

# The Networked Economy

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# Networks

- A massive literature on empirical and theoretical networks has developed over the past 15 years
- Physicists, quantitative sociologists, anthropologists, computer scientists – not many economists
- D Farmer, M Gallegati, C Hommes, A Kirman, P Ormerod, S Cincotti, A Sanchez and D Helbing, 'The Economy as a Complex Evolving System', *EPJ*, 2012 forthcoming
- **Why?**

# J-C Trichet, ECB, Nov 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.
- Scientists have developed sophisticated tools for analysing complex dynamic systems in a rigorous way. These models have proved helpful in understanding many important but complex phenomena

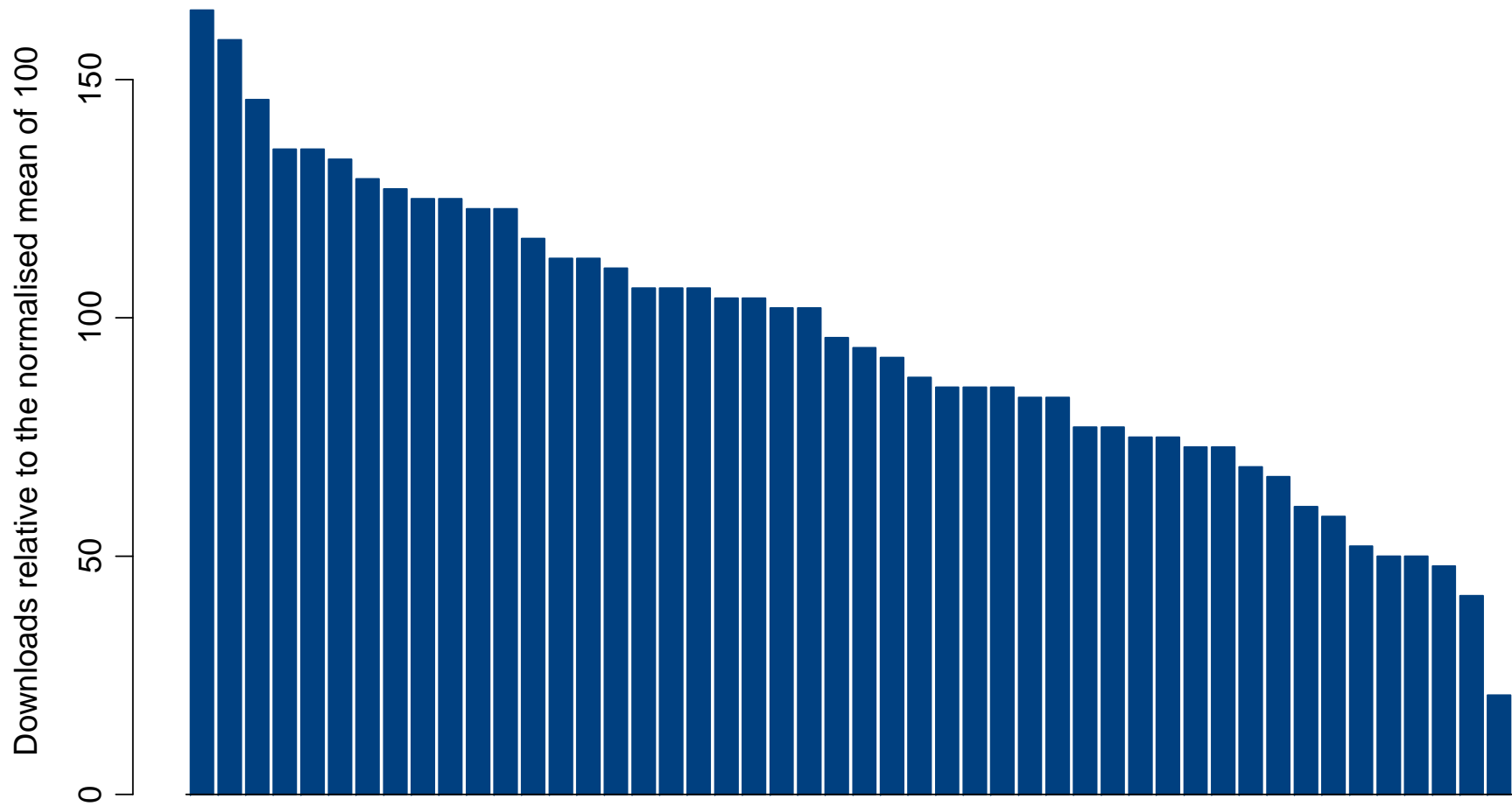
# Theoretical considerations: the background

