

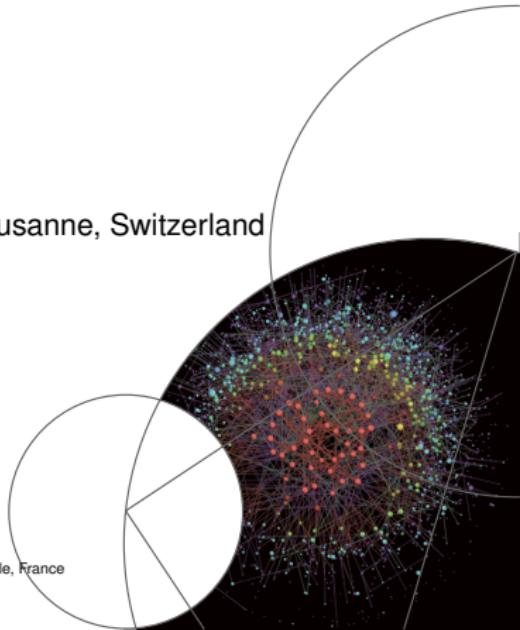


To vaccinate or not to vaccinate? A coevolutionary dilemma

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Dr AJ Wakefield, FRCS[✉], SH Murch, MB, A Anthony, MB, J Linnell, PhD, DM Casson, MRCP, M Malik, MRCP, M Berelowitz, FRCPsych, AP Dhillon, MRCPath, MA Thomson, FRCP, P Harvey, FRCP, A Valentine, FRCR, SE Davies, MRCPath, JA Walker-Smith, FRCP

Altmetric 1,475 DOI: [http://dx.doi.org/10.1016/S0140-6736\(97\)11096-0](http://dx.doi.org/10.1016/S0140-6736(97)11096-0)

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Early Report

RETRACTED: Ileitis, colitis, and peritonitis

Dr AJ Wakefield, FRCS, FRCR, FRCPsych, AP Dhillon, MRCR, Smith, FRCP

DOI: <http://dx.doi.org/10.1016/j.laneuro.2016.03.001>

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Anti Vaccine Movement

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Here's The Truth About Vaccines And Herd Immunity

Natalia Reagan | Posted 04.26.2016 | Science

Read More: Vaccines, Herd Immunity, Vaccinations, Immunization, World Immunization Week, Preventable Disease, Health, Healthcare, Science, Anti-Vaccine Movement, Anti-Vaxxers, Sb277, #SB277, Talking Science, Polio, Polio Vaccine, Measles Outbreak, Measles, Personal-Belief-Exemptions, Science News

This week is World Immunization Week and what better way to commemorate it than by discussing the facts about vaccines and the importance of herd immunity.

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How Anti-Vaccination Misinformation Could Exacerbate An International Health Emergency

