Discussion of “Is automating AI research enough for a growth explosion?” by Davidson, Halperin, Houlden, and Korinek

Paul Luk

Research Department
Hong Kong Monetary Authority

Presentation at the International Conference on Generative Artificial Intelligence (Gen(AI))
10 April 2025

Disclaimer

- **The presentation represents the views of the authors, which are not necessarily the views of the Hong Kong Monetary Authority.**

Research Question

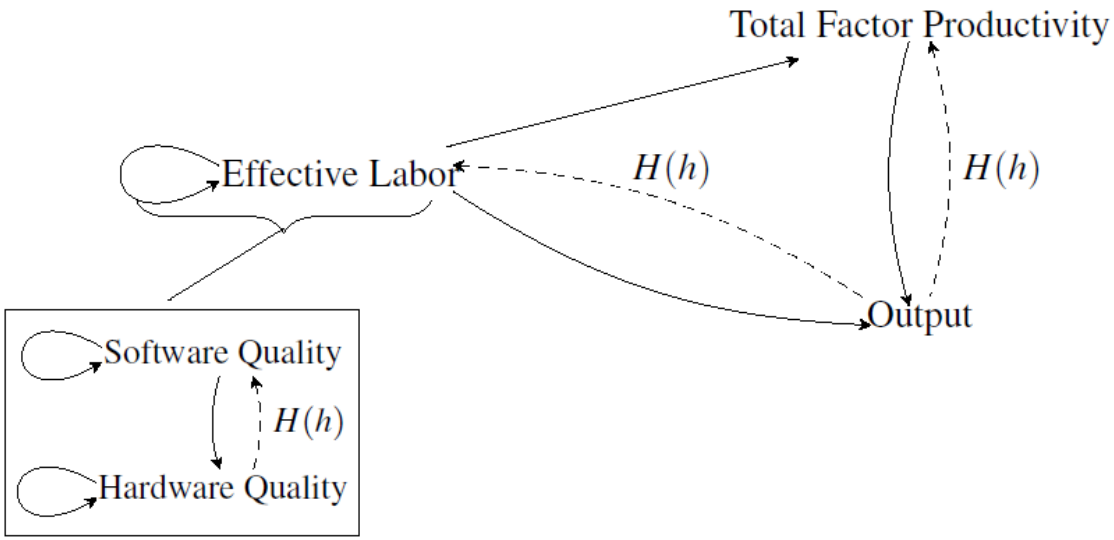
- **How does the ‘self-improving’ feature of AI affect the condition that leads to an economic singularity?**
  - Singularity means infinite growth in finite time.

- **Do current estimates of research productivity point in the direction of a singularity?**

What this paper does

- **A semi-endogenous growth framework (Jones, 1995).**
  - Focus on supply side. No demand side.
  - AI modelled as a technology that improves effective labour.
  - Feedback loops due to software and hardware improvement.

Figure 1: Channels for Impact of Software and Hardware Improvements



Main finding 1: AI relaxes condition for singularity

- **Even though ideas are getting harder to find (Bloom et al. , 2020), i.e.:**

$$g_{At} = vA_t^{\phi-1}\hat{L}_t^{\lambda}, \;\; \phi < 1,$$

- **if effective labour ($\hat{L}_t$) is increasing in technology, i.e. $\frac{\partial \hat{L}_t}{\partial A_t} > 0$, then constant or exponential growth can occur.**

- **The condition for singularity is further relaxed with feedback loops.**

Main finding 2: Automating ~13% of tasks leads to singularity

- **Singularity condition:**

$$f_Y + \frac{1}{\alpha} f_A r_A + f_h r_h + f_z r_z > 1,$$

  - f_x = share of automated tasks in sector x,
  - r_x = returns to research in sector x.

- **Singularity requires automating around 13% of tasks in each domain.**

Comment 1: estimates of *r*

- **Large uncertainty on estimates of returns to research *(r).***
  - $r = \frac{\Delta research\ output}{\Delta research\ input}$
  - Research input is hard to measure.

- **How stable is *r* in the future?**

- **Low automation share mainly driven by large *r* on hardware research.**
  - Moore's law: *"Doubling of the number of transistors on a chip every 2 years."*
  - If $r_h = 2$ instead of 5, the automation share goes up from 13% to ~22%.

Comment/Question 2: reconciling with other estimates

- **How to reconcile with less optimistic estimates?**
  - Acemoglu (2024): Total TFP effect is 0.7% in next 10 years.
  - Nordhaus (2021): Singularity is not near. (in the order of a century)

- **Slow technology diffusion**
  - Solow (1987): "*You can see the computer age everywhere but in the productivity statistics.*"

- **Does AI improve or reduce productivity?**
  - Addictive AI algorithms.

Comment 3: preferences and incentives

- **Supply side:**
  - How does incentive to innovate arise?
    - Acemoglu and Restrepo (2019): depends on factor prices.

- **Demand side:**
  - Can all goods and services be produced by AI (e.g. company and care by human beings)?
  - Baumol's cost disease: if people have inelastic demand for these other goods not produced by AI, then expenditure share of these goods will rise.

Concluding remarks

- **Thought-provoking paper on future of human societies.**

- **Enlightening theoretical analysis**
  - showing the possibility that AI and automation may relax the condition for singularity.

- **Numerical results subject to uncertainty.**