

DEWSB from deformed AdS

Luca Vecchi

SISSA

Phys.Rev.D78,045009 M. Fabbrichesi, M. Piai, L.V.

Dynamical EW Symmetry Breaking

Very appealing Candidate but...

Serious Problem:

Calculability !!! (Gauge/Gravity?!)

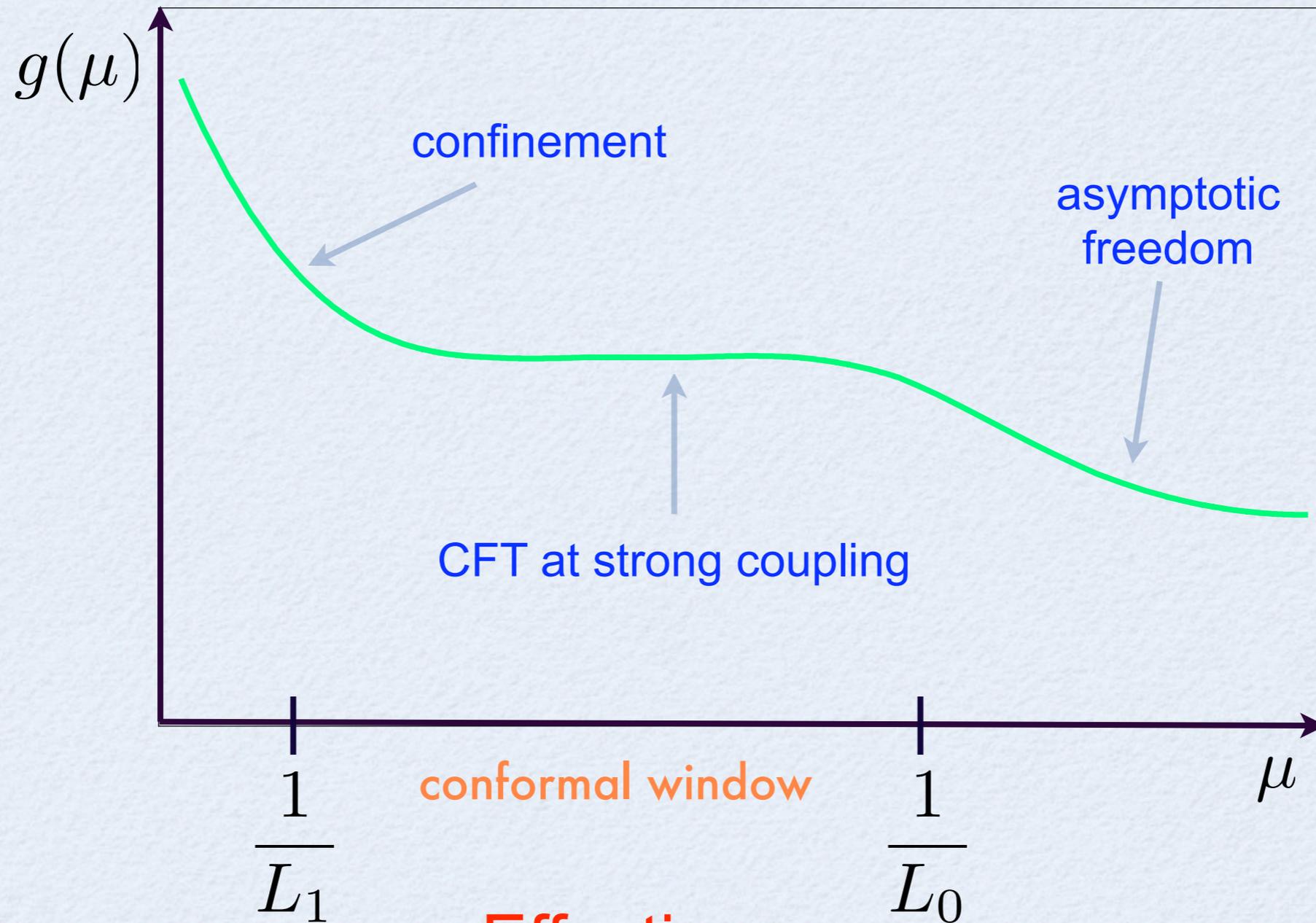
Conformal Window: Strong Dynamics
above the Confinement scale
(Non QCD-like)

Possible improvement on:

-  EW Precision Tests
-  SM Flavor structure

Conformal Window (Walking)

Holdom, Yamawaki et al., Appelquist et al.



EW Chiral
Lagrangian

Effective
Field Theory
???