- Consumers now face a stupendous proliferation of choice – over 10 billion – billion! – choices are available in New York City alone
- Many of these products are complex, hard to evaluate
- We are **far** more aware than ever before of the behaviour/opinions/choices of others
- In 1900, most of the world's population lived in villages. Now, over half live in cities
- The internet is transforming the world like the printing press did in the 15<sup>th</sup> century
- The preferences of agents are **not** fixed, they evolve in many ways. Specifically, they can be altered *directly* by the behaviour of other agents
- **We are dealing in general with systems of interacting agents which are out of equilibrium – complex systems**

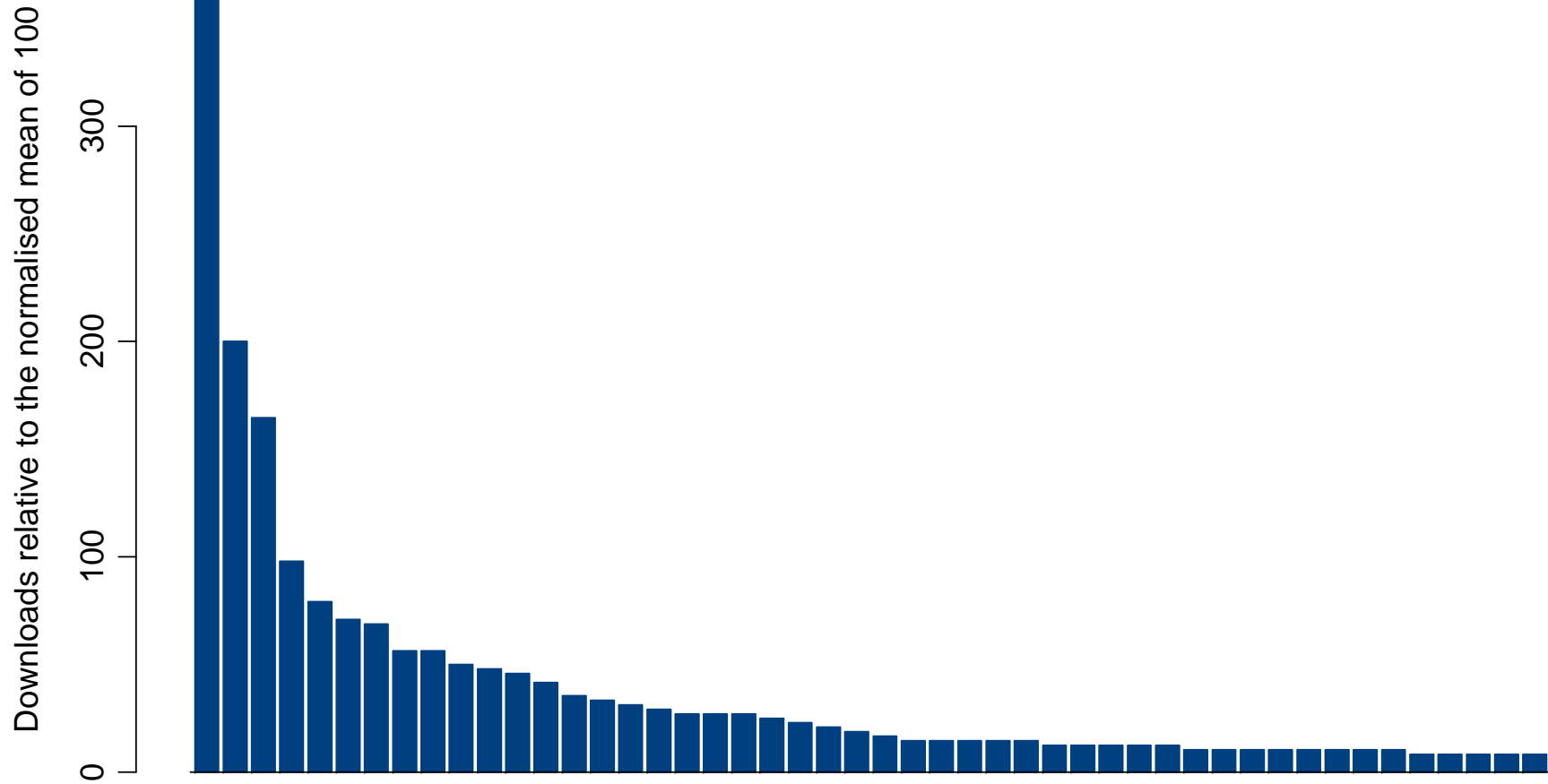
# The music download experiment: an example of copying

