Grant Lottery
: Why Are Grant Proposals Rejected (Seemingly) Randomly?

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Extremely preliminary

Motivation

- Researchers often complain that grant application outcomes seem random: Deserving projects are rejected, while weak proposals sometimes funded.
- It is natural that deserving projects can be rejected when the grants are limited. Although the subtitle is why grant proposals are rejected randomly, a better question is: *Why are low-quality grant proposals accepted randomly?*
- Countless anecdotes about how the grant applications end up with random decisions.

Questions: Is this randomness a failure or a feature? If randomness leads to an inefficient allocation, why does it persist?

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Main Claim

It is a feature. Some degree of randomness in grant allocation can be **intentional and optimal**.

Two Competing Goals

Funding agencies pursue two competing goals:

1. **High quality** of funded projects.

   (‘High quality’ can be measured in different ways, but here I focus on the average quality of granted projects.)

2. **Broad participation**: More applications (and *lower acceptance rates*) signal
   - program success;
   - inclusion of diverse ideas; and
   - endeavor of preventing groupthink and path dependence.

Core Idea

Key Mechanism

Introducing **noise** in grant decisions can increase overall welfare.

- Accurate selection ⇒ discourages even some top applicants from applying.
- Randomness ⇒ encourages broad participation.
- Too much randomness ⇒ encourages top applicants to seek outside options, causing adverse selection.
- The agency can deliberately choose the optimal *degree of randomness*.

Related Work

Still limited, your comments/inputs will be appreciated.

- **Reliability of peer review:** low agreement and predictive power (Pier et al., 2018; Bendiscioli, 2019), Sattler et al. (2015), Liu et al. (2025).
- **Lotteries in practice:** HRC of New Zealand for Explorer Grants; SNSF tie-breaks; Funding Nigerian semi-finalists SMEs
- **Random grants, acknowledging review failure**: Fang and Wagner (2016), Avin (2019), Philipps (2021), Larue (2025)
- **Strategic use of review inefficiency:** Lee (2009)

Contribution

Prior studies aim to *fix* review or introduce lotteries after acknowledging review failure. This paper shows that **intentional randomness** can be optimal *even without* reviewer error.

Illustration

- N potential applicants.
- Two project types: High (H) or Low (L) quality; N_H and N_L.
- Fraction of high-quality applicants: $h = \frac{N_H}{N} \in [0, 1]$.
- Institution awards G grants: $G \leq N_H \leq N_L$.

Institution's Objective

$$W = \alpha Q + (1 - \alpha)A$$

- Q: average quality of granted projects
- A: number of applications, $A_H + A_L$.
- $\alpha \in [0, 1]$: weight on quality

Assignment Rule

Challenge: The number of grants, G, is fixed. Cannot set an exogenous probability of award by type.

- To avoid unnecessary complications, assume $A_H + A_L > G$.
- $\delta \in \{0, \frac{1}{G}, \frac{2}{G}, \ldots, \frac{G-1}{G}, 1\}$: high-type priority.
- The institution awards $\min\{\delta G, A_H\}$ H-type applicants, and then the remaining applicants with $p_L = \frac{G - \min\{\delta G, A_H\}}{\max\{0, A_H - \delta G\} + A_L}$
- If $\delta = 0$, allocation is a **pure lottery**. Probability of being awarded conditional on applying is $\frac{G}{A_H + A_L}$ for both types.
- If $\delta = 1$, allocation is purely **meritocratic**. If $A_H > G$, only H-type applicants are awarded. If $A_H < G$, $p_L = \frac{G - A_H}{A_L}$.
- The **degree of randomness** is defined by $1 - \delta$.

  (One notable observation: Zero randomness doesn't necessarily imply $p_H > p_L$. Example: $G = 3, A_H = 1, A_L = 2$)

Two elephants in the room

I won't include

1. reviewer's imperfect evaluation ability;
2. granting institution's rational inattention;

in the model. Those are too obvious reasons why some resource allocations go "wrong" no matter how the granting institution tries to improve the allocative efficiency.

