The Global Economy in Rest of the Decade

Michael Spence

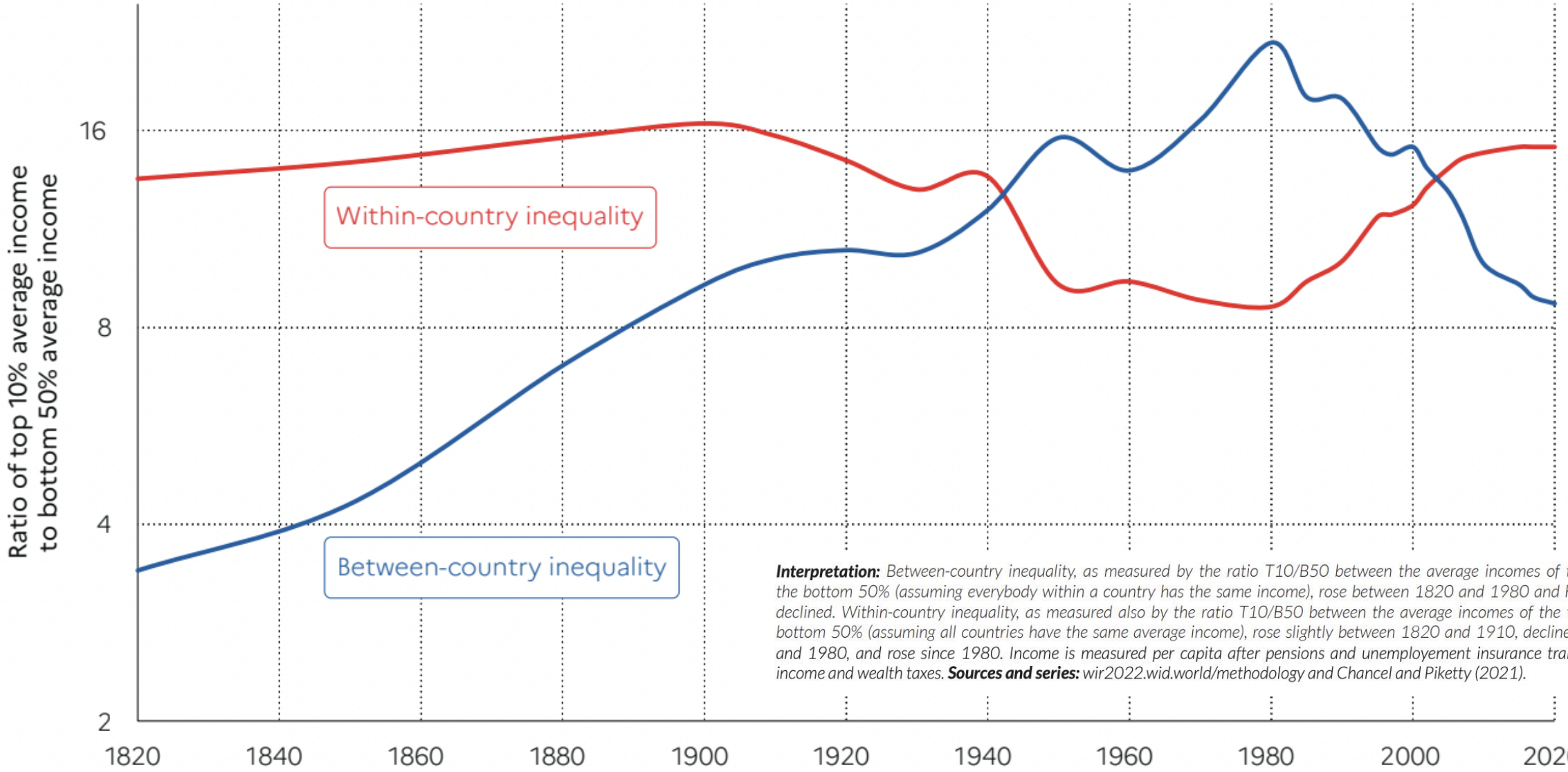
June 15, 2023

Regime Change:
A few tough years followed by potential for transformative change

- **Supply side constraints and inflation**
- **The end of a multi-decade period of deflationary forces anda shift from demand constrained growth to supply constrained growth**
- **The digital transformation and biomedical and life sciences revolution**
- **Global explosion of science and tech related entrepreneurial activity**
- **Generative AI and a potential surge in productivity and growth**