- Salganik, Dodds, Watts, 'Experimental study of inequality and unpredictability in an artificial cultural market', *Science*, 2006
- Students downloaded previously unknown songs either with or without knowledge of previous participants' choices
- This information was both ranked and unranked
- Students also gave the songs a rating

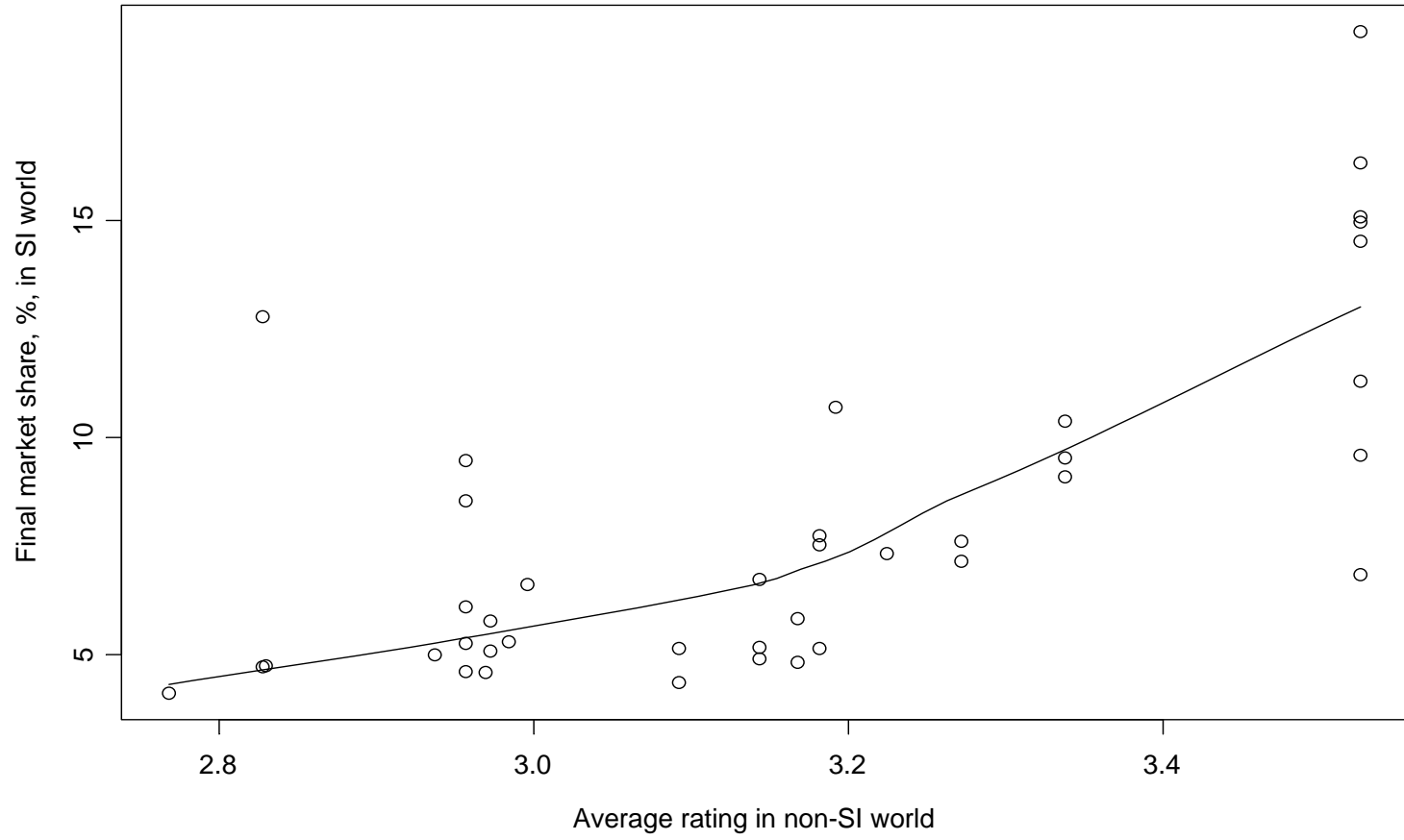
# Number of downloads of each of the 48 songs No social influence



