

MERITOCRACY IN THE FACE OF GROUP INEQUALITY

Rajiv Sethi

Workshop on Reducing Inequality to Promote Social Justice

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Meritocracy and Representation

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Meritocracy in the Face of Group Inequality*

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The Meaning of Meritocracy

Standard conception of meritocracy in selection practices:

- (Strictly) increasing in measures of past performance (monotonicity)
- Contingent only on productive traits (group-blindness)

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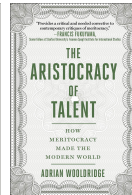
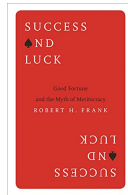
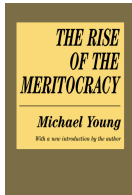
But past performance is a garbled signal and group-membership can be informative

- Under what conditions will monotonic and group-blind selection maximize performance?
- What is the structure of performance-maximizing policies more generally?
- Can a disadvantaged group be overrepresented if performance is the only goal?
- What are the effects of allowing for underreporting or underinvestment?
- What are the effects of allowing for commitment?

We do **not**...

... argue that meritocracy is a desirable **standard**

... or that it is approximated in **reality**



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John Adams: any elite, once formed, would entrench itself indefinitely: “**Aristocracy, like Waterfowl, dives for Ages and then rises with brighter Plumage. It is a subtle Venom that diffuses itself unseen, over Oceans and Continents, and triumphs over time... it is a Phoenix that rises again out of its own Ashes.**”

Three Recent Empirical Findings

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These findings make sense if the “meritocratic” benchmark is not performance-maximizing

Profiling versus Preferential Treatment

*A student who has, in some way, experienced hardship may underperform on achievement tests relative to his or her capability. By taking account of such empirically grounded differences across demographic groups, a district may be better able to determine which students are most suited to admission to the gifted program... While this **profiling** based on differences in distributions across racial groups is beneficial to minority students, **it is not preferential treatment**.*

Cestau, Epple, and Sieg (2017)

Overview

Suppose selection is based only on **expected performance** and

- Individuals differ along two dimensions: **ability** and **resources**
- Both ability and resources affect qualifications or **training**
- Training is **observable** (via a score) but ability and resources are not
- **Performance** depends on both ability and training
- So ability affects performance both **directly** and **indirectly**
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What is the optimal selection policy?

What if individuals can **underinvest** in training relative to potential?

What if **commitment** to a selection policy is possible?

A Discrete Case

Two groups, populations shares s_1 and s_2

Ability levels $\{a_l, a_h\}$, common ability distribution $F(a)$

Resource levels $\{r_l, r_h\}$, proportion with high resource in group i is q_i

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Performance $p = \phi(a, t)$ is increasing in both arguments

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Benchmark (no underinvestment): four training levels $t_{ij} = \tau(a_i, r_j)$ with

$$t_{ll} < t_{lh}, t_{hl} < t_{hh}$$

Monotonicity

Two types of monotonicity:

- **inference monotonicity** higher levels of training signal higher ability
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If $t_{lh} < t_{hl}$, inference and (hence) performance monotonicity hold

If $t_{lh} > t_{hl}$, inference monotonicity fails and performance monotonicity

- holds if $\phi(a_l, t_{lh}) > \phi(a_h, t_{hl})$;
- fails if $\phi(a_l, t_{lh}) < \phi(a_h, t_{hl})$

If performance monotonicity fails, selection is **non-monotonic** in training

An Example

Suppose that $t_{lh} > t_{hl}$ and $\phi(a_h, t_{hl}) > \phi(a_l, t_{lh})$, so performance monotonicity fails to hold

Population shares $s_1 = s_2 = 0.5$

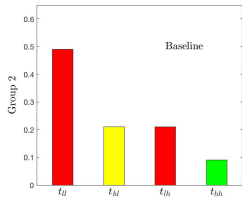
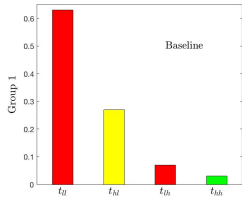
Ability distribution (common): $F(a_l) = 0.7$

Resource Distributions: $q_1 = 0.1, q_2 = 0.3$

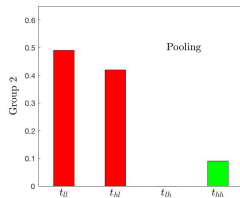
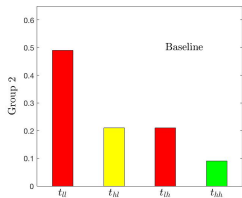
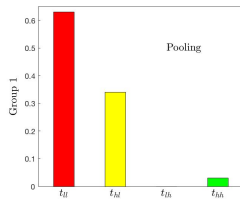
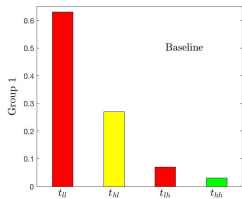
Elite Capacity $k = 10\%$

