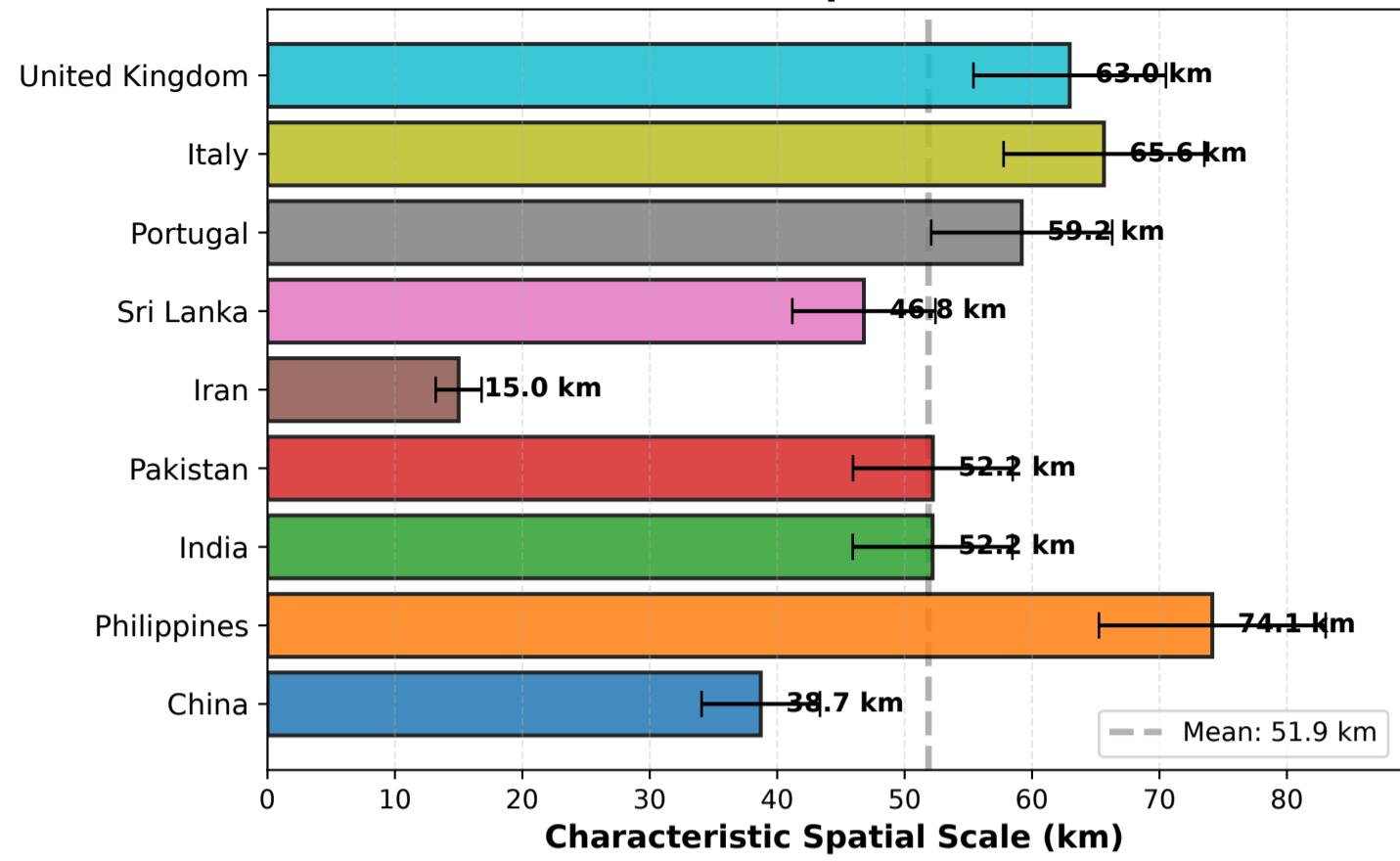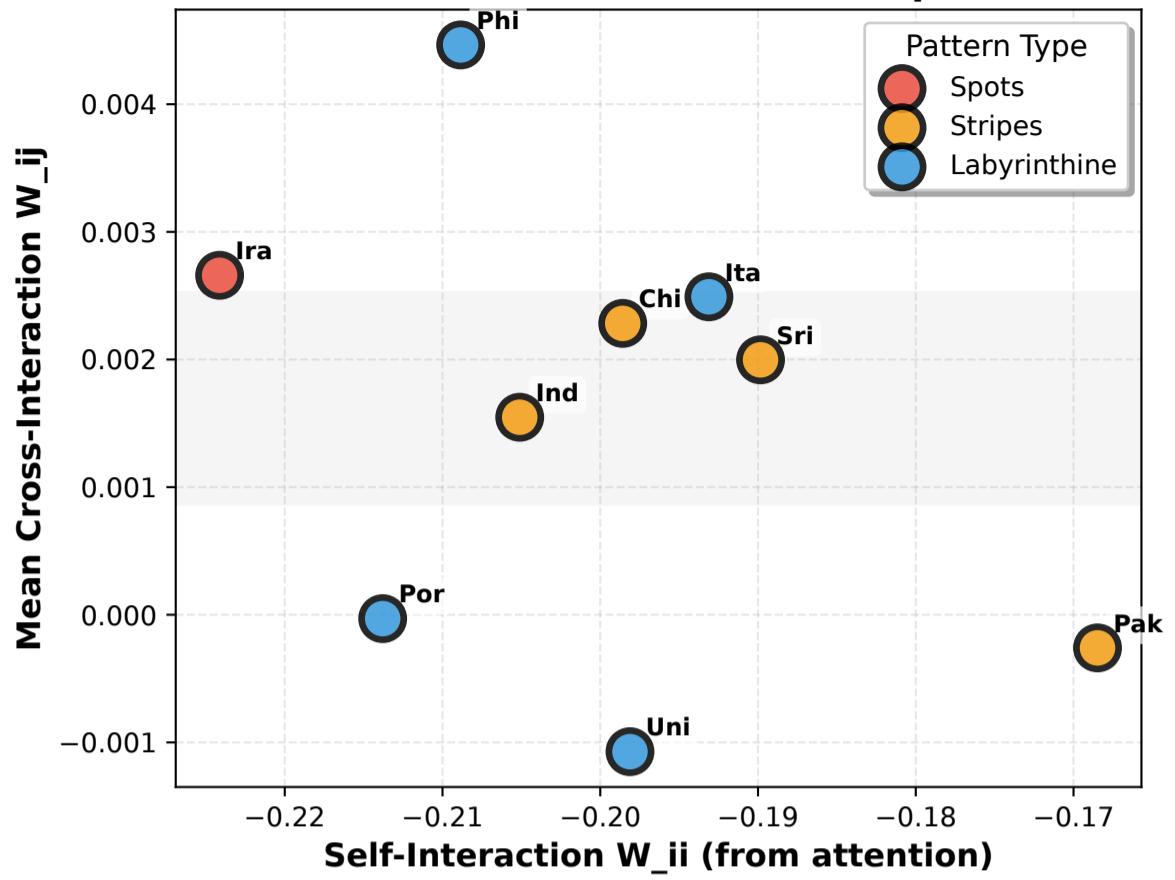# Learned Spatial Patterns from GraphPDE Model Across All Ethnic Groups

