Selection in Social Networks
the influence of network structure when agents face decisions over many similar choices

Latsis Symposium, ETH, Zurich, September 2012
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Social network markets

• “the very act of consumer choice in these industries is governed not just by the set of incentives described by conventional consumer demand theory, but by the choices of others in which an individuals payoff is an explicit function of the actions of others.” Potts et al. J Cultural Economics, 2008

• A key question is what happens in such markets when consumers find it difficult to distinguish between alternatives in terms of their objective attributes?

• This is obviously important in not just in modern cultural and creative markets, but in areas such as the diffusion of innovation and technology
A table describing the burning of Bishop Ridley and Father Latimer at Oxford, D. Smith there preaching at the time of their martyrdom.
Typical outcomes of social and economic processes

• Non–Gaussian outcomes
• Not necessarily power laws (Perline 2005)
• But with turnover in rankings/popularity
A behavioural model with these characteristics

• Can generate any non-Gaussian distribution, with turnover
• $N$ agents initially choose at random across $L$ ‘locations’
• In each step of the model, either new agents enter and choose, or the fixed number of agents re-contracts
• With small probability, $\mu$, innovate and choose a ‘location’ no-one else has chosen before
• With probability $(1 - \mu)$ use preferential attachment
• But with a parameter to determine the degree of ‘forgetting’ of the previous choices of agents
• Basic model, Bentley, Ormerod, Batty, *Behavioral Ecology and Sociobiology*, 2011
Neutral copying with multiple choice

Modified Wright-Fisher model yields:
(a) Popularity distributions (b) Lifespan distributions (c) Turnover among most popular

\[ t = 0 \quad t = 1 \]

Kimura & Crow (1964) Genetics
Neutral copying on ‘amplifier’ networks

Averaged 500 independent model runs over each network for 2000 periods, for different values of invention parameter $\mu$.

Square lattice

Fully connected

Meta-funnel

Superstar

Metafunnel: a central node connected to 3 groups of 5 nodes. Each 5 then connected to 25 at level 2, those connected to 125 at level 3. Total = 466 nodes.

Superstar: a central node connected to all 480 other nodes. 20 groups of 24 nodes, each with a dominant node connected to all 24 other nodes of group.
Networks similar, except superstar more skewed

\[ \mu = 0.01 \]
Increasing $\mu$ flattens choice distribution
Lifespans shorter in hierarchical networks

(a new choice by a hub or ‘superstar’ changes much of the entire network)

\[ \mu = 0.01 \]

- square
- metafunnel
- connected
- superstar

Rank (by longevity)
Implications

• a clear winner emerges in social network markets even when, by assumption, there is no inherent superiority of any of the alternative choices available to agents
• we find this network effect even in the very restrictive conditions of no increasing returns in the model. By this, we mean that if an available alternative becomes popular under increasing returns it would acquire characteristics which would make it even more popular
• Very similar results obtained with random, SW and SF networks
• Non-Gaussian outcomes at a point in time and turnover over time seem to be fundamental principles of social network markets.
• It is a feature of such markets regardless of whether agents are able to distinguish between the objective attributes of competing alternatives.