The Inheritance of Advantage

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Summary

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“We know all men are not created equal in the sense some people would have us believe - Some people are smarter than others, some people have more opportunity because they’re born with it, some men make more money than others, some ladies make better cakes than others - some men are born gifted beyond the normal scope of most men.”

Atticus Finch, To Kill a Mockingbird (Harper Lee, 1960)
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• We want to:
  • model process by which some have more opportunity than others.
  • going “beyond” capital market imperfections
1. The correlation of inequality and intergenerational mobility and the joint distribution of income and talent:

- Assume that income is good for talent:
  - Imagine some sort of capital market imperfections.
  - Provision of private education, etc...
- Observable (with noise) whether the parents of kids are rich.
- Thus, you can use the income of the parents to infer the talent of kids.
  - Statistical Discrimination.
- More inequality implies more differences in talent between the children of rich and poor.
- Thus, more statistical discrimination.
- Which feeds back into:
  - Further income inequalities,
  - Lower intergenerational mobility.
  - Possible multiplicity.
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2. Possible **perverse effects of meritocracy**:

- If firms are better at judging talent of individuals, more inequality.
- which feeds back into more statistical discrimination...
- More inequality and less mobility
Motivation (1/2)

- Big negative correlation across countries Inequality-Mobility: Corak’s “Great Gatsby” Curve.

![Graph showing correlation between Inequality (Gini Coefficient) and Intergenerational Earnings Elasticity across countries.]
• In developed countries with relatively large inequality (and low mobility) there are very meritocratic institutions:
  
  • UK: Oxbridge...
  
  • US: Ivy League...

• While in very equal (and mobile, and rich) countries these institutions are way less prominent:
  
  • Sweden, Norway, Finland, Germany, Denmark
Firms will react to a signal on the parental income of a worker.

Relevant because talent is a function of parental income and luck
  role played by parental income is governed by $\alpha$.

$$\tau = \alpha (y_{-1} - \bar{y}_{-1}) + \epsilon_{\tau}$$  \hspace{1cm} (1)

- $\tau$ is a worker's talent,
- $y_{-1}$ is his parent's income,
- $\bar{y}_{-1}$ is the mean of parental income, and
- Tournament component
- $\epsilon_{\tau} \sim N \left(0, \frac{\sigma^2_{\epsilon_{\tau}}}{\bar{y}_{-1}}\right)$.

Firms pay wages according to their belief about agent's talent.
Takes expectations of talent, conditional on available information:

$$E (\tau | \theta_1) = \alpha E \left(y_{-1} - \bar{y}_{-1} | \theta_1\right) + E (\epsilon_{\tau} | \theta_1)$$  \hspace{1cm} (2)
First we will assume that firms do not observe any signal on $\tau$.

- $\theta_1$ is the **information available** to a firm, two elements:
  - **Prior**: Information on distribution of income in parents’ generation;
  - $s_1$, a **signal** on $y_{-1}$ given by,
    \[ s_1 = y_{-1} + \epsilon_{s_1}; \quad \epsilon_{s_1} \sim N(0, \sigma_{\epsilon s_1}^2) \]  
    (3)
  - Thus, beliefs on a person’s talent depend on the signal on their parent’s income:
    \[ E(\tau|\theta_1) = \frac{\alpha \sigma_{y_{-1}}^2}{\sigma_{y_{-1}}^2 + \sigma_{\epsilon s_1}^2} \times (s_1 - \bar{s}_1) \]  
    (4)
  - Coefficient of **regression of the signal on talent**.
  - times the value of signal.
Model I Set up (3/7)

\[ E(\tau|\theta_1) = \frac{\alpha \sigma^2_{y-1}}{\sigma^2_{y-1} + \sigma^2_{e s_1}} \times (s_1 - \bar{s}_1) \]

- If \( \sigma^2_{y-1} \uparrow \),
  - prior gives little information,
    - as people can be very different from each other.
  - Use signal more to determine posterior.
  - Thus, to determine talent.

