Innovation and Imitation Strategies in the Age of the Upgrade

- An agent-based simulation model -

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What is the age of the upgrade?

2007   2008   2009   2010   2011   2012   2013   2014

Adapted from: https://www.repairsharks.com/iphone-repair-services/attachment/iphone-allgenerations-evolution-repairsharks

The age of the upgrade

- Consumers in durable technology goods markets have become used to upgrading from one generation of a product to the next
    - Cars, refrigerators, clothes washers, TVs, and coffee makers: Bayus (1991), Bayus, Metha and Cardes (1995)
    - Mobile phones: Danaher et al. (2001), Huh and Kim (2008) and Venkitachalam et al. (2015)
- New competitive dynamics in the context of innovation and imitation strategies

Agent-based simulation model

- Model of a durable consumer goods market with upgrading behavior

- Producers compete using innovation and imitation strategies

    - technology level

    - preference fit

- Fixed unit price

- Test which strategies work best (business perspective) and how fast the pace of technical innovation is (policymaker perspective)

Innovation and imitation strategies

	Innovation	Pure imitation	Lateral imitation	Improving imitation
Technology strategy	Lead	Imitate best selling product	Imitate most advanced product	Imitate best selling product, then improve it
Preference strategy	Market research	Imitate best selling product	Market research, reposition	Imitate best selling product

Based on the innovation and imitation strategy typologies by Pérẽz-Luno, Carbrera and Wiklund (2007), Ulhøi (2012) and Valdani and Arbore (2007)