Performance-maximizing selection policy accepts all t_{hh} scores (6% of population)

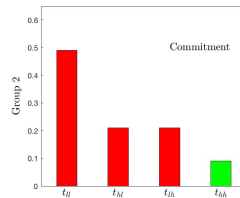
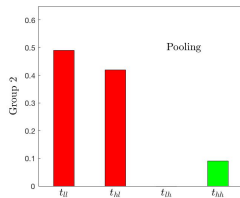
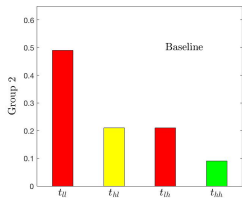
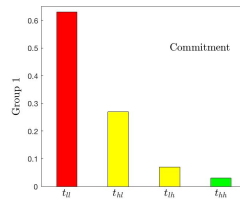
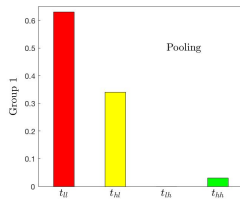
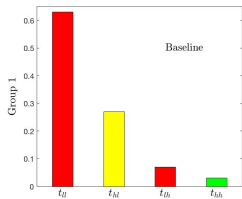
But how are the remainder selected?



Equal size groups, 30% high ability, 10% and 30% high resources, 10% elite capacity



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Comparing Regimes

Baseline:

- Selection is **non-monotonic** but (possibly) **group-blind**
- Disadvantaged group **underrepresented** under optimal group-blind selection

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- Disadvantaged group **underrepresented** under optimal group-blind selection

Pooling:

- Disadvantaged group **favored** under performance-maximization (55% of those selected)
- Selection effect overwhelms disadvantage

Commitment:

- Same individuals selected as under pooling
- No underinvestment, so average performance is **higher**

How general is this?

Notation

Let $\pi_i(t)$ denote **selection probability** conditional on training t for group i

Policy is (strictly) **monotonic** if $\pi_i(t) > 0$ implies $\pi_i(t') = 1$ for all $t' > t$

Policy is **group-blind** if $\pi_1(t) = \pi_2(t)$ at all t

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Define k_1 as proportion of population with high ability **and** resources:

$$k_1 = (1 - F(a_I))(s_1 q_1 + s_2 q_2)$$

and k_2 as proportion with high ability **or** resources

$$k_2 = 1 - F(a_I)(s_1(1 - q_1) + s_2(1 - q_2))$$

Conditions for Monotonicity and Group-Blindness

*If **performance monotonicity holds**, then there exists a monotonic and group-blind equilibrium*

*If **performance monotonicity fails** to hold, there is monotonic and group-blind equilibrium **if and only if** $k < k_1$ or $k > k_2$*

Under monotonic selection, **no incentive to underinvest** or underreport training

But no monotonic and group-blind equilibrium for **intermediate elite capacity**

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But no monotonic and group-blind equilibrium for **intermediate elite capacity**

What does equilibrium look like if $k \in (k_1, k_2)$?

Intermediate Elite Capacity

Define λ_i as **proportion with high ability** in group i among those with $t \in \{t_{hl}, t_{lh}\}$

$$\lambda_i = \frac{(1 - q_i)(1 - F(a_l))}{(1 - q_i)(1 - F(a_l)) + q_i F(a_l)}$$

If $q_1 < q_2$ then $\lambda_1 > \lambda_2$

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Suppose **performance monotonicity fails**, so $t_{hl} < t_{lh}$ and

$$\phi(a_h, t_{hl}) > \phi(a_l, t_{lh})$$

Then there exists $\mu \in (0, 1)$ such that

$$\mu\phi(a_h, t_{hl}) + (1 - \mu)\phi(a_l, t_{hl}) = \phi(a_l, t_{lh})$$

This is a **pool composition** such that **performance is equalized** across training levels

Equilibrium Possibilities 1

$$\lambda_1 > \lambda_2 > \mu$$

	$\pi(t_{ll})$	$\pi(t_{hl})$	$\pi(t_{hl})$	$\pi(t_{hh})$
Group 1	0	+	0	1
Group 2	0	0	0	1

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Group 1	0	1	0	1
Group 2	0	+	0	1

