

Voting, Success, and Superstars


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Principles of Complex Systems, Vols. 1, 2, 3D, 4 Fourever, V for Vendetta

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University of Vermont | Santa Fe Institute



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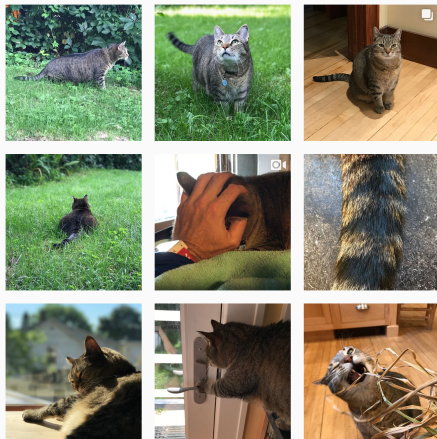
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Voting, Success, and
Superstars
3 of 28

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Outline

The PoCSverse
Voting, Success, and
Superstars
4 of 28

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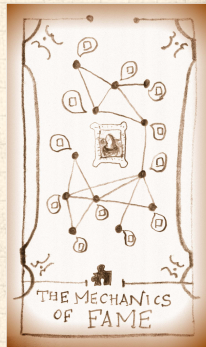
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Outline

The PoCSverse
Voting, Success, and
Superstars
6 of 28

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References

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References



Where do superstars come from?


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Voting, Success, and
Superstars
7 of 28

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“The economics of superstars” 

S. Rosen,

Am. Econ. Rev., **71**, 845–858, 1981. ^[5]

Examples:



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Superstars
7 of 28


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Examples:

 Full-time Comedians (≈ 200)



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Voting, Success, and
Superstars
7 of 28

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Voting, Success, and
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7 of 28

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Voting, Success, and
Superstars
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The PoCverse
Voting, Success, and
Superstars
7 of 28


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Examples:

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



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8 of 28

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Rosen's theory:

 Individual quality q maps to reward $R(q)$.



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Rosen's theory:

- Individual quality q maps to reward $R(q)$.
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- Two reasons:



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A very good surgeon is worth many mediocre ones



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2. **Technology:**


Media spreads & technology reduces cost of reproduction of books, songs, etc.




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 Joint consumption versus public good.



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- 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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“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.*”





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 Success can be purely a social construction








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 Assumes extreme case of equal ‘inherent quality’

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 Success can be purely a social construction

 (How can we measure ‘inherent quality’?)




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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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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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“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




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




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-  If $\alpha < 1$, correct quality ordering is uncovered




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-  If $\alpha > 1$, some objects are never evaluated and mistakes are made...




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-  Related to Adler's approach




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-  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
-  Tragic reality: Laureti et al.'s paper has 7 citations ($\alpha > 1$)



Dominance hierarchies

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13 of 28

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“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 *Metriacrima* zebra:



 Pecking orders for fish...

Dominance hierarchies

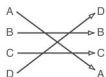
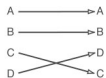
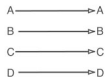
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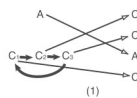
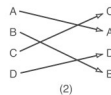
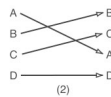
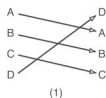
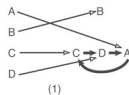
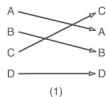
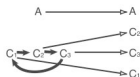
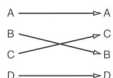
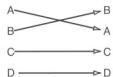
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Fish forget—changing of dominance hierarchies:

1st Hierarchy \Rightarrow 2nd Hierarchy



1st Hierarchy \Rightarrow 2nd Hierarchy



Dominance hierarchies

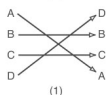
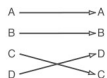
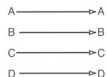
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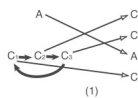
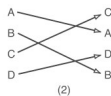
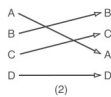
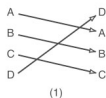
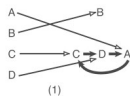
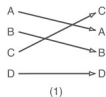
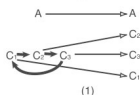
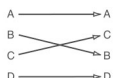
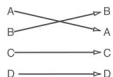
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22 observations: about 3/4 of the time, hierarchy changed



