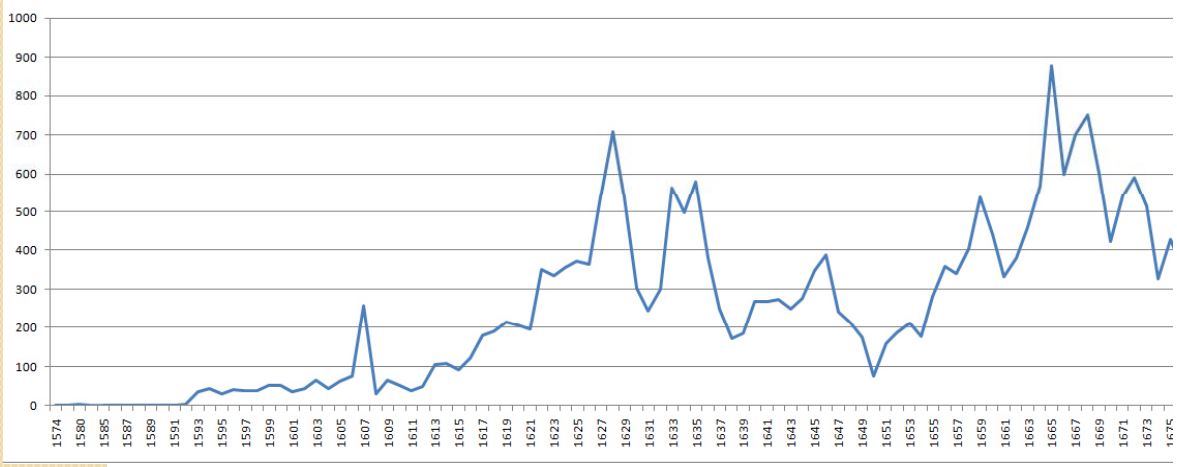
Fitting Agent-Based Models to Historical Networks

Using early-modern scientific correspondence networks and a little bit of elbow grease



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Disclaimer

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Agent Roles [Chang & Harrington, 2006]

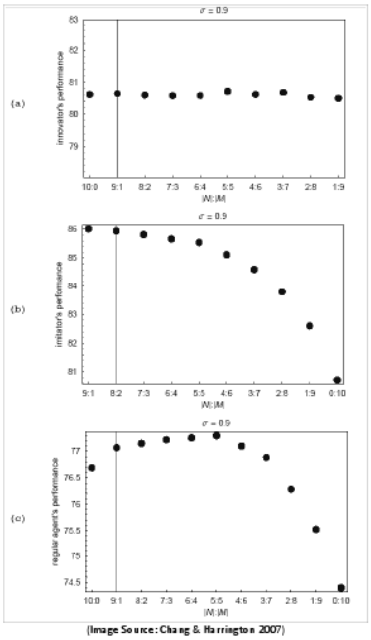
- Innovators – Highly productive in generating new ideas
- Imitators – Highly productive in identifying the ideas of others
- Regular Agents – Moderately productive at both activities

Hierarchy of Roles [Chang & Harrington, 2006]

- Stable Environment
  - *Regular Agents* learn from *Imitators* learn from *Innovators*
- Volatile Environment
  - *Regular Agents* learn from *Innovators*, *Imitators* become *Innovators*

Remarks on C&H's Model

Figure 2: An Average Agent's Performance in Each Group
N: Number of Innovators
M: Number of Connectors



(Image Source: Chang & Harrington 2007)

- Optimal ratio of *Innovators:Immitators* is somewhere between 7:3 and 4:6, depending environmental volatility
- Agent-based models should easily augment Grim's & Payette's epistemic nodal networks (yesterday), Goldstone's collective behavior models (spp)

Does it work?

- Assign each scientist in Hatch DB separate *Innovator:Imitator* scores based on contribution to a discipline
- Score each year in scientific output (letters, publications, discoveries within a discipline)
- Preliminary results show years with the highest output correspond to "sweet spot" *Innovator:Imitator* ratios.

Food For Thought

- "Sweet Spot" ratios shown to be an emergent property of stable environments
- Specially trained "between-group brokers" required to keep the sweet spot during volatility
- What happens when environment is continuously and increasingly volatile, as with today? What property needs to change about *Imitators* to allow them the speed required for *Regular Agents* to still follow them?

Thank You