Deena Zelenowitz | Posted 02.29.2016 | Healthy Living

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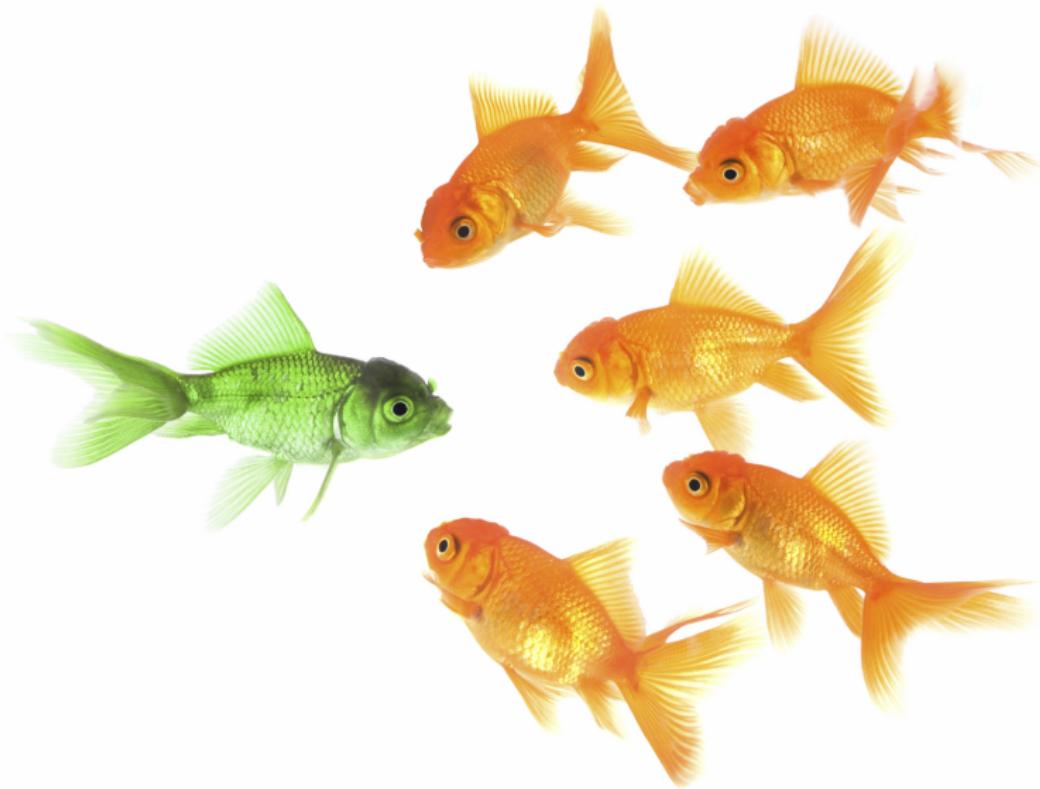
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Vaccination dilemma



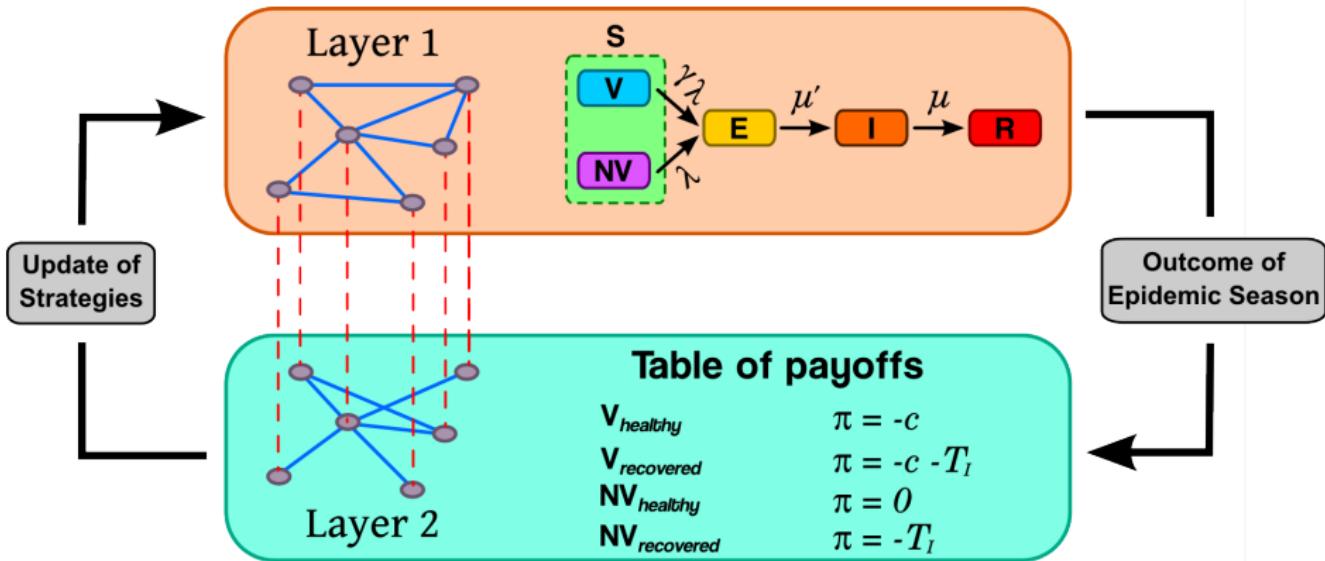
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Cooperation VS Spreading who will prevail?

Can we trace some **guidelines** to bolster the adoption of pro-vaccine behaviours?

