

Labor Market Challenges in the Age of AI

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Joint Vienna Institute

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Overview

Part I: Technological Advances

Part II: Implications for Economics

Part III: Labor Market Challenges

Part I: Technological Advances

Rapid Pace of Advances in AI

Frontier AI models are improving rapidly:

- rising capabilities (accuracy, context window length, etc.)
 - more and more areas in which AI meets/exceeds human capabilities
- increasing speed
- growing efficiency/lower cost
- most recently, significant progress in reasoning (OpenAI's o1)

Longer-term trajectory:

- recent advances are merely a continuation of decade-long trends

Moore's Law: The number of transistors on microchips has doubled every two years

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important for other aspects of technological progress in computing – such as processing speed or the price of computers.



Transistor count

50,000,000,000

10,000,000,000

5,000,000,000

1,000,000,000

500,000,000

100,000,000

50,000,000

10,000,000

5,000,000

1,000,000

500,000

100,000

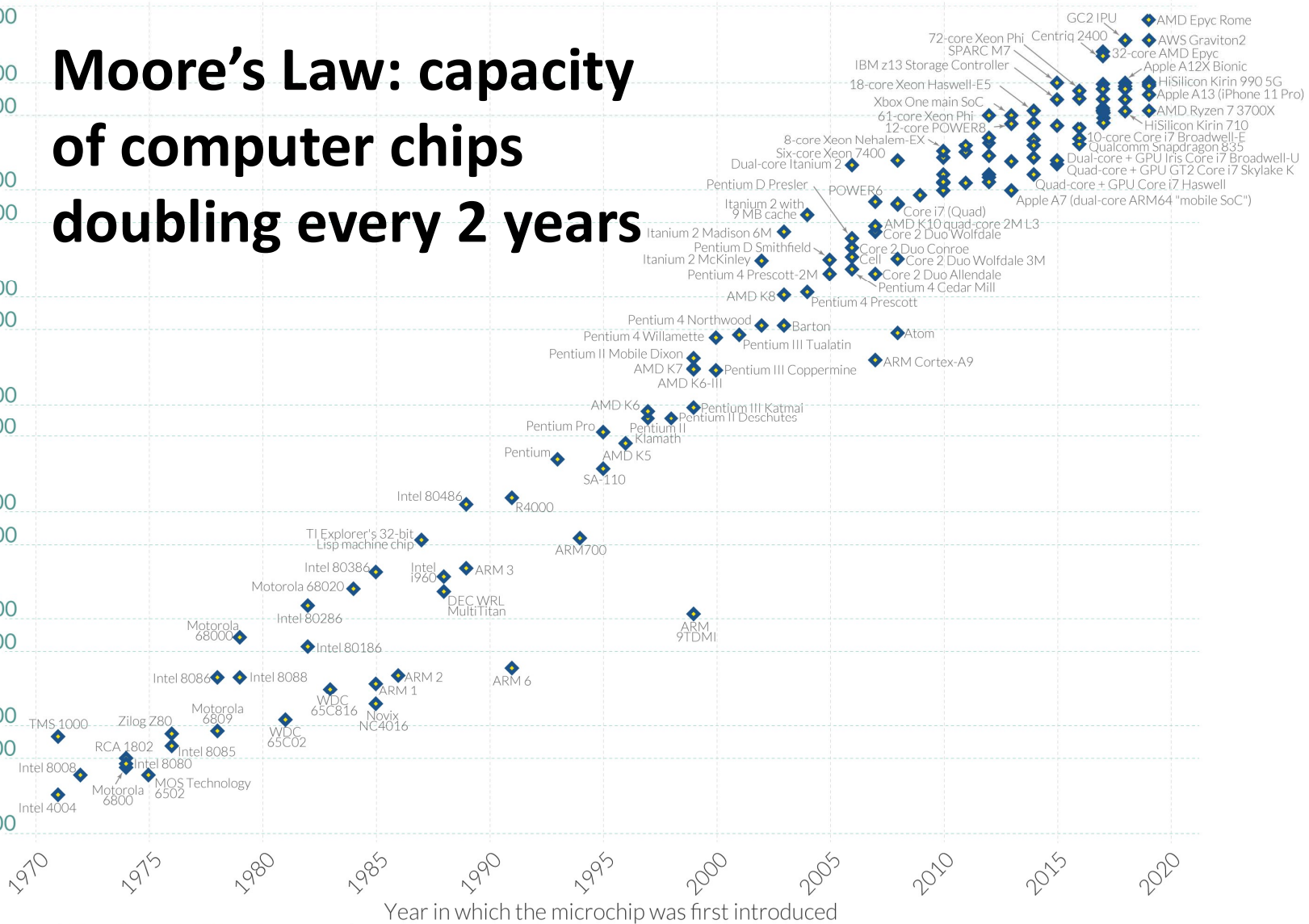
50,000

10,000

5,000

1,000

Moore's Law: capacity of computer chips doubling every 2 years



Data source: Wikipedia (wikipedia.org/wiki/Transistor_count)