- If all parents have equal income, \( \sigma^2_{y-1} = 0 \).
  - Signal is irrelevant.

- It is so simple because of conjugate normal distributions.
Our point is that $\sigma^2_y$ is endogenous:

- Income equals the belief about an individual’s talent,
  \[ y = E(\tau|\theta_1) = \beta_1(s_1 - \bar{s}_1) \tag{5} \]
- No further learning on talent (not important)
- Equilibrium $\beta_1$, is such that this is the optimal reaction.
  - $\beta_1$ depends and causes $\sigma^2_y$
    - ↑ $\beta_1$ more income variance from any given signal distribution.
    - ↑ $\sigma^2_y$ more value into signal relative to prior
• In steady state: $\sigma_y^2 = \sigma_{y-1}^2$. Given $\beta_1$, $\sigma_y^2$ is a function of $\beta_1$

$$
\sigma_y^2(\beta_1) = \begin{cases} 
\frac{\beta_1^2\sigma_{\epsilon_1}^2}{1-\beta_1^2} & \text{if } \beta_1 < 1 \\
\infty & \text{if } \beta_1 \geq 1
\end{cases}
$$

• From before:

$$
\beta_1 = \frac{\alpha \sigma_y^2}{\sigma_y^2 + \sigma_{\epsilon_1}^2}
$$

• Steady state is thus a matter of finding a fixed point.

$$
\beta_1 = F(\sigma_y^2(\beta_1)) = \frac{\alpha \sigma_y^2(\beta_1)}{\sigma_y^2(\beta_1) + \sigma_{\epsilon_1}^2} = \begin{cases} 
\alpha \beta_1^2 & \text{if } \beta_1 < 1 \\
\alpha & \text{if } \beta_1 \geq 1
\end{cases}
$$
• $\alpha < 1 \implies \beta_1 = \sigma_y^2 = 0$
  • Talent is just luck
  • Equal incomes
• $\alpha > 1$

• Three SS
  • stable SS with $\sigma_y^2 = 0, \beta_1 = 0$.
  • stable SS with $\sigma_y^2 \to \infty, \beta_1 = \alpha$. 
Feed-Back Mechanism (1/2)

- If talent depends on parents income, **more inequality** means that you care more about the signal

- Which makes people **incomes more different**, because they have an extra meaningful dimension in which they differ.

- If $\downarrow \sigma_y^2$, you do not care about the signal because
  - They are similar, anyway
  - But also because the **signal is KNOWN to be UNINFORMATIVE**

- If $\uparrow \sigma_y^2$, you want to use the signal because
  - They are different
  - And the **signal IS INFORMATIVE**
More inequality

more dispersion of talent

more value on the signals, $\beta_1$

More dispersion of incomes

The existence of people that are rich gives advantages to their children that go beyond their abilities.
The Curse of Meritocracy I (1/5)

- Next we want to consider a signal on talent given by:

\[ s_2 = \tau + \epsilon_{s_2}; \quad \epsilon_{s_2} \sim N(0, \sigma_{\epsilon_{s_2}}^2) \]  

(6)

- This replaces our original signal.

- An improvement in meritocracy is modelled as \( \downarrow \sigma_{\epsilon_{s_2}}^2 \)

- \( \theta_2 \) denotes the new information set of the firm. It has 2 elements:
  - the prior
  - the new signal

- With this new information set, beliefs on an individual’s talent depend on the value of the signal on talent:

\[ E(\tau|\theta_2) = \frac{\alpha^2 \sigma_{y-1}^2 + \sigma_{\epsilon \tau}^2}{\alpha^2 \sigma_{y-1}^2 + \sigma_{\epsilon \tau}^2 + \sigma_{\epsilon_{s_2}}^2} \times s_2 \]  

(7)
• As before, income equals beliefs about an individual’s talent,

\[ y = E(\tau|\theta_2) = \beta_2 s_2 \]  \hspace{1cm} (8)

• We will find value(s) of \( \beta_2 \) such that this holds . . .