The coevolutionary model

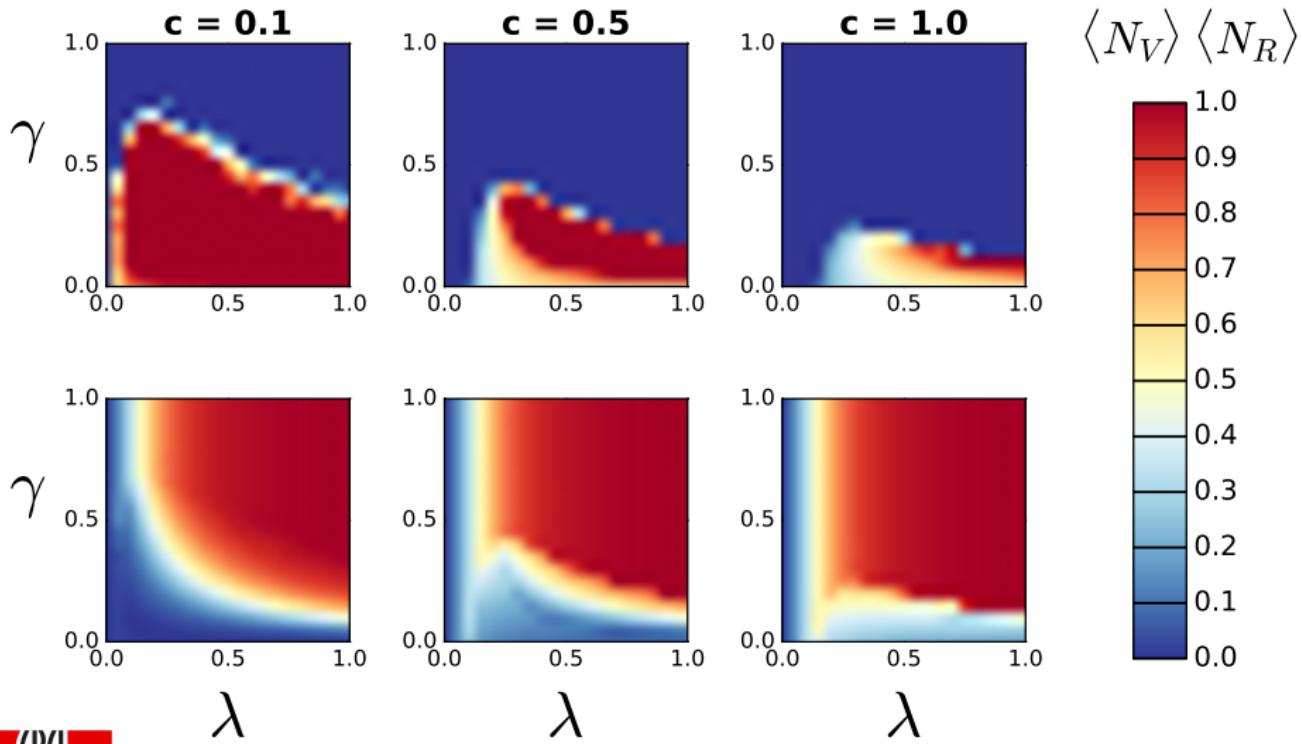


A. Cardillo, et al. "Evolutionary vaccination dilemma in complex networks." Phys. Rev. E, **88**, 032803. (2013).

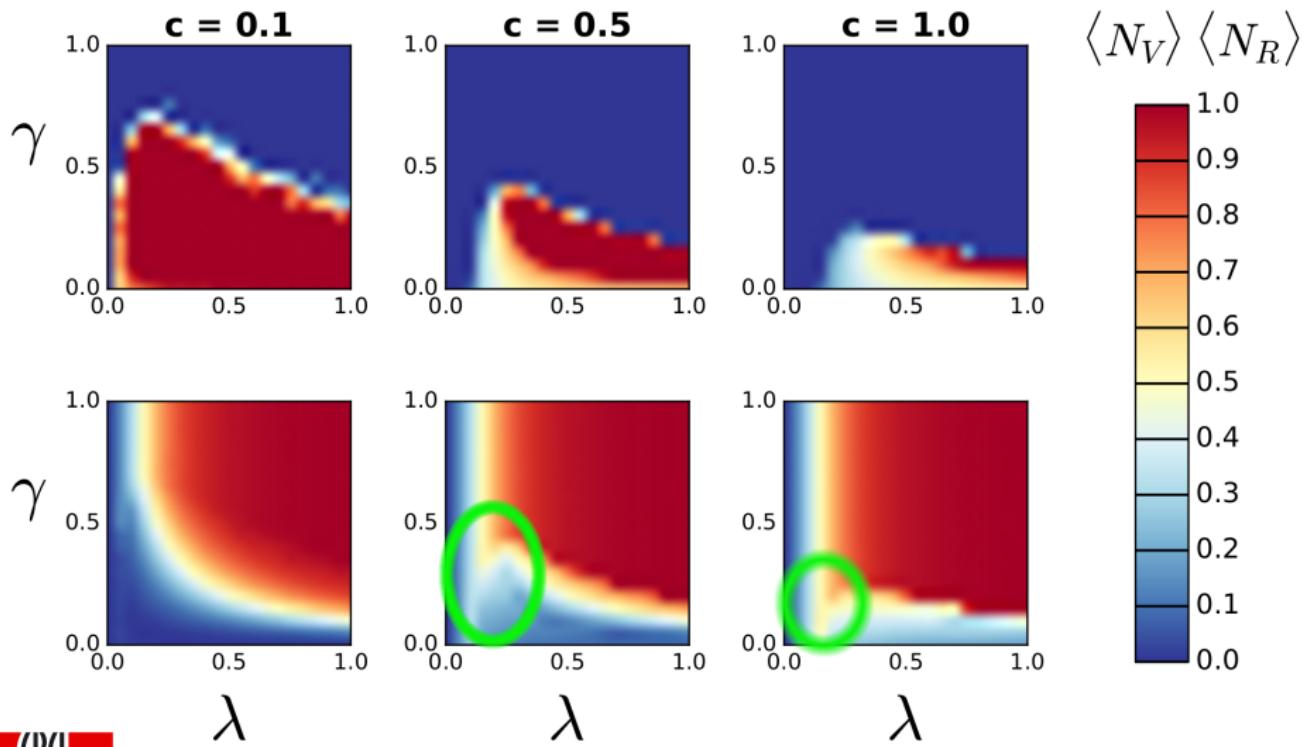
Results

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Global behaviour (RGG – SF)

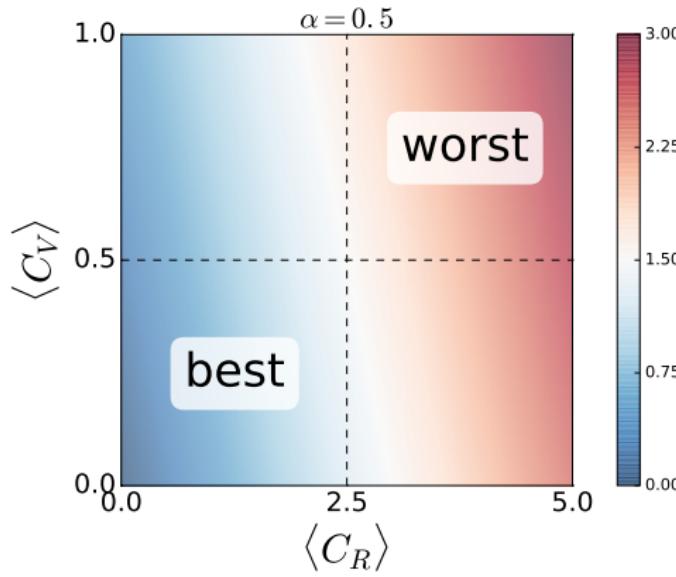


Global behaviour (RGG – SF)



Overall cost

$$\rho = \alpha \langle C_V \rangle + (1 - \alpha) \langle C_R \rangle$$



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Zealots

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Zealots

“ Between 2005 and 2010, the proportion of French people in favour or very in favour of vaccination dropped from 90% to 60% (2013 INPES Peretti-Watel health barometer). The percentage of French people between the ages of 18 and 75 who are anti-vaccination increased from 8.5% in 2005 to 38.2% in 2010. In 2005, 58% of doctors questioned the usefulness of vaccines administered to children while 31% of doctors were expressing doubts about vaccine safety. These figures must surely have increased since then. (Michèle Rivasi)