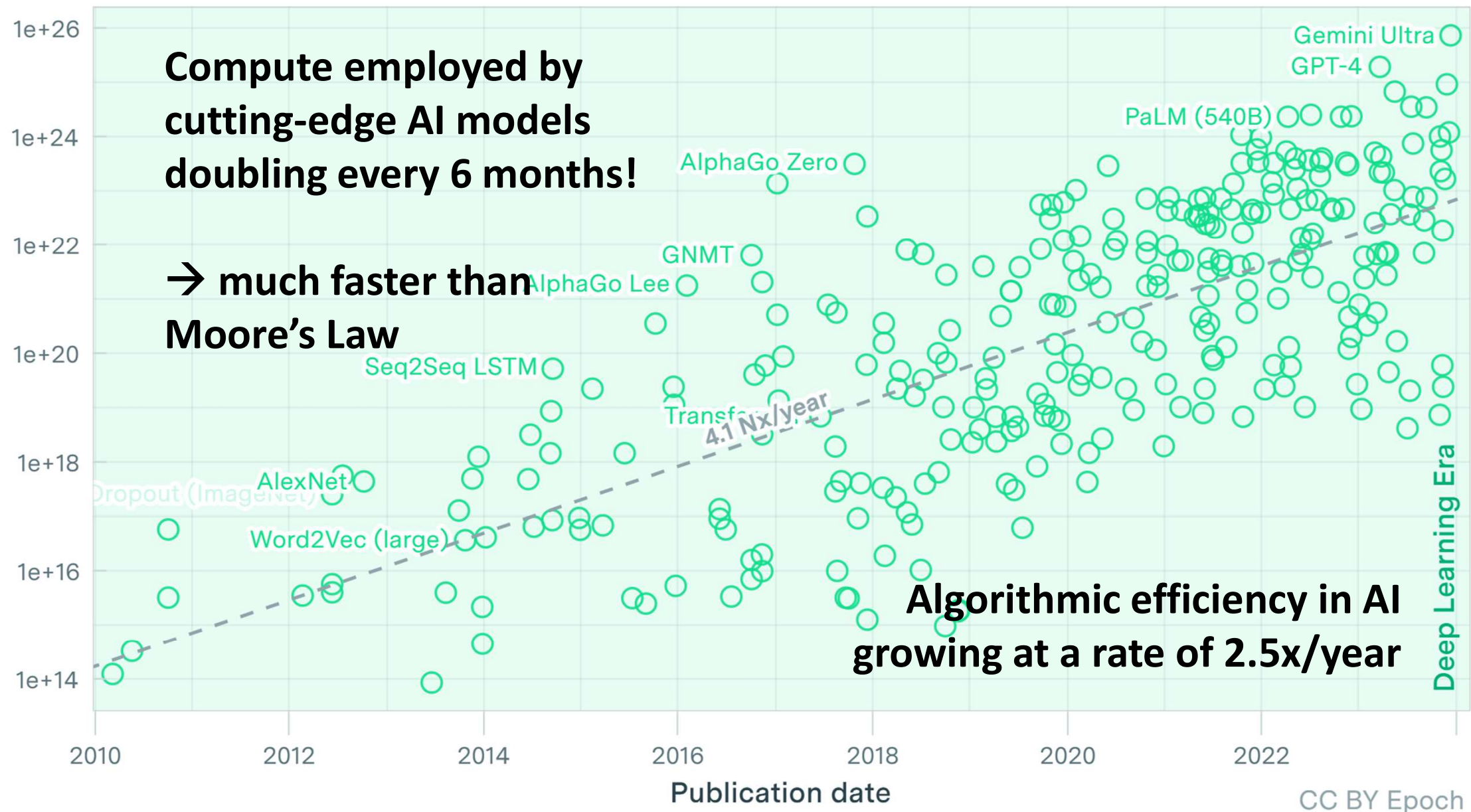
OurWorldinData.org – Research and data to make progress against the world's largest problems.

