Hope, Noise, and the Efficiency of Perfect Meritocracy

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Outline

- Introduction
- Our Contribution
- Theoretical Approach
- Main Results
- Conclusions

Meritocracy

"The idea of meritocracy may have many virtues, but clarity is not one of them" (Sen, 2000).

The debate on the real meaning of meritocracy is entwined with the concept of (distributive) justice.

This paper does not focus on the relationship between justice and meritocracy. We look at **efficiency** and **welfare** (from a utilitarian point of view).

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Our paper

We consider:

1. Two steps in the working life of an individual, recruitment and career advancement.
2. We assume that in the first step, there is asymmetric information between the employer and the worker on the exact level of talent of the latter.
3. We compare two alternative scenarios: perfect meritocracy in career advancements and a "noisy" process, in which less productive workers may get a promotion
4. Under some conditions, noise is better than perfect meritocracy both in terms of total output and from a utilitarian welfare approach.
5. Some additional Rawlsian implications.

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Main Intuition

Two competing effects:

1. **Hope Effect** Less talented and productive workers may provide more effort in a noisy environment, raising aggregate output and welfare.
2. **Misallocation Effect** Noise implies more skilled and productive workers do not get the job they "deserve".

If the disutility of effort is not too large, the first effect wins, implying larger output and welfare under a "noisy" scenario.

The Model

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L of individuals, each one born with talent $s_i \in [s_1, s_2, ..., s_I]$.

A discrete distribution of job positions ranked in terms of their TFP $a_j \in [a_1, a_2, ..., a_J]$. For simplicity $I = J$.

Recruitment: For asymmetric information, workers with s_i may find themselves in a job with a_j, j taking values i, $i + 1$, and $i - 1$.

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L_j = workers employed in the job position with productivity a_j.

$\gamma_{i=j-1} \cdot L_j$ = are the (slightly) under qualified workers.

$\gamma_{i=j} \cdot L_j$ = the qualified workers.

$\gamma_{i=j+1} \cdot L_j$ = the (slightly) over-qualified workers.

We assume that $\gamma_{i=j-1} \approx \gamma_{i=j+1}$ and $\gamma_{i=j-1} + \gamma_{i=j+1} < 0.5$

The Model (Preferences and Career Advancements)

Linear utility function. Any worker is aware that can be promoted and pass to a job position with a higher total factor productivity a_{j+1}, thereby consuming a larger amount of output.

A necessary (but not sufficient) condition to get a promotion is to exert some extra effort $e_h > 1$ that, however, also implies a certain level of disutility d.

The Model (Preferences and Career Advancements)

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Utility Functions

$$a_{j+1}\, s_i\, e_h \;-\; d \;>\; a_j\, s_i \;>\; a_j\, s_i\, e_h \;-\; d$$

for any $a_j \in [a_1, a_2, ..., a_{J-1}]$ and $i \in [j-1,\; j,\; j+1]$.

Production Functions

Either

$$y_i \;=\; a_j s_i \quad \text{with } i \in [\,j-1,\, j,\, j+1\,]$$

Or

$$y_i \;=\; a_j s_i e_h \quad \text{with } i \in [\,j-1,\, j,\, j+1\,]$$

The Model (Labour Market Flows)

Model developed in steady state:

- An exogenous fraction δ of workers in positions with productivity a_j retire.
- A fraction α of such replacements occurs via a job promotion.
- A fraction $1-\alpha$ of such replacements via new workers entering the labour market.

$$\delta L_J = \alpha\delta L_J + (1-\alpha)\delta L_J$$
$$\delta L_{J-1} + \alpha\delta L_J = \alpha\delta(L_{J-1} + \alpha L_J) + (1-\alpha)\delta(L_{J-1} + \alpha L_J)$$

Solving recursively, promotions from position j to position $j+1$ are equal to:

$$P_{j+1} = \alpha\,\delta \sum_{x=1}^{J-j} \alpha^{x-1} \cdot L_{j+x}$$

Perfect Meritocracy in Career Advancements

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You have a chance to get promotion only if workers with higher productivity in your same job position do not exert e_h.

