	Ω_P^{***} and Ω_M^{***}		-	ND
1998	Ω_P^{***} and Ω_M^{***}		ND	-

- The year in row dominates the year in column for the indicated index set.
- Year 1 dominates Year 2 means that there is less inequality of opportunity due to gender stratification in Year 1 than in Year 2.





Social Class Dominance				
	2018	2012	2006	1998
2018	-	Ω_P^{***} and Ω_M^{***}	Ω_P^{***} and Ω_M^{***}	Ω_P^{***} and Ω_M^{***}
2012		-	Ω_P^{**} and Ω_M^{**}	Ω_P^{**} and Ω_M^{**}
2006			-	ND
1998			ND	-

- The year in row dominates the year in column for the indicated index set.
- Year 1 dominates Year 2 means that there is less inequality of opportunity due to social class at birth in Year 1 than in Year 2.

Changes in inequality of opportunity for men

Men				
	2018	2012	2006	1998
2018	-	Ω_P^{***} and Ω_M^{***}	Ω_P^{***} and Ω_M^{***}	Ω_P^{***} and Ω_M^{***}
2012		-	Ω_P^{**} and Ω_M^{**}	Ω_P^{***} and Ω_M^{***}
2006			-	ND
1998			ND	-

- The year in row dominates the year in column for the indicated index set.
- Year 1 dominates Year 2 means that there is less inequality of opportunity in Year 1 than in Year 2.

Changes in inequality of opportunity for women

Women				
	2018	2012	2006	1998
2018	-			ND
2012	Ω^{***}	-	Ω^{***}	Ω^{**} , Ω_P^{***} , and Ω_M^{***}
2006	Ω_P^{**}		-	ND
1998	ND		ND	-

- The year in row dominates the year in column for the indicated index set.
- Year 1 dominates Year 2 means that there is less inequality of opportunity in Year 1 than in Year 2.

- We develop a framework for measuring inequality of opportunity using the definition of inequality of opportunity proposed by Roemer (1998) and the definition of complaint proposed by Temkins (1986)
- We show how this framework allows us to decompose these inequalities into a component due to social class at birth and another component due to stratification based on an identity marker. This provides a new measurement framework for identity stratification.
- We provide the dominance conditions for all inequality of opportunity indices. We also provide dominance conditions for pro-poor indices and meritocratic indices.
- We use the available econometric models to estimate the model and test the dominance conditions

- We offer an empirical application aiming at measuring the contribution of gender stratification to inequality of opportunity in Egypt between 1998 and 2006.
- This twenty-year period in Egypt is an interesting case because it witnessed uprisings related to the Arab Spring, and an increase in demand for more equity in the population.
- It is interesting to note that confronted with an increased demand for equality, empirical evidences seem to suggest that the social system adjusted by decreasing the burden of inequalities of opportunity for the dominant group, men, while increasing it for the marginalized group, women.
- The method we propose can be adapted to other contexts in which stratification is another identity marker.
- It can also be adapted to incorporate multiple identities and potentially assess the impact of intersectionality of discrimination.