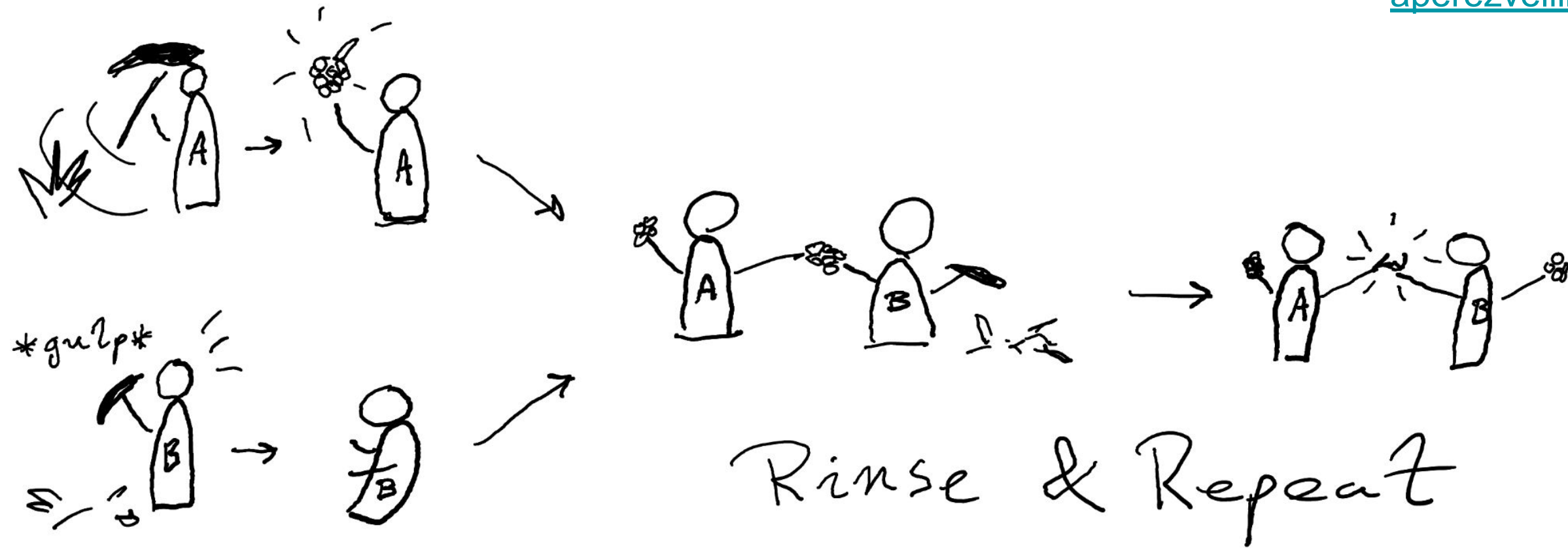


The evolution of sharing networks under risk and uncertainty

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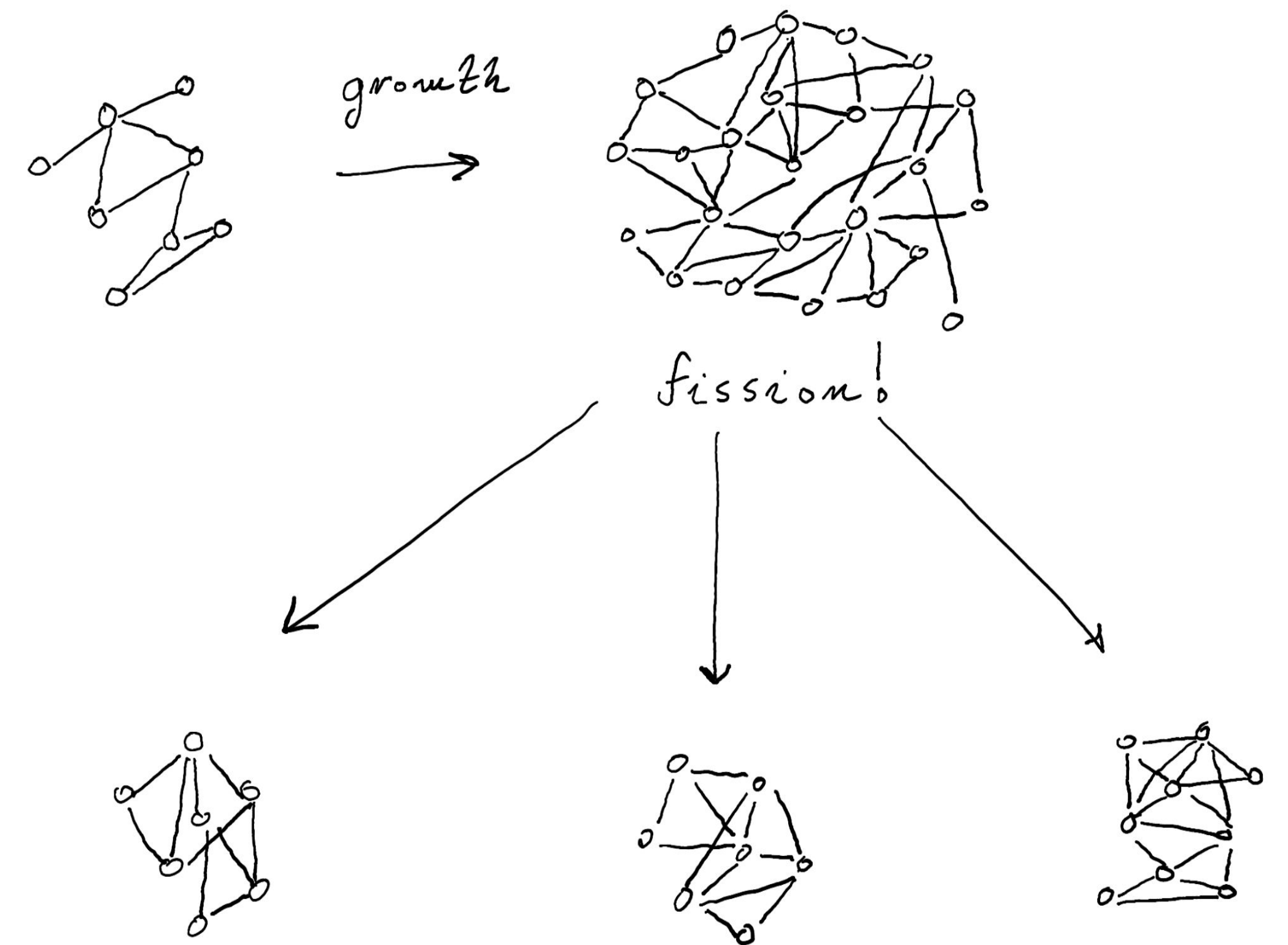