For workers with $s_{i=j+1}$ that exert extra effort e_h this probability is equal to:

$$\mathbb{P}^{j+1}_{i=j+1} = \frac{P_{j+1}}{\gamma_{i=j+1} \cdot L_j}; \quad \text{with } \mathbb{P}^{j+1}_{i=j+1} = \text{probability promotion to position } j+1.$$

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For workers with $s_{i=j}$ that exert extra effort e_h:

$$\mathbb{P}^{j+1}_{i=j} = \frac{P_{j+1}}{\gamma_{i=j} L_j} \iff \text{workers with } s_{i=j+1} \text{ NO } e_h. \quad \mathbb{P}^{j+1}_{i=j} = 0 \text{ otherwise.}$$

For workers with $s_{i=j-1}$ that exert extra effort e_h :

$$\mathbb{P}^{j+1}_{i=j-1} = \frac{P_{j+1}}{\gamma_{i=j-1} L_j} \iff \text{those with } s_{i=j} \text{ and } s_{i=j+1} \text{ NO } e_h. \; \mathbb{P}^{j+1}_{i=j-1} = 0 \text{ otherwise.}$$

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Perfect Meritocracy in Career Advancements: Nash equilibrium

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Two alternative Nash equilibria:

1. If and only if

$$d \; > \; s_{i=j+1} \cdot \left[\mathbb{P}_{i=j+1}^{j+1} \cdot e_h (a_{j+1} - a_j) \; + \; a_j (e_h - 1) \right]$$

   at the equilibrium **no worker exerts any extra effort** e_h.

2. If and only if

$$d \; < \; s_{i=j+1} \cdot \left[\mathbb{P}_{i=j+1}^{j+1} \cdot e_h (a_{j+1} - a_j) \; + \; a_j (e_h - 1) \right]$$

   at the equilibrium **workers with talent** $s_{i=j+1}$ **exert extra effort** e_h**, while the remaining workers do not put any extra effort**.

Noise in Career Advancements

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Add a noise ϵ: the probability that employers do not distinguish between the output produced by workers with skill s_i (equal to $a_j\, s_{i=j}\, e_h$) and that produced by workers with skill s_{i+1} (equal to $a_j\, s_{i=j+1}\, e_h$).

In this case, $(\gamma_{i=j+1} + \gamma_{i=j}) \cdot L_j$ workers may aspire to a promotion, conditional on all putting extra effort e_h.

So, if an error with probability ϵ occurs, the individual chances for a career advancement become:

$$\mathbb{P}^{j+1}_{i=j\,\cup\, i=j+1} \;\equiv\; \frac{P_{\epsilon,\, j+1}}{(\gamma_{i=j+1} + \gamma_{i=j}) \cdot L_j}$$

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Noisy Scenario: Best response strategies.

Workers with $s_{i=j}$ choose e_h if workers with talent $s_{i=j+1}$ choose e_h if and only if

$$\epsilon \cdot \mathbb{P}^{j+1}_{i=j \cup i=j+1} \cdot (a_{j+1}\, s_{i=j}\, e_h - d) + \left(1 - \epsilon \cdot \mathbb{P}^{j+1}_{i=j \cup i=j+1}\right) \cdot (a_j\, s_{i=j}\, e_h - d) > a_j\, s_{i=j}$$

Workers with $s_{i=j+1}$ choose e_h if workers with talent $s_{i=j}$ choose e_h if and only if

$$\left[\epsilon \cdot \mathbb{P}^{j+1}_{i=j \cup i=j+1} + (1-\epsilon) \cdot \mathbb{P}^{j+1}_{\epsilon,\, i=j+1}\right] \cdot (a_{j+1}\, s_{i=j+1}\, e_h - d) + \left[1 - \left(\epsilon \cdot \mathbb{P}^{j+1}_{i=j \cup i=j+1} + (1-\epsilon) \cdot \mathbb{P}^{j+1}_{\epsilon,\, i=j+1}\right)\right] \cdot (a_j\, s_{i=j+1}\, e_h - d) > a_j\, s_{i=j+1}$$

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$$+ \; \left[1 - \left(\epsilon \cdot \mathbb{P}^{j+1}_{i=j \cup i=j+1} + (1-\epsilon) \cdot \mathbb{P}^{j+1}_{\epsilon,\, i=j+1}\right)\right] \cdot (a_j\, s_{i=j+1}\, e_h - d) > a_j\, s_{i=j+1}$$

Noisy Scenario: Nash Equilibria

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Three alternative Nash equilibria.

1. If and only if

$$d \;>\; s_{i=j+1} \cdot \left[\mathbb{P}^{j+1}_{\epsilon,\, i=j+1} \cdot e_h(a_{j+1} - a_j) \;+\; a_j(e_h - 1)\right]$$

   at the equilibrium no worker exerts any extra effort e_h

2. If and only if

$$s_{i=j}\left[\epsilon\, \mathbb{P}^{j+1}_{i=j\,\cup\, i=j+1} \cdot e_h(a_{j+1} - a_j) + a_j(e_h - 1)\right] < d < s_{i=j+1}\left[\mathbb{P}^{j+1}_{\epsilon,\, i=j+1} e_h(a_{j+1} - a_j) + a_j(e_h - 1)\right]$$

   at the equilibrium only workers with talent $s_{i=j+1}$ choose e_h.