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

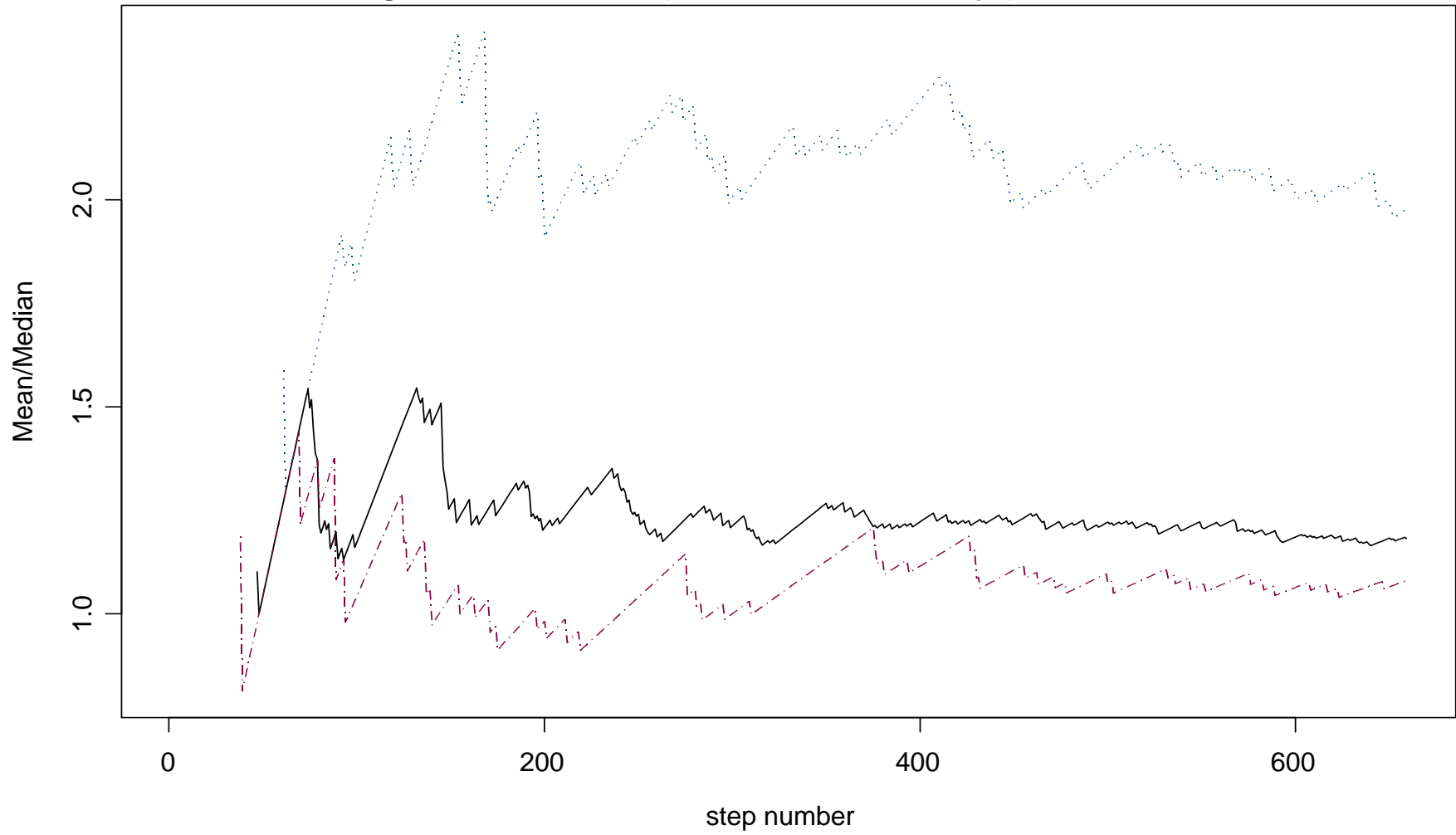


Final market share in SI world and average rating non-SI world





Time evolution of mean/median, average of each category of experiment strong, weak and no positive externality processes



# Outcomes

- *Increasing the strength of 'social learning' increased both inequality of outcome and unpredictability of success*
- Success was 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/products may not always win!***
- Colbaugh, R., K. Glass, and P. Ormerod, Predictability of 'unpredictable' cultural markets, *Proc. 105<sup>th</sup> Annual Meeting of the American Sociological Association*, Atlanta, GA, August 2010
- P .Ormerod and E.Evans (2011), *Ex ante* prediction of cascade sizes on networks of agents facing binary outcomes, *arXiv:1103.3457*

# Cultural and creative markets

- A large and rapidly growing part of the world economy
- ‘social network markets’: a connected group of individual agents who make production and consumption decisions based on the actions (signals) of other agents on the social network
- consumer tastes and preferences are continually evolving in symbiosis with the producer offers
- Rapid and persistent innovation is the key to success
- **Outcomes at a point in time are typically (highly) non-Gaussian**
- **And there is turnover in the rankings over time**

# The social network markets sector

- systems that build and maintain social networks (e.g., advertising, architecture, media, ICT software, etc.)
- systems that create value on these social networks through content (e.g., film, TV, music, fashion, design, etc)
- **These require different rules of agent behaviour**
- **Copying/imitation is more important than the attributes of the alternatives on offer**
- AL Barabasi and R Albert, 'Emergence of scaling in random networks', *Science*, 1999
- R Bentley, P Ormerod and M Batty, 'Evolving social influence in large populations', *Behavioral Ecology and Sociobiology* , 2011

# The economy as a system of evolving coupled networks

- Network structure matters – who is connected to who, who pays attention to who and when?
- Interbank lending
- International trade (e.g. propagation of recessions)
- Sentiment – ‘animal spirits’
- The link between ‘objective reality’ and outcomes is now much weaker
- A great deal depends upon which *narrative* percolates across the relevant network(s)

# Total private debt in America compared to the size of the economy