Extracted from trained model: attention-based competition + physics parameters + neural residuals
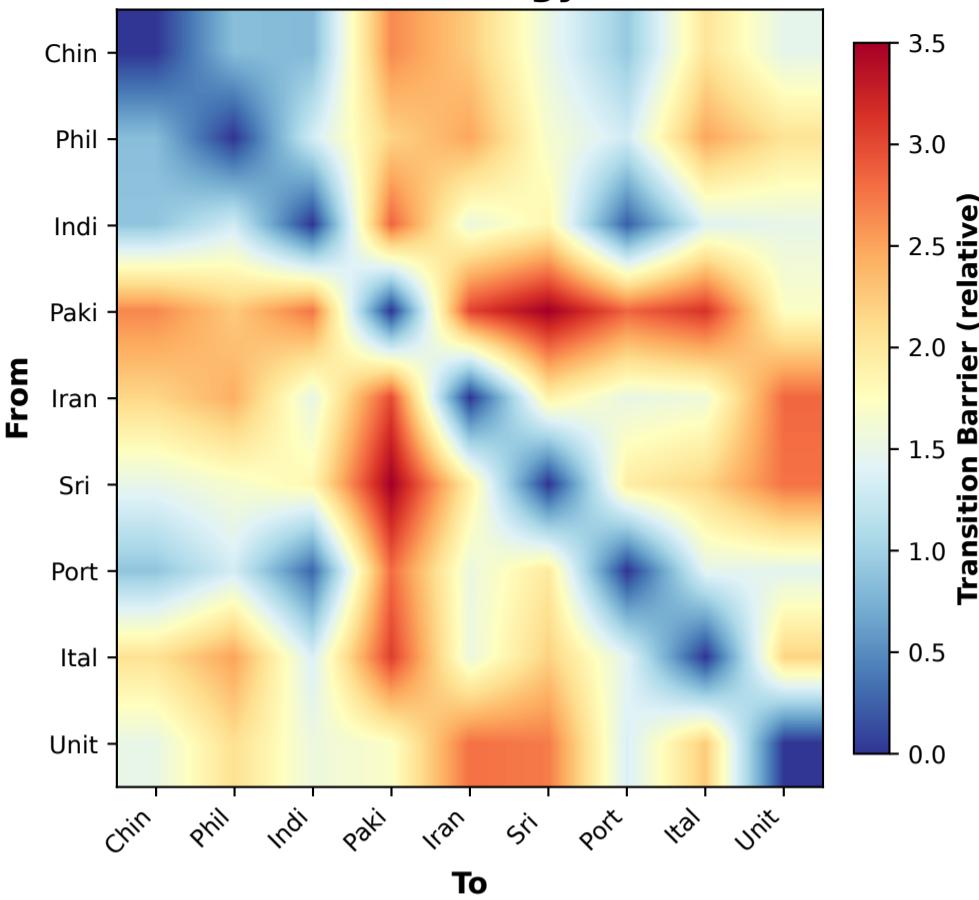