

Dear Sir/Madam,

Please consider our manuscript entitled “Cascades across networks are sufficient for the formation of echo chambers: An agent-based model”, for submission to *Scientific Reports*.

The formation of echo chambers on social media facilitates intolerance towards differing opinions, which threatens democratic ideals such as diversity and public dialogue. Echo chambers have been shown to induce spreading and retention of misinformation, including disbelief in climate change (Jasny, Waggle, & Fisher, 2015, *Nat. Clim. Chang*) and polarisation of opinions (Del Vicario et al., 2016, *Sci. Rep.*). Previous research identified cognitive biases (e.g., confirmation bias; see Sikder, Smith, Vivo, & Livan., 2020, *Sci. Rep.*), individual differences (Starnini, Frasca, & Baronchelli, 2016, *Sci. Rep.*; Del Vicario et al., 2016, *Proc. Natl. Acad. Sci.*) and repeated interaction between users (Madsen, Bailey, & Pilditch, 2018, *Sci. Rep.*) as *necessary* causes for the formation of echo chambers.

This work makes a substantial step forward in understanding the causal contribution of social media environments *themselves* for the formation of echo chambers and potential implications for counteracting the spreading of digital misinformation and false news. More precisely, we show:

- That the echo-chambers found in online and social environments do not require special cognitive bias, individual difference explanations, or repeated interaction.
- We show that echo-chambers can result from two core elements that define social networks:
  - The self-selection of network peers (e.g., friends).
  - The lateral (peer to peer) sharing of information (e.g., news feeds).

Critically, we uniquely demonstrate that the way in which information *enters the network* already “skews the pitch” to produce echo-chambers, *prior to any subsequent interaction*. When placed in the larger research context, which highlights the echo-chamber solidifying properties of these repeated interactions (e.g., Madsen et al., 2018, *Sci. Rep.*), this paints grave implications for the battle against misinformation and political polarisation, positioning social networks – by their very nature – as causal antecedents.

The manuscript is original, not previously published, and not under concurrent consideration elsewhere. All authors have signed off on this submission, and we declare no conflict of interest. The authors had no prior discussions with a *Scientific Reports* Editorial Board Member about the work described in the manuscript.

Kind Regards,



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