Dimensions and setup
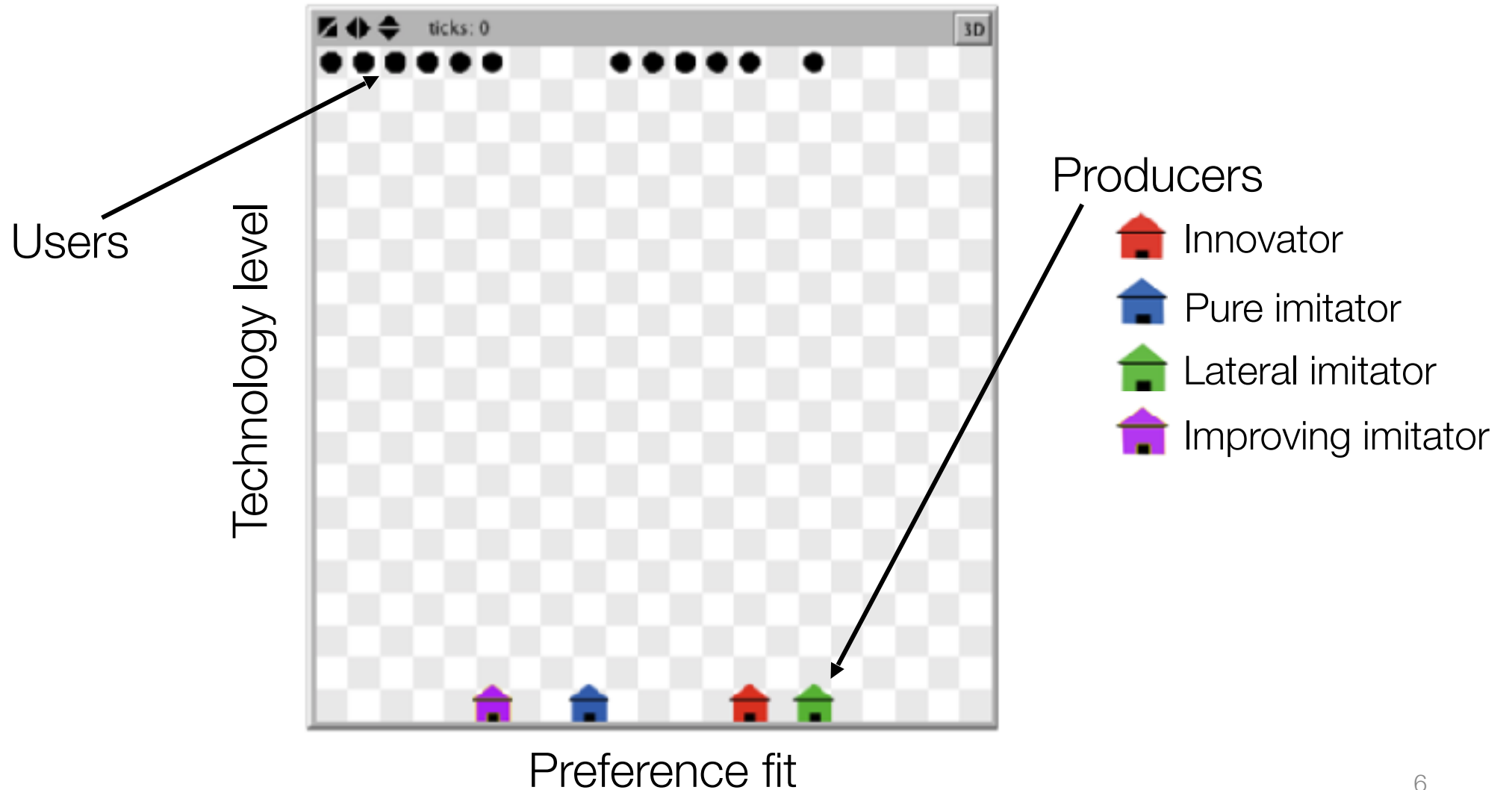
Users

Technology level

Preference fit

Producers

🏠 Innovator
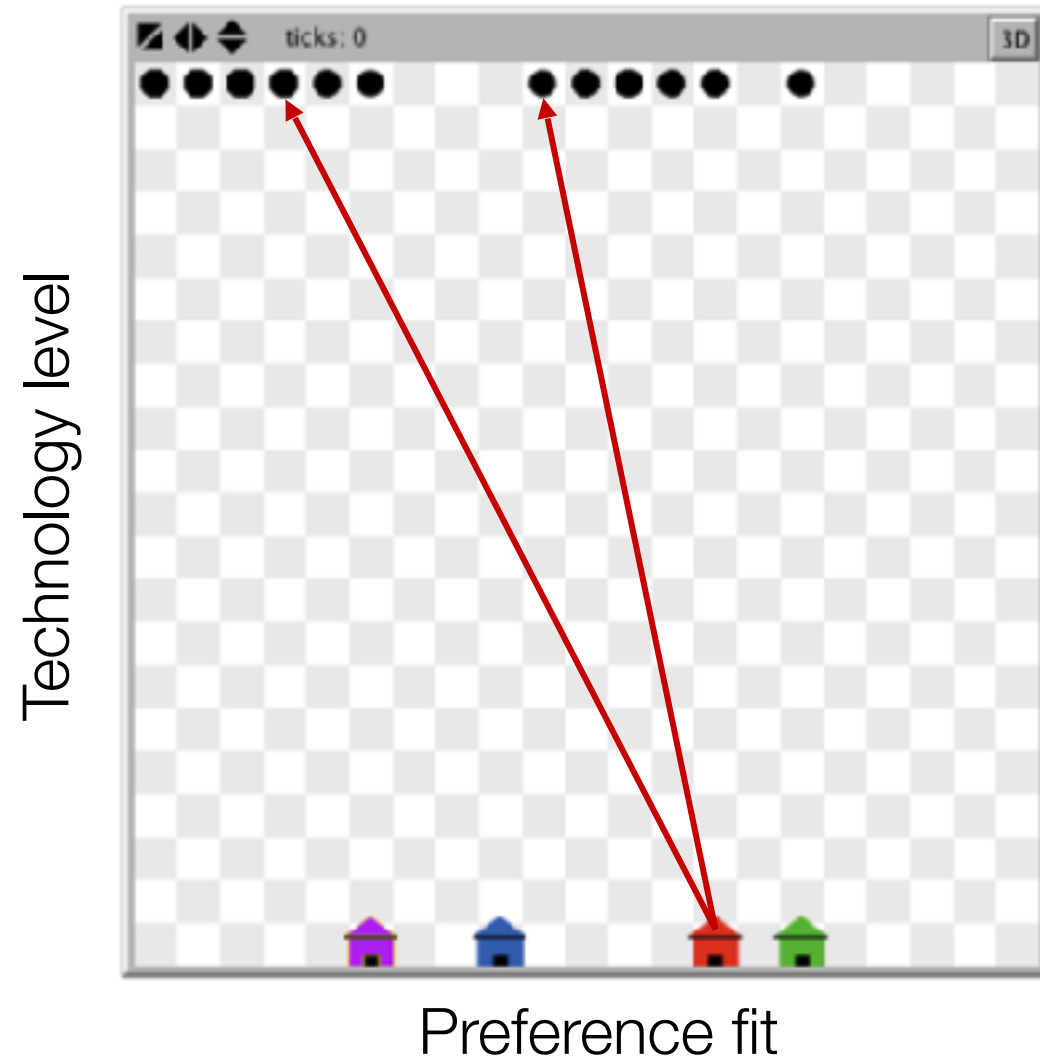
🏠 Pure imitator

🏠 Lateral imitator

🏠 Improving imitator