Zealots

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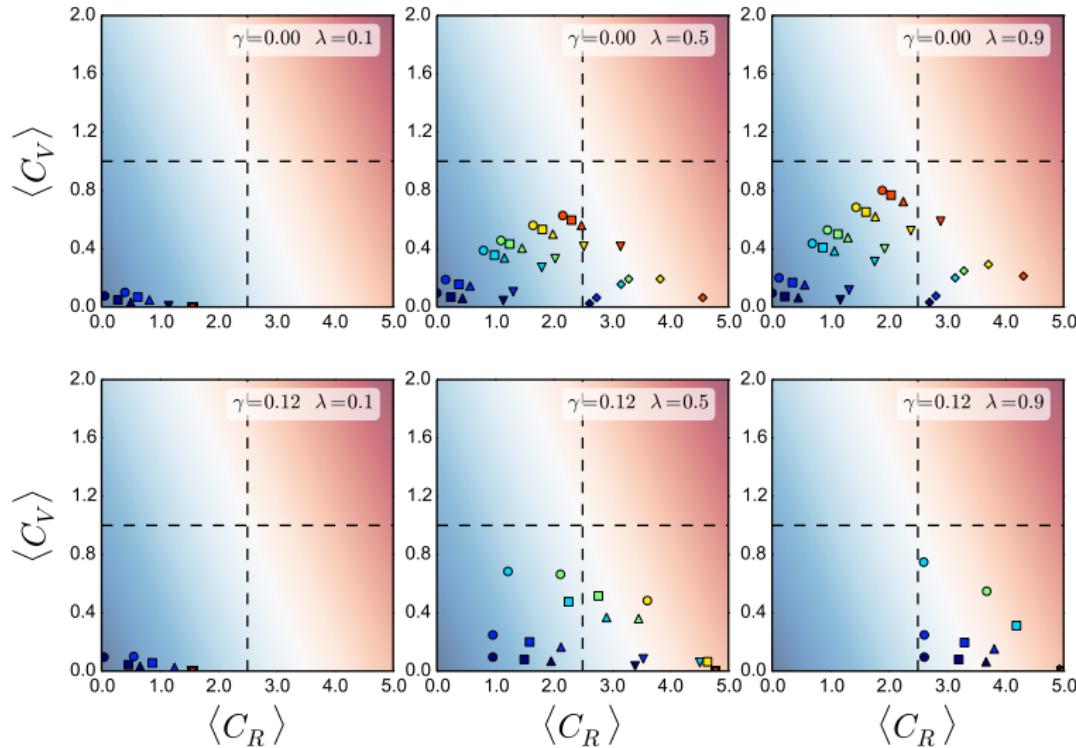
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Zealots & overall cost



- $Z=0\%$
- $Z=5\%$
- ▲ $Z=10\%$
- ▼ $Z=25\%$
- ◆ $Z=50\%$

Summing up . . .

Take home messages

- Coevolutionary model based on **epidemic spreading** and **evolutionary game theory** on multiplex networks.

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Summing up . . .

Take home messages

- Coevolutionary model based on **epidemic spreading** and **evolutionary game theory** on multiplex networks.
- Influence of vaccination on the overall cost.

IAEWm

Summing up . . .

Take home messages

- Coevolutionary model based on **epidemic spreading** and **evolutionary game theory** on multiplex networks.
- Influence of vaccination on the overall cost.
- Effects of zealotry and cost on the overall performances and possible solutions.