Dominance hierarchies

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Methods of Forming Hierarchies			
Size of set	Group assembly	Round-robin competition	
4	<p>(23) (2) n=25</p>	<p>(9) (3)</p>	<p>(3) (1) n=16</p>
5	<p>(10) (1) n=11</p>	<p>(6) (1)</p>	<p>(2) (1) (1) n=12</p>



Group versus isolated interactions produce different hierarchies



Outline

The PoCSverse
Voting, Success, and
Superstars
16 of 28

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References

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References



Music Lab Experiment



48 songs
30,000 participants

BAND NAME

SONG TITLE

NUMBER OF DOWNLOADS

[Help]	[Log off]	# of downloads
GROWTH PEOPLE:	"names"	86
ACCEPT THAT	"the r people"	52
LISTFORPEOPLE:	"no way out"	45

multiple 'worlds'
Inter-world variability

The PoCVerse
Voting, Success, and
Superstars
17 of 28

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References




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30,000 participants

 How probable is the world?

	[Help]	[Log off]	# of down loads
GROWTH PEOPLE: "names"			86
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BAND NAME (points to GROWTH PEOPLE)

SONG TITLE (points to "names")

NUMBER OF DOWNLOADS (points to 45)

multiple 'worlds'
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The PoCServe
Voting, Success, and
Superstars
17 of 28

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References



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The PoCSverse
Voting, Success, and
Superstars
17 of 28

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BAND NAME (red arrow pointing to the band names)


SONG TITLE (red arrow pointing to the song titles)

NUMBER OF DOWNLOADS (red arrow pointing to the download counts)

48 songs

30,000 participants

 How probable is the world?

 Can we estimate variability?

multiple 'worlds'
Inter-world variability



Music Lab Experiment

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Voting, Success, and
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48 songs

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 Superstars dominate but are unpredictable. Why?

multiple 'worlds'

Inter-world variability



Music Lab Experiment

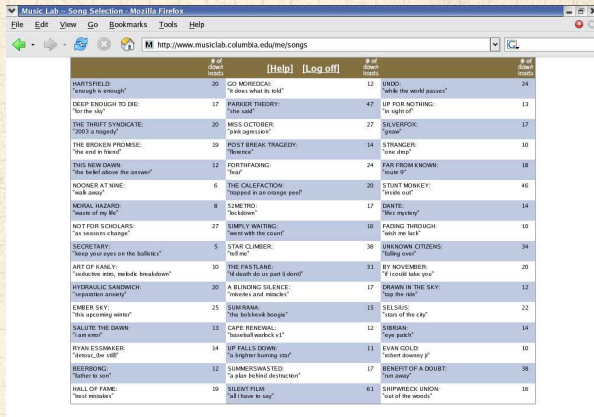
The PoCSverse
Voting, Success, and
Superstars
18 of 28