ticks: 0

3D

Consumer behavior

R&D, costs and learning
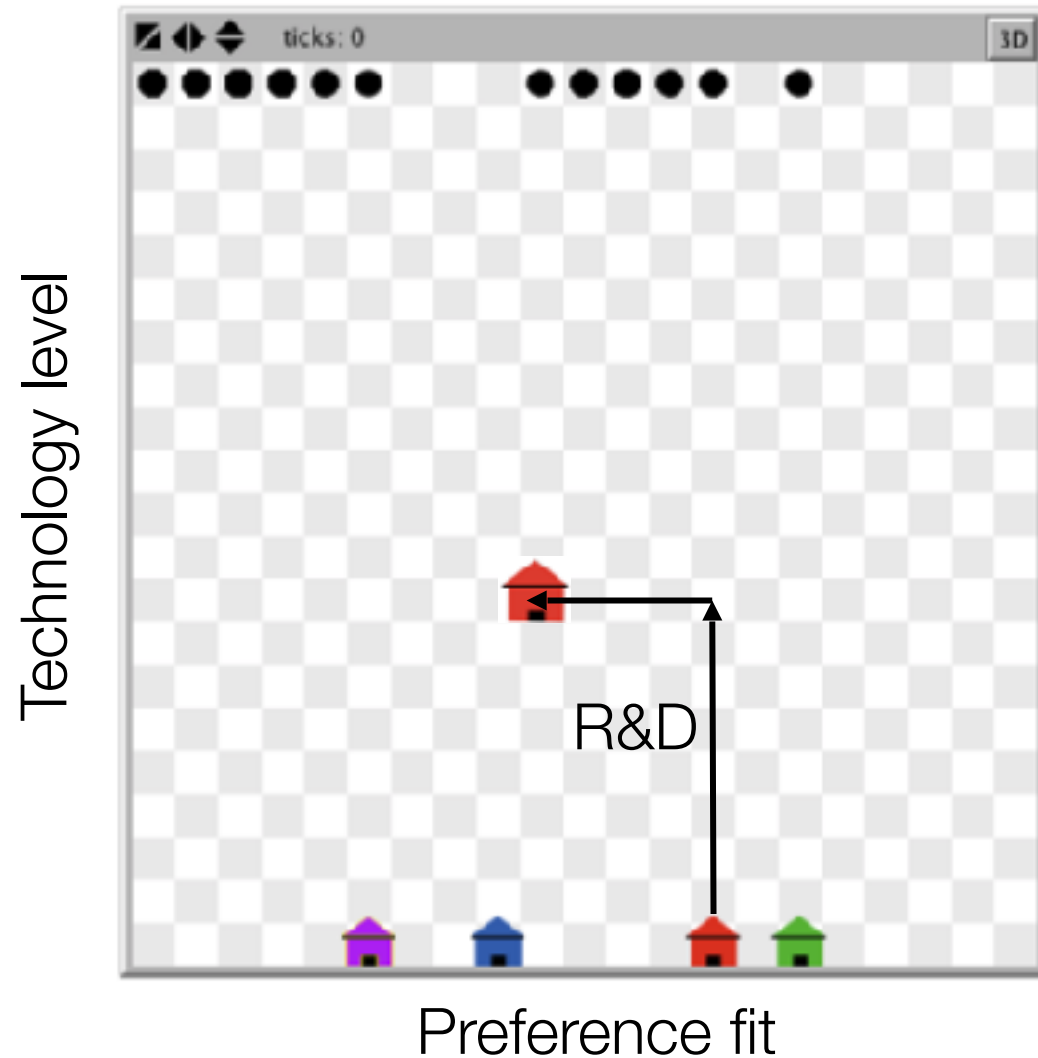
Market research

Optimization

End of the simulation

Producers

🏠 Innovator
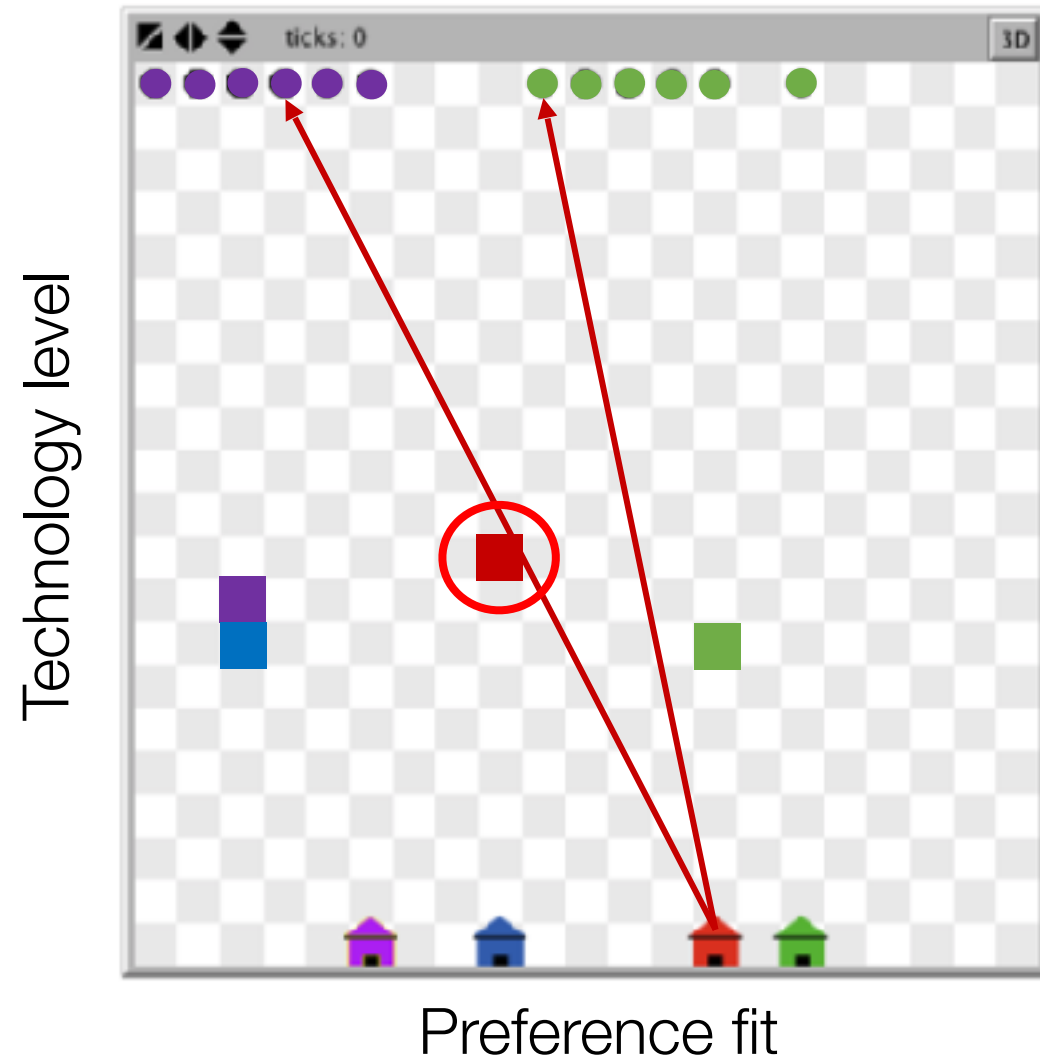
