

Voting, Success, and Superstars

Principles of Complex Systems | @pocsvox
 CSYS/MATH 300, Fall, 2015 | #FallPoCS2015

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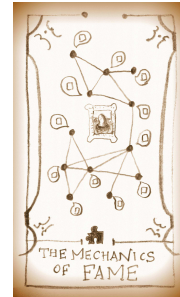
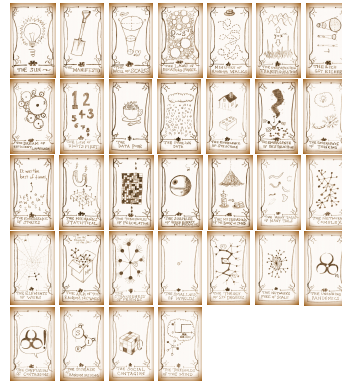
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Where do superstars come from?



"The economics of superstars" [↗](#)
 S. Rosen,
 Am. Econ. Rev., **71**, 845–858, 1981. ^[5]

Examples:

- ▶ Full-time Comedians (≈ 200)
- ▶ Soloists in Classical Music
- ▶ Economic Textbooks (the usual myopic example)
- ▶ Highly skewed distributions again...

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Outline

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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:
 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 *Metriaclima 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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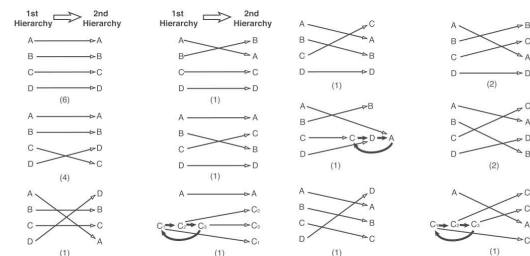
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Dominance hierarchies

Fish forget—changing of dominance hierarchies:



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

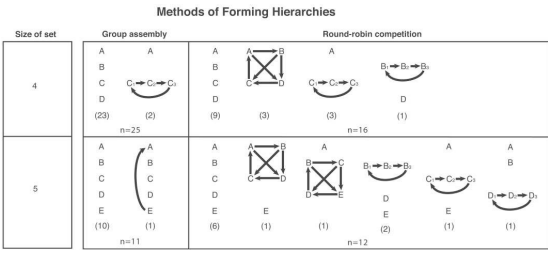
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Dominance hierarchies



▶ Group versus isolated interactions produce different hierarchies

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Music Lab Experiment

Experiment 1



Experiments 2-4



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Music Lab Experiment



48 songs
30,000 participants

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



multiple 'worlds'
Inter-world variability

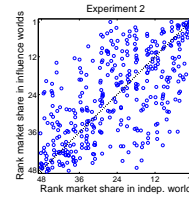
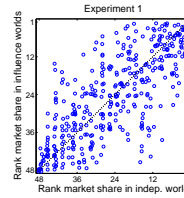
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Music Lab Experiment



▶ Variability in final rank.

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Music Lab Experiment

Rank	Band	Song	# of Downloads
1	THE BROWNS	THE BROWNS	100
2	THE BROWNS	THE BROWNS	80
3	THE BROWNS	THE BROWNS	60
4	THE BROWNS	THE BROWNS	45
5	THE BROWNS	THE BROWNS	30
6	THE BROWNS	THE BROWNS	20
7	THE BROWNS	THE BROWNS	15
8	THE BROWNS	THE BROWNS	10
9	THE BROWNS	THE BROWNS	8
10	THE BROWNS	THE BROWNS	6
11	THE BROWNS	THE BROWNS	5
12	THE BROWNS	THE BROWNS	4
13	THE BROWNS	THE BROWNS	3
14	THE BROWNS	THE BROWNS	2
15	THE BROWNS	THE BROWNS	1

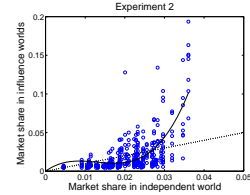
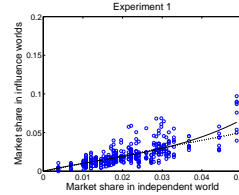
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Music Lab Experiment



▶ Variability in final number of downloads.

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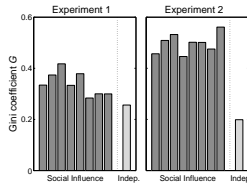
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"An experimental study of inequality and unpredictability in an artificial cultural market"
Salganik, Dodds, and Watts, Science, 311, 854-856, 2006. [6]

Music Lab Experiment



- Inequality as measured by Gini coefficient:

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

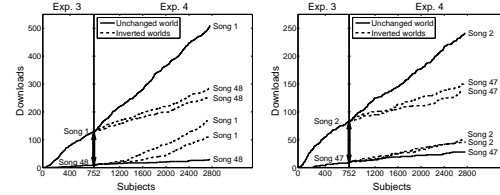
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Music Lab Experiment—Sneakiness [7]



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

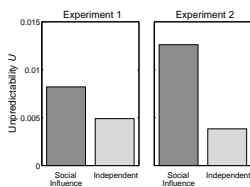
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Music Lab Experiment



- 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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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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- [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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Leading the herd astray: An experimental study of
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