Community Resilience through Innovation Networks: An Agent Based Approach

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Kirsten Wright
David Robinson

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Table of contents

The setting

- Forestry communities dominate the boreal region
- Canada has world's largest trade surplus forest products.
- 1.25% of GDP
- Double the contribution of oil in 2010
- Labour shedding - 40% in 10 years
- Communites are in decline

The setting

Why some regions will decline: A Canadian case study with thoughts on local development strategies

Mario Polse, Richard Shearmur . Papers in Regional Science, Volume 85 Number 1 March 2006.

1. "Their foreseeable decline is not solely a matter of projecting past trends, but rather the result of a combination of factors, which make further growth highly unlikely."
2. "population decline is the inevitable result of net out-migration."
3. Canada and Australia, Sweden, Finland, Japan, Russia
4. "Regional decline will become an increasingly prevalent occurrence in nations at the end of the demographic transition whose economic geographies display centre-periphery relationships."

The larger project

This paper is one of a series in a project to find possible solutions

1. Economic Theory of Community Forestry
2. Innovation in communities as small world networks
3. A product-space approach to innovation for community forestry
4. The effect of innovating communities on the network of forestry communitues.

The larger project

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This paper examines the effect of introducing real community forestry on the network of communites

A simulation model

1. 20 communities on a ring (Hotelling-Salop)
2. Net regional outmigration (state of the world)
3. There is migration from smaller to larger communities (agglomeration)
4. Some communities have expanded capacity to add people (innovation)
5. Simple simulation model in R

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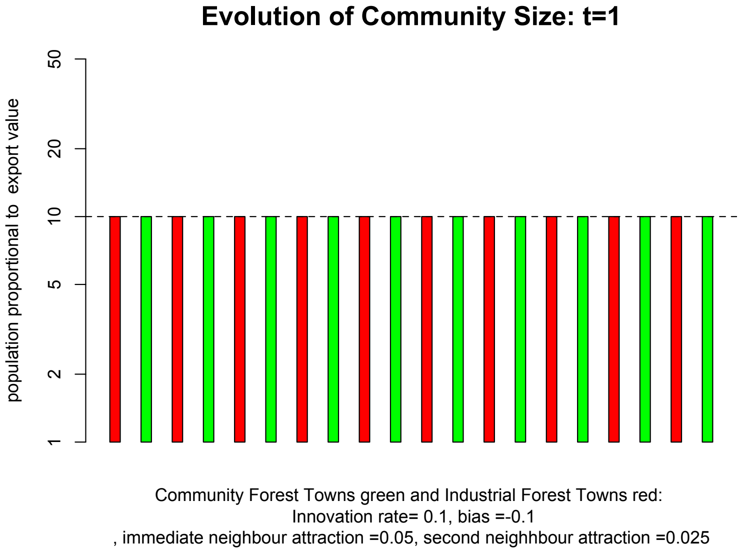
Example

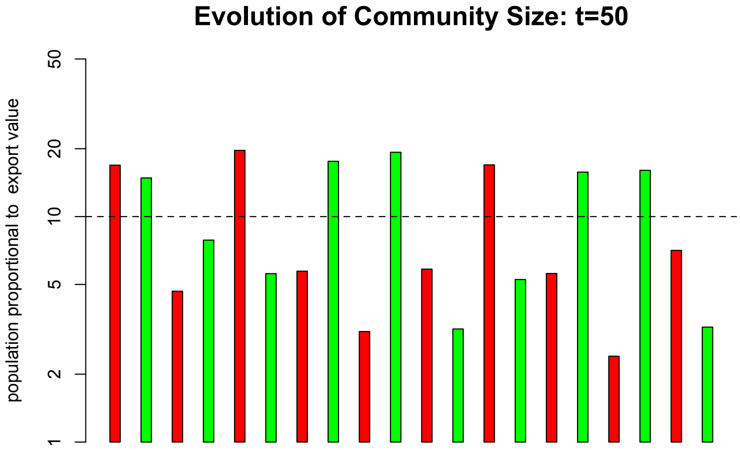
No outmigration, No innovation

- equal initial population of 10 in 20 communities
- $b = 0$
- $v = 0$
- $sd = 0.15$
- $m1 = 0.05$ Migration rate to nearest neighbours
- $m2 = 0.025$ Migration rate to second- nearest neighbours
- MIN=2
- log scale, max =50