🏠 Pure imitator

🏠 Lateral imitator

🏠 Improving imitator

Technology level
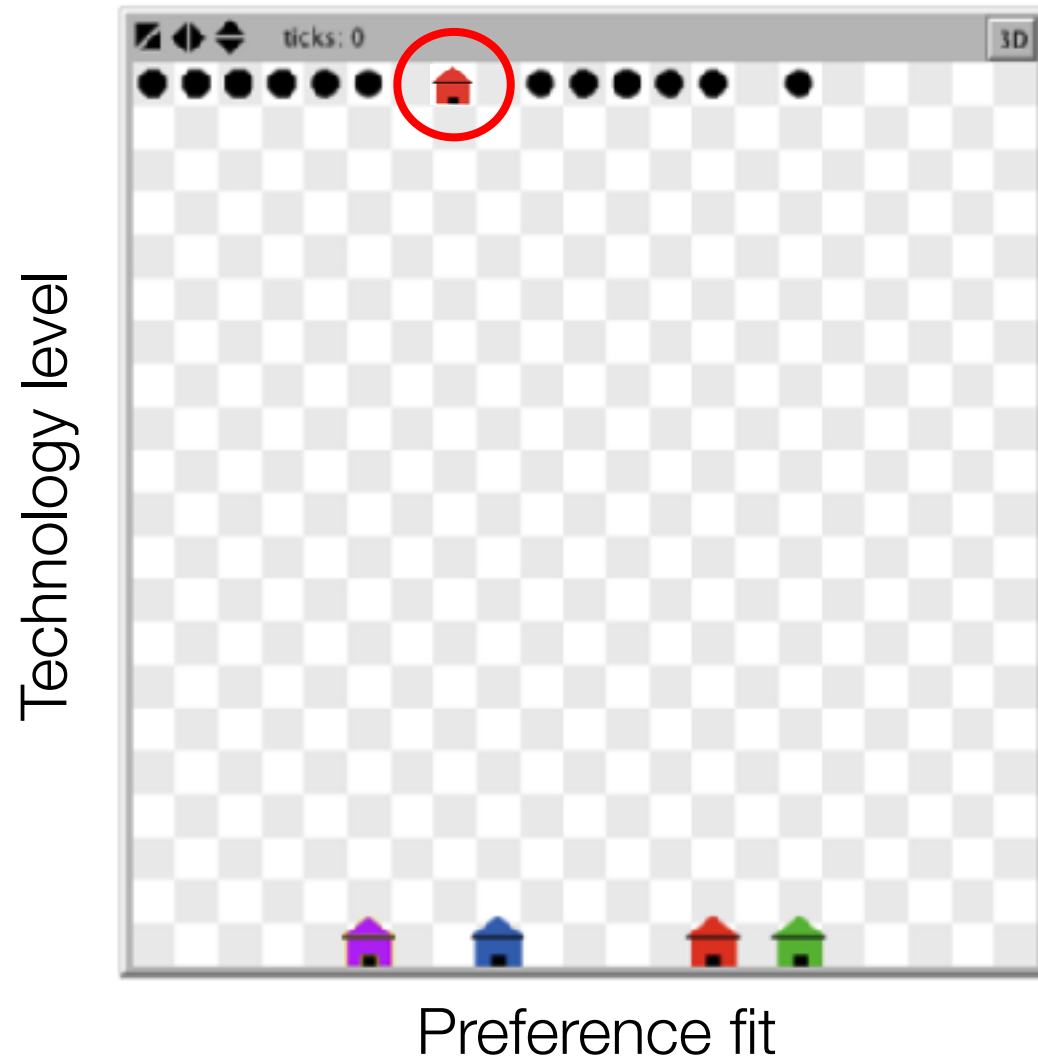
Preference fit

Development of a run

Step 9 · Step 15 · Step 19

Technology level
