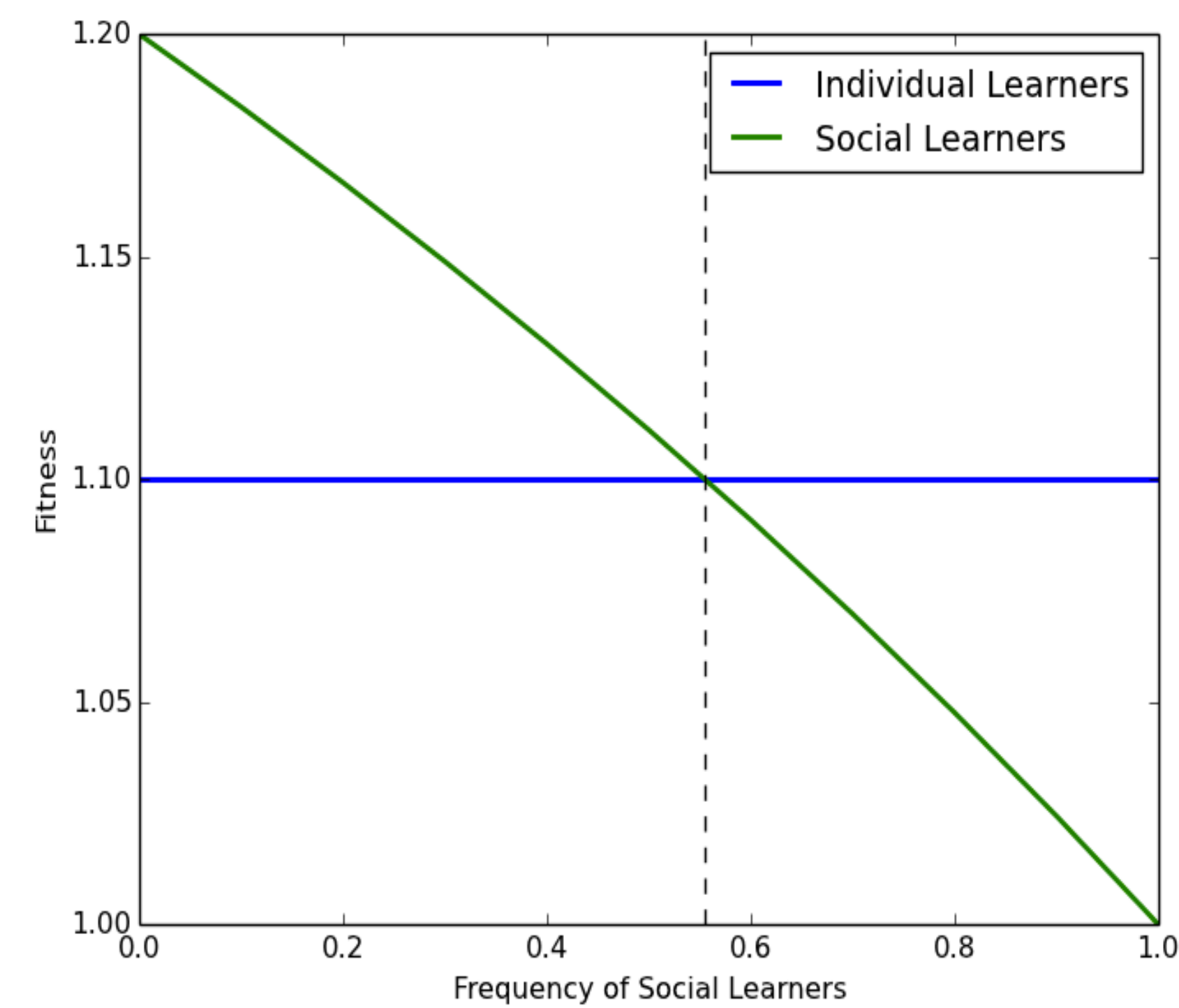


Rogers' Paradox Replicated and Resolved

Ecological Variation and the Evolution of Social Learning Strategies

Aaron D. Lightner, Department of Anthropology, Washington State University

Introduction



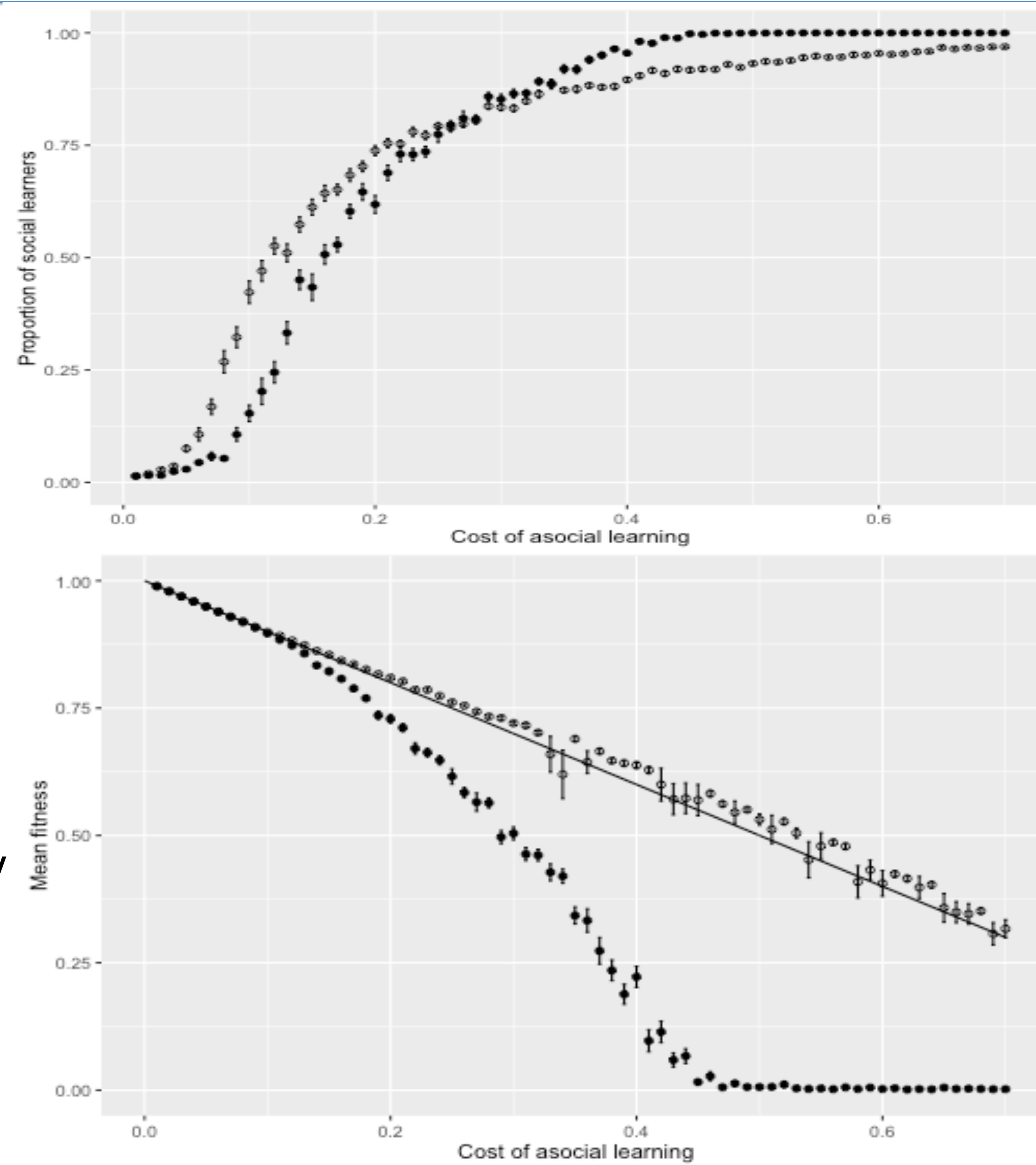
- Polymorphic equilibrium has mean fitness equal to that of only asocial learners
- Rogers' Paradox (RP): commonly held assertion that culture enhances fitness

Aims & Methods

- Replicated spatially explicit ABM from Rendell et al (2010)
- Varied environmental *harshness* and *spatial variation*
- **Critical** learners use social first, asocial as failsafe
- **Conditional** learners use asocial first, social as failsafe