Initial situation

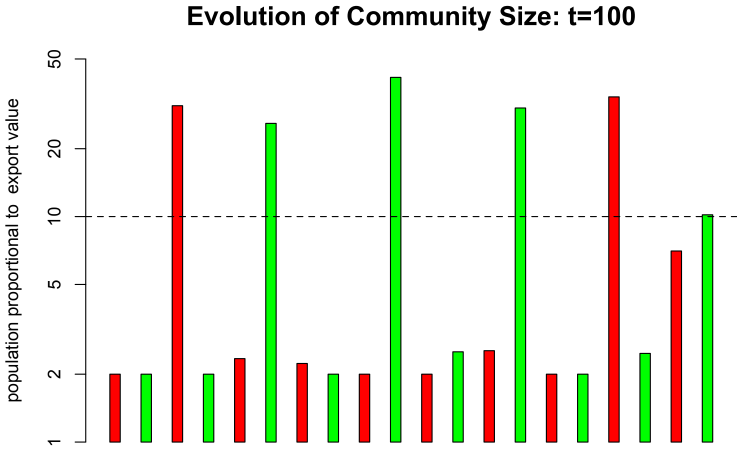


No bias after 50 rounds



Community Forest Towns green and Industrial Forest Towns red:
Innovation rate= 0, bias =0
, immediate neighbour attraction =0.05, second neighhbour attraction =0.025

No bias after 100 rounds



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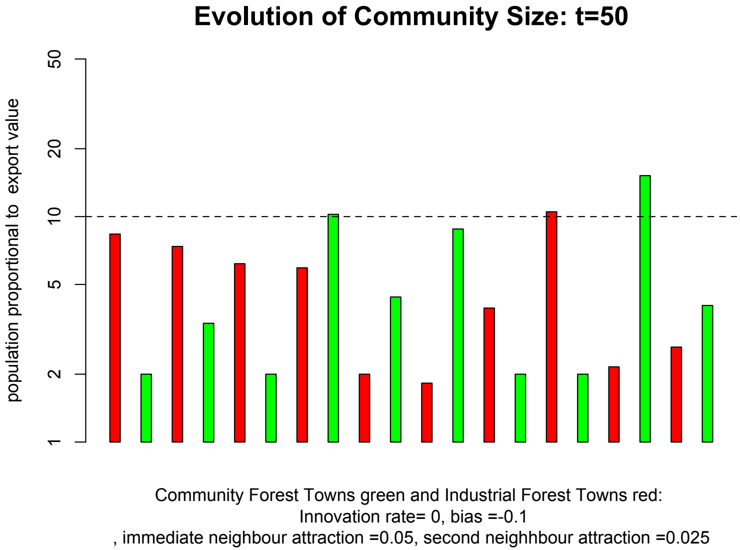
Real world outmigration after 50 rounds



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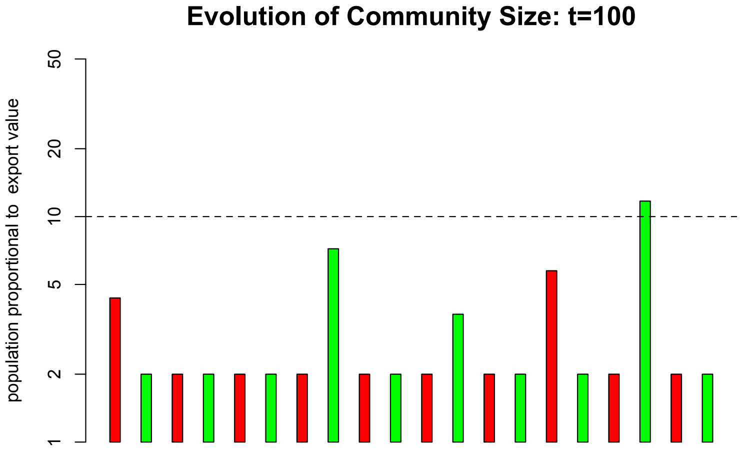