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Acknowledgements

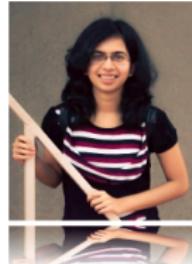


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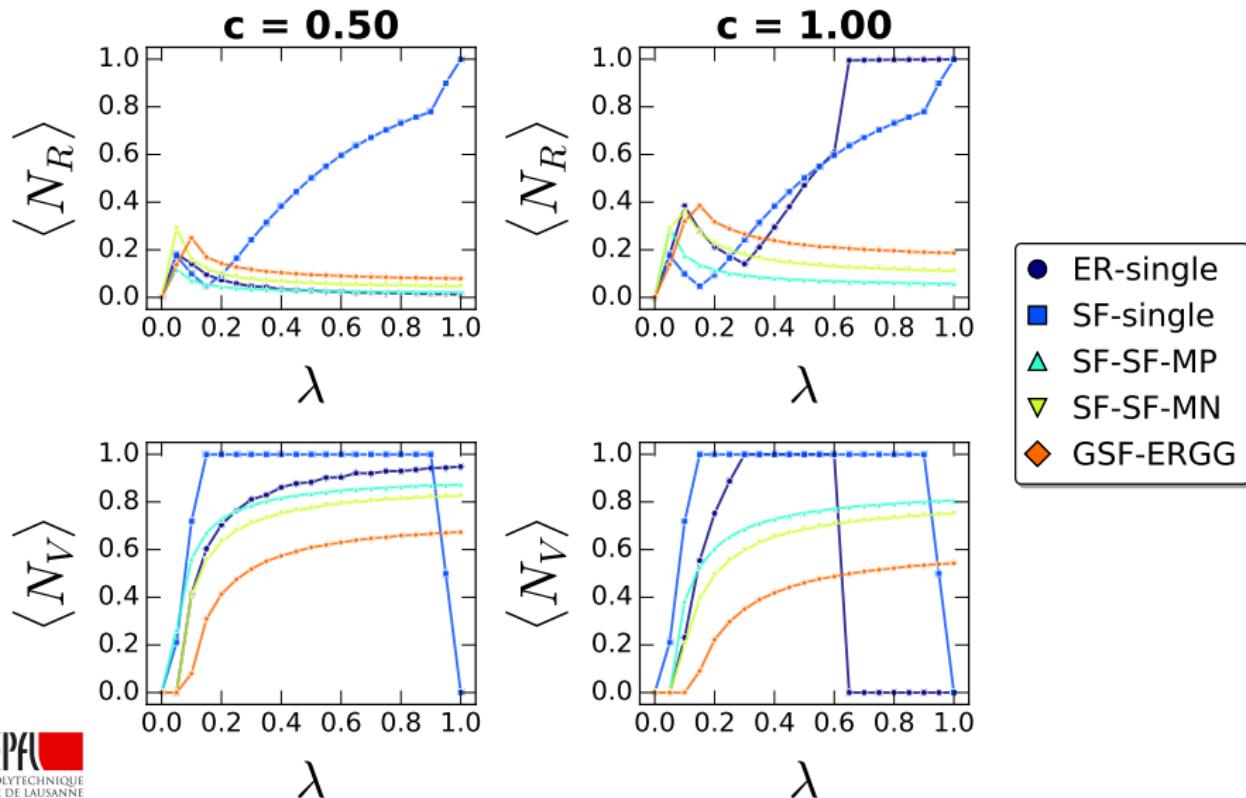
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Part II