Perturbation
Theory

Gauge/Gravity Correspondence

Maldacena, Witten

String theory



4D Gauge theory



Weakly coupled
Gravity (5D)



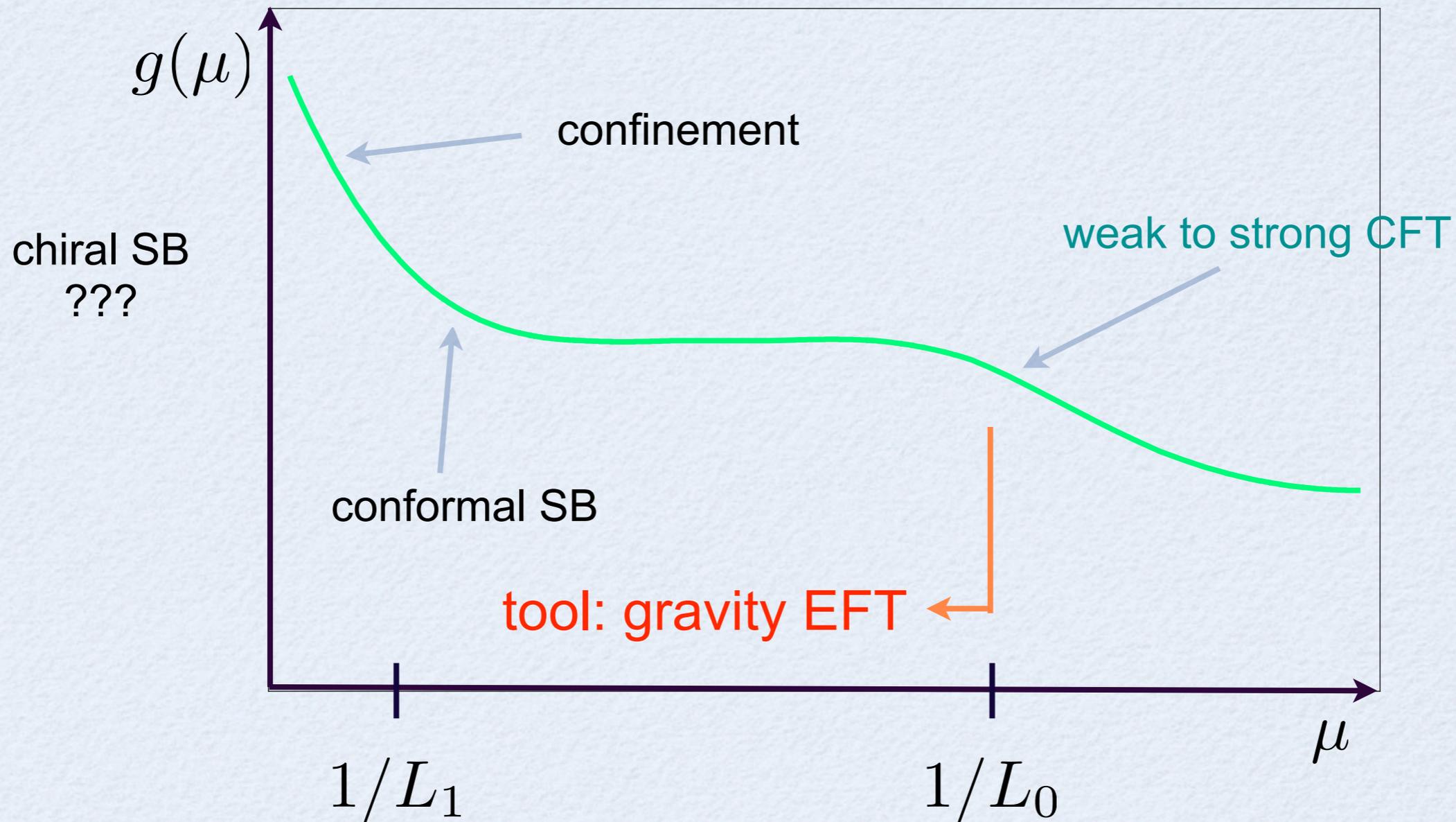
Large N and Large
't Hooft coupling



- 🔍 gravity duals for Non-CFT exist!
- 🔍 calculable correlation functions!

Effective Field Theory below $\frac{1}{L_0}$?!

EFT describes 3 Phase Transitions



Conformal SB, Confinement, and Chiral SB
are in principle different transitions !!!

What does their separation imply?

Implications for Phenomenology

(discuss mainly spin-1)

Confinement



resonance masses

Conformal SB



decay constants

Chiral SB



EW precision tests
(mainly S)

... following qualitative 4D expectations,
5D provides quantitative predictions!!!