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	# of down loads	[Help] [Log off]	# of down loads
HARTSFIELD: "enough is enough"	20	GO MOREDECA: "it does what it told"	12
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "the sad"	47
THE THRIFT SYNDICATE: "2009 a tragedy"	20	MISS OCTOBER: "my expression"	27
THE BROKEN PROMISE: "the end is here"	19	POST BREAK TRAGEDY: "horror"	14
THIS NEW DAWN: "the belief above the answer"	12	FORTHFACING: "leaf"	24
NOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peel"	20
MORAL HAZARD: "waste of my life"	8	SZMETRO: "lockdown"	17
NOT FOR SCHOLARS: "six seasons change"	27	SIMPLY WAITING: "smoke with the count"	16
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "hell no"	38
ART OF KAMELY: "seductive into, melodic breakdown"	10	THE FASTLANE: "if death do us part i don't"	31
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "riddles and riddles"	17
EMBER SKY: "his upcoming winter"	25	SUM RANA: "the bobbeik boogie"	15
SALUTE THE DAWN: "i am one"	13	CAPE RENEWAL: "hassled workday v1"	12
RYAN ESSMAKER: "detour, be still"	14	UP FALLS DOWN: "a brighter burning star"	11
BEERBORG: "father to son"	12	SUMMERSWASTED: "a plan behind destruction"	17
HALL OF FAME: "best mistakes"	19	SILENT FILM: "all i have to say"	61
		UNDO: "while the world passes"	24
		UP FOR NOTHING: "in sight of"	13
		SILVERFOX: "glide"	17
		STRANGER: "cute deep"	10
		FAR FROM KNOWN: "route 9"	18
		STUNT MONKEY: "inside out"	46
		DANTE: "his mystery"	14
		FACING THROUGH: "with me left"	10
		UNKNOWN CITIZENS: "telling over"	34
		BY NOVEMBER: "if i could take you"	20
		DRAWN IN THE SKY: "tap the ride"	12
		SELSAUS: "stars of the city"	22
		SIBIRIAN: "spin park"	14
		EVAN GOLD: "robot downey jr"	10
		BENEFIT OF A DOUBT: "run away"	38
		SHIPWRECK UNION: "out of the woods"	16



"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

The PoCVerse
Voting, Success, and
Superstars
19 of 28

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References

Experiment 1

Rank	Artist	Album	Score
1	ANTHONY & DAVID	"I'm a musician"	24
2	CHER	"I never want to see you"	24
3	CHER	"I never want to see you"	24
4	CHER	"I never want to see you"	24
5	CHER	"I never want to see you"	24
6	CHER	"I never want to see you"	24
7	CHER	"I never want to see you"	24
8	CHER	"I never want to see you"	24
9	CHER	"I never want to see you"	24
10	CHER	"I never want to see you"	24
11	CHER	"I never want to see you"	24
12	CHER	"I never want to see you"	24
13	CHER	"I never want to see you"	24
14	CHER	"I never want to see you"	24
15	CHER	"I never want to see you"	24
16	CHER	"I never want to see you"	24
17	CHER	"I never want to see you"	24
18	CHER	"I never want to see you"	24
19	CHER	"I never want to see you"	24
20	CHER	"I never want to see you"	24

Experiments 2-4

Rank	Artist	Album	Score
1	ANTHONY & DAVID	"I'm a musician"	24
2	CHER	"I never want to see you"	24
3	CHER	"I never want to see you"	24
4	CHER	"I never want to see you"	24
5	CHER	"I never want to see you"	24
6	CHER	"I never want to see you"	24
7	CHER	"I never want to see you"	24
8	CHER	"I never want to see you"	24
9	CHER	"I never want to see you"	24
10	CHER	"I never want to see you"	24
11	CHER	"I never want to see you"	24
12	CHER	"I never want to see you"	24
13	CHER	"I never want to see you"	24
14	CHER	"I never want to see you"	24
15	CHER	"I never want to see you"	24
16	CHER	"I never want to see you"	24
17	CHER	"I never want to see you"	24
18	CHER	"I never want to see you"	24
19	CHER	"I never want to see you"	24
20	CHER	"I never want to see you"	24



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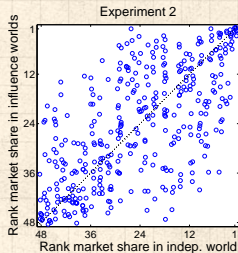
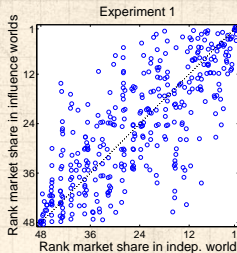
The PoCverse
Voting, Success, and
Superstars
20 of 28

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Variability in final rank.