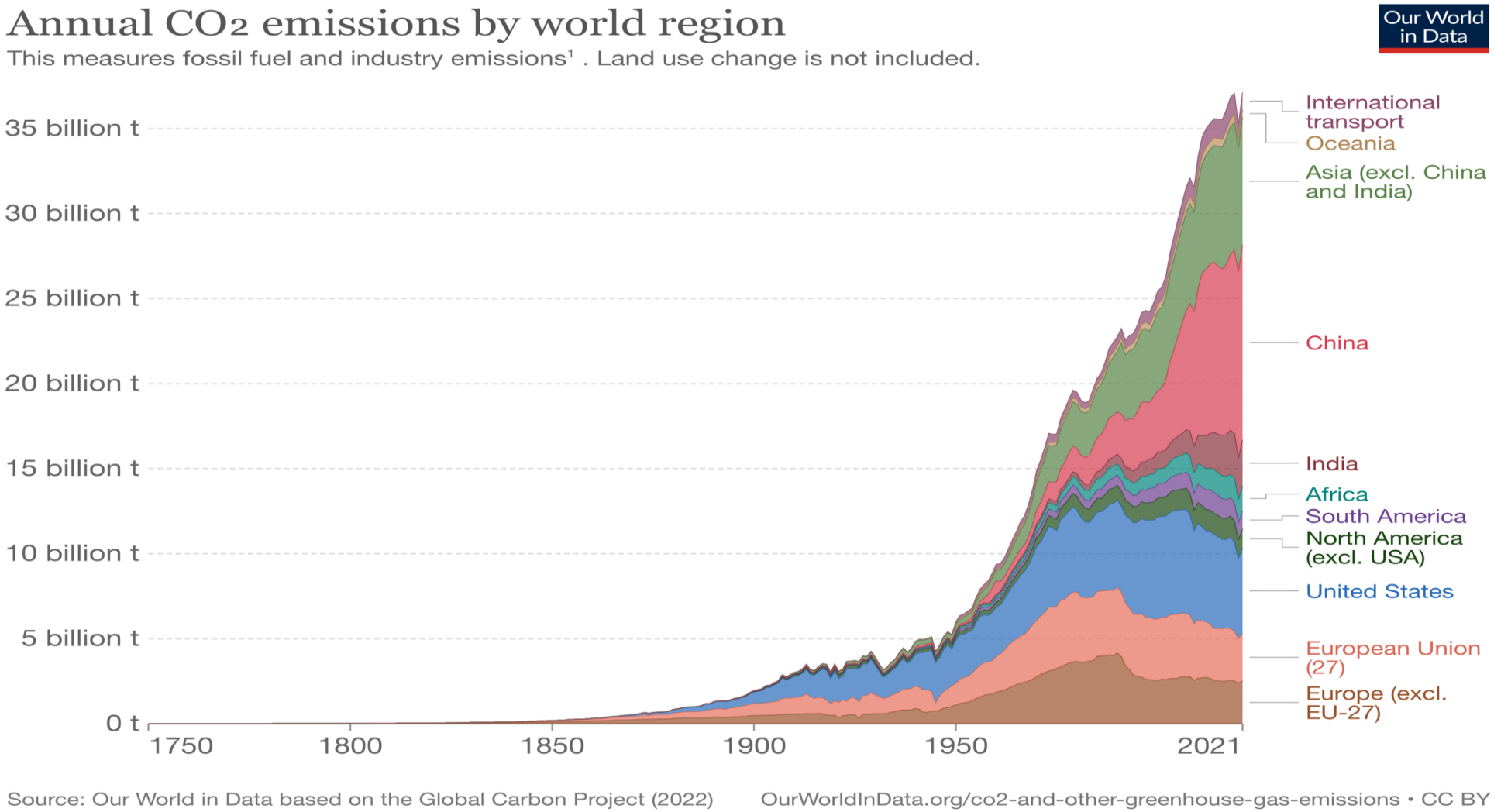
Evolution of Income Inequality: Top 10% to Bottom 50%

Figure 2.4 ***Global income inequality: Between-country vs Within-country inequality (ratio T10/B50), 1820-2020***



Interpretation: *Between-country inequality, as measured by the ratio T10/B50 between the average incomes of the top 10% and the bottom 50% (assuming everybody within a country has the same income), rose between 1820 and 1980 and has since strongly declined. Within-country inequality, as measured also by the ratio T10/B50 between the average incomes of the top 10% and the bottom 50% (assuming all countries have the same average income), rose slightly between 1820 and 1910, declined between 1910 and 1980, and rose since 1980. Income is measured per capita after pensions and unemployement insurance transfers and before income and wealth taxes.* ***Sources and series:*** *wir2022.wid.world/methodology and Chancel and Piketty (2021).*

