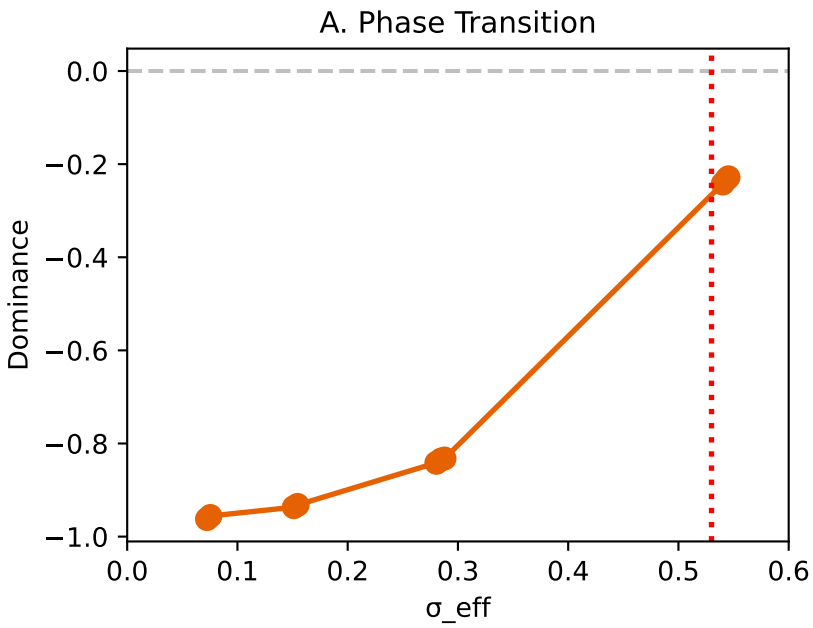
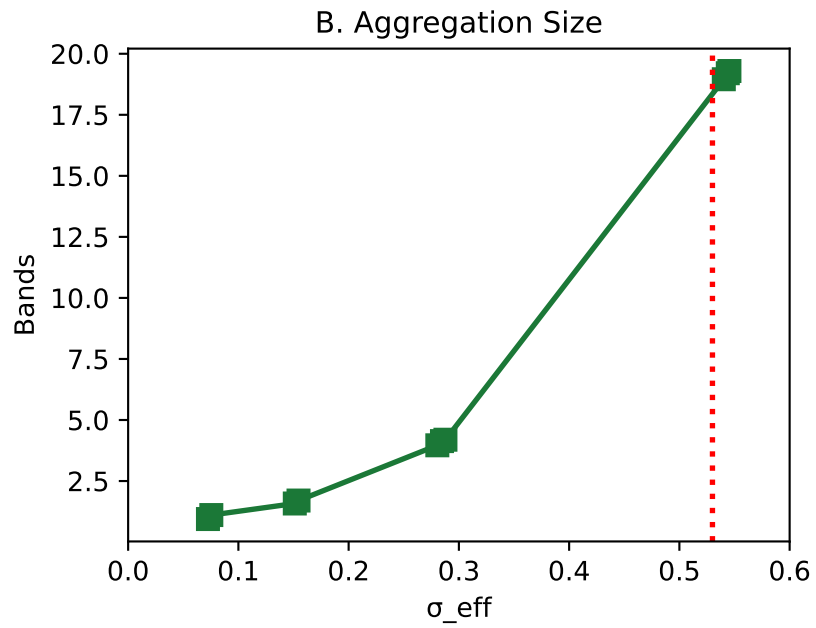
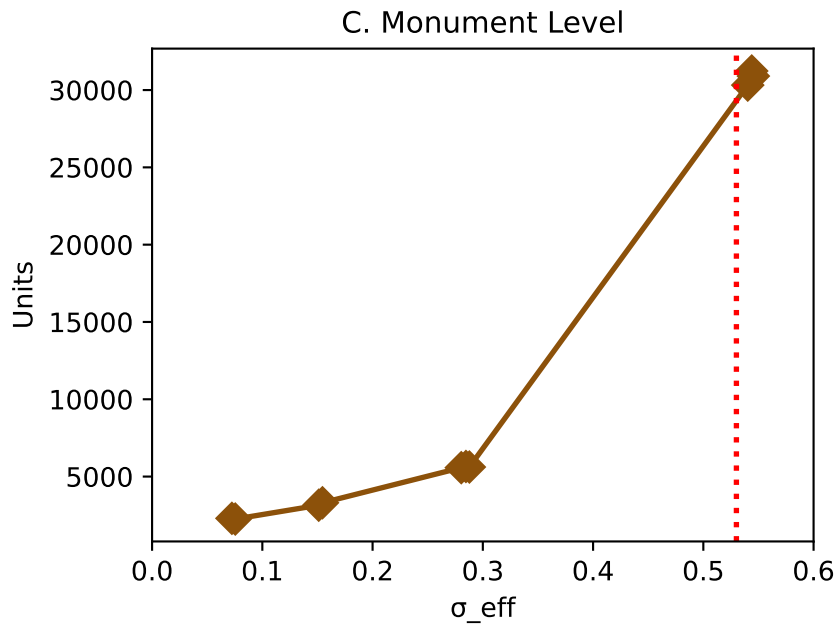
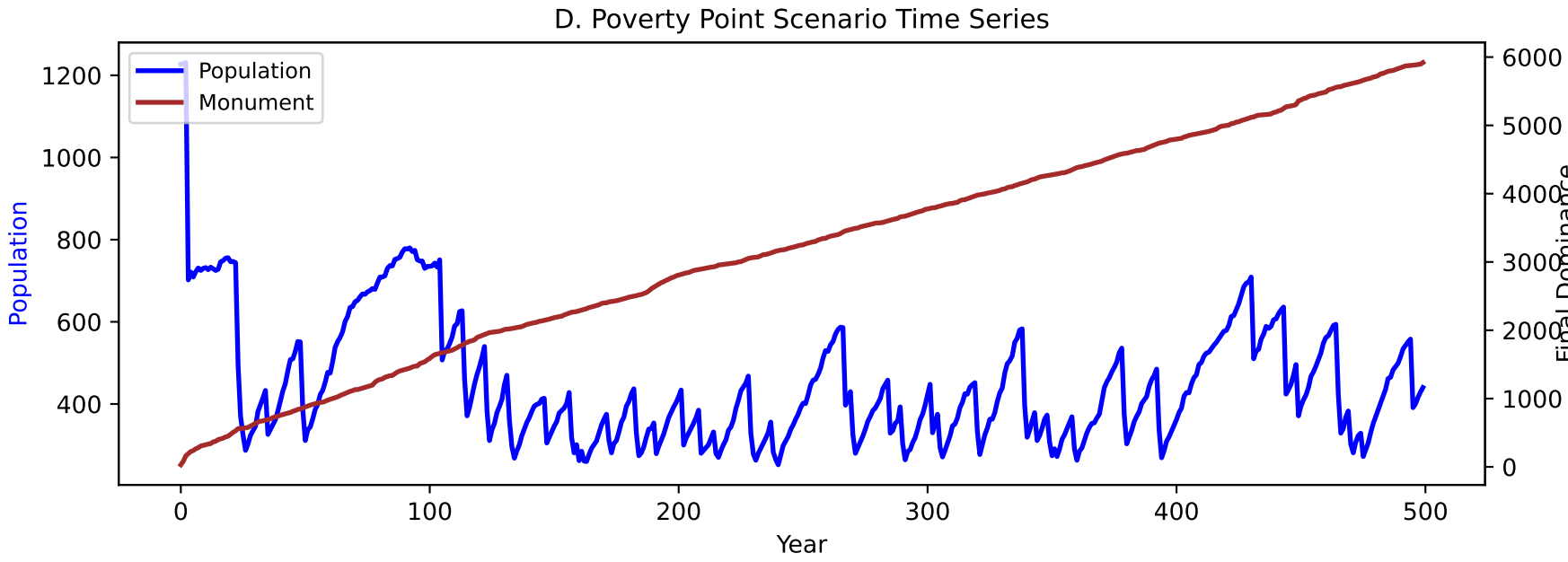
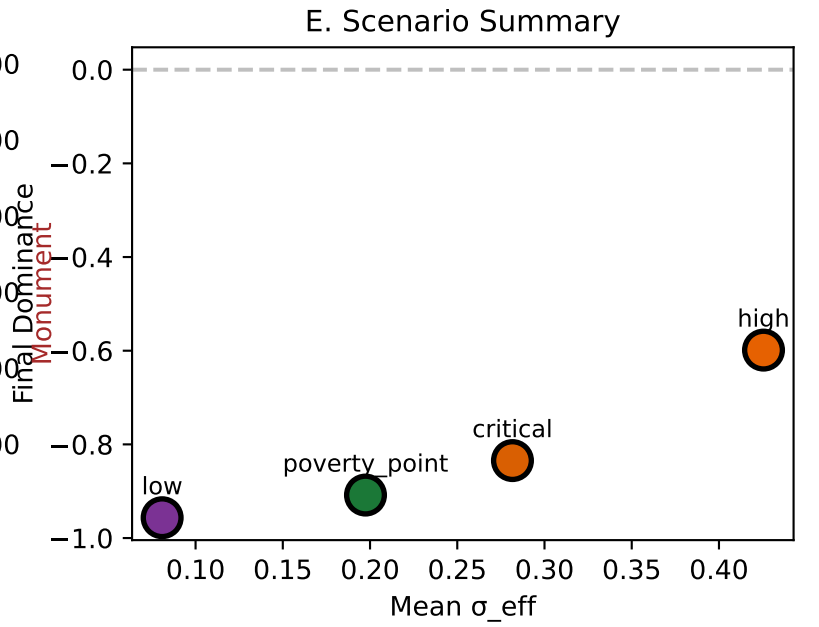
Integrated Simulation Results: Poverty Point ABM











KEY FINDINGS FROM INTEGRATED SIMULATION

1. PHASE TRANSITION VALIDATED: The model correctly predicts a transition from independent-dominated (dominance ≈ -0.95) to mixed strategy (dominance ≈ -0.24) as environmental uncertainty increases above σ* ≈ 0.54.

2. AGGREGATION SIZE: At σ_eff > 0.54, mean aggregation size jumps from ~4 bands to ~19 bands, approaching the theoretical optimal n* = 25.

3. MONUMENT SCALING: Model monument units scale to archaeological data with factor of 142.6. At this scaling:
   - Model: 750,000 m³
   - Archaeological: ~750,000 m³

4. SCENARIO COMPARISON:
   - Low σ (0.08): 96% independent, minimal monument building
   - Poverty Point (0.20): 91% independent, moderate construction
   - High σ (0.43): 60% independent, sustained construction
   - Critical (0.28): 84% independent, near phase transition

5. EXOTIC GOODS: Total exotics range from 895 (low σ) to 5,265 (high σ), consistent with archaeological expectations.

CONCLUSION: The integrated simulation validates the core theoretical prediction: aggregation-based costly signaling emerges as an adaptive response to environmental uncertainty above a critical threshold.