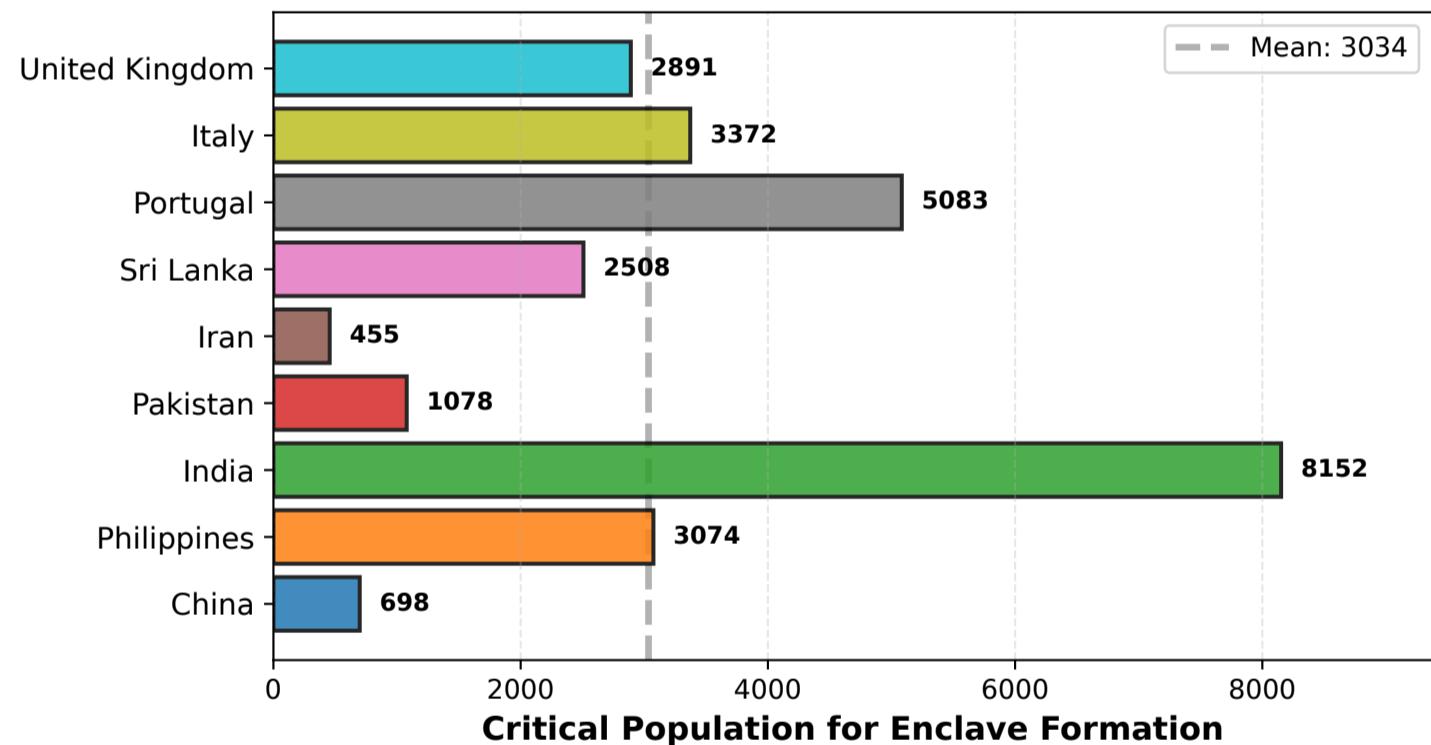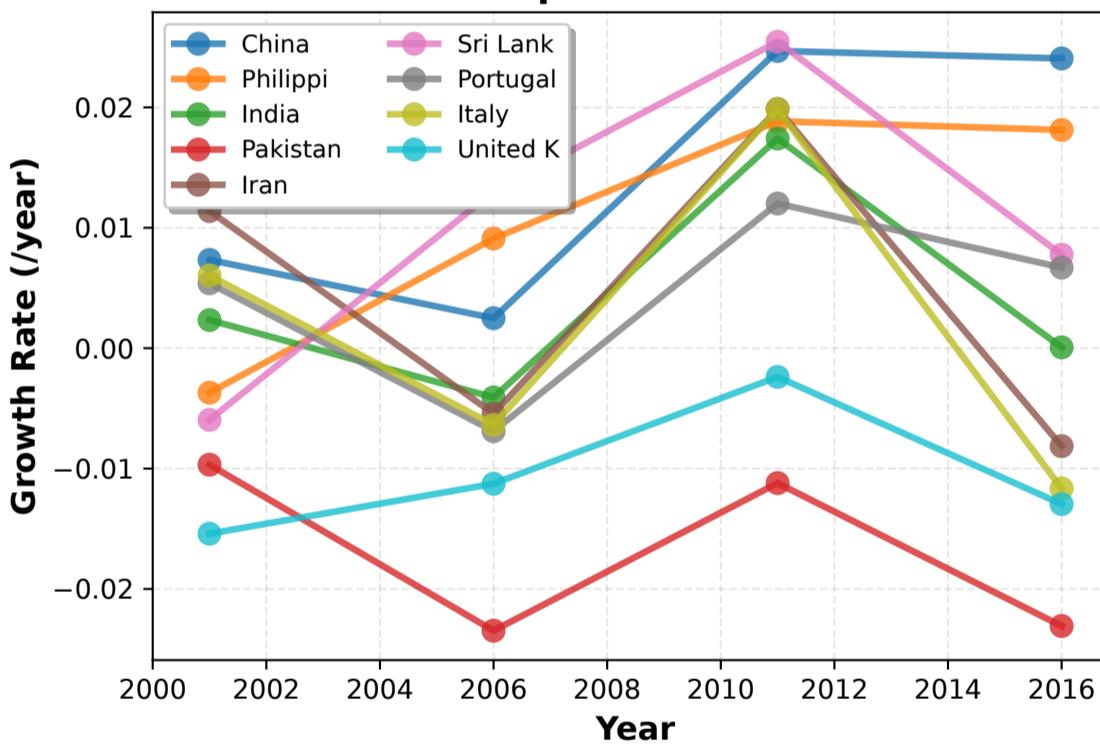
a Learned Spatial Scales