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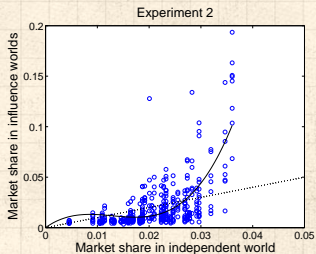
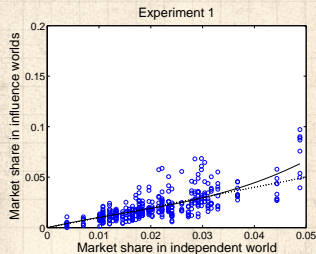
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Voting, Success, and
Superstars
21 of 28

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Variability in final number of downloads.



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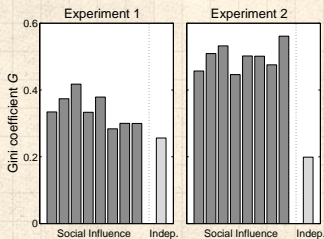
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Voting, Success, and
Superstars
22 of 28

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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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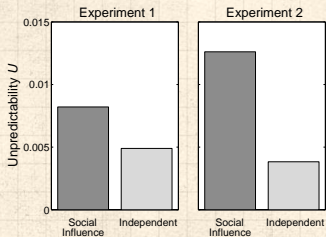
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Voting, Success, and
Superstars
23 of 28

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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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Superstars
24 of 28


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Sensible result:

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



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Voting, Success, and
Superstars
24 of 28


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Peculiar result:



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Voting, Success, and
Superstars
24 of 28


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The PoCVerse
Voting, Success, and
Superstars
24 of 28


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Very peculiar observation:



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Voting, Success, and
Superstars
24 of 28


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References


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Peculiar result:

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Very peculiar observation:

 The most unequal distributions would suggest the greatest variation in underlying 'quality.'



Music Lab Experiment

Sensible result:

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

Peculiar result:

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- But success may be due to social construction through **following**.



Music Lab Experiment

Sensible result:

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Peculiar result:

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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]

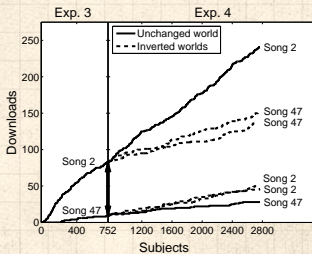
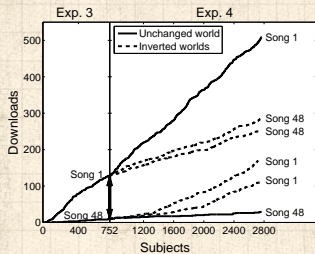
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25 of 28

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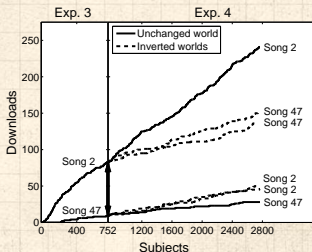
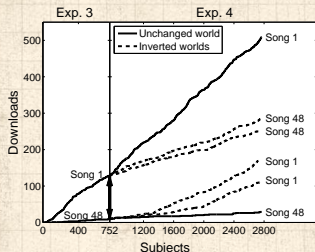
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Voting, Success, and
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25 of 28

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The pretend rich get richer ...



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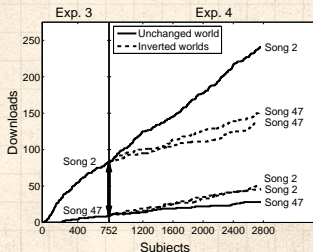
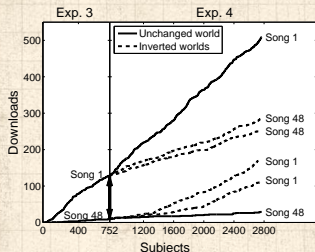
The PoCverse
Voting, Success, and
Superstars
25 of 28


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 The pretend rich get richer ...

 ... but at a slower rate






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28 of 28

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