

Networks and economic theory
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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

A policy maker's perspective

- **Jean-Claude Trichet, Governor ECB, November 2010:**

When the crisis came, the serious limitations of existing economic and financial models immediately became apparent. Macro models failed to predict the crisis and seemed incapable of explaining what was happening to the economy in a convincing manner. As a policy-maker during the crisis, I found the available models of limited help. In fact, I would go further: in the face of the crisis, we felt abandoned by conventional tools.

- We need to develop complementary tools to improve the robustness of our overall framework. In this context, I would very much welcome inspiration from other disciplines: physics, engineering, psychology, biology.
- Bringing experts from these fields together with economists and central bankers is potentially very creative and valuable.

Networks and economic theory

- There are different mathematical structures of networks, which describe how agents are connected (M Newman, *Networks: An Introduction*, 2010)
- One simple way of thinking about networks is that they make explicit the agents from which/to which any given agent receives/sends information
- In this sense they help formalise bounded rationality
- More profoundly, they provide the basis for a different model of rationality to that in standard economics
- **Are tastes and preferences fixed? Do agents select independently?**
- A model in which the primary driver is not the evaluation of the attributes of alternatives, but ‘copying’ the behaviour of agents to which you are connected without reference to the attributes
- There is a large psychological literature which provides support for this kind of behaviour





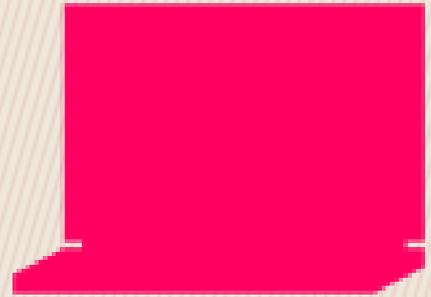


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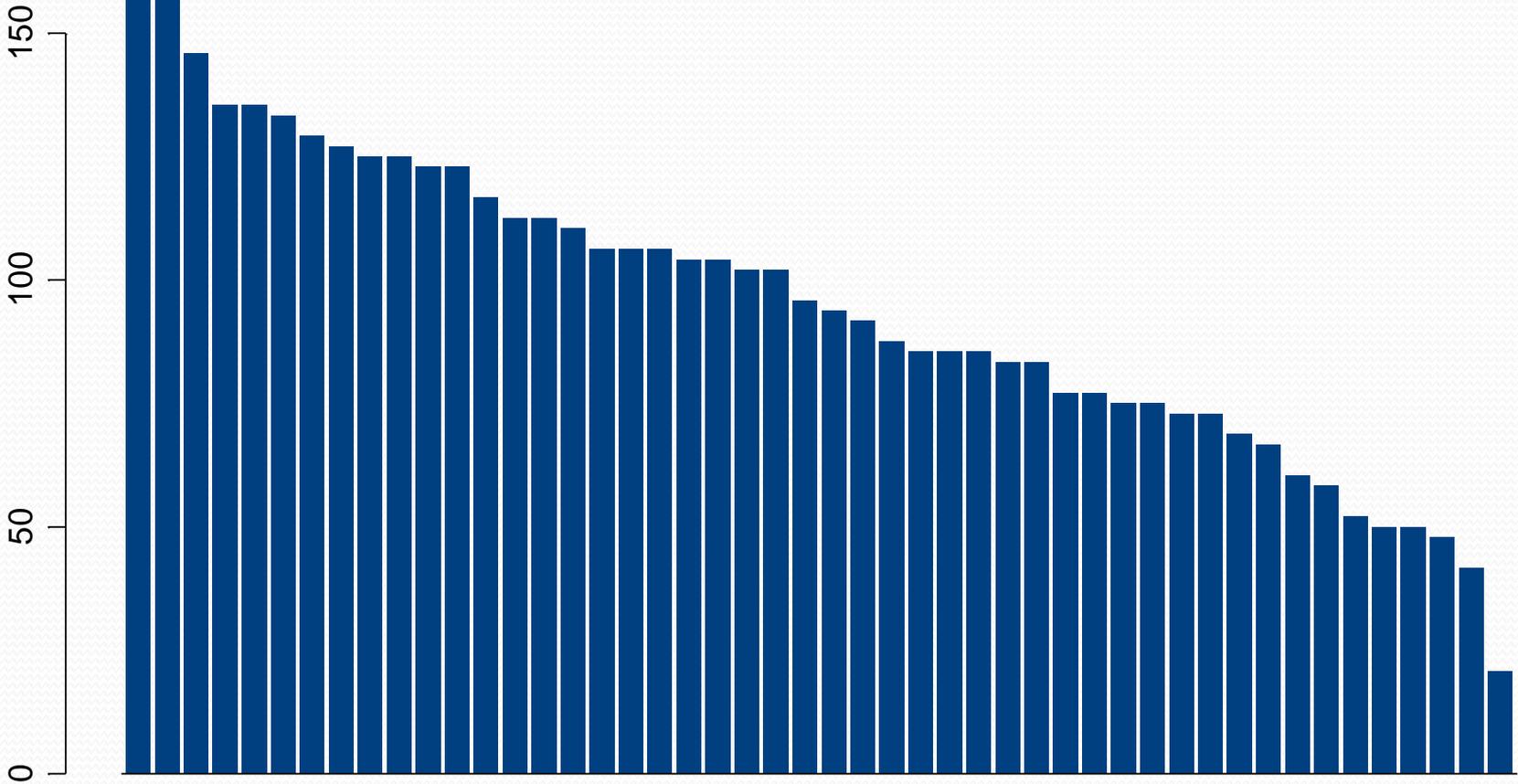
The music download experiment: an example of copying