All underinvest in both groups, disadvantaged group favored

Equilibrium Possibilities 2

$$\lambda_1 > \mu > \lambda_2$$

	$\pi(t_{ll})$	$\pi(t_{hl})$	$\pi(t_{hl})$	$\pi(t_{hh})$
Group 1	0	+	0	1
Group 2	0	0	0	1

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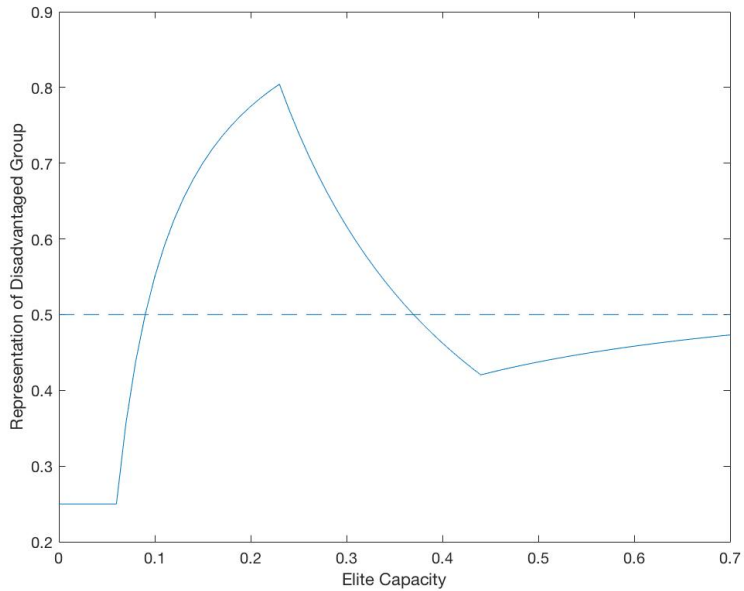
All underinvest in group 1, some in group 2, disadvantaged group favored

Equilibrium Possibilities 3

$$\mu > \lambda_1 > \lambda_2$$

	$\pi(t_{ll})$	$\pi(t_{hl})$	$\pi(t_{hl})$	$\pi(t_{hh})$
Group 1	0	+	+	1
Group 2	0	+	+	1

Some underinvest in both groups, selection is **group-blind** and **weakly monotonic**



Extensions

Commitment

- Underinvestment is **wasteful** since training is productive
- Can implement the same outcomes with **commitment** to weakly monotonic selection

Robustness

- Extensions to multiple ability and resource levels straightforward
- Qualitative results hold even with **continuous distributions**

Continuous Ability Distributions

Common ability distribution $F(a)$, density $f(a) > 0$, support $[0, 1]$

Benchmark case (no underinvestment): training $t = \tau(a, r)$

Define $\bar{t} = \tau(1, r_h)$ and $t^* = \tau(1, r_l)$; note $t^* < \bar{t}$

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Selection rule (deterministic): possibly group-contingent sets of training levels T_1 and T_2 to maximize expected performance subject to capacity constraint

Ability and Training

Given any t , define $\alpha_l(t)$ and $\alpha_h(t)$ implicitly by

$$t = \tau(\alpha_l, r_l)$$

and

$$t = \tau(\alpha_h, r_h)$$

Note: $\alpha_l(t) > \alpha_h(t)$, and both α_h and α_l are strictly increasing in t

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Selection set (T_1, T_2) that satisfies capacity constraint is an **allocation**

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Expected Performance

Let $\gamma_i(t)$ denote likelihood that individual in group i with training t has high resource access

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$$E(p_i|t) = \gamma_i(t)\phi(\alpha_h(t), t) + (1 - \gamma_i(t))\phi(\alpha_l(t), t)$$

Expected Performance

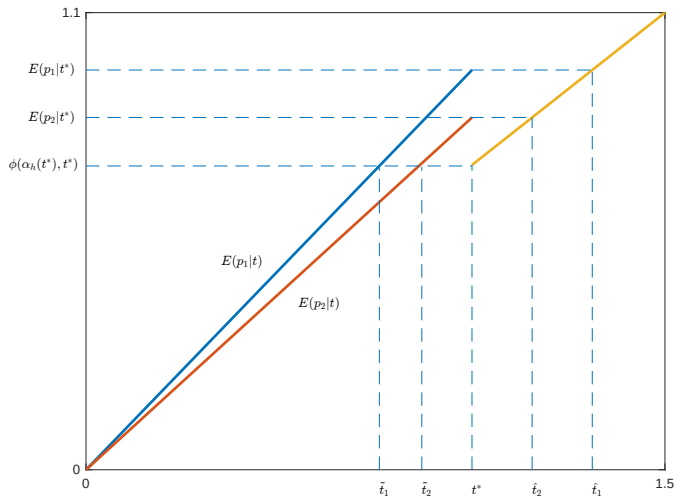
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For $t > t^*$ only high resource individuals are observed, so performance is increasing in t and identical across groups

