Networks, economic theory and resistance to change
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The limits to the standard model

- **Vernon Smith**: 'I urge students to read narrowly within economics, but widely in science. Within economics there is essentially only one model to be adapted to every application: optimization subject to constraints due to resource limitations, institutional rules and /or the behaviour of others, as in Cournot-Nash equilibria. The economic literature is not the best place to find new inspiration beyond these traditional technical methods of modelling'

- The standard model has probably already been applied almost anywhere it might be useful

- **Friedrich Hayek**: ' An economist who is only an economist cannot be a good economist'

Overview

- Some general reflections on resistance to change
- How network theory can increase our understanding of this

Resistance to change

- *Socialisation* – if you have doubts about the postulate of rational maximisers, you probably won't even make it to graduate school

- *Historical lock in*

- *Obvious weaknesses of some of the alternatives*

- *Economics is **not** an empty box* – it does have insights which other social sciences do not

Economic theory in the past 30 years

- Major advances in micro economics – much more empirically grounded evidence on agent behaviour

- Schizophrenia in the use of agents

- The project in macroeconomics has been to import the rational agent as the foundation of the theory!

Macro theory over the past 30 years

- Real Business Cycle theory
- Representative agent – when agents are heterogeneous e.g. Creditors and debtors!
- Choose 'rationally' between leisure and output
- Choose 'rationally' between consumption and investment, given output

Macro theory in the past 30 years (2)

- **R**ational **A**gent **R**ational **E**xpectations –RARE
- Why did the 2008/09 crisis happen according to mainstream theory?
- Can rational expectations ever be rejected for a 'true believer'?
- Individuals act in isolation – even under bounded rationality
- Much of the discipline of psychology rejects the assumption of rationality empirically
- Much of the discipline of sociology rejects the assumption that individuals act purely in isolation, they are part of society

Networks

- **The fundamental feature of networks is that they offer the basis for a different model of agent behaviour**
- 'Humans reason poorly and act intuitively': Daniel Kahneman, Nobel lecture, *American Economic Review*, 2003
- In this approach, agents do not process information and choose rationally. They copy what others have done
- Obviously, in practice there may be a mixture of the two: rational processing and copying
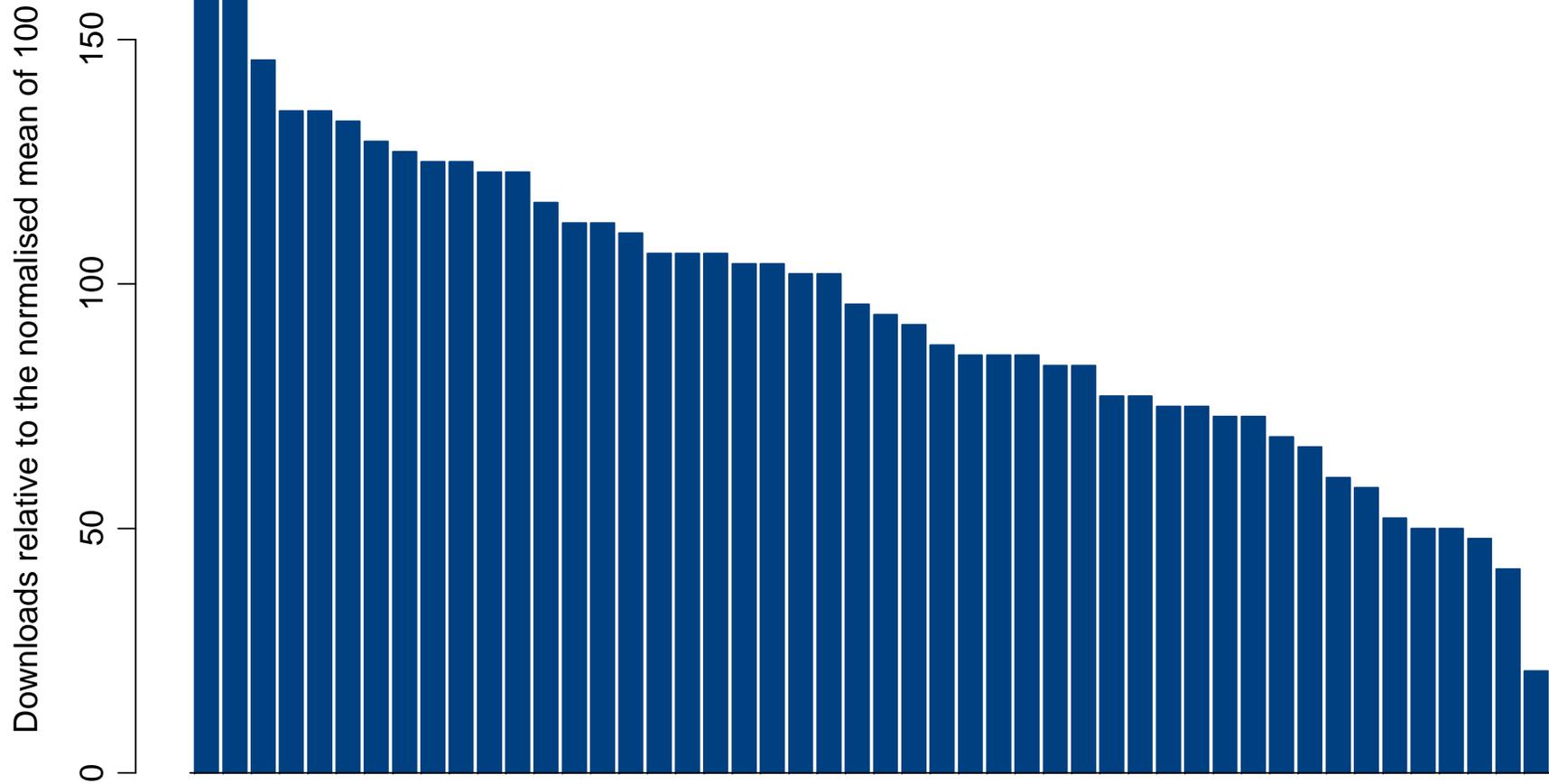- Copying implies tastes and preferences are **not** fixed