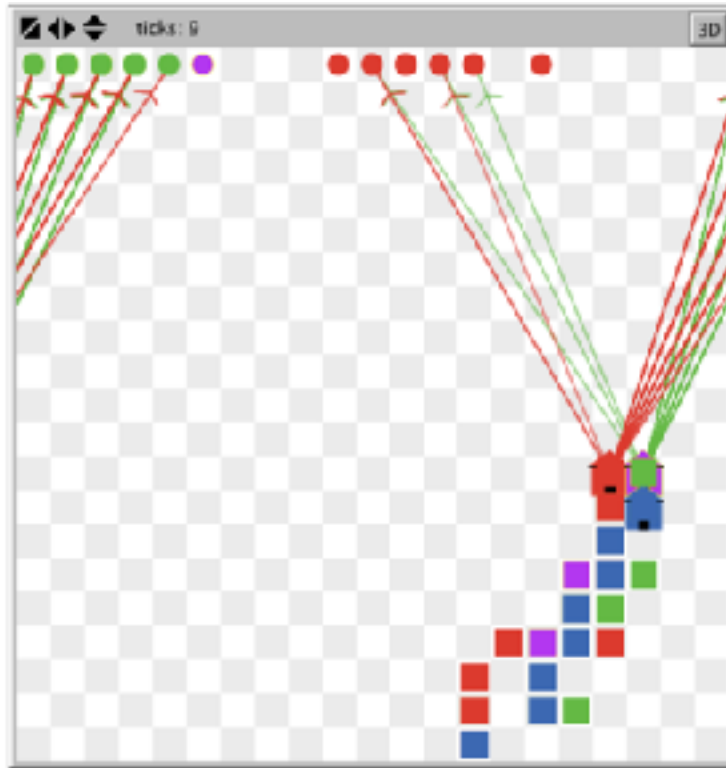
Preference fit
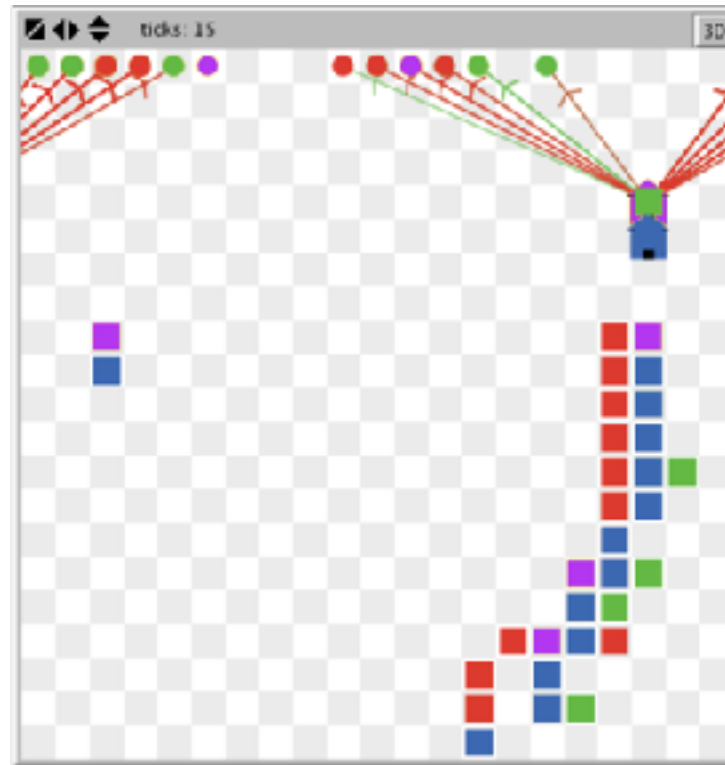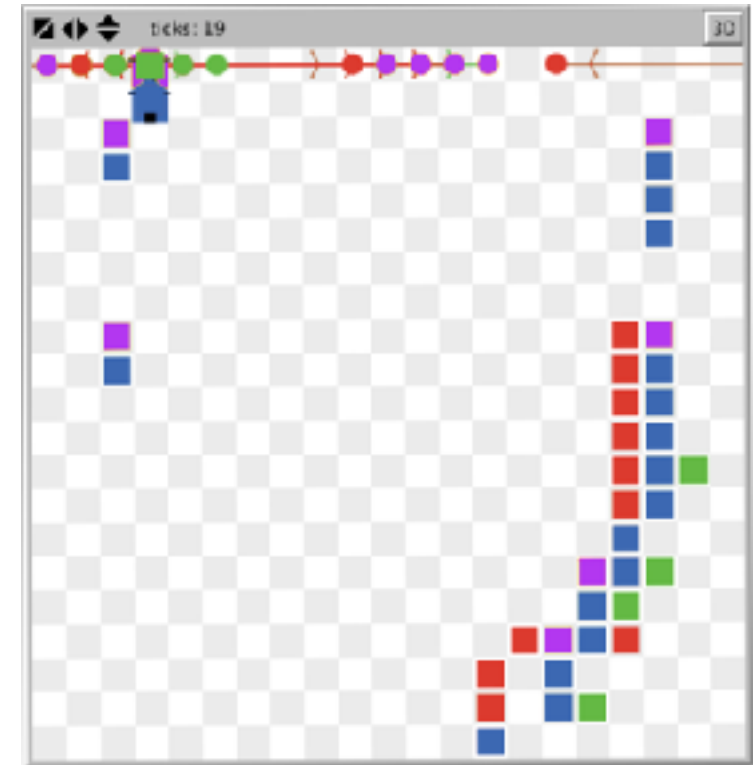
Innovator · Lateral imitator · Pure imitator · Improving imitator

Results in the base setup

	Innovation (A)	Pure imitation (B)	Lateral imitation (C)	Improving imitation (D)
Mean energy	357.11^{BCD}	109.61^{ACD}	322.13^{ABD}	897.34^{ABC}
Standard deviation of energy	199.69	18.32	143.16	332.59

Based on 1000 runs of the simulation.

A: $p<0.05$ in paired t-test of different means with Bonferroni correction in comparison to value for innovation type producers, B for pure imitation, C for lateral imitation, D for improving imitation

