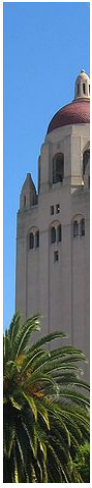

A.I. and Our Economic Future

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A.I. and Our Economic Future

- A.I. is likely to be the most transformative technology in our lifetime
  - Latest in a line: electricity, semiconductors, the internet
- What if machines — A.I. for cognitive work and A.I. plus robots for physical work — can perform every task a human can do, at least as cheaply?
- Two scenarios:
  - A.I. accelerates economic growth
  - A.I. is “business as usual”

Scenario 1: A.I. dramatically accelerates economic growth

- Near-term productivity boosts from A.I.
  - Software: Claude Opus 4.5 performs better than any human on Anthropic's two hour coding exam
  - In the next decade(!): A.I. agents that can automate most coding?
  - Virtuous circle: better algorithms and A.I. agents = virtual remote workers

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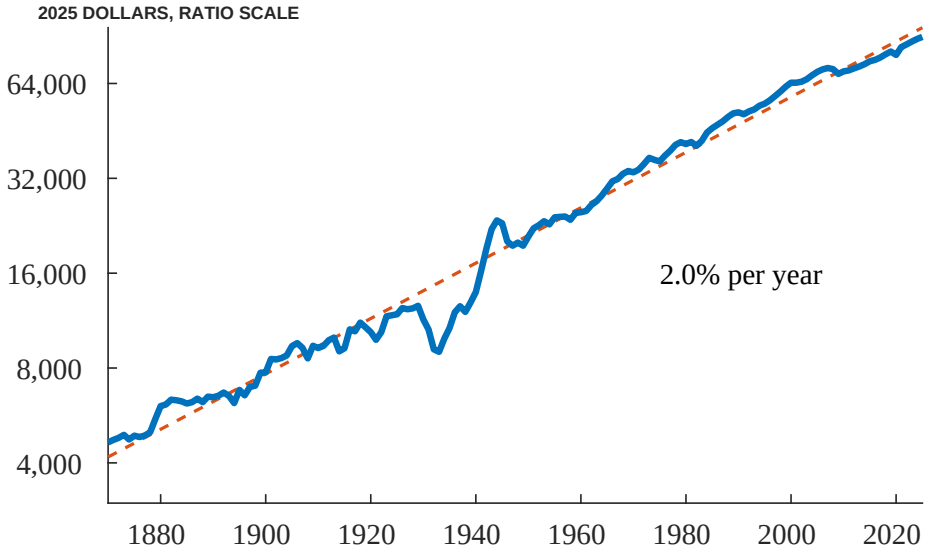
  - Virtuous circle: better algorithms and A.I. agents = virtual remote workers
- Billions of virtual research assistants, running 100x faster than us — a "country of geniuses in a data center" (Dario Amodei)
  - Automate most cognitive tasks $\Rightarrow$ invent new ideas
  - E.g. better chips, robots, medical technologies, etc.
  - A.I. + robots $\Rightarrow$ automate physical tasks
- Potential to raise growth rates substantially over the next 25 years?

Scenario 2: A.I. as "Business as Usual"

- Automation has been going on for 150 years with no speed up in growth
  - Electricity, engines, semiconductors, the internet, smartphones
  - Yet growth always 2% per year
- Maybe those great ideas are what *kept* growth from slowing
  - Perhaps A.I. = latest great idea letting us maintain 2% growth for a while longer. (pessimistic view, but possible)
- Economic history $\Rightarrow$ may take longer than we expect
  - Electricity and computers changed the economy over 50 years

Average income per person in the U.S.



Weak Links

- Firm production requires the successful completion of a number of tasks
  - iPhone: Design/Innovation - Manufacturing - Marketing - Retail - Customer Mgt
  - Failing at any step can reduce value considerably
  - Examples: the space shuttle Challenger's O-ring or Covid-19 supply chain issues
- "A chain is only as strong as its weakest link"
  - Making 17/20 links infinitely strong can have modest effects — bottlenecked by remaining weak links
  - 100m $\times$ more transistors in my pocket than in the early 1970s...
- Weak links are the source of scarcity $\Rightarrow$ earn high returns

Weak Links in Production

- Production requires N tasks: $Y = F(X_1, X_2, \ldots, X_N)$
- Example: Harmonic mean

$$\frac{1}{Y} = \frac{1}{X_{easy}} + \frac{1}{X_{hard}}$$

- Key properties of this Weak Link production function
  - Infinite values for some inputs leave Y finite
  - Y is less than the smallest X_i (the weakest link)

What are the consequences of infinite automation of some tasks (e.g. software)?