Conformal Symmetry Breaking in the IR !

(the weak to strong CFT transition in the UV can be renormalized into the definition of the gauge couplings)

Why?

- Realistic Strong Dynamics
- Stabilized modulos

How? Departure from AdS !!!

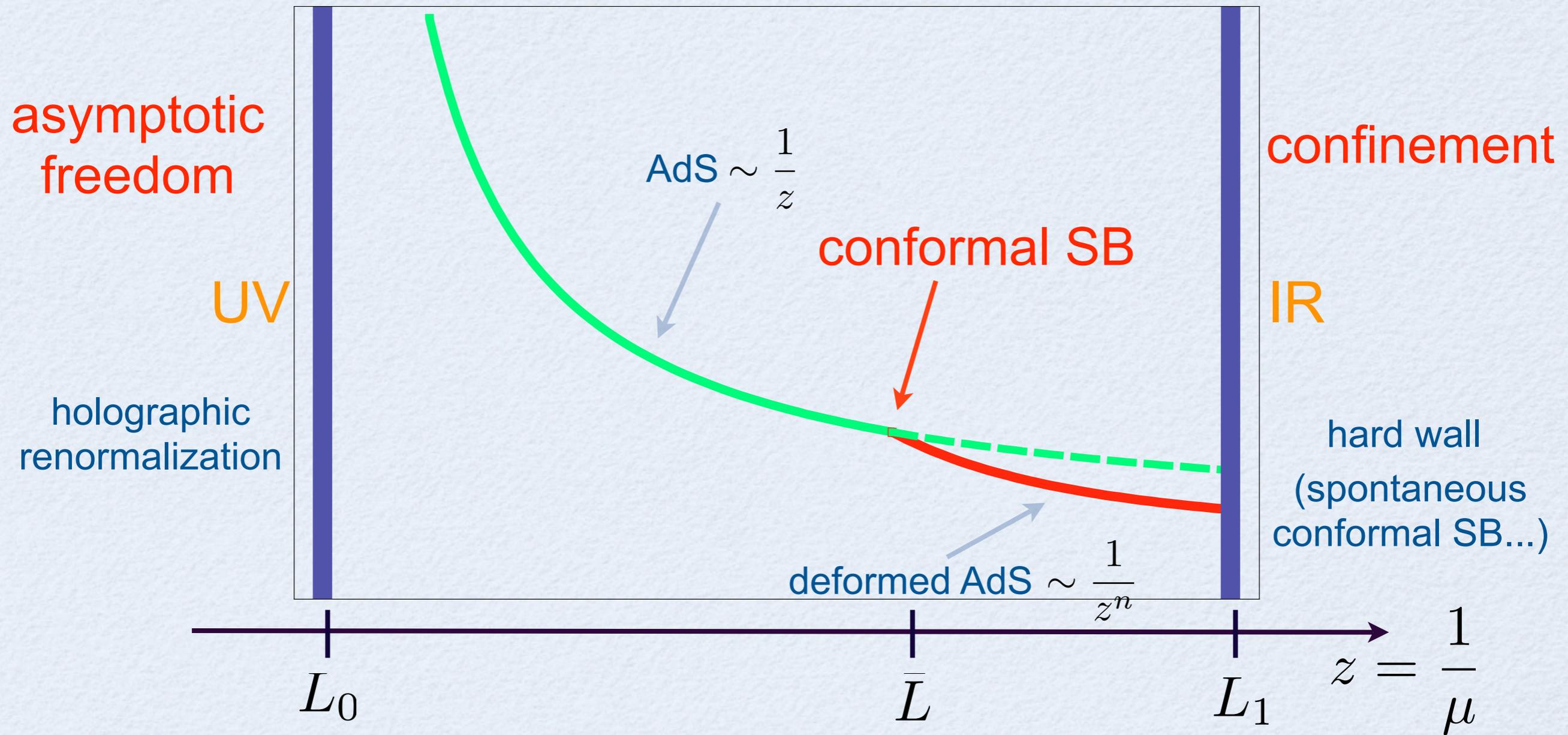
- Consistent deformation

$$ds^2 = a^2(z) [\eta_{\mu\nu} dx^\mu dx^\nu - dz^2] \quad \left(\frac{a'}{a^2} \right)' \leq 0$$