My goal is to examine the granting institution's *intention*, even without such giant factors in randomness of allocation process.

Applicants' Participation

- Applicant with project $i \in \{H, L\}$ applies if:

$$p_i(A_H, A_L)V - c \geq O_i,$$

  where V is the value of the grant, O_i is the value of the outside option, $O_H > O_L = 0$, and $c > 0$ is an application cost. p_i, $i \in \{H, L\}$, is the prob. that type i grant is awarded.
- Assume $\frac{G}{N_H}V - c < O_H$, so that V is not too large (or c and O_H are not too small.)
- Assume $V - c > O_H$, so that V is not too small (or c and O_H are not too large.)
- High outside option $O \Rightarrow$ discourages entry.
- High $\delta \Rightarrow$ discourages L entry.

Problem

1. The granting institution chooses δ to maximize welfare W.
2. With knowing δ, potential applicants simultaneously decide to apply or not.

   (If there are multiple equilibria induced by same δ, I focus on the one with highest W.)

Some observations

- If $\delta = 1$ (pure meritocracy),
  - For appropriate V, (too trivial if V is too high or too low)
  - **Coordination problem** among H applicants. (Note $N_H \geq G$)
  - N_H high-type applicants apply with prob $p \in (\frac{G}{N_H}, 1)$.
  - L applicants stay out.
- If $\delta = 0$ (pure lottery),
  - **Adverse selection** arises as H applicants are more inclined to get the outside option.
  - (There are many cases that I haven't figured out yet, but) conditions for (c, O_H) exist for H to stay out, and only L to apply; note $N_H \leq N_L$.

In both cases, A cannot be greater than $\max\{N_H, N_L\} = N_L$, in expectation.

Main Result

Proposition

There exists $\delta^* \in (0, 1)$ such that

$$W(\delta^*) > W(1)$$

- Perfect accuracy ($\delta = 1$): coordination probabilistically crowds out some H-types.
- Moderate noise: H-type's incentives are not severely compromised; recall that the unaccepted ones still got a chance. Some L join.
- In essence, $\delta < 1$ brings some L into the coordination game.
- Welfare rises due to higher participation A.

Comparative Statics

- Lower outside option $O_H \Rightarrow$ institution reduces accuracy (lower δ^*).

$\Rightarrow$ Testable hypothesis: Even prestigious journals can lower δ when O_H is low. (Journal of Finance?)

- Larger α (weight on quality) $\Rightarrow$ higher δ^*.

$\Rightarrow$ Testable hypothesis: Journals with higher submission fees (which care for the number of submissions) would publish more "poorly substantiated" papers. (Journal of Finance?)

- Higher application cost (c) $\Rightarrow$ lower δ.

$\Rightarrow$ Testable hypothesis: Grant agencies that require high costs (costly preliminary data or complex application procedures) should optimally compensate by having a more lottery-like final selection process to maintain participation.

Things to discuss

- $V(A)$ seems more reasonable than V constant.
  - Justification: Getting a very competitive grant signals better quality than getting a grant with no competitions.
  - In this case, more randomness can be allowed because H types would enjoy more L types enlarge the void denominator.
- Although not having in mind, the noise is introduced in an affirmative action way. It indirectly predicts that the affirmative action policy can increase welfare.
- Predatory journal's objective can be captured by $\alpha = 0$.
- Essay-based admissions: Occasional admissions of low-performing students boost application fee revenues.
- Startup accelerators may want to add random allocations.

Limitations and Extensions

- Binary quality assumption.
- No endogenous effort before applying: It would be fine if effort and quality are single-crossing.
- Future work:
  - Continuous quality distributions.
  - Empirical calibration using real grant data. (Challenge: How to identify the ‘undeserving’ projects)
  - Dynamic participation over repeated calls. Previous results may render potential applicants a new estimate of δ.
  - Introduction of behavioral types; base-rate neglect, for example

Conclusion

- Grant lottery can be **rational, not accidental**.
- Optimal randomness balances quality and participation.
- Randomization largely sustains allocative efficiency.

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