- United Kingdom: 63.0 km
- Italy: 65.6 km
- Portugal: 59.2 km
- Sri Lanka: 46.8 km
- Iran: 15.0 km
- Pakistan: 52.2 km
- India: 52.2 km
- Philippines: 74.1 km
- China: 38.7 km

Mean: 51.9 km

Characteristic Spatial Scale (km)

b Pattern Formation Phase Space

Pattern Type: Spots, Stripes, Labyrinthine

Self-Interaction W_{ii} (from attention)
Mean Cross-Interaction W_{ij}

c Transition Energy Barriers

Transition Barrier (relative)

From / To: Chin, Phil, Indi, Paki, Iran, Sri, Port, Ital, Unit
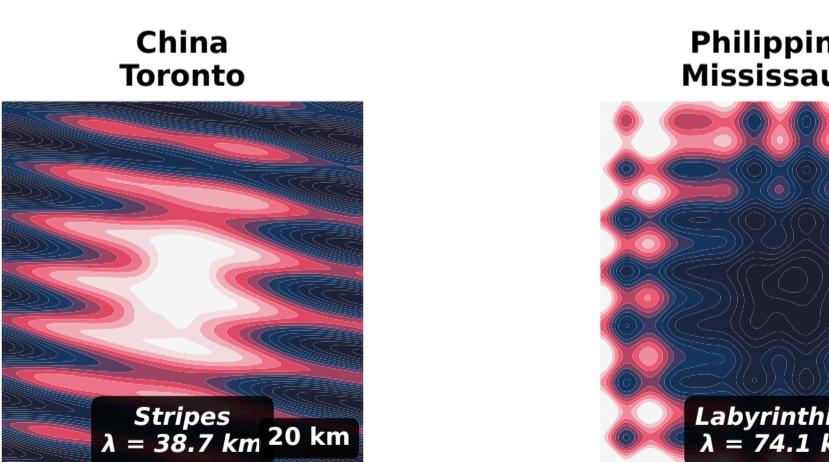
d Nucleation Thresholds

- United Kingdom: 2891
- Italy: 3372
- Portugal: 5083
- Sri Lanka: 2508
- Iran: 455
- Pakistan: 1078
- India: 8152
- Philippines: 3074
- China: 698

Mean: 3034

Critical Population for Enclave Formation

e Temporal Evolution

China, Philippi, India, Pakistan, Iran, Sri Lank, Portugal, Italy, United K

Growth Rate (/year)
Year

f Spatial Patterns

China — Toronto
Stripes $\lambda = 38.7\ km$ 20 km

Philippines — Mississauga
Labyrinthine $\lambda = 74.1\ km$ 20 km

India — Brampton
Stripes $\lambda = 52.2\ km$ 20 km

Pakistan — Markham
Stripes $\lambda = 52.2\ km$ 20 km