- Calculable $a \sim \frac{1}{z^n}$

Conformal SB: Toy Model

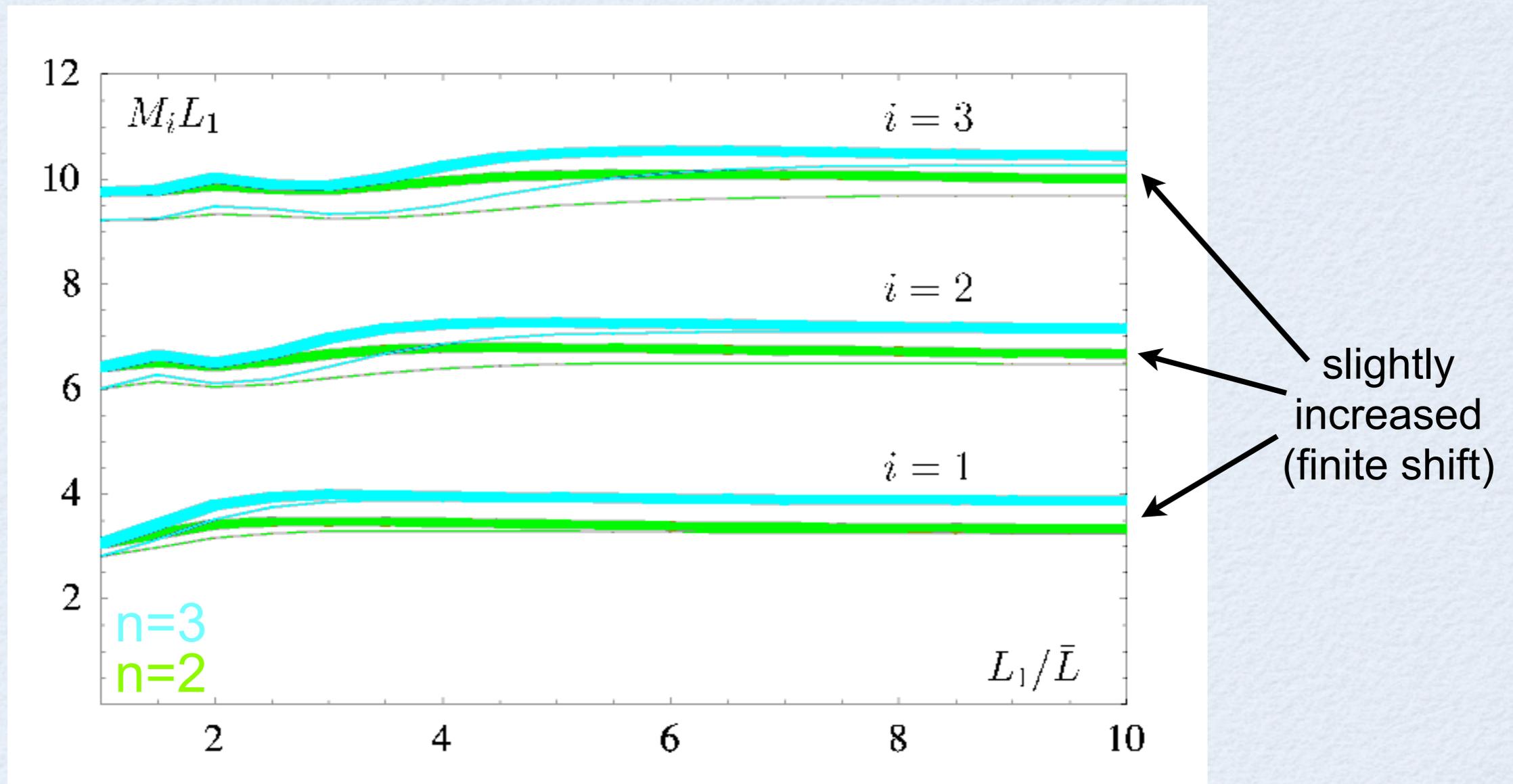
M. Fabbrichesi, M. Piai, L.V.



- Fundamental SM: UV-localized currents
- Hard wall (compare to RS, soft wall?)