Sustainability Challenge



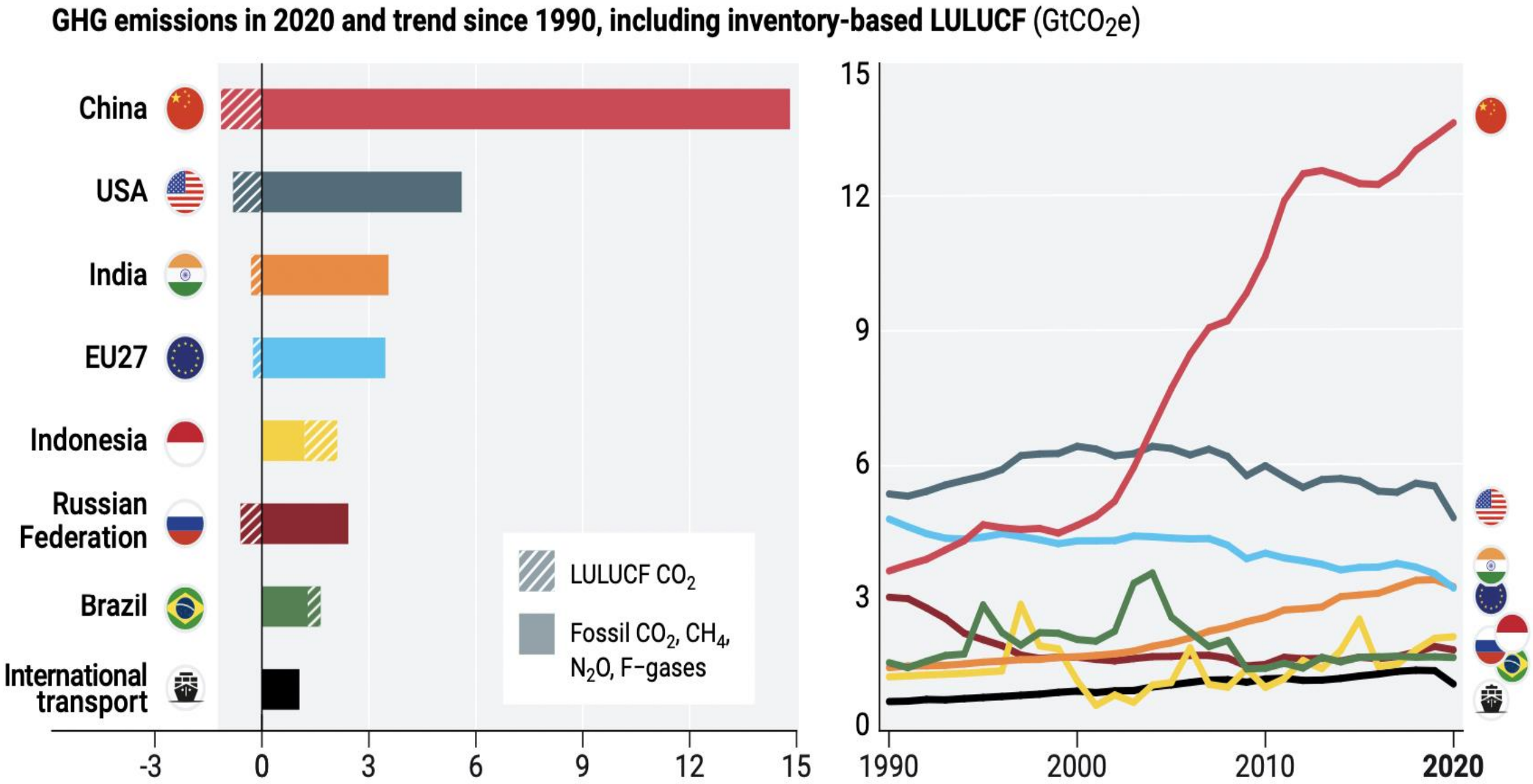
1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

Top Emitters

Top Emitters (*Billions of tons of CO2 per Year)

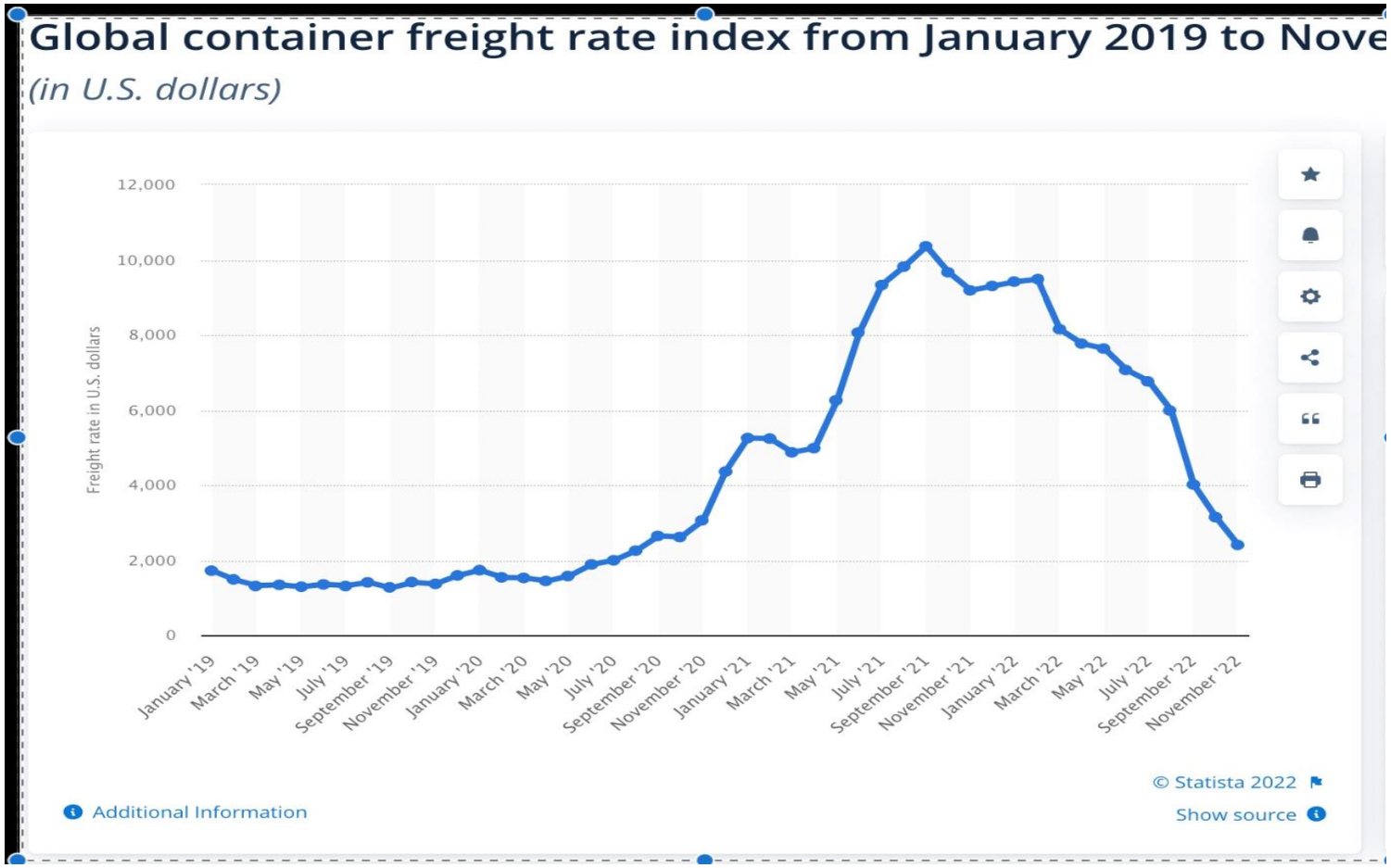
	TOTAL*	PER CAPITA
·China	10.20	7.3
·USA	5.30	15.6
·EU	5.40	9.8
·Canada/Mexico	1.20	10.0
·India	2.60	1.9
·Japan	1.10	5.5
·World	36.60	4.9
Percentage of top 6		71%

