

# Voting, Success, and Superstars

## Principles of Complex Systems | @pocsvox

### CSYS/MATH 300, Fall, 2017

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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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📷 On Instagram at [pratchett\\_the\\_cat](https://www.instagram.com/pratchett_the_cat/) [↗](#)

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## Superstars

### Rosen's theory:

- 🧩 Individual quality  $q$  maps to reward  $R(q)$ .
- 🧩  $R(q)$  is 'convex' ( $d^2 R/dq^2 > 0$ ).
- 🧩 Two reasons:
  1. **Imperfect substitution:**  
A very good surgeon is worth many mediocre ones
  2. **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



"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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# Voting

Evidence from the web suggestions (Huberman et al.)

1. Easy decisions (yes/no) lead to bandwagoning  
 e.g. jyte.com
2. 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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# 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 *Metriaclimis zebra*:



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# Voting

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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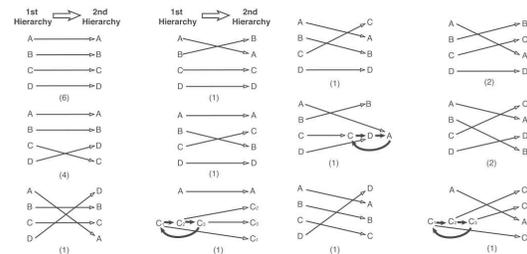


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# Dominance hierarchies

- Pecking orders for fish...

Fish forget—changing of dominance hierarchies:



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

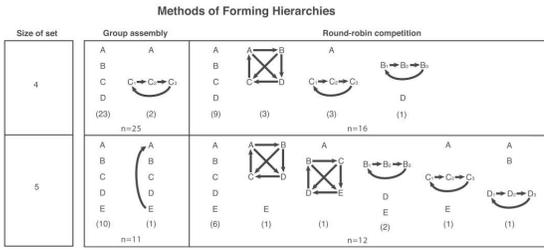
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# Dominance hierarchies



Group versus isolated interactions produce different hierarchies

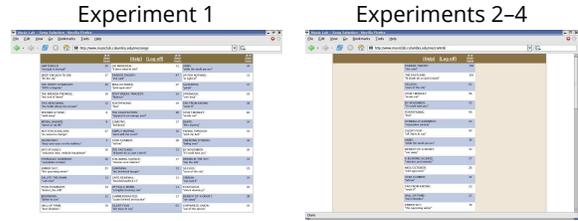
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# Music Lab Experiment



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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?

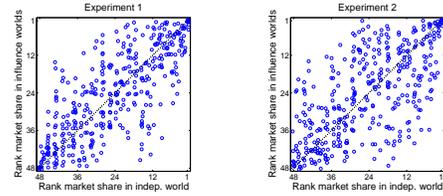
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# Music Lab Experiment



Variability in final rank.

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# Music Lab Experiment

Rank	Title	Downloads	# of Downloads
1	ROCK ON!	100	100
2	ROCK ON!	90	90
3	ROCK ON!	80	80
4	ROCK ON!	70	70
5	ROCK ON!	60	60
6	ROCK ON!	50	50
7	ROCK ON!	40	40
8	ROCK ON!	30	30
9	ROCK ON!	20	20
10	ROCK ON!	10	10



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

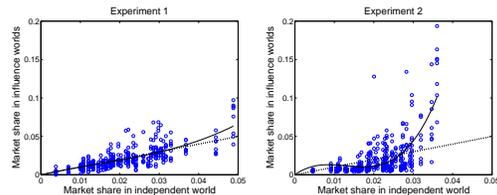
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# Music Lab Experiment



Variability in final number of downloads.

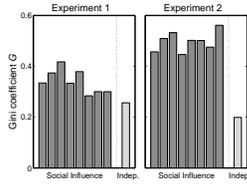
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Inequality as measured by Gini coefficient:

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

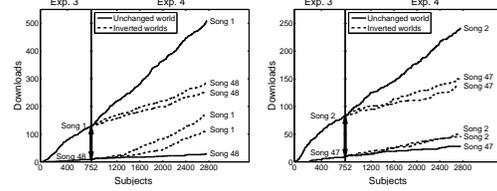
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# Music Lab Experiment—Sneakiness [7]



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

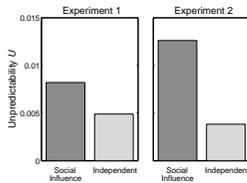
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# Music Lab Experiment



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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# References I

- [1] M. Adler. Stardom and talent. [American Economic Review](#), pages 208–212, 1985. [pdf](#)
- [2] M. Balinski and R. Laraki. A theory of measuring, electing, and ranking. [Proc. Natl. Acad. Sci.](#), 104(21):8720–8725, 2007. [pdf](#)
- [3] 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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# 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])

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# References II

- [4] 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](#)
- [5] S. Rosen. The economics of superstars. [Am. Econ. Rev.](#), 71:845–858, 1981. [pdf](#)
- [6] 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](#)

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## References III

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- [7] 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](#) 

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Superstars  
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[References](#)

- [8] C. R. Sunstein.  
[Infotopia: How many minds produce knowledge.](#)  
Oxford University Press, New York, 2006.

- [9] N. N. Taleb.  
[The Black Swan.](#)  
Random House, New York, 2007.