- Let s be some input's initial share of total cost and σ the elasticity of substitution
- Having an infinite amount of that input raises Y by the factor:

$$\left(\frac{1}{1-s}\right)^{\frac{\sigma}{1-\sigma}} \approx 1 + \frac{\sigma}{1-\sigma} s \quad \text{for } s \text{ small} \tag{1}$$

- Key insight:
  - $s \approx 2\%$ for software $\Rightarrow$ about 2% increase in GDP from complete-automation of the software industry with infinite productivity! (for $\sigma = 1/2$ — sensitive!)

The remaining weak links constrain output

What has happened to the “computer income” share of GDP?

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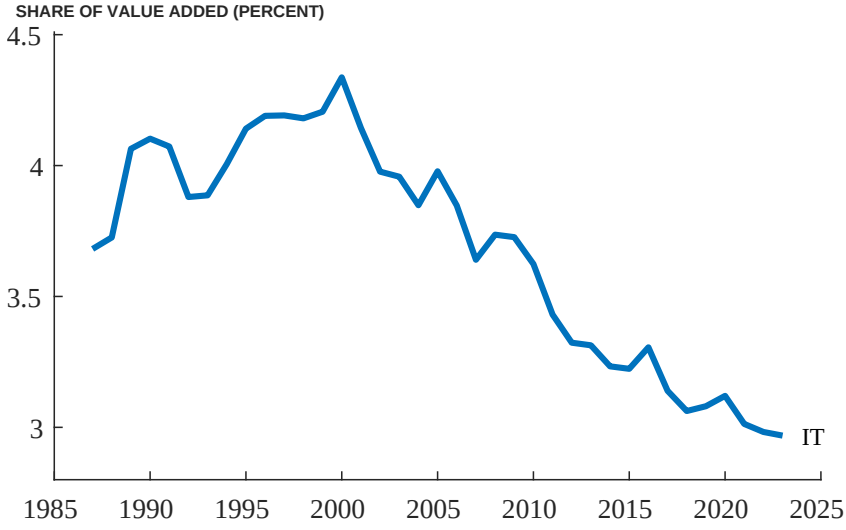
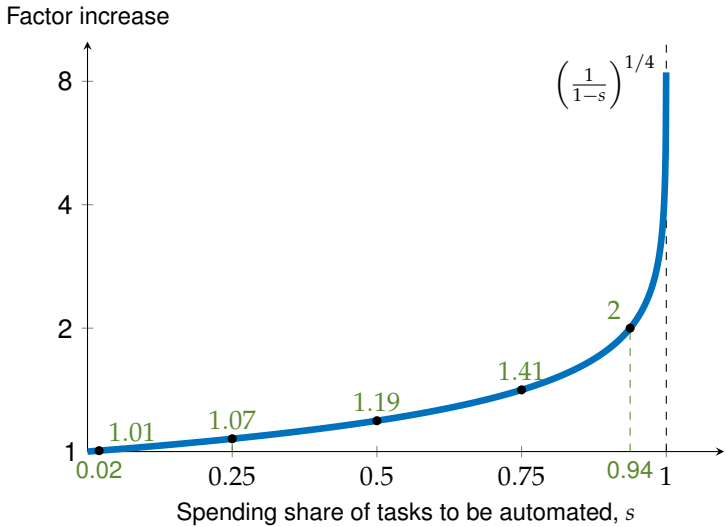


Computers are everywhere, but rapid price declines dominate — weak links

GDP per Person with Infinite Automation ($\sigma = 0.2$)



Simulations of a Model (Jones and Tonetti, 2026)

- Model of our economic future
  - Ideas are the source of long-run economic growth
  - Production of goods and ideas involves weak links
  - Automation of both goods and idea production occurs endogenously over time
  - Calibrate to historical data
- Features both of the key ingredients from the two scenarios
  - Positive feedback: automation $\rightarrow$ new ideas $\rightarrow$ more automation
  - Weak links limit the effect of automation

