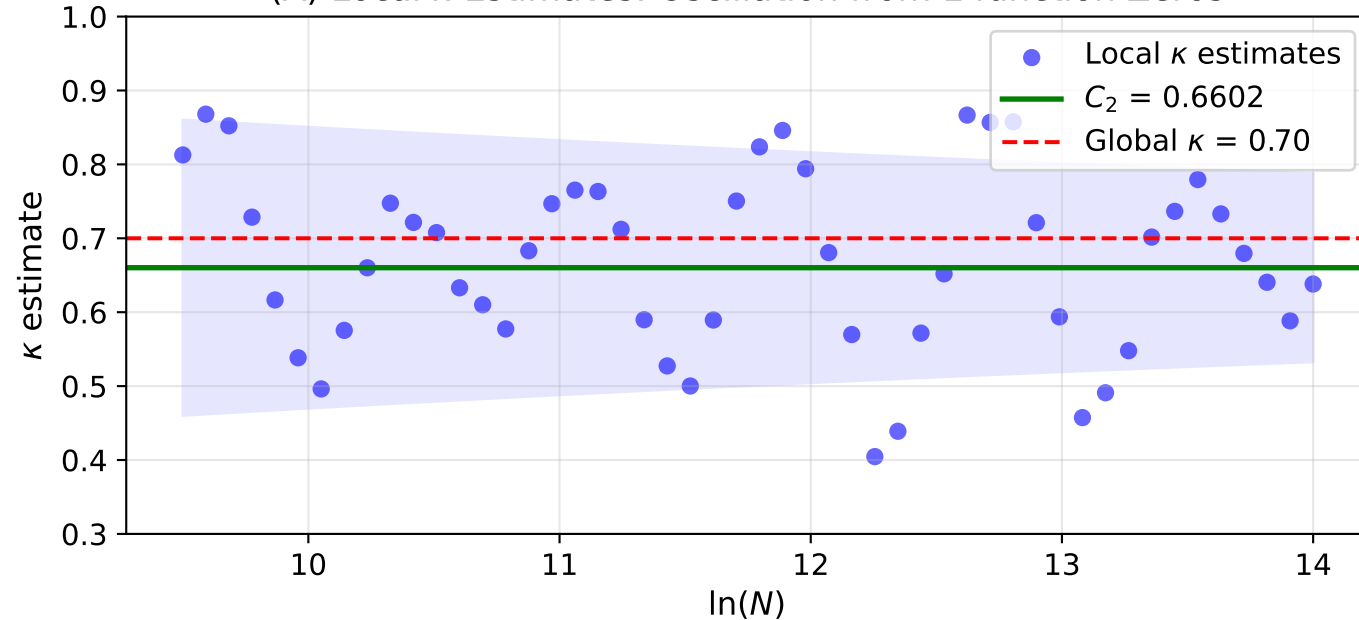


(A) Local  $\kappa$  Estimates: Oscillation from L-function Zeros



### WHY DO LOCAL $\kappa$ ESTIMATES OSCILLATE?

The oscillations are NOT numerical noise.  
They arise from L-function zero interference:

$$\kappa(N) = C_2 + \sum_{\gamma} A_{\gamma} \cos(\gamma \ln N + \phi_{\gamma})$$

where  $\gamma$  are imaginary parts of L-function zeros.

#### Key Insight:

These oscillations are STRUCTURE,  
not noise. They encode the same  
L-function zeros detected by FFT.

Global regression averages over  
oscillations  $\rightarrow \kappa \approx C_2$

#### Evidence:

- Oscillation frequencies match FFT peaks
- Amplitude decays as  $1/\ln(N)$
- Phase coherent across different  $c_p$  series

#### Conclusion:

The constant consistency  $\kappa = C_2$  holds  
when averaged over L-function zero phases.