• We find:

  1. The feedback mechanism, again

  2. (Part of) the **curse of meritocracy**
Steady States

- there are a maximum of 3 SS
- all 3 exist when $1 < \alpha < \alpha^*$ and $\sigma_{\epsilon \tau}^2 < \sigma_{\epsilon s}^2$
Feedback

More inequality

more dispersion of talent

more dispersion of signals

more value on the signals, $\uparrow \beta_2$

More dispersion of incomes
• Steady state intergenerational correlation of incomes is given by,

\[ \rho_{y,y_{-1}} = \begin{cases} \alpha \beta_2 & \text{if } \beta_2 < \frac{1}{\alpha} \\ 1 & \text{if } \beta_2 \geq \frac{1}{\alpha} \end{cases} \]

\[ \downarrow \sigma^2_{\epsilon_2} \Rightarrow \uparrow \beta_2 \Rightarrow \uparrow \rho_{y,y_{-1}} \]

Increase meritocracy \implies \text{firms better at picking talent} \implies \text{talented likely to have rich parents} \implies \text{Decrease mobility}

• An INCREASE in meritocracy leads to a DECREASE in mobility
• We put back in the signal on parent’s income ($s_1$)

• This will make the curse of meritocracy **worse** because:
  
  • firms better at picking out the talented
    • who will increasingly be from rich backgrounds
  
  • **AND** firms will use MORE the signal on parent’s income.
• Firms now have a larger information set, $\theta'$:
  • the prior
  • the signal on parent’s income ($s_1$)
  • the signal on talent ($s_2$)

• Beliefs about an individual’s talent are linear combination of both signals,

\[
E(\tau|\theta') = \frac{\alpha \sigma_{\varepsilon s_2}^2 \sigma_y^2}{\alpha^2 \sigma_y^2 \sigma_{\varepsilon s_1}^2 + (\sigma_{\varepsilon \tau}^2 + \sigma_{\varepsilon s_2}^2) (\sigma_y^2 + \sigma_{\varepsilon s_1}^2)} (s_1 - \bar{s}_1)
\]  

\[
+ \frac{\alpha^2 \sigma_y^2 \sigma_{\varepsilon s_1}^2 + \sigma_{\varepsilon \tau}^2 (\sigma_y^2 + \sigma_{\varepsilon s_1}^2)}{\alpha^2 \sigma_y^2 \sigma_{\varepsilon s_1}^2 + (\sigma_{\varepsilon \tau}^2 + \sigma_{\varepsilon s_2}^2) (\sigma_y^2 + \sigma_{\varepsilon s_1}^2)} s_2
\]  

(9)

(10)

• And people are still paid according to their expected talent:

\[
y = E(\tau|\theta') = \beta_1 (s_1 - \bar{s}_1) + \beta_2 s_2
\]  

(11)
• To find the solution(s) for $\beta_1$ and $\beta_2$:

1. Fix $\beta_2$, to find solution(s) for $\beta_1$
   • do this for all possible values of $\beta_2$
   • chosen values of $\beta_1$ as a function of an exogenously imposed $\beta_2$
   • We’ll call this $\hat{\beta}_1$

2. Fix $\beta_1$, to find solution(s) for $\beta_2$
   • do this for all possible values of $\beta_1$
   • chosen values of $\beta_2$ as a function of an exogenously imposed $\beta_1$
   • We’ll call this $\hat{\beta}_2$

3. When the two correspondences cross, we have a solution $(\beta_1, \beta_2)$

• There are again a maximum of 3 SS: 2 stable and 1 unstable
The Curse of Meritocracy II (4/7)
As a function of $\beta_1$ and $\beta_2$:

$$
\rho_{y,y-1} = \begin{cases} 
\beta_1 + \alpha \beta_2 & \text{if } \beta_1 + \alpha \beta_2 < 1 \\
1 & \text{if } \beta_1 + \alpha \beta_2 \geq 1
\end{cases}
$$

$$
\sigma_y^2 = \frac{\beta_1^2 \sigma_{\epsilon s_1}^2 + \beta_2^2 \left( \sigma_{\epsilon s_2}^2 + \sigma_{\epsilon \tau}^2 \right)}{1 - (\beta_1 + \alpha \beta_2)^2}
$$

