The evolution of sharing networks under risk and uncertainty

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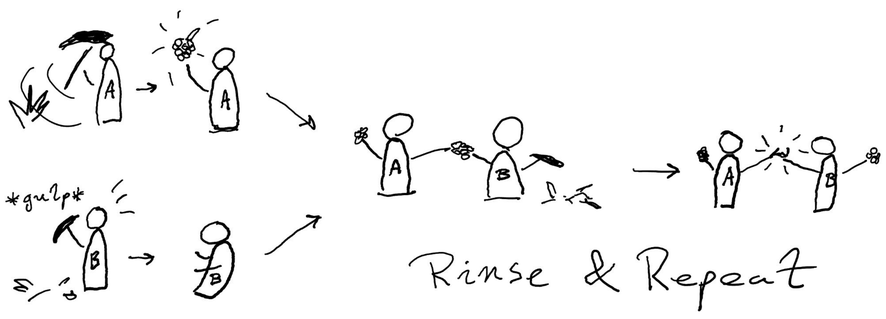
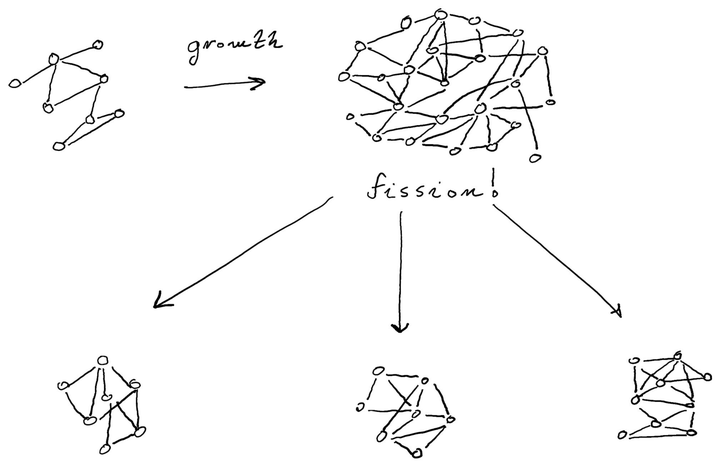
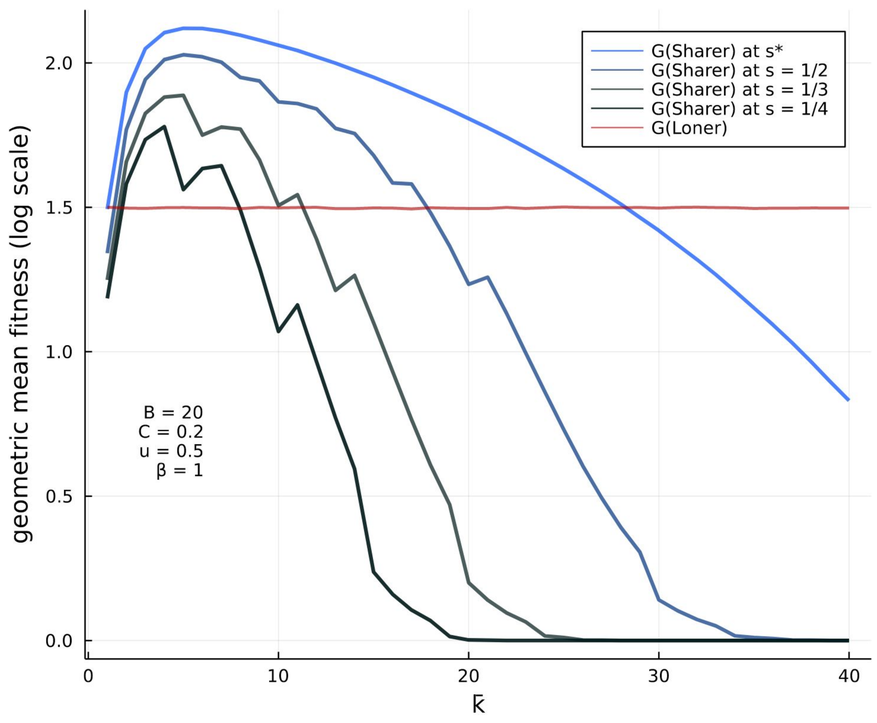
Equation List	
G(Sharer)	$u\log\{(1-s)B+\beta S\}+(1-u)\log\{1+\beta S\}$
G(Loner)	$u\log(B)$
V(Sharer)	$1+\beta S+u^{\delta}\{(1-s)B-1\}$
V(Loner)	$1+u^{\delta}(B-1)$
S (net shared benefits)	$uB-\bar{k}C$