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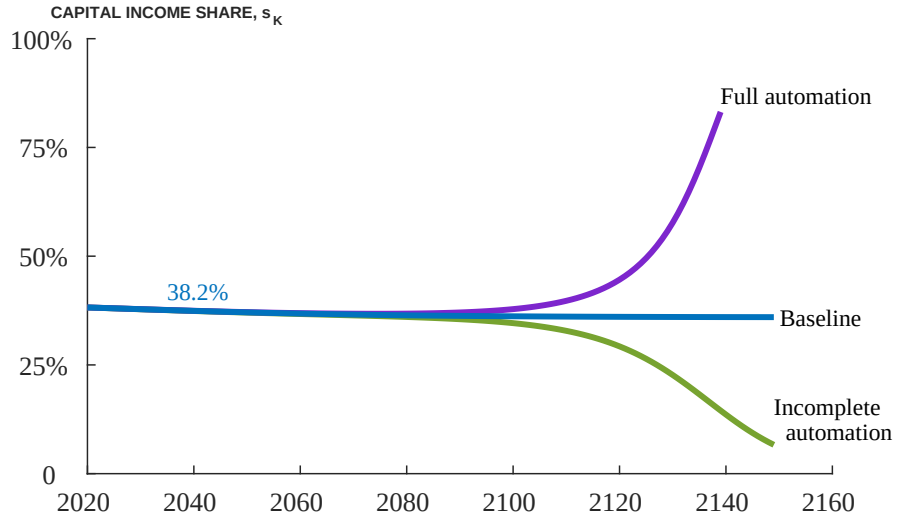
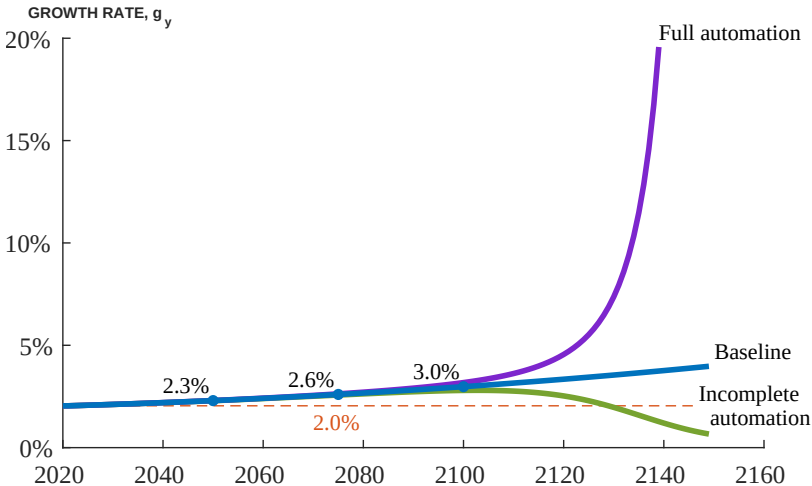
- Two sets of simulations
  1. A.I. as a continuation of historical automation throughout the economy
  2. A.I. as a break with past: Moore's Law applies everywhere

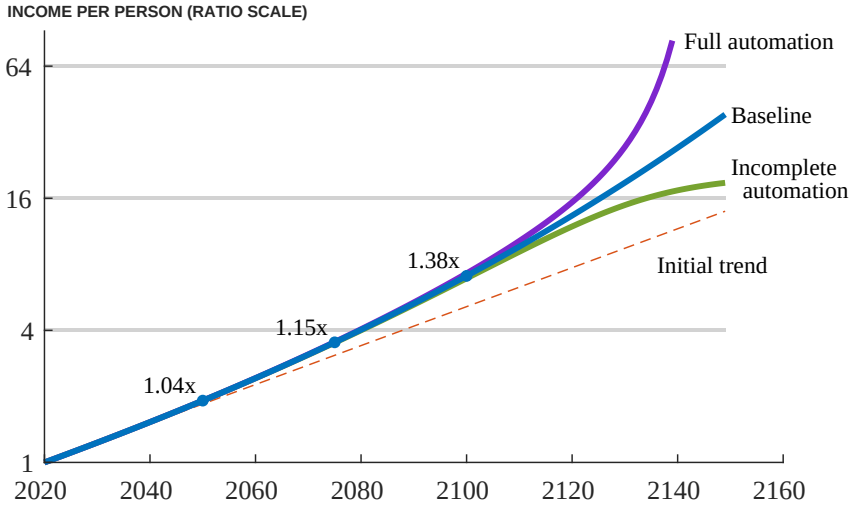
The Future if AI = Continuing the Past: Capital Share