- Unfortunately, the expressions for $\beta_1$ and $\beta_2$ are too complicated.
  - We got implicit solution, but meaningless

- Next, we did a numerical analysis to see how the finite variance stable steady state moved as $\sigma_{\epsilon s_2}^2$ falls.
Increase in meritocracy ($\downarrow \sigma_{\epsilon s^2}^2$)

- There are two forces at work:

  1. Given $\beta_1$ and $\beta_2$, decrease noise $\Rightarrow$ decrease variance.

  2. but $\beta_1$ and $\beta_2$ adjust endogenously.
     - $\beta_2$ necessarily increases for a fixed $\sigma_y^2$.
     - $\Rightarrow$ increases variance $\Rightarrow$ increases $\beta_1$ $\Rightarrow$ ...

- Whenever there is multiplicity (high $\alpha$), in the low variance SS:

  - Both $\uparrow \beta_1$ and $\uparrow \beta_2$
  - More use of both signals
  - Decrease mobility.
  - Increase inequality virtually always.
The Curse of Meritocracy II (7/7)

- More Meritocracy
- More use of Signal on Talent
- More inequality
- More use on signal on parents income
- More inheritance of advantages
- Less Mobility
Model II Set up

Model with finite income variance in all steady states.

- Two values of talent, $\tau \in \{0, 1\}$
  - **Inheritance**: $P(\tau = 1)$ larger if $y_{t-1} > \mu$:
  - More likely to be talented if rich parents.

- Signal on parent’s income: $s_1 \in \{0, 1\}$
  - **Advantage**: $P(s_1 = 1)$ larger if $y_{t-1} > (1 + \lambda)\mu$:
  - More likely to look rich if you got rich parents.

- Signal on talent: $s_2 \in \{0, 1\}$
  - **Meritocracy**: $P(s_2 = 1)$ larger if $\tau = 1$
  - More likely to look clever if you are clever.

- Firms observe 4 possible types:
  - $(s_1, s_2) \in \{(0, 0), (0, 1), (1, 0), (1, 1)\}$
The feedback mechanism

- No $s_2$
- $s_1$ used only if differential probability.
- Two equilibria.
The curse of meritocracy: Part 1

- Look at the evolution of low variance equilibrium as the quality of $s_2$ increases.
- As the quality of $s_2$ increases, firms use it more in their income choices.
- **Meritocracy**: Richer people, people with more talent
  - **Inheritance**: Their children also get more talent.
- **No Advantage**: If the income difference is not high enough, $s_1$ is not used, as both (rich and poor) have the same probability of having it.
The curse of meritocracy: Part 2

- **Advantage**: Eventually those with \( s_2 = 1 \) will be paid so much that their kids are:
  - more likely to be talented
  - more likely to have \( s_1 = 1 \)

- Thus, income conditional on parents income too.
  - Less mobility and more inequality.
In our model, inequality leads to discrimination (heavier use of signals) because:
- people are more different
- signals are of better quality

Discrimination feeds back into inequality
- via inheritance

Meritocracy leads to inequality
- via inheritance

and vice versa
- because by being more different signals are more valuable.

Thus, meritocracy leads to discrimination
Conclusions (2/3)

- Multiplier effect of inheritance via signaling:
  - Creates negative correlation inequality-mobility
    - “Great Gatsby” curve.
  - May lead to multiplicity

- Meritocracy reduces mobility if inheritance is prevalent

- Meritocracy increases discrimination if inheritance is prevalent.
So what?

- **Policy**: if you want to increase mobility,
  - decrease $\alpha$
  - do not decrease $\sigma_{\varepsilon s_2}$
  - You will decrease inequality too

- **Early intervention versus university**.
  - If early intervention is decreasing $\alpha$
  - But universities are an Spence (screening) device

- **Endogenizing the joint distribution of talent and advantages.**
  - Models of misallocation
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