Supplemental Material S3 Text: Motif plasticity in homogenous networks

If all neurons have the same weighted in- and out-degrees, then the motif dynamics simplify considerably. In such a homogenous network, divergent motifs obey:

\[
\frac{dq^{\text{div}}}{dt} = \frac{2}{N^3} \sum_{i,j,k} W_{ik} \frac{dW_{jk}}{dt} - \frac{dp}{dt}
\]

\[
= \frac{2}{N^3} \sum_k \left( \sum_i W_{ik} \sum_j \frac{dW_{jk}}{dt} \right) - \frac{dp}{dt}
\]

\[
= \frac{2}{N^3} Np \sum_{j,k} \frac{dW_{jk}}{dt} - \frac{dp}{dt}
\]

\[
= 2p \frac{dp}{dt} - 2p \frac{dp}{dt} = 0
\]

Convergent and chain motifs are also neutrally stable. So, it is inhomogeneities in the network structure that give rise to drift of the motif structure.