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Training Compute of Notable machine learning Systems Over Time

≡ EPOCH

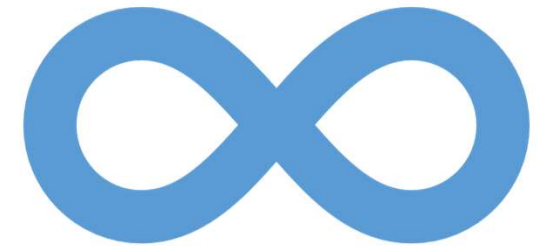
Training compute (FLOP)



Regularities Driving AI Progress

Scaling Laws:

- describe a predictable relationship between
 - the amount of compute used by AI models
 - and the resulting capabilities
- have held for more than a decade now
- are at the heart of the strategy pursued by frontier AI labs



AI Projections for the Near Term

In 2025: Growth of AI Agents

- AI systems that act autonomously to pursue longer-term goals
- Rely on three new abilities of AI systems:
 1. Planning
 2. Longer-term memory
 3. Access to external tools (internet, compiler, ...)
- Will automate many complex cognitive tasks
 - including many that you thought we could never automate

Where is this all going?

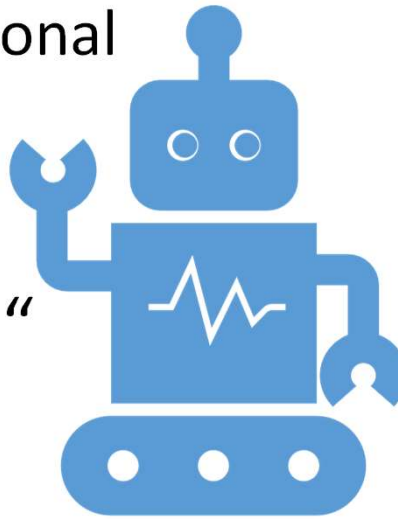
- There is no obvious ceiling to the capabilities of AI
 - Just scaling current systems will deliver very powerful capabilities, esp. in light of recent breakthroughs in reasoning
- Significant uncertainty about:
 - speed of progress
 - acceleration of progress
 - breadth of progress



Where is this all going?

Declared goal of frontier AI labs: Artificial General Intelligence (AGI)

- AGI = AI that can perform any cognitive task performed by humans
 - General reasoning, problem-solving, abstract thinking, creativity, emotional intelligence, ...
- Implication: AI Agents everywhere, role of humans diminished
- Potential for recursive self-improvement, "intelligence explosion"
- Potential timelines: expert estimates range from 3 to 20 years
- Robotics is not far behind



Geoff Hinton: "I have suddenly switched my views on whether these things are going to be more intelligent than us." ...
"I now predict 5 to 20 years..."

Quoted in MIT Technology Review & Twitter 2023

Sam Altman (2024):
AGI will be a reality in
"5 years, give or take"

Quote in "Our AI Journey" 2024

Part II: Implications for Economics

An Economic Paradigm Shift

For clarity's sake, let's take brain-machine parity in 5 - 20 years as a given**

What are the implications for economics and labor markets?

(**Even if this timeline turns out to be premature, the direction is the right one!)

Evolution of Economic Paradigms

Question: What will be different? Let's focus on the big picture:

The Malthusian Age: A ... stagnant
T ... bottleneck
L ... dispensable (reproducible)

The Industrial Age: A ... driving force
L ... bottleneck
K ... reproducible

The Age of AI: A ... accelerating
K ... reproducible
L ... reproducible

Evolution of Economic Paradigms

Implications for output Y:

The Malthusian Age: A ... stagnant
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The Industrial Age: A ... driving force
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The Age of AI: A ... accelerating
K ... reproducible
L ... reproducible $\rightarrow Y = AF(K, L+M) \rightarrow$ ultimately $Y = AK$

Evolution of Economic Paradigms

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Big picture:

