How AI can Lower the Cost of the Net-Zero transition by Accelerating Clean Energy Innovation

LSE Research Briefing

Summary

- The transition to net-zero is cheaper if clean energy technologies catch up with dirty energy technologies, in terms of cost and performance. This happens through innovation. The speed of innovation in clean technology affects the cost of the transition.

- **New research from LSE's Dr Marion Dumas, Dr Eugenie Dugoua and Dr Pia Andres** addresses how innovations in AI spill over to many other areas of innovation including clean and dirty energy technologies. It shows how AI can help the net-zero transition by accelerating innovation in clean technologies so that these catch up to, and surpass, the affordability and performance of the dirty technologies they are to replace.

- The research informs important policy recommendations, including: **improving R&D funding to AI and clean tech innovation; encouraging co-location; and facilitating transformative partnerships between AI and energy researchers**.

Three key policy questions

1) Do innovations in AI improve clean technologies at a higher rate than they improve dirty ones?

2) Does a higher rate of spillovers from AI to clean technologies compared to dirty technologies make the transition cheaper?

3) How can technology policy take advantage of the spillovers from AI to clean technologies and deliberately increase the intensity with which AI innovations are used to improve clean technologies and thereby lower the cost of the transition?

Research findings

- The analysis considers all ICT and AI patents and all clean and dirty energy patents (in electricity and transport) globally. AI is used in many crucial areas of green energy, including solar power generation and smart grid systems; on the other hand, it is also used in robotics to explore new oil fields.

- The study finds that innovators working on clean technologies build on AI at *double the rate* than those working on dirty energy technologies, even within the same firm. In other words, **innovations in AI spill over asymmetrically to clean versus dirty technologies, in a way that benefits clean technologies**.

- The modelling shows that this asymmetry in spillovers is very important for policy: ***it lowers the cost of the transition***, because it helps clean technologies catch up faster to the frontier of performance of dirty technologies. This in turn means that carbon prices do not need to be as high to bring about the transition.

- The data analysis shows that one key driver is whether *energy firms are exposed to AI innovations*. Specifically, we show that energy firms that operate in the same geographical area as AI innovators draw on AI innovations more in their energy R&D and, as a result, increase their effort in clean energy R&D and away from dirty energy R&D.

Policy implications

- Notwithstanding the energy cost of data centres, **AI can help the net-zero transition by accelerating innovation in clean technologies so that these catch up and surpass the affordability and performance of the dirty technologies they are to replace**.

- This is already happening to some extent spontaneously.

- R&D policy can deliberately intensify this process in three ways:

    - Support from public finances for both AI and clean technology innovation (i.e. **targeted R&D subsidies**). Note that R&D subsidies to AI only make the transition more expensive, because it causes innovators to move towards AI and away from clean energy.

    - However, policymakers can commensurately increase R&D subsidies in both fields, which would likely make the transition easier.

    - Policymakers can increase support for the flow of knowledge between clean energy innovators and AI innovators, for example through **encouraging co-location** via the design of clusters.

    - Policymakers should also focus on **facilitating partnerships** in which AI researchers work directly with energy researchers and engineers, as is the case with OpenAI's and Microsoft's partnerships with Department of Energy National Laboratories in the USA.