3. If and only if

$$d < s_{i=j} \cdot \left[\epsilon\, \mathbb{P}^{j+1}_{i=j\,\cup\, i=j+1} \cdot e_h(a_{j+1} - a_j) + a_j(e_h - 1)\right]$$

   both workers with talent $s_{i=j+1}$ and workers with talent $s_{i=j}$ choose e_h

Output

Perfect meritocracy equilibrium where only workers with talent $s_{i=j+1}$ exert extra effort:

$$Y_i = \gamma_i s_i \left\{ L_{j=i} a_{j=i} + L_{j=i+1} a_{j=i+1} + L_{j=i-1} e_h \left[\mathbb{P}_i^{j=i} a_{j=i} + \left(1 - \mathbb{P}_i^{j=i}\right) a_{j=i-1} \right] \right\}$$

Noisy equilibrium where workers with talents $s_{i=j+1}$ and $s_{i=j+1}$ choose e_h:

$$Y_{\epsilon,\, i} = \gamma_i s_i \{ L_{j=i+1} a_{j=i+1} + L_{j=i} e_h \cdot \left[\epsilon \cdot \mathbb{P}_{i \cup i+1}^{j=i+1} \cdot a_{j=i+1} + \left(1 - \epsilon \cdot \mathbb{P}_{i \cup i+1}^{j=i+1}\right) \cdot a_{j=i} \right] +$$
$$+ L_{j=i-1} e_h \left[\left(\epsilon \cdot \mathbb{P}_{i \cup i-1}^{j=i} + (1-\epsilon) \cdot \mathbb{P}_{\epsilon,\, i}^{j=i} \right) \cdot a_{j=i} + \right.$$
$$\left. + \left(1 - \epsilon \cdot \mathbb{P}_{i \cup i-1}^{j=i} - (1-\epsilon) \cdot \mathbb{P}_{\epsilon,\, i}^{j=i}\right) \cdot a_{j=i-1} \right] \}$$

Output Results

1. $Y_{1,\epsilon} > Y_1$ and $Y_{I,\epsilon} < Y_I$.
2. If
$$\frac{e_h - 1}{e_h} > \frac{a_{j=i} - a_{j=i-1}}{a_{j=i}} \cdot \left[1 - \left(\frac{\alpha_\epsilon}{\alpha}\right)^{I-i} + \epsilon\right]$$
then $Y_{\epsilon,i} > Y_i$ for $i \in [2, \ldots I - 1]$.

Hope vs. Misallocation

Hope is more likely to be output enhancing if e_h is large.

Misallocation more likely to reduce output if $\frac{a_{j=i}-a_{j=i-1}}{a_{j=i}}$ and ϵ large

The hope effect is absent for workers with talent I.

The misallocation effect is absent for workers with talent 1.

Utilitarian Welfare functions:

$$W_i = Y_i - \gamma_i L_{j=i-1} \cdot d$$

$$W_{\epsilon,i} = Y_{\epsilon,i} - \gamma_i L_{j=i-1} \cdot d - \gamma_i L_{j=i} \cdot d$$

Welfare Results

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1. $W_{1,\epsilon} > W_1$ and $W_{I,\epsilon} < W_I$. $\implies$ Rawlsian and Young ("The Rise of the Meritocracy", 1958) implications.
2. If

$$\frac{e_h - 1}{e_h} > \frac{a_{j=i} - a_{j=i-1}}{a_{j=i}} \cdot \left[1 - \left(\frac{\alpha_\epsilon}{\alpha}\right)^{I-i} + \epsilon\right]$$

AND

$$d < s_{i=j} \cdot \mathbb{P}_{i \cup i+1}^{j=i+1} \cdot e_h(a_{j+1} - a_j)$$

then $W_{\epsilon,i} > W_i$ for $i \in [2, ...I - 1]$.

Concluding Remarks

- When perfect meritocracy in recruitment is unattainable, it may not be optimal to enforce it in career advancement. Kind of "**second best**" analysis.
- **Human Capital** not modeled. However, a similar trade-off may occur, as those poorly endowed in terms of talent in learning could decide not to invest in human capital accumulation if there is perfect meritocracy.
- Our production function does not account for **skill complementarity**. An increase in Y_i may have a positive effect on Y_{i+1} (managers' performance positively affected by his/her team).