Peaks and Growth in CO2 Emissions



The Transitory Mistake

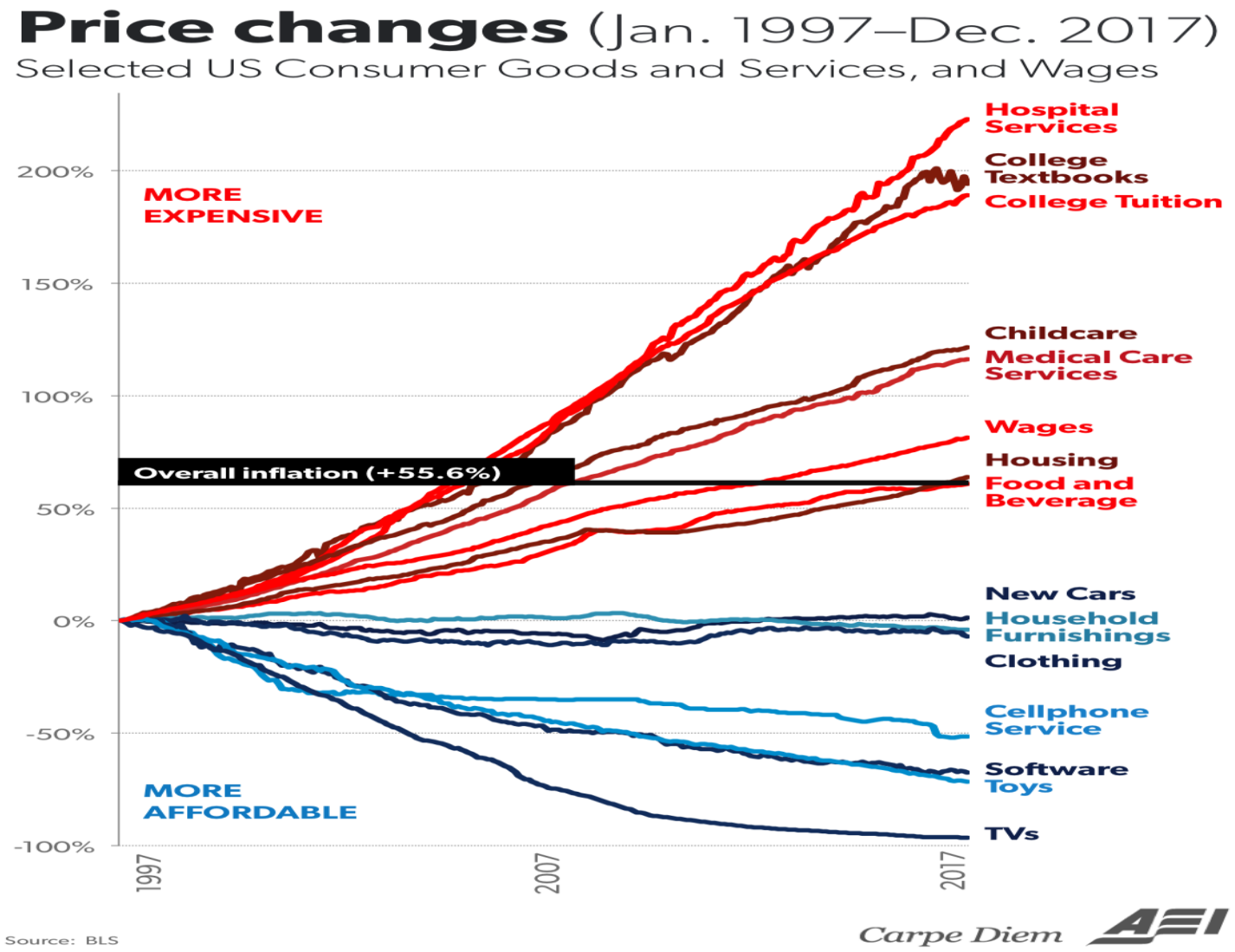
- **Supply chain imbalances and bottlenecks**
- **Pandemic closures**
- **China Zero-Covid**
- **Semiconductor shortages mostly in past**
- **But inflationary pressures persist – and they are everywhere**