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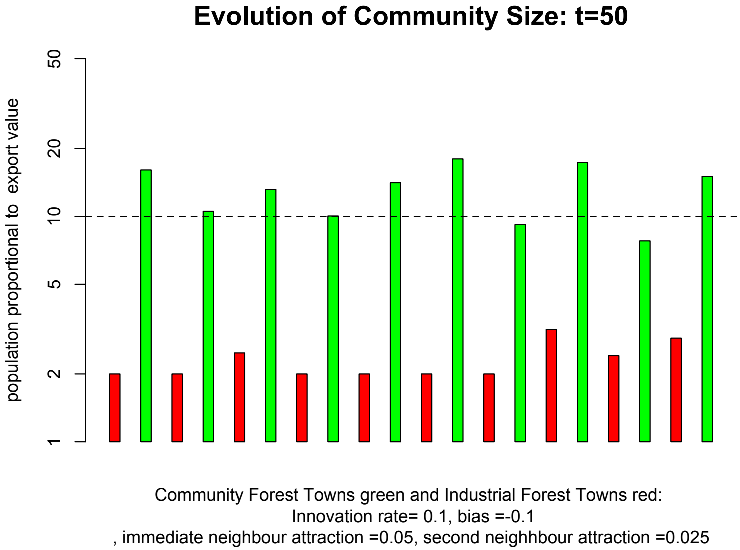
Results for the parameter space

<table>
<tr><th></th><th>$b > 0$</th><th>$b = 0$</th></tr>
<tr><td>$v = 0$</td><td>2
population declines, temporary hierarchy emerges</td><td rowspan="4">1
hierarchy emerges, small communities are eaten, population steady</td></tr>
<tr><td>$v < b$</td><td>3
population declines, temporary hierarchy emerges, innovators dominate and survive longest</td></tr>
<tr><td>$v = b$</td><td>4
population declines initially then stabillizes innovators grow and dominate. Some are eventually eaten. Only innovators survive</td></tr>
<tr><td>$v > b$</td><td>5
innovating communities grow indefinitely after consuming non- innovating neighbours.</td></tr>
</table>

Outmigration = innovation, 200 rounds



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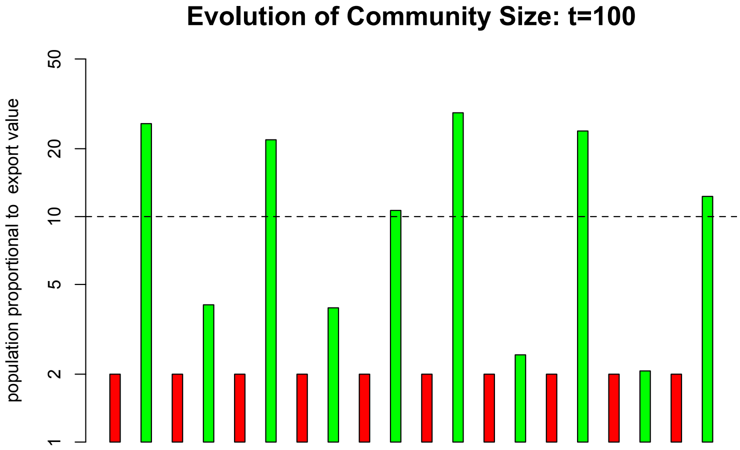

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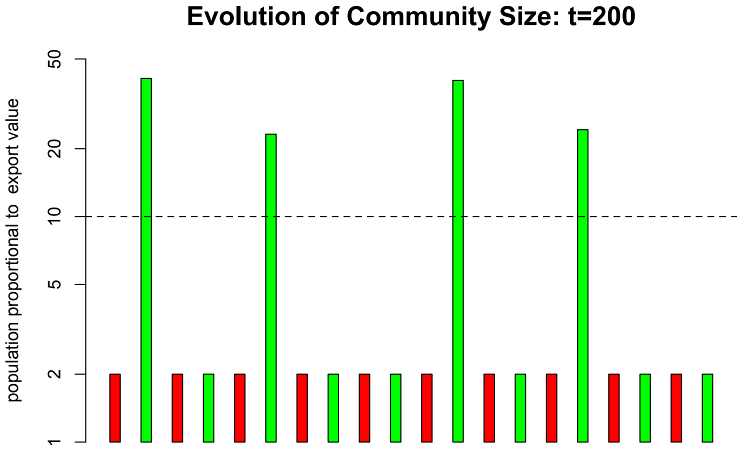

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Conclusions

- Key parameter is innovation rate
- Boundary is when innovation rate equals effect of outmigration
- Increasing innovation in some communities results in those communities dominating their local area
- We argue elsewhere that community forestry will systematically raise innovation and can stabilize communites

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Thank You

Kirsten Wright,
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Write drobinson@laurentian.ca to get the paper or the simulation program