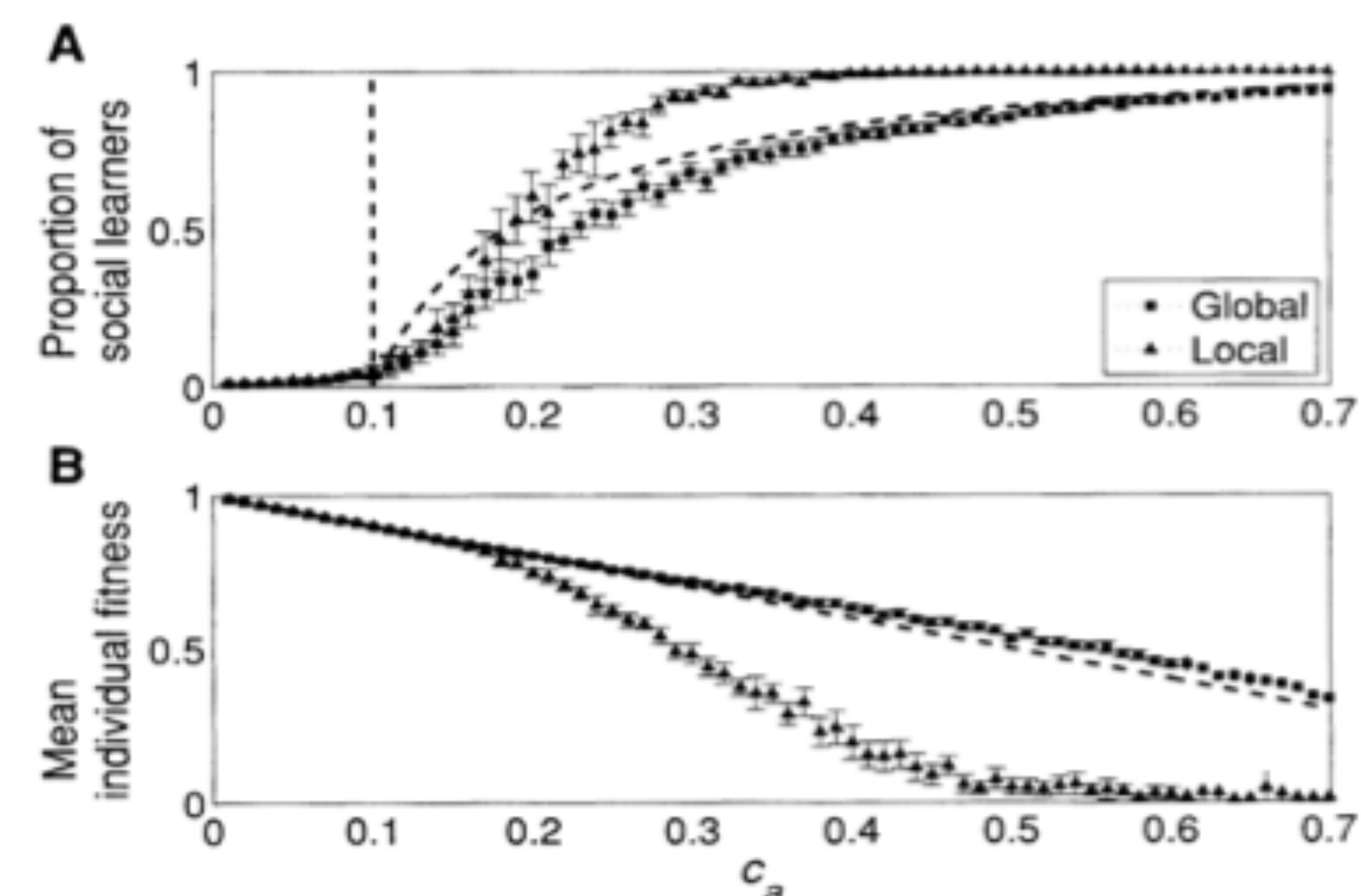
Research questions:

1. What is the effect of spatially explicit context on RP?
2. Effect of mixed strategies under various harshness and spatial variation conditions?



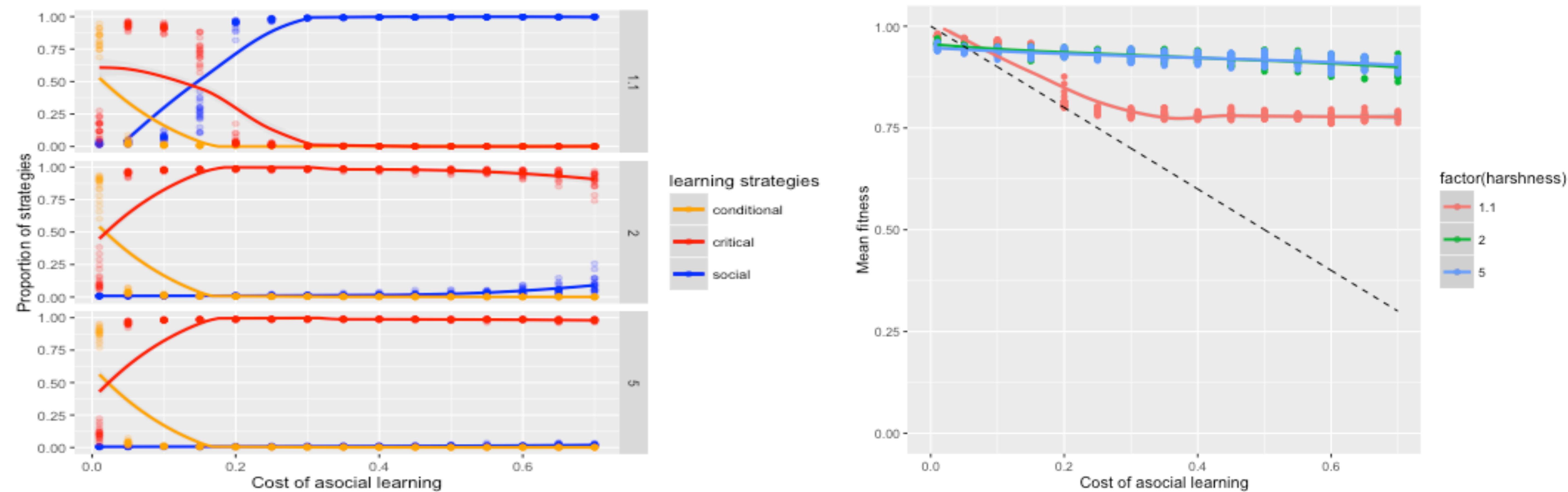
Figures 1-2.