Secular Supply Conditions, Inflation and Slow Growth

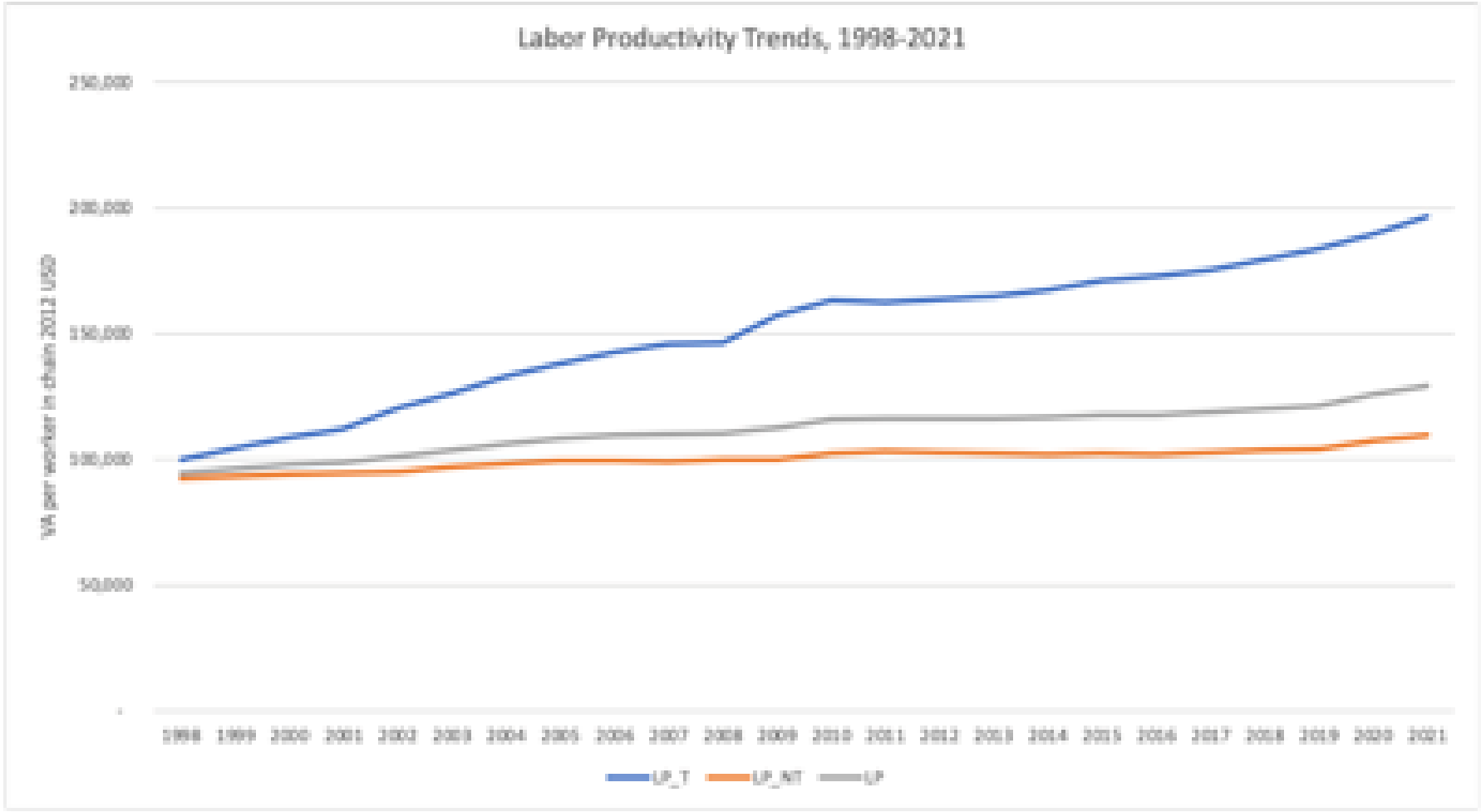
- After 40 plus years of essentially demand constrained growth
- Shift to a supply constrained growth
- Put differently, the elasticity of global supply has dropped
- Aging
- Shocks and Diversification
- Public Debt – in an inflationary rising interest rate period
- Declining productivity trends
- Major sectors resistant to digitally enabled productivity growth
- Geo-political tensions and fragmentation
- Permanent increase in real interest rate
- Asset price reset
- Major shifts in labor market conditions
  - Labor shortages
- Industrial concentration and questions about competition