For $t \leq t^*$ both resource levels are pooled, and there is some $t \leq t^*$ with higher expected performance than some $t' > t^*$



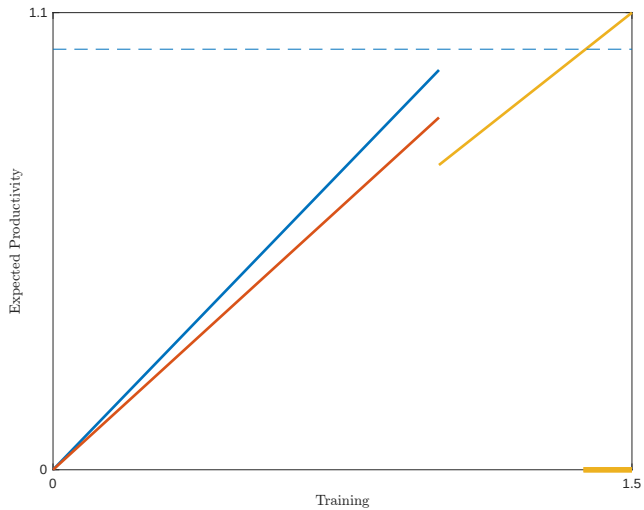
Uniform Ability and Linear Training and Performance Functions

Regimes

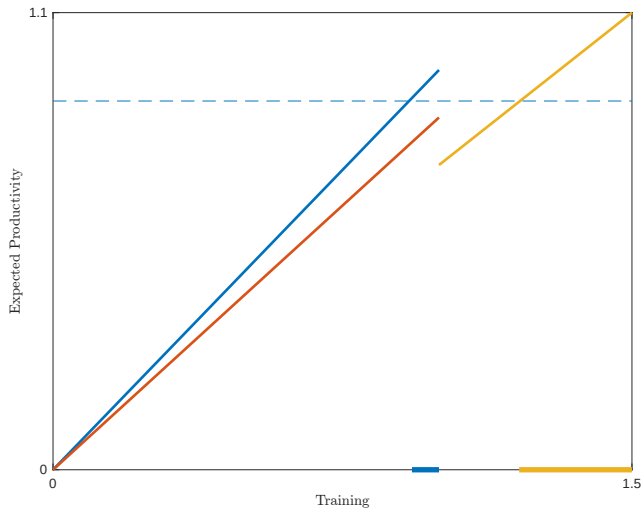
Performance-maximizing allocation must lie in one of four regimes

- For small k allocation is **monotonic and group-blind**
- For larger k **disadvantaged** group faces **non-monotonic** selection
- For even larger k , **both** groups face nonmonotonic selection
- For still larger k allocation is **monotonic** but not **group-blind**

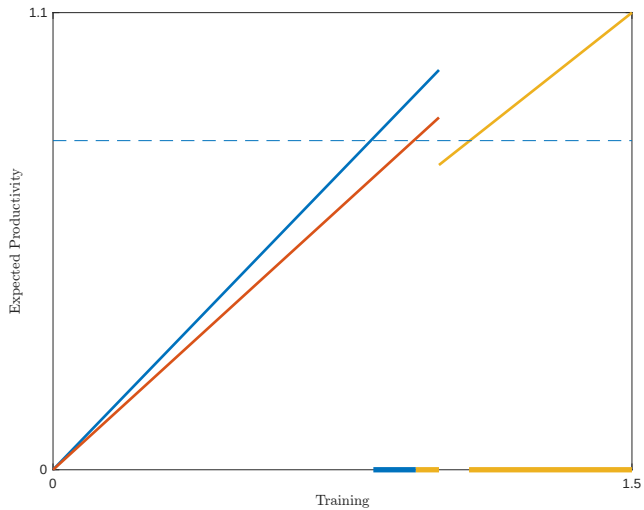
Standard for disadvantaged group **less restrictive** except in first regime