Conformal Symmetry Breaking

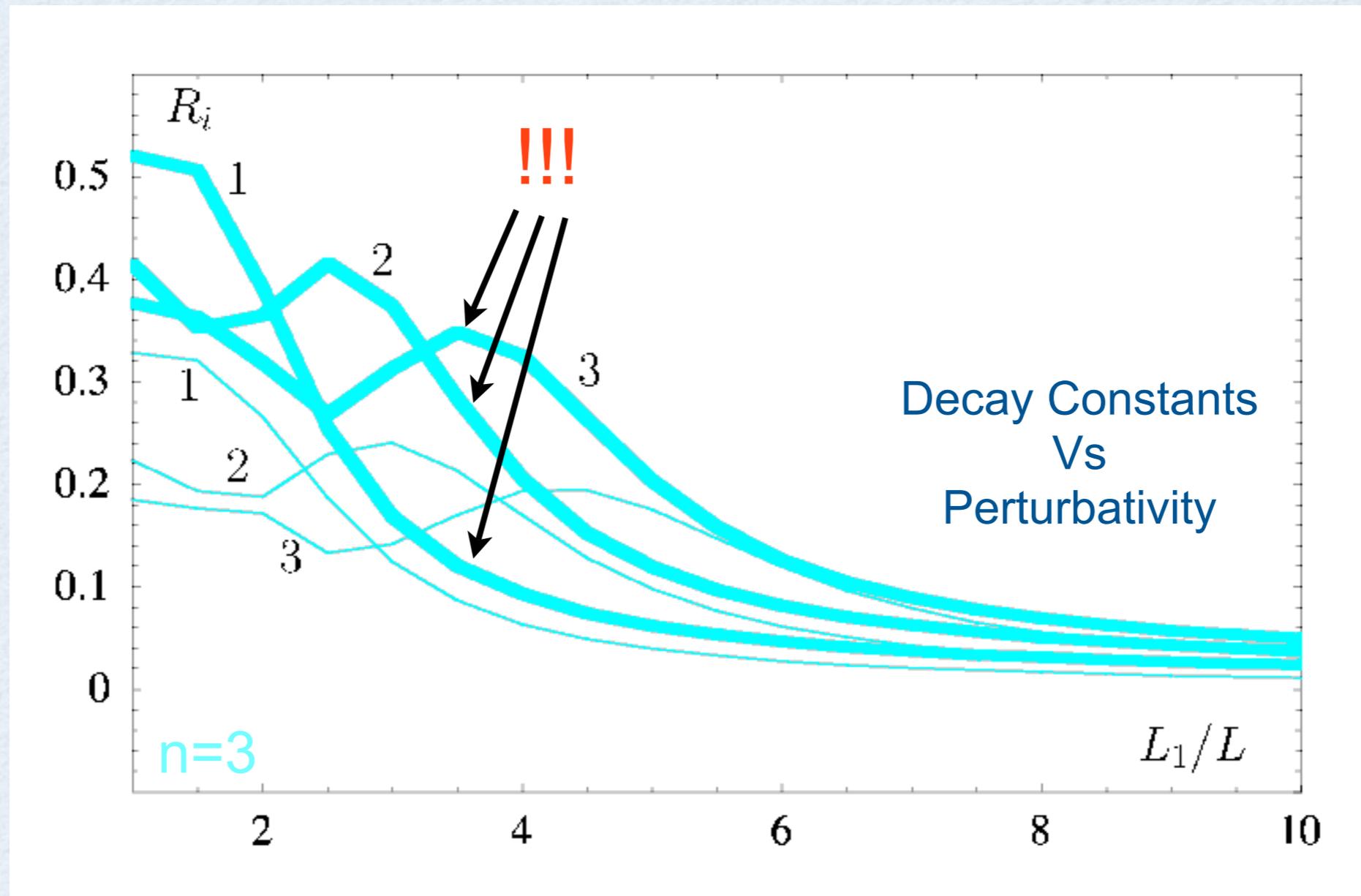
Resonance Masses



Spectrum IS NOT very sensitive to Conformal SB

Conformal Symmetry Breaking

Resonance Couplings



Couplings (of lightest resonances)
ARE very sensitive to Conformal SB

Chiral Symmetry Breaking

EW Precision Tests

EW symmetry breaking: $\Lambda_\chi \sim \frac{1}{L_1}$

$$\hat{S} \approx \cos^2 \theta_W \left(\frac{1}{n+1} + \frac{1}{2} (\bar{L}/L_1)^2 - \frac{1}{n+1} (\bar{L}/L_1)^{n+1} \right) L_1^2 M_Z^2$$

EW symmetry breaking: $\Lambda_\chi \sim \frac{1}{\bar{L}}$ No stringent bound on the Confining scale

$$\hat{S} \approx \frac{\cos^2 \theta_W \left(n+1 - 2 (\bar{L}/L_1)^{n-1} \right)}{2(n-1)} \bar{L}^2 M_Z^2$$

EW Precision Tests ARE very sensitive to the Chiral symmetry breaking scale

Conclusions

- Gauge/Gravity is an effective tool: Testable Models!
- Couplings are sensitive to the details of Conformal SB
- Precision Tests are sensitive to the details of Chiral SB
- Dynamical Models?

Thank you!

Luca Vecchi