Introduction of an imitation cost

- The pace of technical innovation is unchanged
- Imitation strategies suffer
- Innovation strategy becomes the most successful one
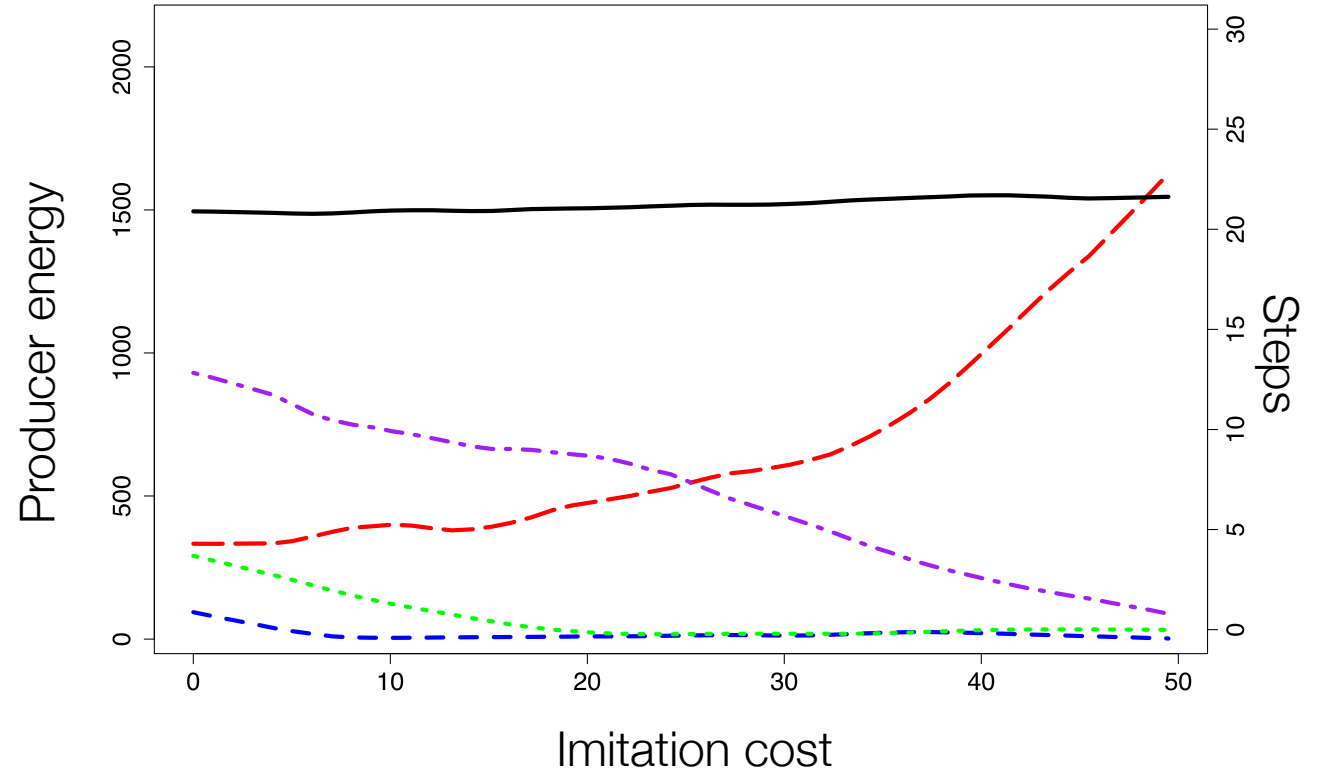
Based on 1000 runs of the simulation: 10 runs in each step of 0.5 imitation cost between 0 and 49.5

Legend:
— Steps
– – Innovation
– – Pure imitation
······ Lateral imitation
–·–· Improving imitation

Conclusion: Insights for managers

- In the age of the upgrade, pure imitation does not work, because it will always have a second-mover disadvantage

- Producers that combine technical innovation with imitation are the most successful ones

- Completely independent innovation is less successful than improving imitation

- However, if imitation is too costly, going independent is the best strategy

Conclusion: Insights for policymakers

- Raising the costs of imitation by strengthening protection of intellectual property rights does not significantly change the pace of technical innovation, it just changes the distribution of profits

- Consumer upgrading preferences determine the pace of technical innovation

- Horizontal product differentiation can be an incentive for faster technical innovation (see parameter sensitivity analysis in the paper)

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Questions?