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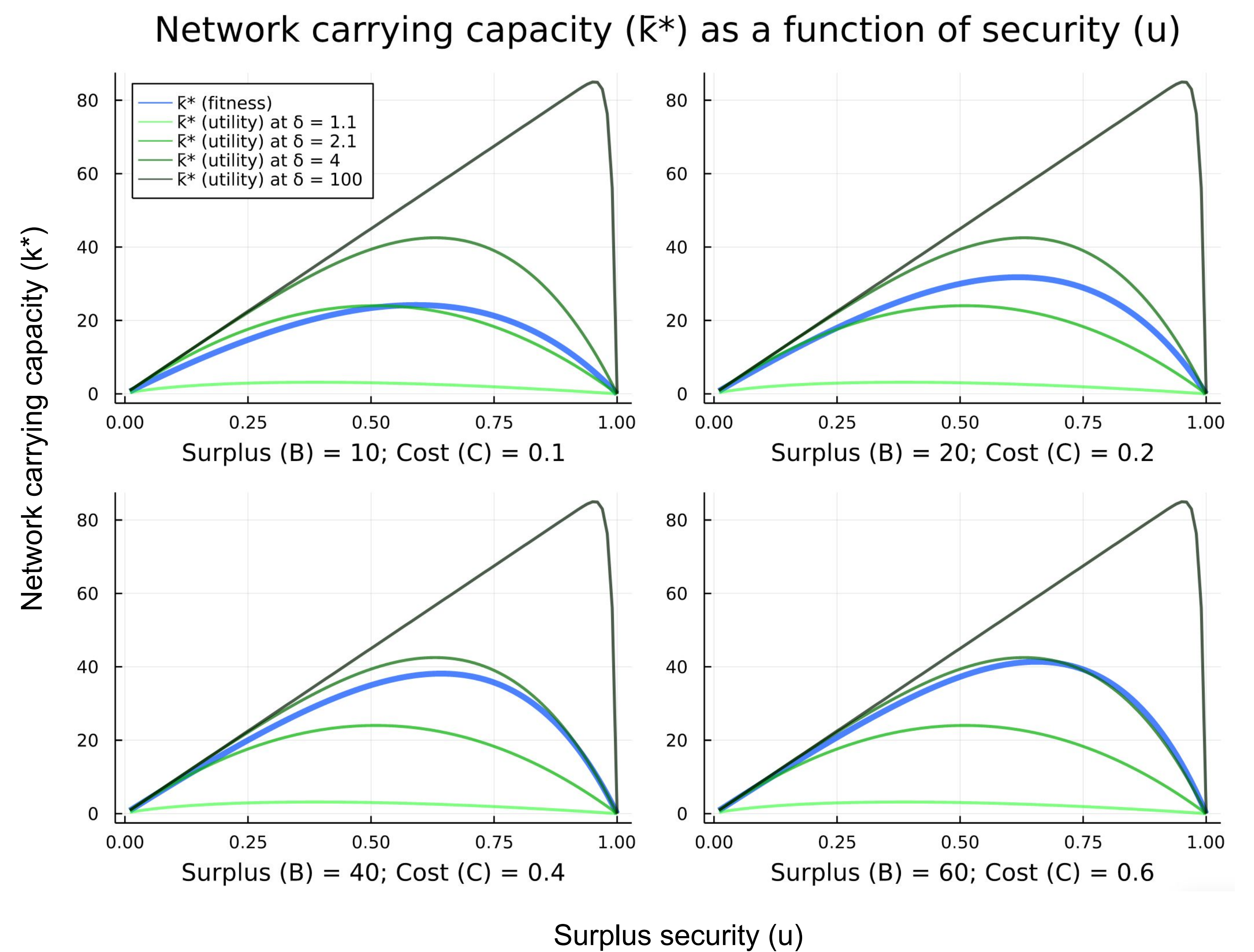
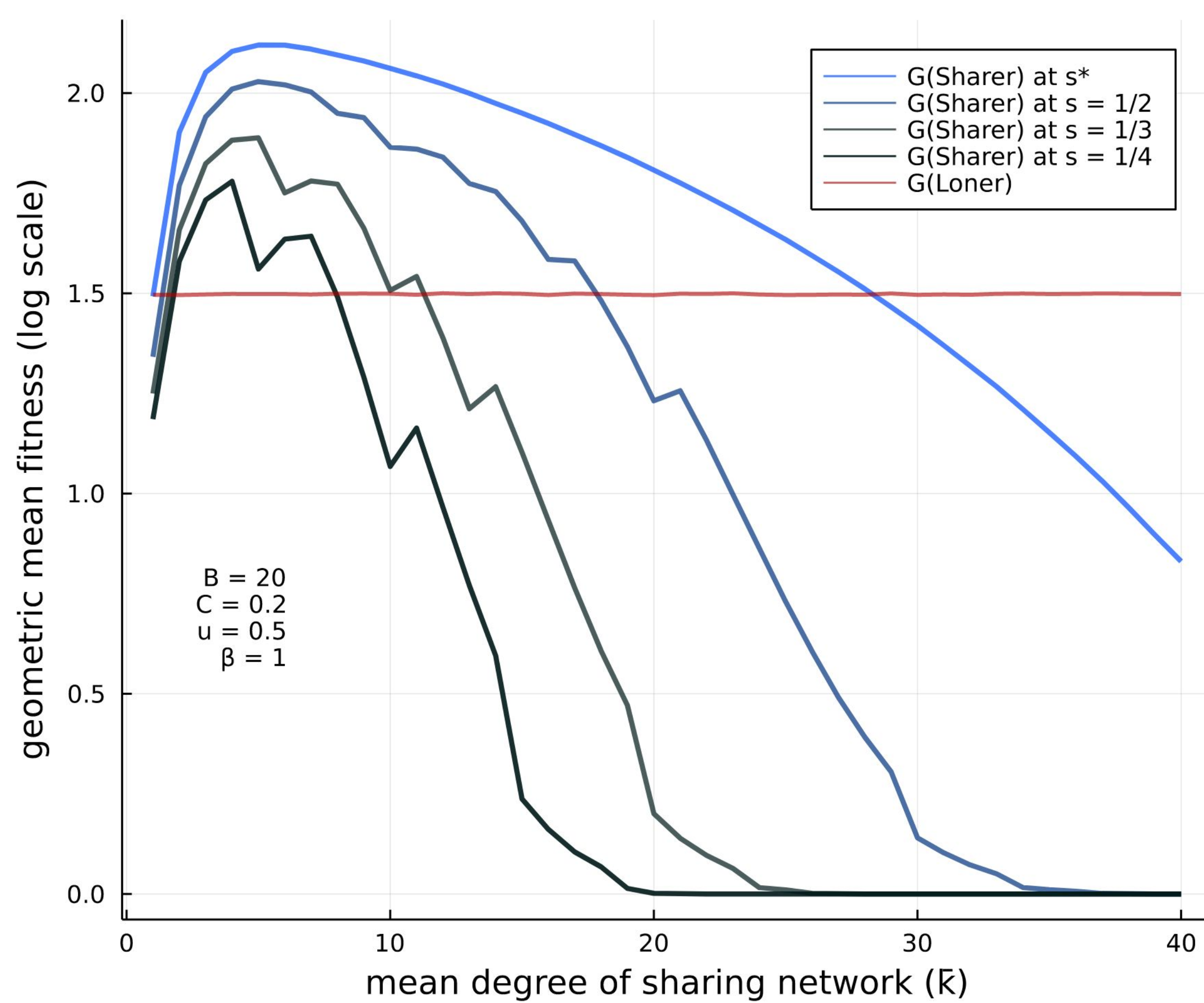


Foragers in a stochastic environment form normative sharing networks to share risky surpluses and reduce variance in returns. Connections are costly and sharing norms can be more or less intense. Reciprocal sharing is maintained by the normative group environment in which sharing happens, and foragers choose to abandon the network when they believe they will do as well (or better) on their own.

