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1 Methods 1.1 Generalised Bernoulli social equation We model the density
of interaction ties ρ(r, t) in an n-dimensional social phase space.
Inspired by incompressible fluid flow, we propose the continuity-like equation
∂ρ ∂t + ∇·(ρ v) = , (1) with velocity field v = −α∇Φ + β r, (2
) where Φ = ln ρ is a potential akin to information pressure, α
> modulates entropic attraction, and β > encodes centrifugal social cost.
Combining both gives the **generalised Bernoulli equation** ∂Φ ∂t + α 2
⊠ ⊠ ∇Φ ⊠ ⊠ 2 + β r·∇Φ = . (3) 1.2 Fractal dimension estimators At s
teady state (∂ t Φ = 0), the density ρ ∗ admits a scaling form ρ ∗
(r) ∝ r −(D 1 +1) for r in the mesoscopic range. We estimate the capa
city (D), information (D 1) and correlation (D 2) dimensions via a
standard box-counting scheme[?]. D q = lim ϵ→0 1 q − 1 log P i p
q i log ϵ , (q ∈ R). (4) 1.3 Entropy-based stability criterion Table 1
: Symbols and units used throughout the manuscript Symbol Meaning Unit (SI)
ρ(r, t) Social tie density ties m −n v Social flow velocity m s −1
Φ Informational potential ln ρ — α Entropic attraction coefficient m 2 s
−1 β Radial cost coefficient s −1 D ,1,2 Fractal dimensions — H Shanno
n entropy nat ∂ρ ∂t + ∇·(ρ v) = , (5) v = −α∇Φ + β r, (6) Define
the Shannon entropy of degree distribution p k as H = − P k p k l
og p k . We posit global stability when dH dt = and d 2 H dt
2 ⊠ ⊠ ⊠ ⊠ crit > 0. (7) Substituting Eq. (??) yields the critical rati

o D /D 1 ≈ 1.37 ± 0.05, at which the social layer sizes naturally quan tise to 5, 15, 50, 150. Abstract 2 Introduction 3 Methods 3.1 Generalised Bernoulli Equation 4 Results 5 Discussion 6 Conclusion 1