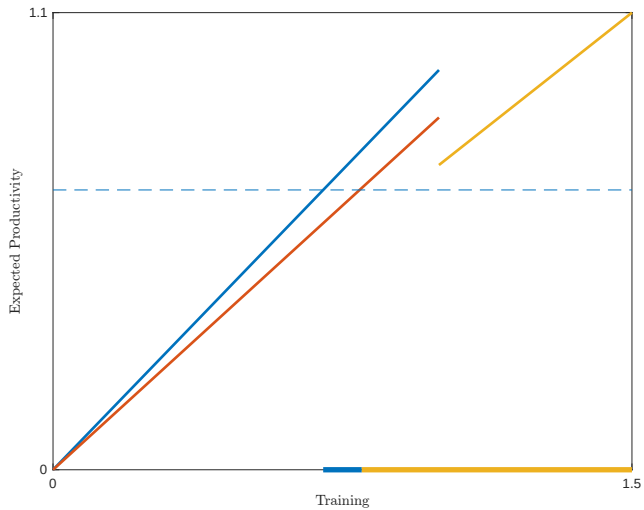
Regime 1: Monotonic and Group-Blind Selection



Regime 2: Nonmonotonic Selection for Disadvantaged Group



Regime 3: Nonmonotonic Selection for Both Groups



Regime 4: Monotonic (but not Group-Blind) Selection

Underrepresentation

Given any performance-maximizing allocation (T_1, T_2) , let ρ_i be defined

$$\rho_i = \frac{1}{k} \left(q_i \int_{A_h(T_i)} dF(a) + (1 - q_i) \int_{A_l(T_i)} dF(a) \right).$$

Measure of the degree to which group i is underrepresented

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Measure of the degree to which group i is underrepresented

Note: $\rho_1 = \rho_2 = 1$ if and only if the allocation is group egalitarian

Disadvantaged group is **underrepresented** if $\rho_1 < 1 < \rho_2$

Clearly disadvantaged underrepresented if allocation is **monotonic** and **group-blind**

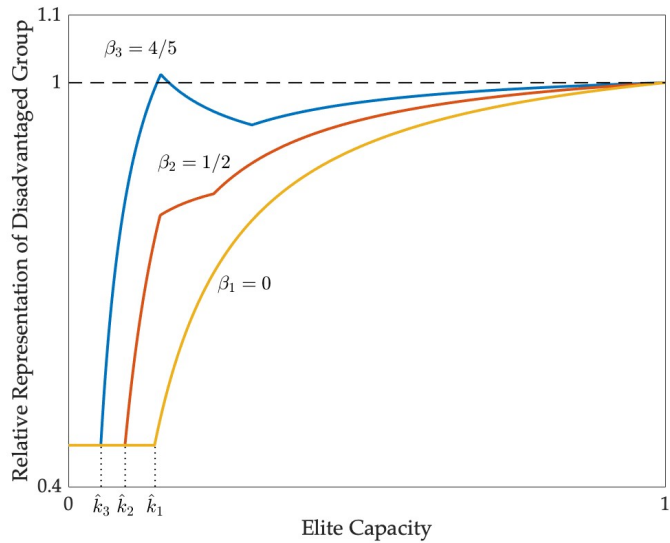
But is this true at all allocations?

Example

- Groups are of identical size
- Resource access: $q_1 = 1/5$, $q_2 = 2/3$
- Resource levels: $r_l = 1$, $r_h = 3/2$
- Training $t = ar$
- Uniformly distributed ability

Consider parametric specification for performance:

$$p = \phi(a, t) = \beta a + (1 - \beta)t.$$



Conclusions

Unconstrained allocations motivated by expected performance can exhibit

- Non-monotonic selection within groups
- Non-uniform selection across groups
- Less restrictive criteria for disadvantaged groups
- Overrepresentation of disadvantaged under certain conditions
- Imposing monotonicity and group-blindness can result in welfare losses
- Even greater than requiring statistical mirroring

Capacity constraint and importance of ability are key parameters

Conclusions

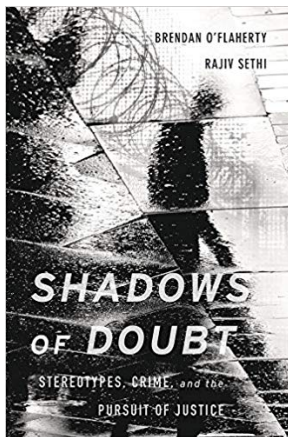
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Capacity constraint and importance of ability are key parameters

Usual framing of the trade-off between **performance** and **representativeness** is misleading

Resource differences make **identity informative** about ability and performance



<https://www.hup.harvard.edu/books/9780674976597>

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RAJIV SETHI
APR 12, 2024

Note to readers: I have used the LaTeX editing features of substack for the first time in the post below. If the displayed income distributions do not render correctly in your email message or browser please leave a comment to let me know and I'll avoid this in the future.

Over the past few years I have been working with a group of students at Barnard and Columbia on the development of interactive teaching resources for economics. I am thrilled to announce that Interactive Economics is now live and available for use worldwide without charge under a creative commons license.

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