

# Voting, Success, and Superstars

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Principles of Complex Systems, Vols. 1, 2, & 3D  
CSYS/MATH 300, 303, & 394, 2022-2023 | @pocsvox

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## Superstars

### Rosen's theory:

- Individual quality  $q$  maps to reward  $R(q)$ .
- $R(q)$  is 'convex' ( $d^2R/dq^2 > 0$ ).
- Two reasons:
  - Imperfect substitution:**  
A very good surgeon is worth many mediocre ones
  - Technology:**  
Media spreads & technology reduces cost of reproduction of books, songs, etc.
- Joint consumption versus public good.
- No social element—success follows 'inherent quality'.

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## Superstars



"Stardom and Talent"  
Moshe Adler,  
American Economic Review, **75**, 208-212,  
1985. [1]

- "Consumption capital": "Appreciation [of music] increases with knowledge. But how does one know about music? By listening to it, *and discussing it with other persons who know about it.*"
- Assumes extreme case of equal 'inherent quality'
- Argues desire for coordination in knowledge and culture leads to differential success
- Success can be purely a social construction
- (How can we measure 'inherent quality?')

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## Voting

### Evidence from the web suggestions (Huberman et al.)

- Easy decisions (yes/no) lead to bandwagoning  
e.g. jyte.com
  - More costly evaluations lead to oppositional votes  
e.g. amazon.com
- Self-selection:** Costly voting may lower incentives for those who agree with the current assessment and increase incentives for those who disagree.

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## Voting

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### Score-based voting versus rank-based voting:



"A theory of measuring, electing, and ranking"  
Balinski and Laraki,  
Proc. Natl. Acad. Sci., **104**, 8720-8725,  
2007. [2]

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## Voting



"Aggregating partial, local evaluations to achieve global ranking"  
Laureti, Moret, and Zhang,  
Physica A, **345**, 705-712, 2004. [4]

- Model: participants rank  $n$  objects based on underlying quality  $q$
- Assume evaluation of object  $i$  is a random variable with mean  $q_i$
- Choose objects based on votes:

$$p_i(t) \propto v_i(t)^\alpha \text{ or } p_i(t) \propto q_i v_i(t)^\alpha.$$

- If  $\alpha < 1$ , correct quality ordering is uncovered
- If  $\alpha > 1$ , some objects are never evaluated and mistakes are made...
- Related to Adler's approach

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## Dominance hierarchies



"Individual differences versus social dynamics in the formation of animal dominance hierarchies"  
Chase et al.,  
Proc. Natl. Acad. Sci., **99**, 5744-5749, 2002. [3]

- The aggressive female *Metriaclicma zebra*:



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## Outline

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## Where do superstars come from?



"The economics of superstars"  
S. Rosen,  
Am. Econ. Rev., **71**, 845-858, 1981. [5]

### Examples:

- Full-time Comedians ( $\approx 200$ )
- Soloists in Classical Music
- Economic Textbooks (the usual myopic example)

Highly skewed distributions again...

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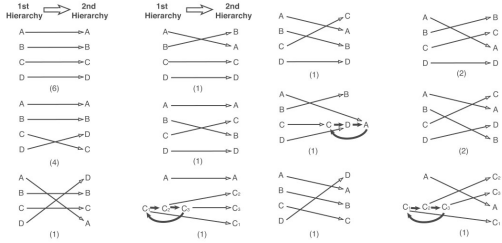
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# Dominance hierarchies

## Fish forget—changing of dominance hierarchies:



22 observations: about 3/4 of the time, hierarchy changed

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Rank	Market share in indep. world	Rank	Market share in indep. world
1	0.01	17	0.01
2	0.02	18	0.01
3	0.03	19	0.01
4	0.04	20	0.01
5	0.05	21	0.01
6	0.06	22	0.01
7	0.07	23	0.01
8	0.08	24	0.01
9	0.09	25	0.01
10	0.10	26	0.01

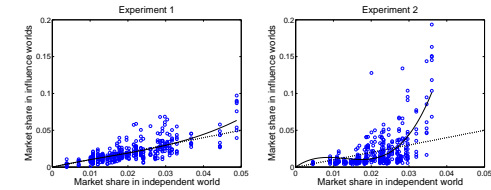
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“An experimental study of inequality and unpredictability in an artificial cultural market”  
Salganik, Dodds, and Watts, Science, 311, 854–856, 2006. [6]

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# Music Lab Experiment



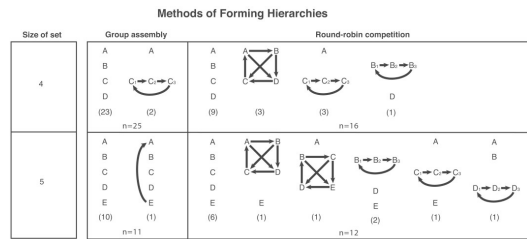
Variability in final number of downloads.