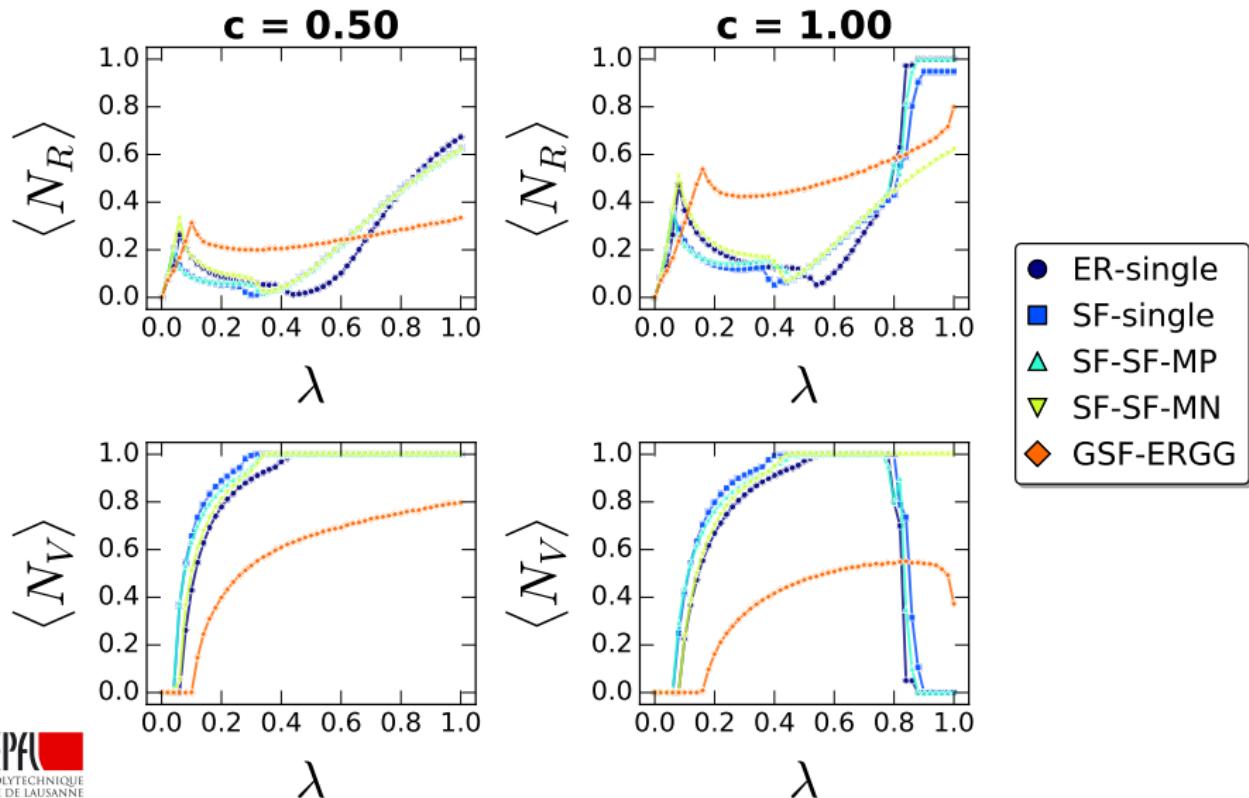
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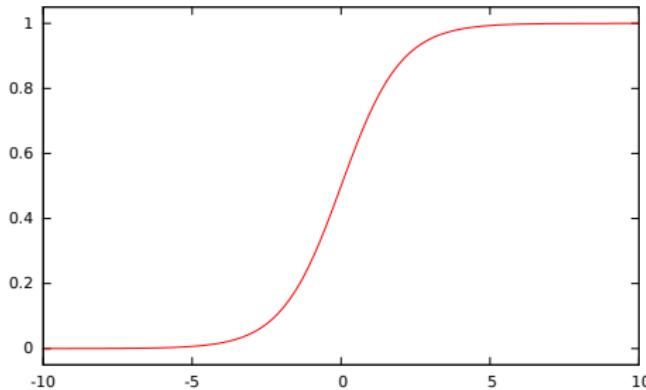
Effect of multiplexity



Effect of multiplexity



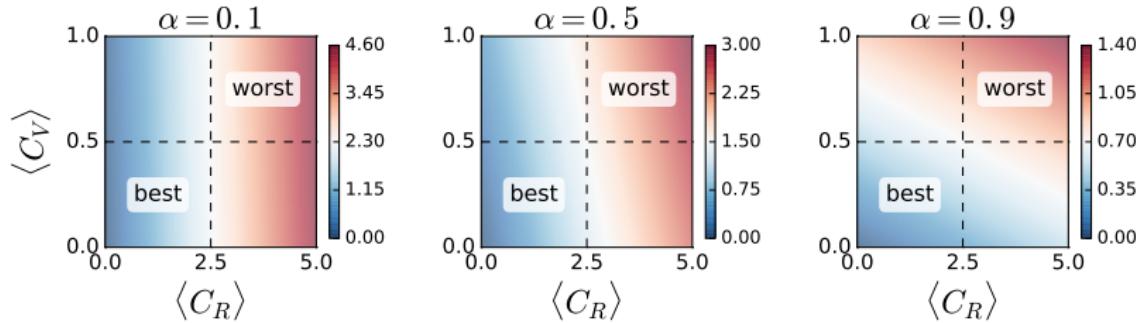
Update of strategy



Fermi's Rule

$$P_{I \rightarrow m} = \frac{1}{1 + e^{-\beta(p_m - p_I)}}.$$

Relative cost



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