Long Period of Deflation is Largely Over



Over all 2.2%

Supply Constraints and Productivity



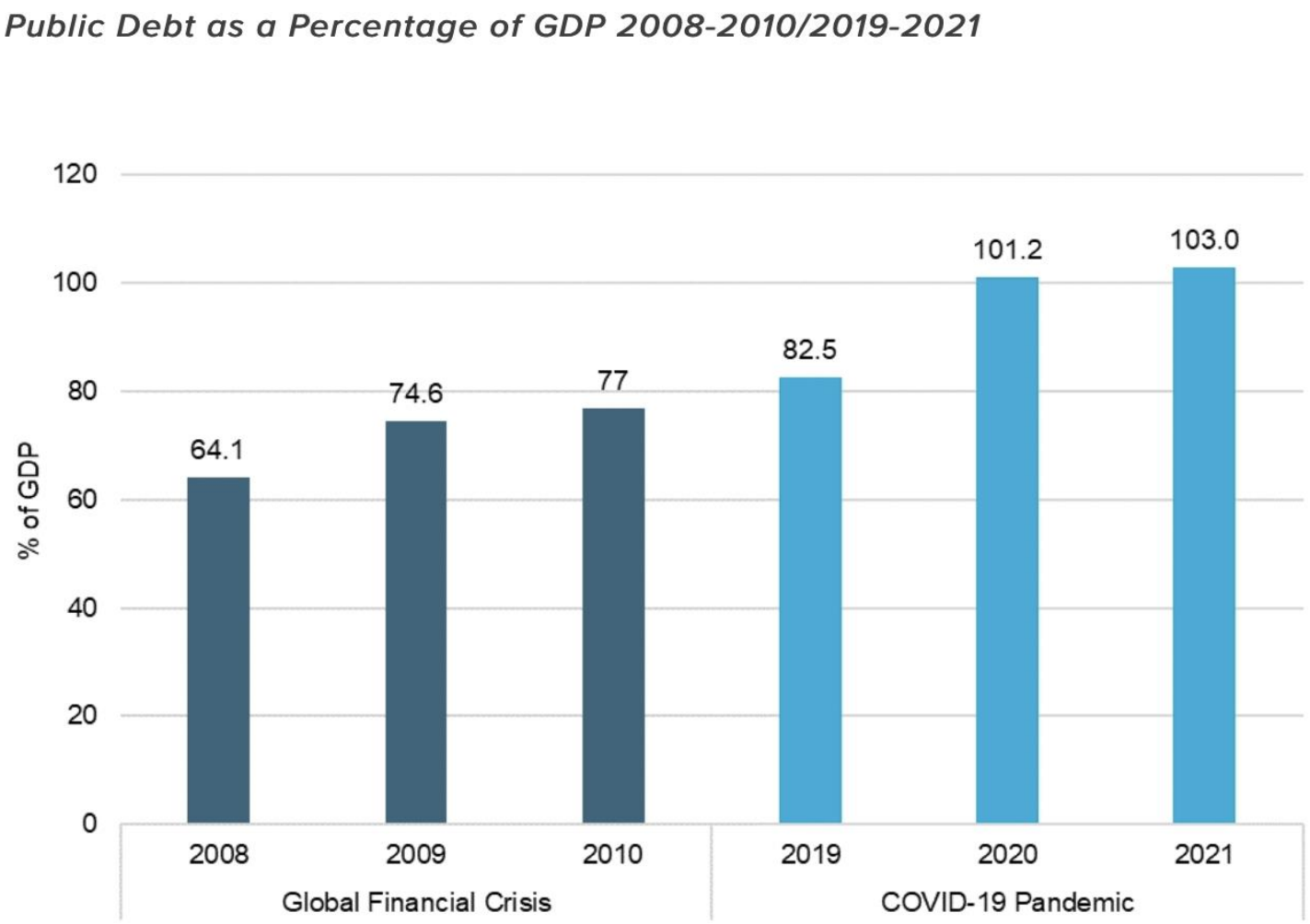
For nontradable, labor productivity per worker went from 92,201 in 1998 to 104,034 in 2019 while labor productivity grew from 99,976 in 1998 to 183,601 in 2019 for tradables, That's a 0.57% and 2.94% average annual growth rate for nontradables and tradables, respectively.

Aging, Labor Supply, Dependency Ratios and Demand

	GDP 2021 (BILLIONS $)	POPULATION (MILLIONS)
WORLD GDP	94.9	8000
AGING COUNTRIES/REGIONS		
EUROPE	23.5	746
USA	22.9	332
CHINA	16.9	1300
JAPAN	5.1	125
CANADA	2.1	38
AUSTRALIA	1.6	26
NEW ZEALAND	0.25	5
RUSSIA	1.65	143
TOTAL - AGING COUNTRIES	74	2715
% OF THE GLOBAL ECONOMY AGING - BY GDP AND POPULATION	78	34

