

# Theoretical Predictions: Aggregation-Based Costly Signaling

*Derived from Multilevel Selection Framework*

## CORE PREDICTION

Aggregation + costly signaling emerges when:

$$\sigma > \sigma^* \text{ AND } \varepsilon > \varepsilon_{\min}$$

## KEY PARAMETERS

$$\sigma^* \approx 0.53 \text{ (at } \varepsilon=0.35, n=25\text{)}$$

$$\varepsilon_{\min} \approx 0.20 \text{ (minimum ecotone)}$$

$$n^* \approx 25 \text{ bands (optimal size)}$$

## SPATIAL

- Site primacy at max ecotone
- Distance decay in participation
- Hierarchy: PP >> secondary sites
- Multi-directional exotic sources

## TEMPORAL

- Construction  $\propto$  uncertainty
- Pulses during high  $\sigma$  periods
- Gradual exotic accumulation
- Collapse when  $\sigma < \sigma^*$  persists

## INDIVIDUAL

- Exotic variation among bands
- Contribution  $\propto$  surplus
- Reciprocal obligation network
- Prestige affects partnerships

## TESTABLE HYPOTHESES

H1: PP location optimal for ecotone access

H2: Construction correlates with  $\sigma$  proxies

H3: Exotics concentrated at aggregation sites

H4: Site size declines with distance from PP

H5: Collapse correlates with  $\sigma$  decline or  $\varepsilon$  shift

H6: Individual exotic holdings show variation