Use a slice of the extra Y
to compensate the L

Scenarios for the Transition to AGI

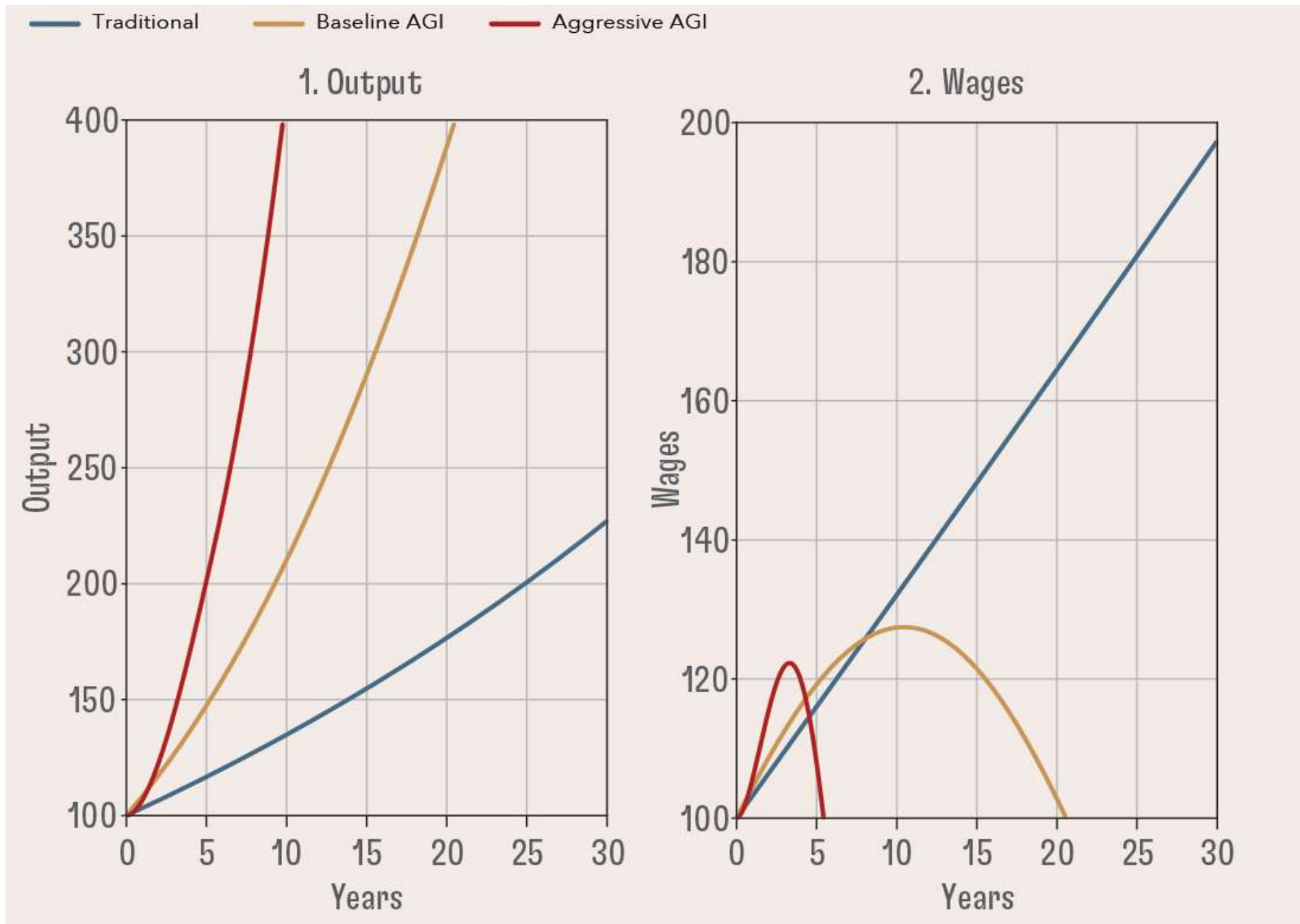
“Scenarios for the Transition to AGI,” with Don Suh, NBER WP 32255

- what our brain does is computation
 - task-based model a la Zeira/Acemoglu-Restrepo, focus on compute
 - AGI could perform all (atomistic) tasks of our brains
- what happens if AI systems can do more and eventually all of it?
- biggest concern: the fate of labor
- There is a race between automation and capital accumulation
 - Under AGI, output growth accelerates but labor loses the race

Scenarios for the Transition to AGI

Scenarios that I consider > 10% probability:

- I) Business as usual: AI boosts productivity – akin to the internet boom
- II) AGI within 20 years: Gradual advancement towards AGI over 2 decades
- III) AGI within 3-5 years: Rapid advancement in coming years



→ See my IMF F&D Article on [“Scenario Planning for an A\(G\)I Future”](#)

Myths and Truths About an AGI Economy

- AGI may lead to faster growth and greater abundance
- Economic scarcity will still persist (unlike in Star Trek):
 - scarcity = positive prices – indicate trade-offs
- When technologists suggest “everything will become far cheaper,”
 - we economists know that it’s relative prices that matter
 - what will become *relatively* cheaper is what will be more abundant
 - may apply to labor and labor-intensive goods
 - but the opposite may apply to energy & capital-intensive goods
- Ultimate question: what will be the “bottleneck” factors?