Proportion of social learners (topmost) and mean fitness (above) as functions of asocial cost. Global (open circles) and local (black dots) conditions with line in mean fitness figure depicts expected fitnesses of only asocial learners. Replication of original figure from Rendell et al (below) sets harshness = 2, no spatial variation and social cost = 0.



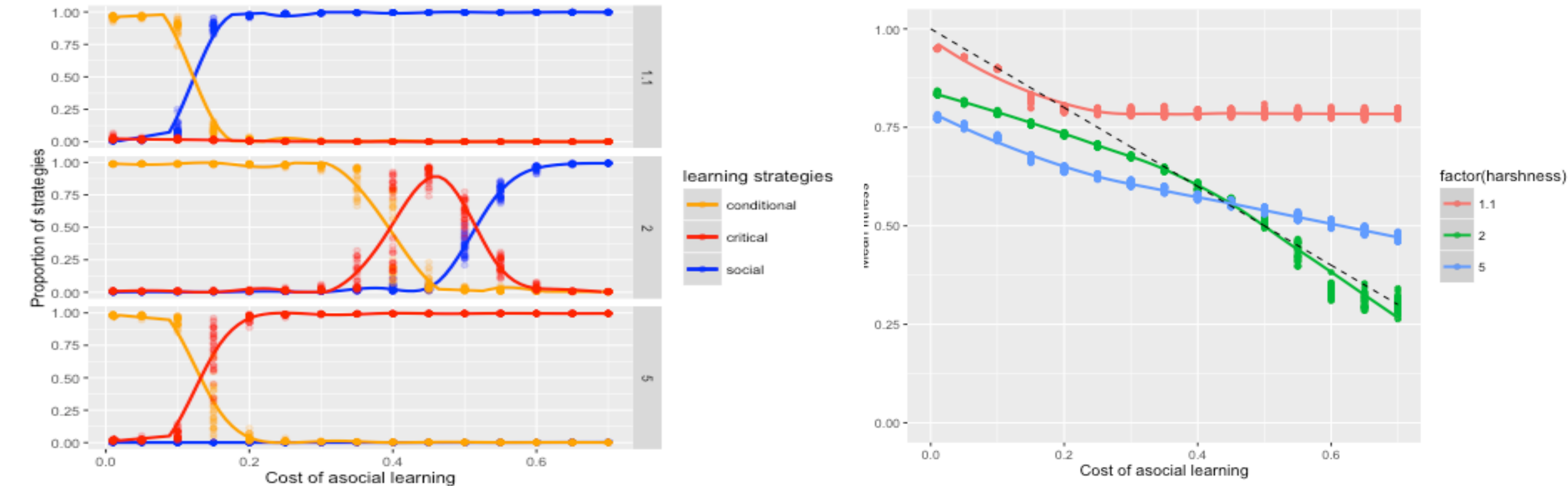
Figures 3-4.

Proportion of learners (left) and mean fitness (right) in spatially *stable* environment, social cost = 0.02



Figures 5-6.

Proportion of learners (left) and mean fitness (right) in spatially *varying* environment, social cost = 0.02



Conclusions

- Spatially explicit model reinforces RP (Figs. 1-2)
- RP is resolved at pivotal asocial costs (Figs 4 & 6), mostly by **critical** learners (Figs 3 & 5)
- In low harshness and high asocial cost, **unbiased social** learning resolves RP
- In spatially varying environments, social learning is less effective; **conditional** learning is favored until pivotal asocial cost is reached

Reference

Rendell, L, Fogarty, L, Laland, KN, 2010. Rogers' paradox recast and resolved: Population structure and the evolution of social learning strategies. *Evolution* 64(2):534-48.