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# Music Lab Experiment

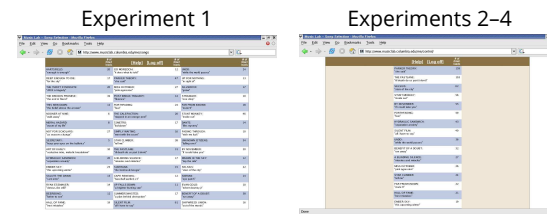
# Dominance hierarchies



Group versus isolated interactions produce different hierarchies

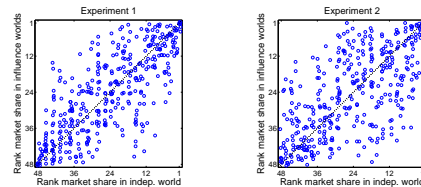
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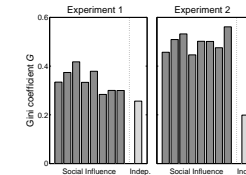


Variability in final rank.

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Inequality as measured by Gini coefficient:

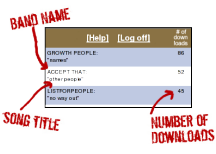
$$G = \frac{1}{(2N_s - 1)} \sum_{i=1}^{N_s} \sum_{j=1}^{N_s} |m_i - m_j|$$

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# Music Lab Experiment



48 songs  
30,000 participants



multiple 'worlds'  
Inter-world variability

- How probable is the world?
- Can we estimate variability?
- Superstars dominate but are unpredictable. Why?

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Unpredictability

$$U = \frac{1}{N_s \binom{N_w}{2}} \sum_{i=1}^{N_s} \sum_{j=1}^{N_w} \sum_{k=j+1}^{N_w} |m_{i,j} - m_{i,k}|$$

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# Music Lab Experiment

## Sensible result:

- Stronger social signal leads to **greater following** and **greater inequality**.

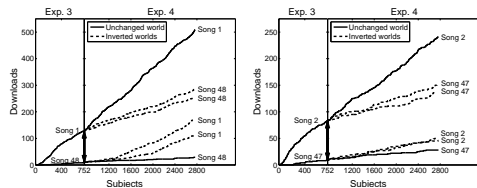
## Peculiar result:

- Stronger social signal leads to greater **unpredictability**.

## Very peculiar observation:

- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through **following**. (so let's tell a story... [8, 9])

# Music Lab Experiment—Sneakiness [7]



- Inversion of download count
- The pretend rich get richer ...
- ... but at a slower rate

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# References I

- M. Adler. **Stardom and talent.** *American Economic Review*, pages 208–212, 1985. [pdf](#)
- M. Balinski and R. Laraki. **A theory of measuring, electing, and ranking.** *Proc. Natl. Acad. Sci.*, 104(21):8720–8725, 2007. [pdf](#)
- I. D. Chase, C. Tovey, D. Spangler-Martin, and M. Manfredonia. **Individual differences versus social dynamics in the formation of animal dominance hierarchies.** *Proc. Natl. Acad. Sci.*, 99(8):5744–5749, 2002. [pdf](#)

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# References II

- P. Laureti, L. Moret, and Y.-C. Zhang. **Aggregating partial, local evaluations to achieve global ranking.** *Physica A*, 345(3–4):705–712, 2004. [pdf](#)
- S. Rosen. **The economics of superstars.** *Am. Econ. Rev.*, 71:845–858, 1981. [pdf](#)
- M. J. Salganik, P. S. Dodds, and D. J. Watts. **An experimental study of inequality and unpredictability in an artificial cultural market.** *Science*, 311:854–856, 2006. [pdf](#)

# References III

- M. J. Salganik and D. J. Watts. **Leading the herd astray: An experimental study of self-fulfilling prophecies in an artificial cultural market.** *Social Psychology Quarterly*, 71:338–355, 2008. [pdf](#)
- C. R. Sunstein. **Infotopia: How many minds produce knowledge.** Oxford University Press, New York, 2006.
- N. N. Taleb. **The Black Swan.** Random House, New York, 2007.

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