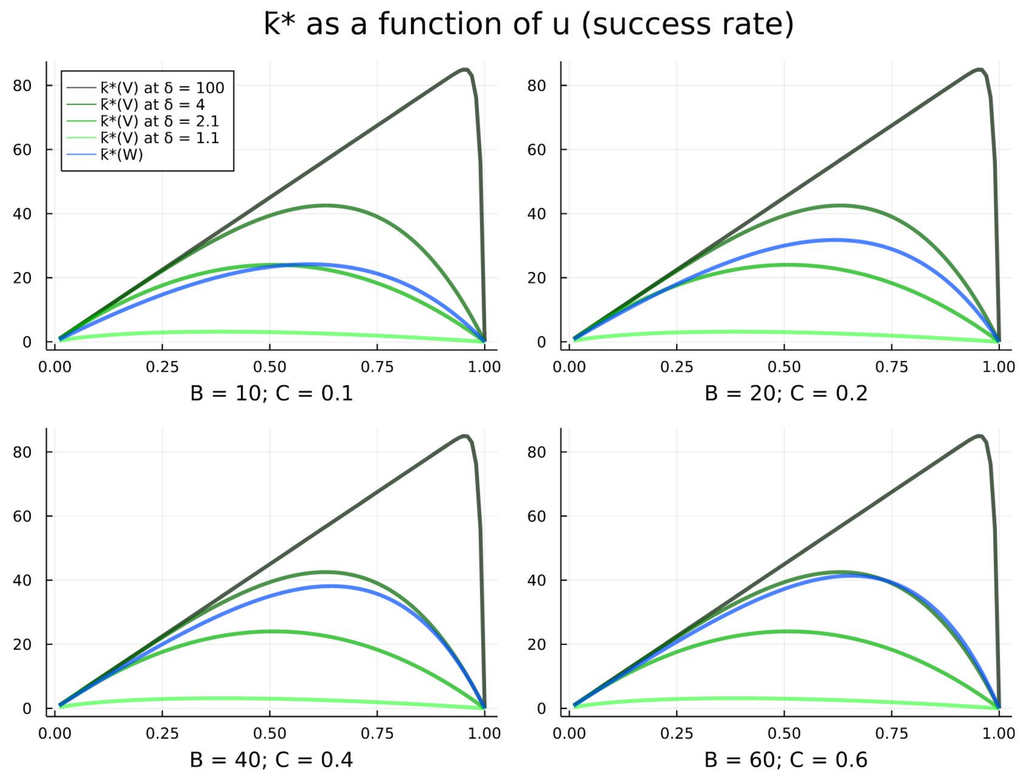
Parameter List		
Parameter Name	Symbol	Domain
Surplus Benefit	$\boldsymbol{B}$	$(1,\infty)$
Per-Connection Cost	$\boldsymbol{C}$	$(0,\infty)$
Security	$\boldsymbol{u}$	$(0,1)$
Risk	$\boldsymbol{1-u}$	$(0,1)$
Sharing Norm	$\boldsymbol{s}$	$(0,1)$
Agent Degree	$\boldsymbol{k}$	$\mathbb{N}_{>0}^{\leq N-1}$
Network Expected Degree	$\boldsymbol{\bar{k}}$	$(0,N-1]$
Degree with respect to the mean	$\boldsymbol{\beta}$	$(0,\infty)$
Risk Preference	$\boldsymbol{\delta}$	$(0,\infty)$
Sharing Group Size	$\boldsymbol{N}$	$\mathbb{N}_{>0}$