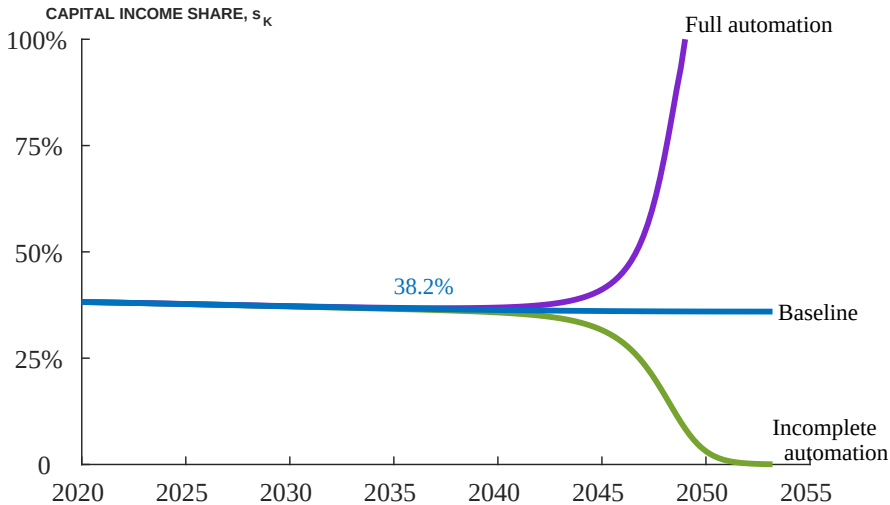
The Future if AI = Continuing the Past: Economic Growth



The Future if AI = Continuing the Past: GDP per Person



The Future if AI = Moore's Law Everywhere: Capital Share



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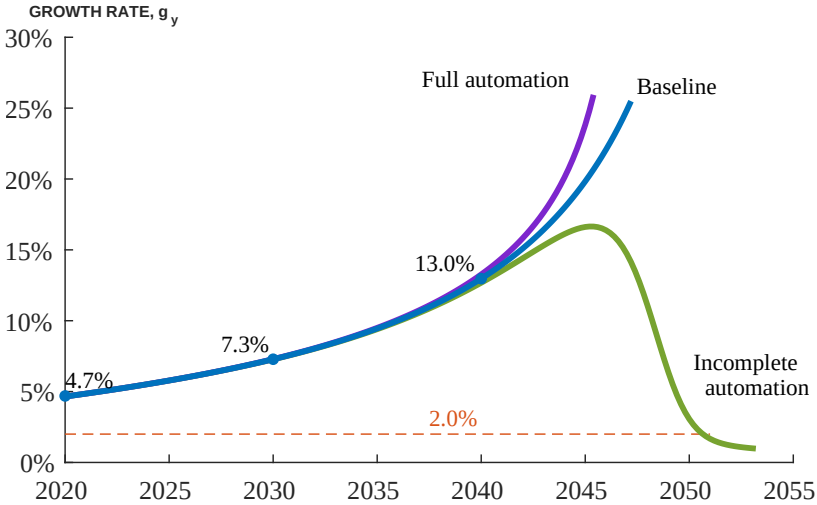

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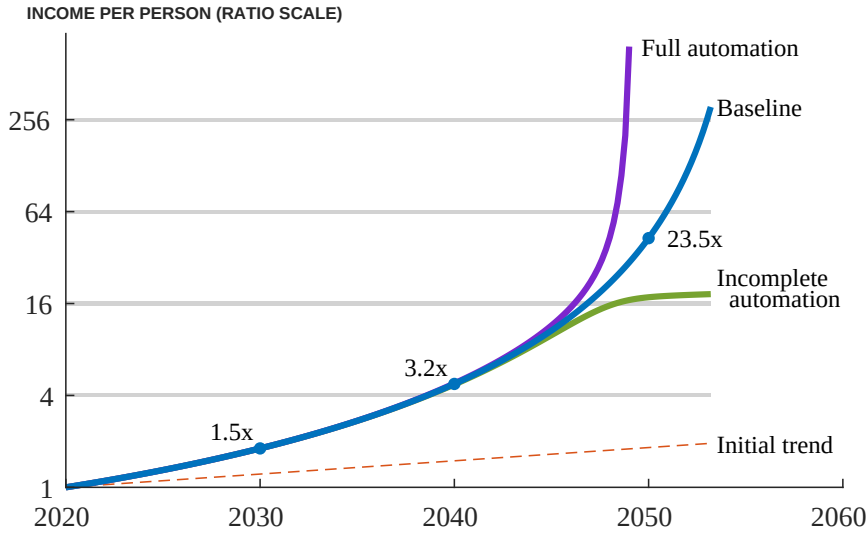