Disentangling Capital Post-AGI

Reproducible Factors:

- Compute and robots: reproducible but still scarce (price > 0)

Irreproducible Factors:

- Land and physical space
- Energy and raw materials/matter
- Original art and historical artifacts
- Intellectual property (artificially scarce)

Part III: Labor Market Challenges

Labor During the Transition (next 3+ years)

AI will be able to do more and more in coming years:

- Most valuable skill: collaborating with AI
 - Productivity gains come from using AI
 - Requires openness and training
 - But there are many low-hanging fruits
- potential for leap-frogging vs risk of a new “intelligence divide” for CEE countries

Reaping the Productivity Benefits of AI

Reduce barriers to adoption:

- institutional inertia / new processes required
- sectoral regulation (eg in medicine, law, education, etc)
- false narratives (“AI is not creative”, “AI can’t do xyz”, etc...)

Support drivers of adoption:

- AI rollout via software rather than new physical capital
- integration into existing software already happening
- interaction in natural language is easy to learn

False Concerns About Current AI

- Benefits of creating versus deploying leading foundation models:
vast majority of productivity gains will come from deployment

→ lots of opportunities for CEE countries
- Safety regulation versus productivity:
at present, we can have both

Labor Post-AGI

The Changing Nature of Labor:

- AGI & robots will ultimately have the capacity to perform any cognitive and physical task humans can
- Labor loses its status as the main irreproducible factor of production
- Potential for widespread labor displacement and wage declines
- Shift from human labor to AI and robots as primary economic drivers

Labor Post-AGI

Transitory Sources of Labor Demand Post-AGI:

- Production and diffusion lags in AI adoption
- Need for AI systems to acquire implicit knowledge
- Trust issues and perceived human superiority in certain roles
- Legal and regulatory protections for human workers

Labor Post-AGI

Long-Term Niches for Human Labor:

- Roles requiring authentic human connection
- Jobs tied to human identity (e.g., sports, arts)
- Religious roles requiring human involvement
- AI alignment and oversight roles

Education in the AGI Era

AGI challenges the traditional value of education:

- Most cognitive skills will become obsolete
→ mantra from SBTC era of “more education” will stop working
- Economic value lost, but persistent civic value of education
- Focus on ethical implications and AI governance

Impact on Educational Institutions

Shifts in demand and supply of education:

- Declining demand for traditional higher education
 - AI-driven alternatives for personalized learning
- universities need to restructure offerings

Role of research:

- Research institutions will face growing AI competition
- Shift from cognitive labor to capital investments in AI

AGI and Income Distribution

Income Distribution and Inequality

- Potential for unprecedented levels of income concentration
- Benefits of AGI may accrue primarily to capital owners
- Need for new mechanisms of income distribution
 - Proposal of a “Seed UBI (Universal Basic Income)”
- Challenge of compensating the losers
 - Rethinking social insurance systems not tied to work
- Challenge most severe for global income distribution
- Fundamental question: What is our end goal?

Economic Policy Challenges for the Age of AI

1. Inequality and income distribution
2. Education and skill development
3. Social and political stability
4. Macroeconomic considerations
5. Antitrust and market regulation
6. Intellectual property
7. Environmental implications
8. Global AI governance

→ see my [NBER WP 32980](#)

Reading the Signals: Harbingers of AGI

- Research:
 - Breakthroughs
 - Automation of breakthroughs
- Financial markets:
 - Growing allocation of financial resources (primary markets)
 - Revaluation of assets (secondary markets)
- AI product releases:
 - Track performance on benchmarks
 - Track trajectory and speed of improvement
- AI deployment:
 - In your own organization
 - Across the economy

Role of Economic Policy in the Age of AI

First and foremost:

- Provide insights into economic implications of AI

But also:

- Contribute to AI governance and safety efforts
- Develop incentive structures for beneficial AI systems
- Leverage AI to enhance our research and modeling

Preparing for the Future

We need an all-hands-on-deck effort to

- do scenario planning for possible AI futures
- work on disseminating the economic benefits of AI
- prepare new economic policy frameworks for a post-AGI world

Goal: an AI-powered future aligned with human values and flourishing