Why Copy ?

- Asch (1953 and 1955): *conformity*
- the behavior of an agent tends to become more similar to that of the group of which he or she is a member
- either because the agent believes the group to have better information than he or she does, or from a desire to conform to group norms
- *Peer acceptance*: 'it is ok/not ok to….. be obese, binge drink'
- Fowler and Christiakis, 'The spread of obesity in a large social network' , *New England Journal of Medicine'*, 2007
- Ormerod and Wiltshire, 'Binge drinking in the UK: a social network phenomenon', *Mind and Society*, 2009
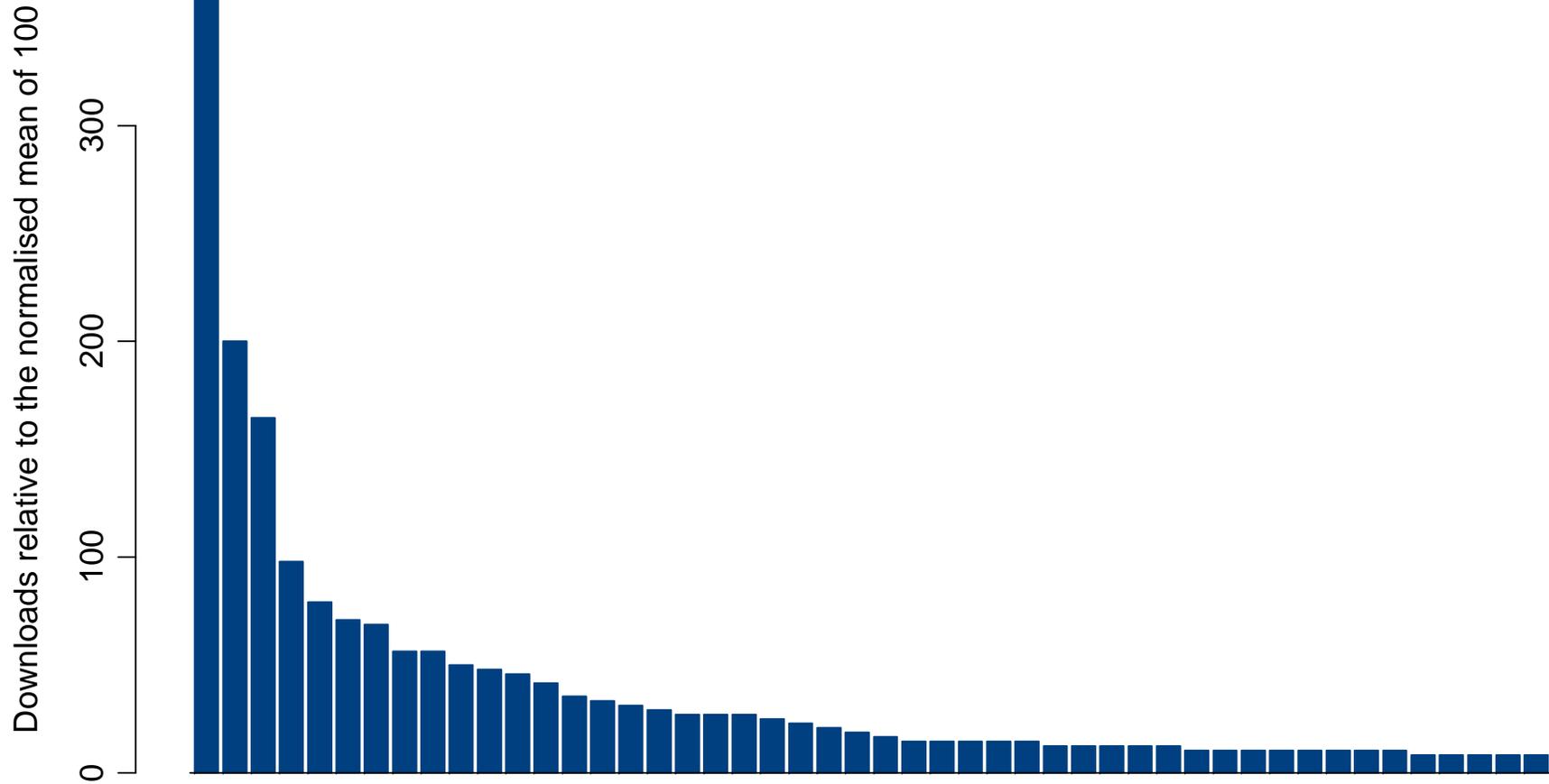
The music download experiment: an example of copying

- Salganik, Dodds, Watts, 'Experimental study of inequality and unpredictability in an artificial cultural market', *Science,* 2006
- Columbia students downloaded previously unknown songs either with or without knowledge of previous participants' choices
- *Increasing the strength of social influence increased both inequality of outcome and unpredictability of success*
- Success was also only weakly determined by quality: the best songs rarely did poorly, and the worst rarely did well
- *But any other result was possible i.e. outcomes are only weakly determined by intrinsic quality of the product*
- ***In other words, the best ideas may not always win!***