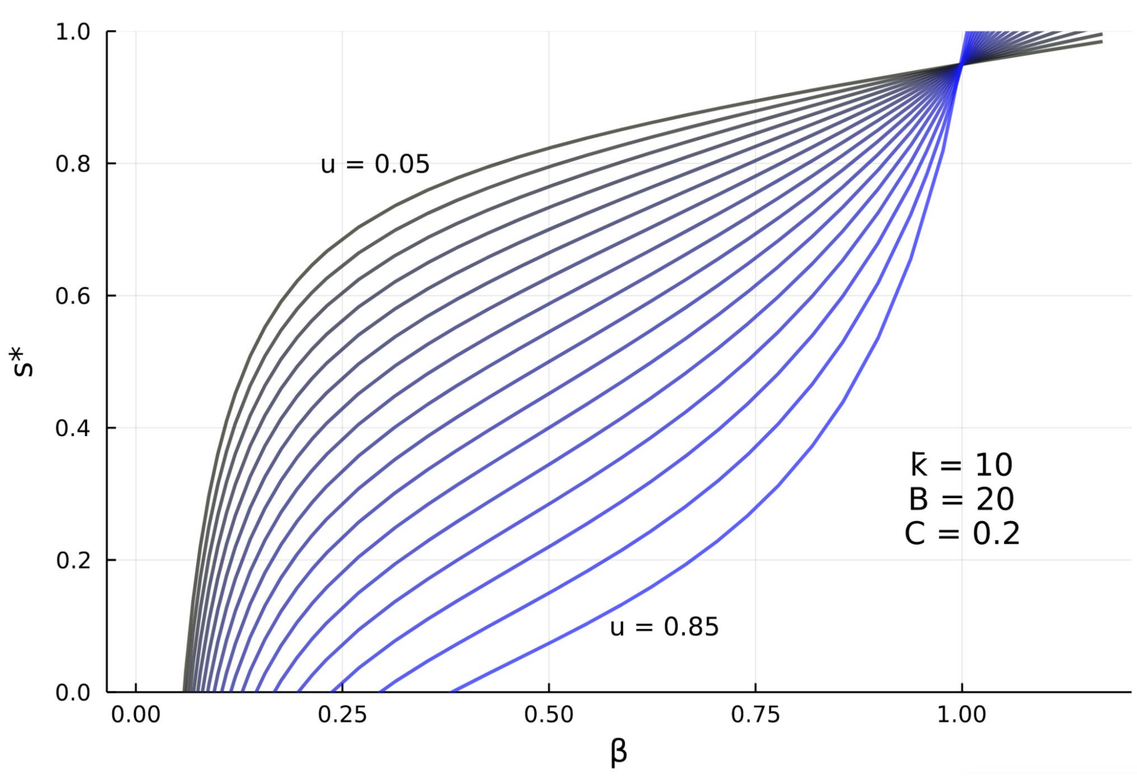
Networks of risk-averse individuals employing sharing norms can maximize fitness with respect to lone foraging in a multiplicative dynamic. **Growth and fission in a cultural group selection scenario leads to the co-evolution of risk aversion, high stable sharing norms and regularity in network structure.**



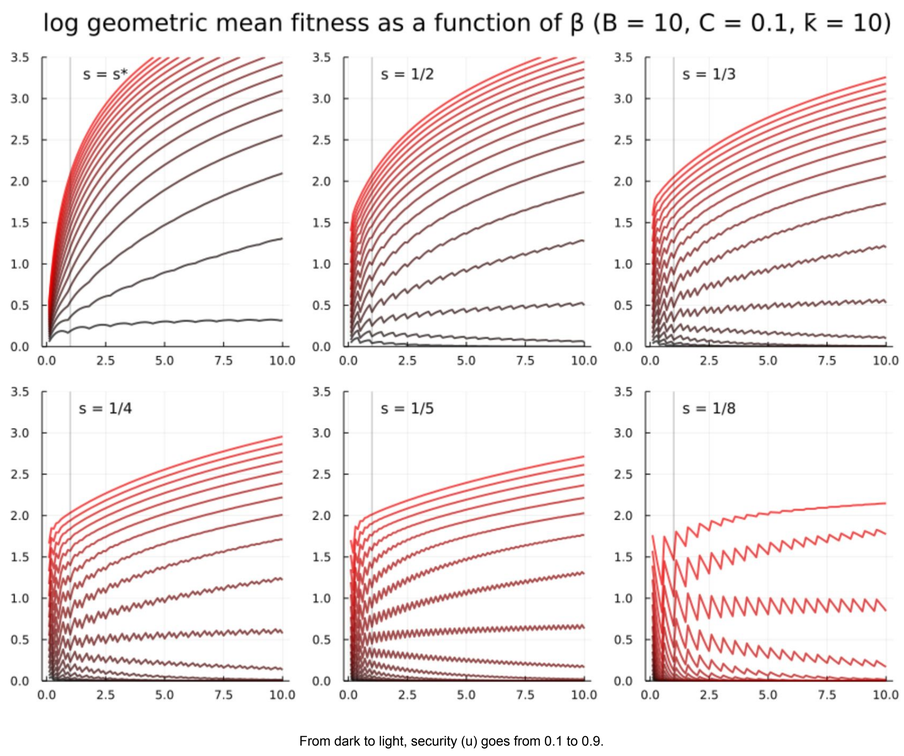


Higher productivity environments foster **higher risk aversion**, **higher sharing norms** and **can support more crowding in sharing networks before they fission**. Sharing networks can be their most crowded at the regions of high uncertainty.

Conflicts of interest are minimized as sharing networks approach full connectivity, and under conditions of high risk.



High risk promotes tolerance for degree inequality in sharing, while keeping sharing norms high.



From dark to light, security (u) goes from 0.1 to 0.9.

High sharing norms smooth out fitness gains from variance reduction and lead to higher increases for above-average sharers, incentivizing competitive sharing.