Breaking of Scale Invariance

at the operator level:

$$\partial_\mu \mathcal{D}^\mu = T^\mu_\mu = \frac{\beta(\alpha_s)}{4\alpha_s} G^a_{\mu\nu} G^{\mu\nu}_a + \bar{\psi} m \psi$$

in the physical vacuum:

$$\langle 0|T^\mu_\mu|0\rangle = \langle 0|\frac{\beta(\alpha_s)}{4\alpha_s} G^a_{\mu\nu} G^{\mu\nu}_a|0\rangle + m\langle 0|\bar{\psi}\psi|0\rangle$$

hadronic matrixelements:

$$\langle h(p)|T^{\mu\nu}|h(p)\rangle = p^\mu p^\nu / M_h$$

$$\langle h(p)|T^\mu_\mu|h(p)\rangle = M_h$$

nucleon:

$$\begin{aligned} M_N \quad =& \langle N(p)|m_u \bar{u}u + m_d \bar{d}d + m_s \bar{s}s|N(p)\rangle \\ &+ \langle N(p)|\frac{\beta(\alpha_s)}{4\alpha_s} G^a_{\mu\nu} G^{\mu\nu}_a|N(p)\rangle \end{aligned}$$