Number of downloads of each of the 48 songs
No social influence

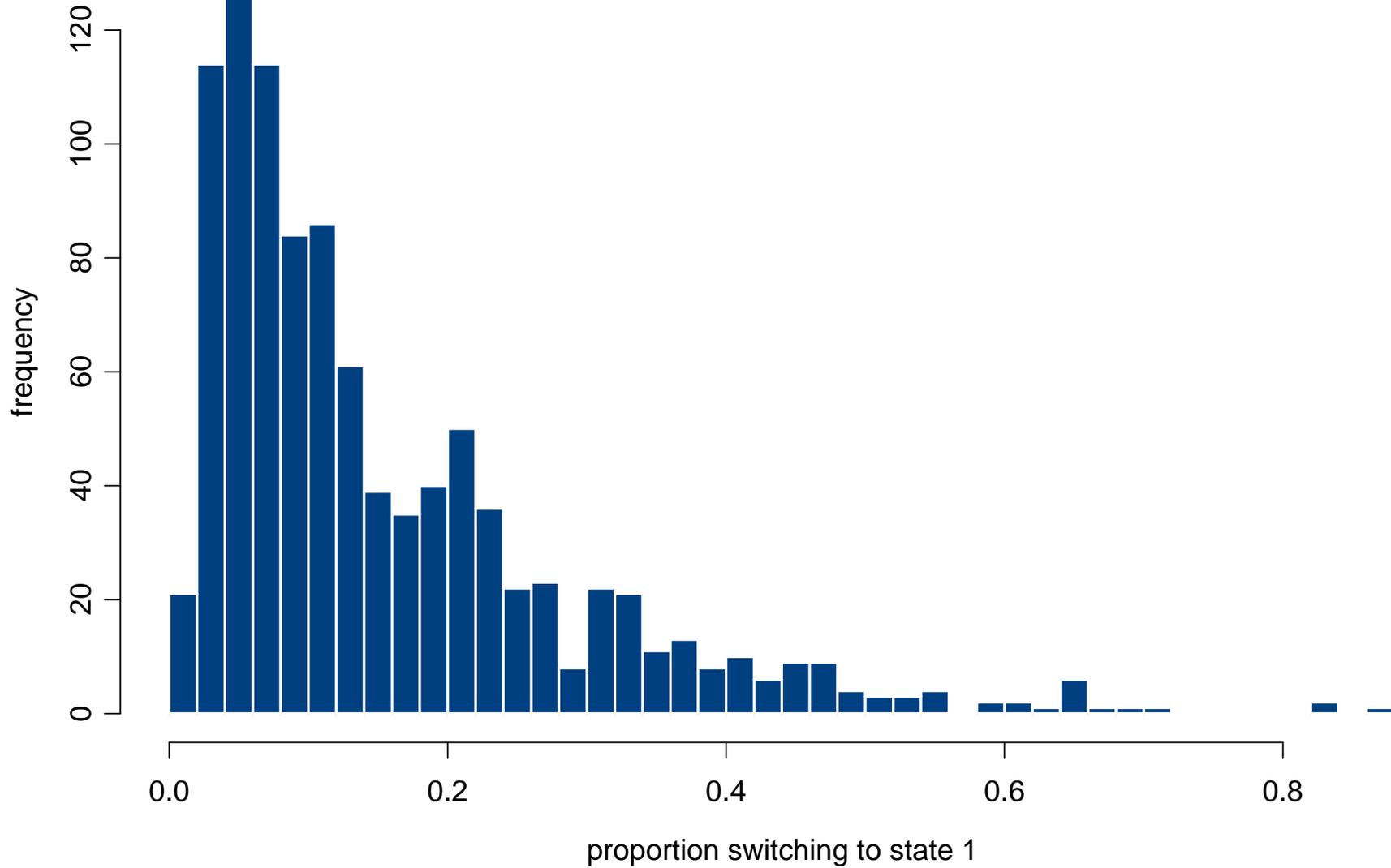Number of downloads of each of the 48 songs
Strong social influence

A simple but powerful model of copying across a network

- The decision of any given agent is governed not just by the standard set of incentives but by the decisions of others

- 'Binary choice with externalities' Schelling, 'Hockey helmets, concealed weapons, and daylight saving: a study of binary choices with externalities', *Journal of Conflict Resolution*, 1973

- The theoretical model is that of Watts, 'A simple model of global cascades on random networks', *Proceedings of the National Academy of Science*, 2002

- This has a fixed network, Ormerod and Colbaugh extend this to networks which evolve as agents seek to increase fitness ('Cascades of failure and extinction in evolving social networks ' *Journal of Artificial Societies and Social Simulation*, 2006)

Percolation across a network

- Agents can be in one of two states of the world, 0 or 1 [e.g. Not buy/buy; optimistic/pessimistic; believe ideology X or ideology Y; solvent/insolvent]

- Initially all agents are in state 0

- A small number are chosen at random to switch to state 1. How far does the cascade spread?

- Agents are heterogeneous. Each agent allocated at random a threshold on a uniform distribution on [0,1]

- An agent switches state of the world if the proportion of agents it is connected to in that state of the world is above its threshold

- Solve the model N times and observe the distribution of cascades

Distribution of size of cascade: identical initial shock
1000 solutions, small world network

What determines the size of a percolation?

- It is generally low on weakly connected networks
- It is also generally low on strongly connected ones
- This is because of the local stability of the nodes
- It is generally high if it first reaches 'persuadable' agents – but in economics, these peel off to different disciplines/communities