- 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*

Number of downloads of each of the 48 songs

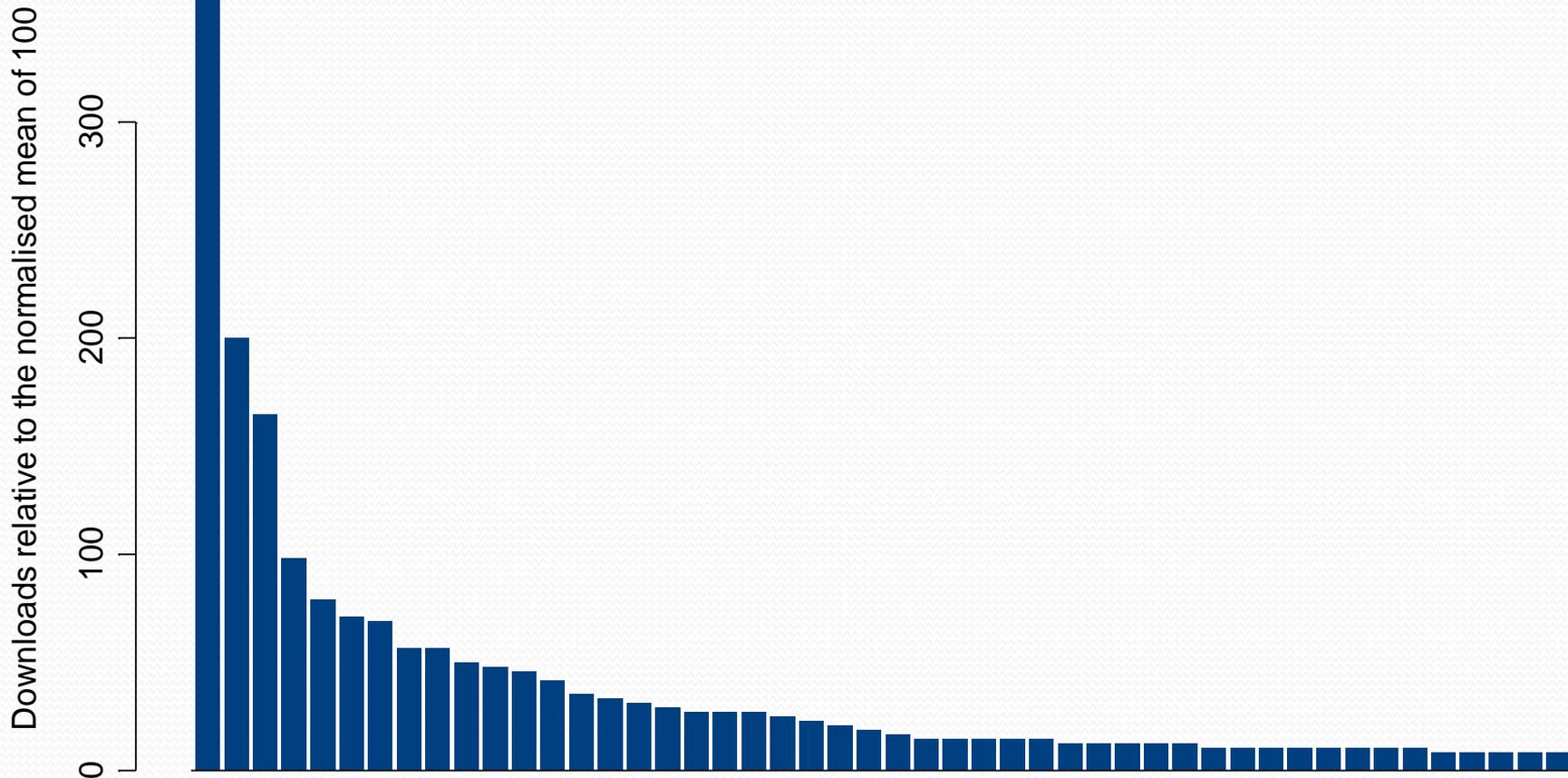
No social influence

Downloads relative to the normalised mean of 100



Number of downloads of each of the 48 songs

Strong social influence



Copying in practice: examples

- *popular culture* e.g. Bentley et.al. 2007, De Vany 2004, Kretschmer et.al. 1999, Walls 2005
- *the adoption of innovations* e.g., Arthur 1989, Rodgers 2003, Young 2005, Bettencourt et al. 2006
- *diffusion of criminal behaviour* e.g. Glaeser et al. 1996, Ormerod et.al. 2004
- *diffusion of sociopolitical behaviors* e.g. Lohmann 1994, Nowak et al. 2000, Hedstrom et al. 2000, Colbaugh and Glass 2009
- *sales in online markets* e.g., Leskovec et al. 2006, Dhar and Chang 2007
- *trading in financial markets* e.g. Kirman 1995, Shiller 2000
- *rise and fall of fads and fashions* e.g. Schelling 1973, Bikhchandani et al. 1998
- *sentiment in the business cycle* e.g. Ormerod 2001, 2004, Xi and Wang 2010
- *financial crises* e.g. Haldane and May 2011

Reflections

- Standard theory remains applicable where the assumption of fixed tastes and preferences is reasonable
- Network theory can help extend the concept of bounded rationality
- But in many contexts, copying/imitation across networks forms a more realistic view of agent behaviour
- Incentives and 'rational' behaviour *combined with* networks is the more general approach