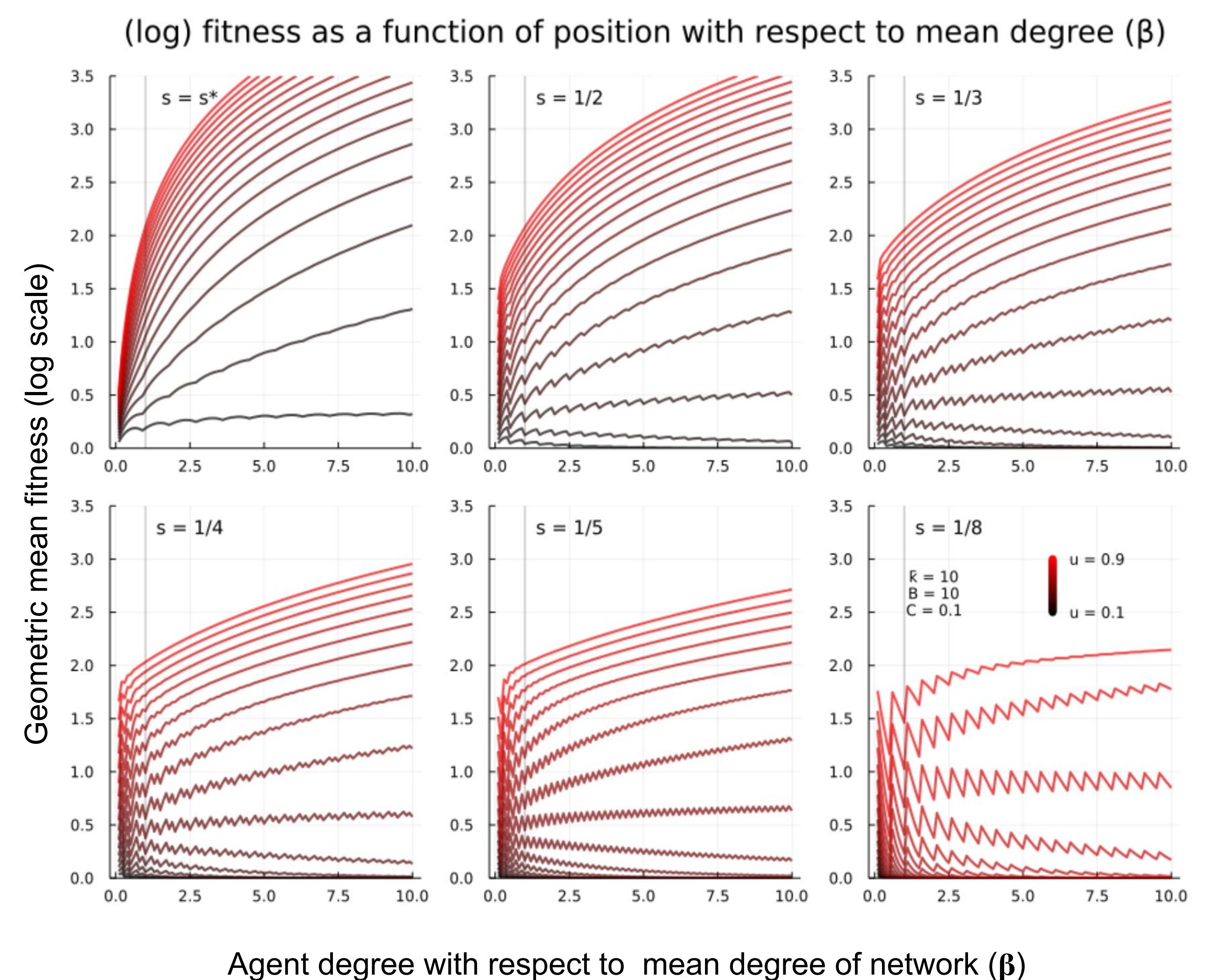
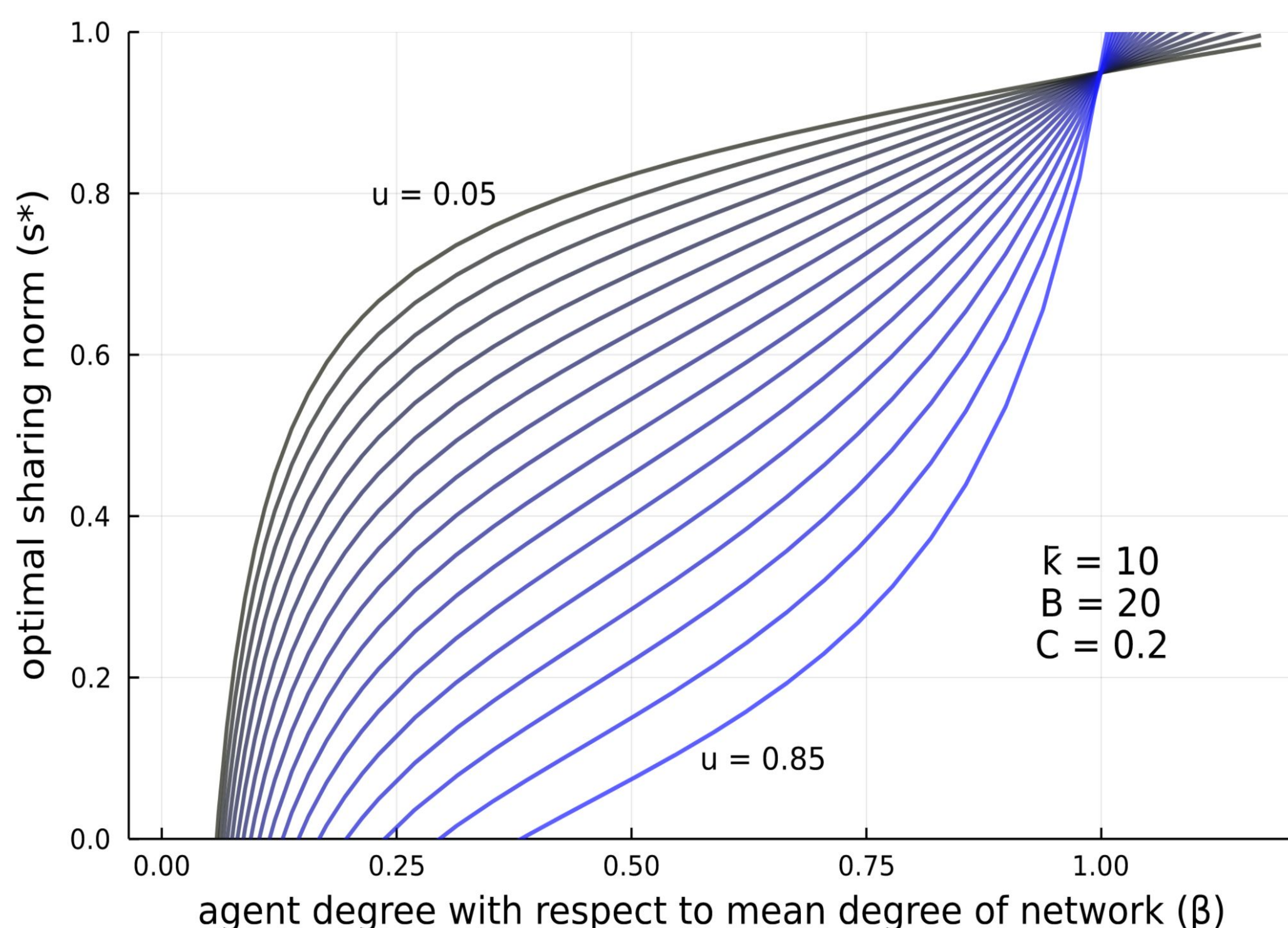
Fission events occur when the networks become overcrowded: sharers have so many connections on average that shared benefits get overtaken by costs and it becomes better to forage alone. A growing network reaching its carrying capacity fissions into several offspring networks that go on to grow and fission, spreading the culture of sharing norms and risk aversion.



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 can lead to the co-evolution of risk aversion, high stable sharing norms and regularity in network structure.** Sharing can also drive norms of exclusivity for group membership.



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 at their most crowded in environments of **high uncertainty**. Conflicts of interest in sharing norms are minimized as sharing networks approach full connectivity.



When surplus is high with respect to baseline payoffs, higher levels of risk promote tolerance for degree inequality in sharing, while keeping sharing norms high.

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