Summing Up

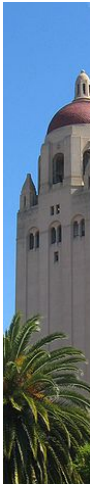
- Growth could indeed explode — but slowly!
  - Weak links make the transformation gradual
  - But as weak links are automated away, flywheel effects dominate
- Example: Self-driving cars — 20+ years since DARPA 2004

Jobs

- Geoff Hinton in 2016: We should stop training radiologists
  - But more radiologists today and higher pay!
- How to understand? Weak links!
  - Jobs are collections of complementary tasks — radiologists do more than just read scans
  - "Weak links" $\Rightarrow$ Automating 75% of tasks can raise wages — radiologists
  - Some jobs: A.I. automates all tasks $\Rightarrow$ wages go down — Uber drivers
- A.I. has nuanced effects on jobs and the labor market

Inequality and Meaningful Work

- Historically, labor is the main asset that many people trade to consume.
  - Could change in the future?
- The world where A.I. “changes everything” is a world where GDP is incredibly high
  - The size of the pie available for redistribution is enormous
  - Rich countries already engage in lots of redistribution, but more may be needed?
  - Transition hard?
- As we get richer, we naturally work less — this is a good thing!
- But there is also good, meaningful work
  - We may choose to value experiences involving people (arts, music, sports)
  - Retirement!



Catastrophic Risks?

Can we use economic analysis to think about the serious risks?

Two Versions of Existential Risk

- Bad actors:
  - Could use ChatGPT-8 / Opus 7 to cause harm
  - E.g. design a virus that is more lethal than Ebola and takes 3 months for symptoms
  - Nuclear weapons mangeable because so rare; if every person had them...
- Alien intelligence:
  - How would we react to a spaceship near Pluto on the way to Earth?
  - “How do we retain power over entities more powerful than us, forever?” (Stuart Russell)

How much should we spend to reduce A.I.'s catastrophic risk? (Jones 2025)

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- Better intuition
  - VSL = \$10 million
  - To avoid a mortality risk of 1% $\Rightarrow$ WTP = $1\% \times \$10$ million $= \$100,000$
  - This is more than 100% of a year's per capita GDP
  - Xrisk over two decades $\Rightarrow$ **annual investment of 5% of GDP**
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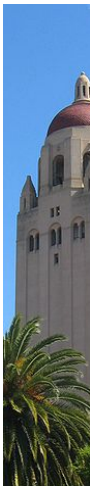
Incomplete: ignores the "effectiveness" of mitigation, but correct intuition; see paper.

Other Safety Considerations

- Easy to justify spending 1/3 of 1% of US GDP on safety = $100 billion!
- Weak links and safety
  - Weak links $\Rightarrow$ large upside benefits arrive slowly
  - ... but harms can come quickly!
  - Mythos and automating software engineering
- Exernalities and race dynamics: A.I. labs do not internalize the risks to all of us
- Should we tax GPUs and use the revenue to subsidize safety?



Final Thoughts

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- How much did the internet change the world between 1990 and 2020?
  - How much will A.I. change things between 2015 and 2045? More or less?
  - I believe the answer is much more
  - Just because changes take 30 years instead of 5 years does not mean that the ultimate effects will not be large

- Downside risks could come sooner

We should use the intervening years to prepare for the changes

Talk based on material from several papers

- Aghion, B. Jones, and C. Jones (2019) “Artificial Intelligence and Economic Growth”
- Jones (2024 AER Insights) “The A.I. Dilemma: Growth versus Existential Risk”
- Jones (2025) “How much should we spend to reduce A.I.’s existential risk?”
- Jones and Tonetti (2026) “Past Automation and Future A.I.”
- Jones (2026) “A.I. and Our Economic Future” (for *JEP*)