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Heterogeneous transmission settings

In its early stage, the epidemic will “see” a transmission rate that depends on i (typically superlinear), akin to “complex contagion”.

Coarse-grained description of the dynamics at the groups level (with $G_{n,i} = \int G^{\beta}_{n,i} \mathrm{d}\beta$)

$$\frac{\mathrm{d}G_{n,i}}{\mathrm{d}t} = \mu(i+1)G_{n,i+1} - \mu i G_{n,i} + (n-i+1)[(i-1)\bar{\beta}_{n,i} + \rho]G_{n,i-1} - (n-i)[i\bar{\beta}_{n,i} + \rho]G_{n,i}$$

where

$$\bar{\beta}_{n,i} = \mathbb{E}[\beta|n,i] = \frac{\int \beta G^{\beta}_{n,i}\mathrm{d}\beta}{\int G^{\beta}_{n,i}\mathrm{d}\beta} \simeq \begin{cases} \dfrac{\mathbb{E}[\beta^i|n]}{\mathbb{E}[\beta^{i-1}|n]} & \text{short term} \\ \\ \mathbb{E}[\beta|n] & \text{long term} \end{cases}$$

Detailled description of the dynamics at the groups level with $\Theta_{n,i,\beta} = i\beta$ ("simple contagion")

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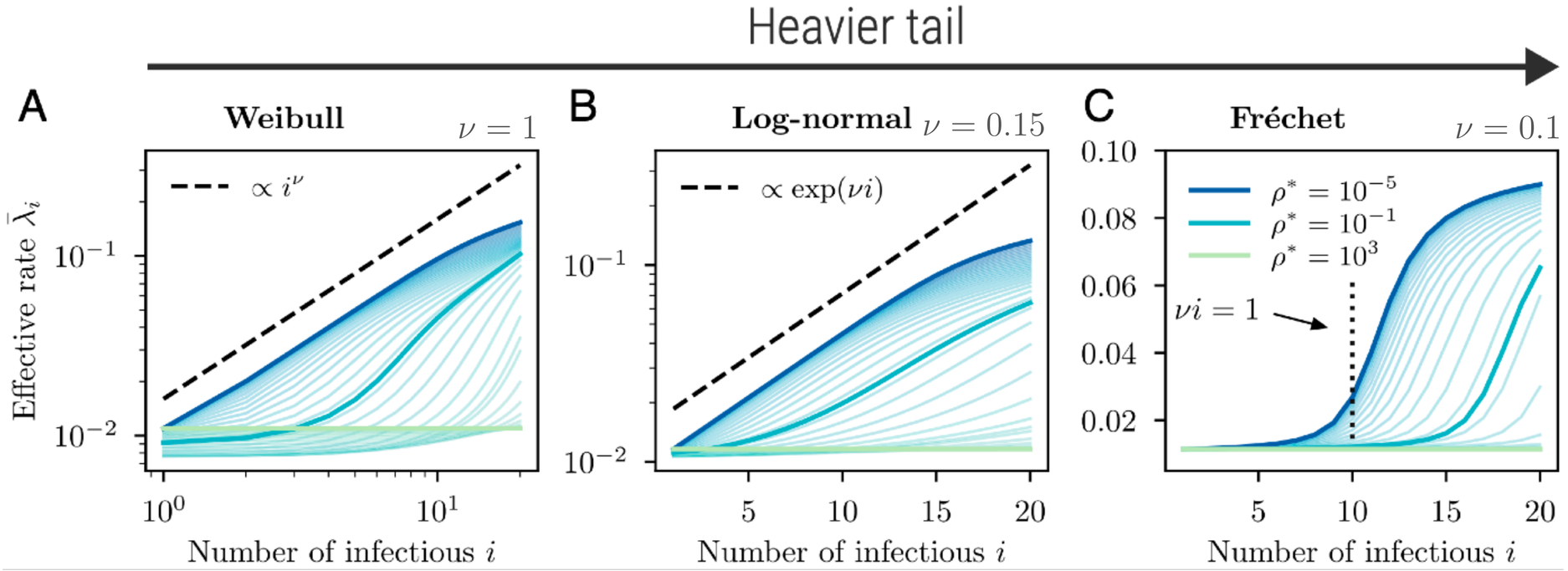

Notation: $\bar{\lambda}_i = \bar{\beta}_{n,i}$.