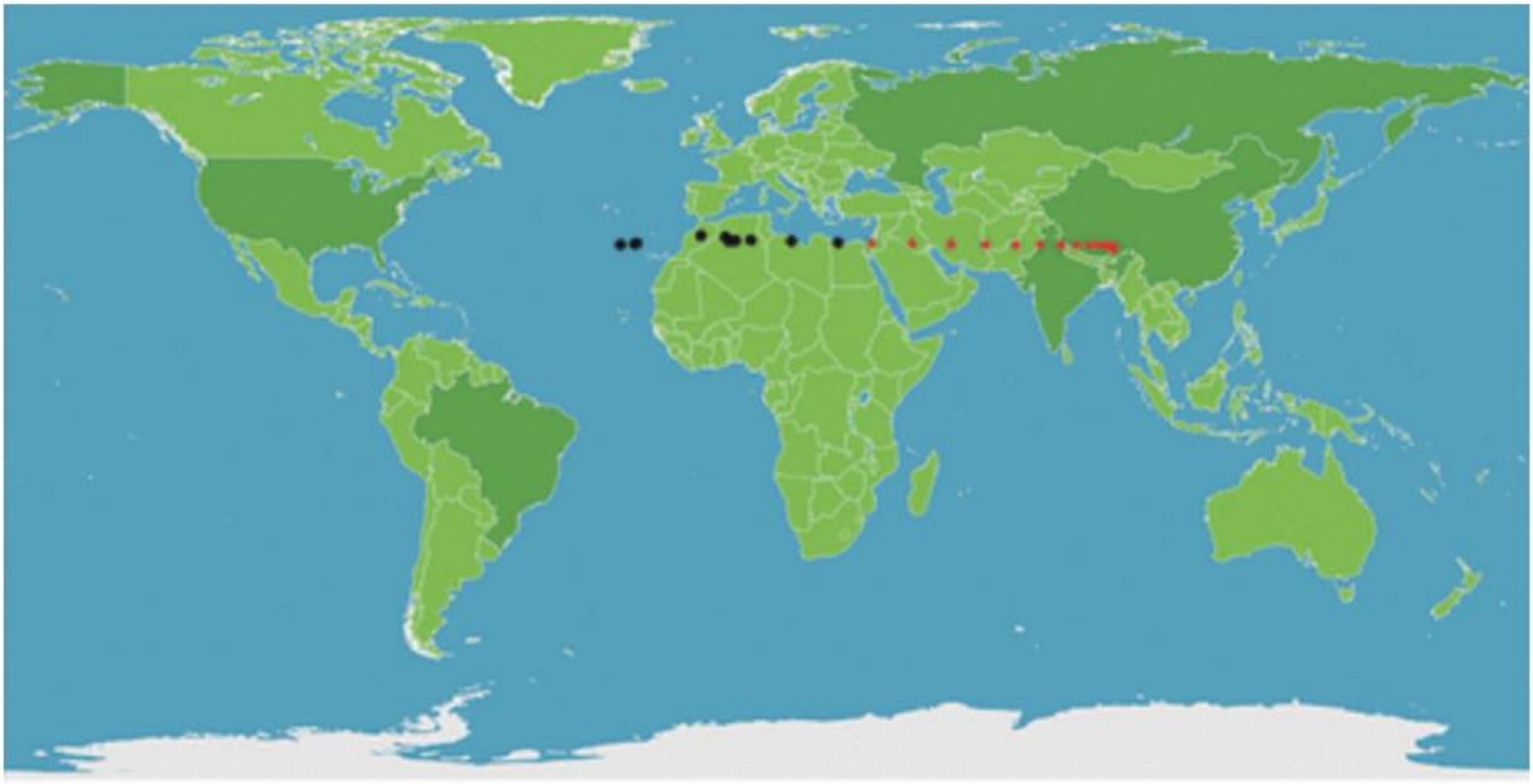
Sovereign Debt

Sovereign Debt From GFC Through the Pandemic Debt

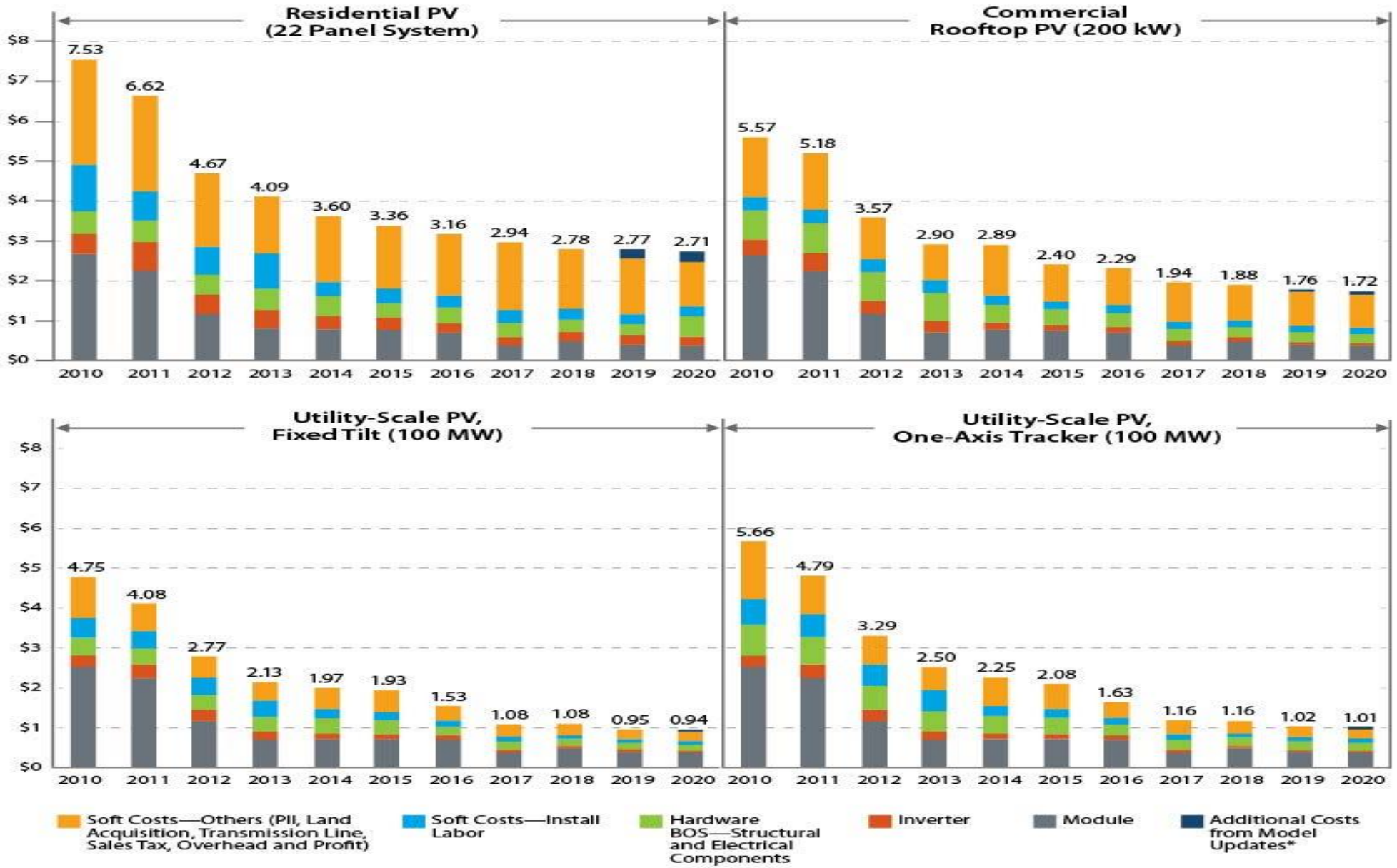


Major Transformations and Future Growth Potential

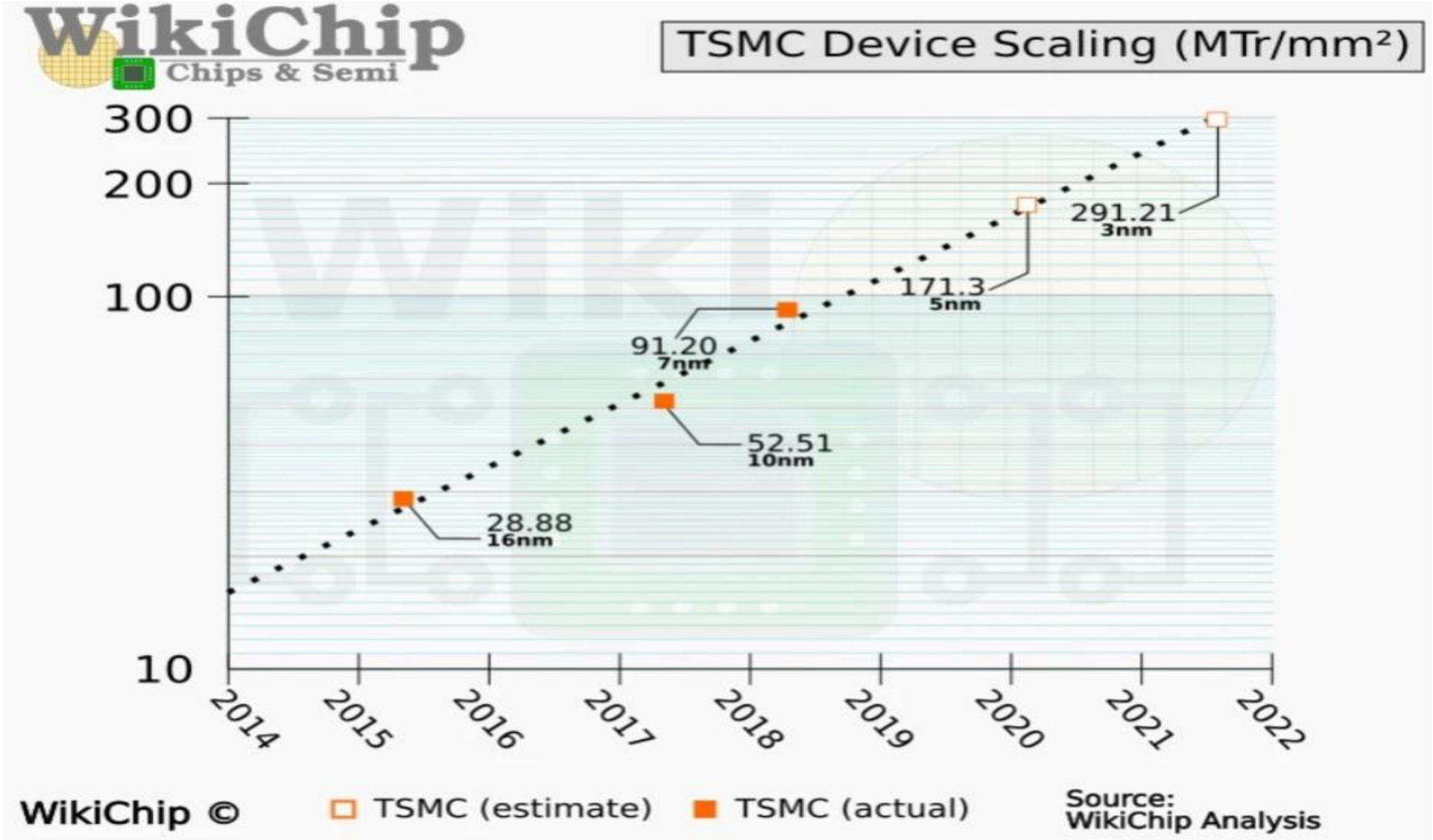
Shift of Center of Gravity of Global Economy toward Asia



Solar Costs


Residential PV (22 Panel System)
Commercial Rooftop PV (200 kW)
Utility-Scale PV, Fixed Tilt (100 MW)
Utility-Scale PV, One-Axis Tracker (100 MW)
$0
$1
$2
$3
$4
$5
$6
$7
$8
7.53
6.62
4.67
4.09
3.60
3.36
3.16
2.94
2.78
2.77
2.71
5.57
5.18
3.57
2.90
2.89
2.40
2.29
1.94
1.88
1.76
1.72
4.75
4.08
2.77
2.13
1.97
1.93
1.53
1.08
1.08
0.95
0.94
5.66
4.79
3.29
2.50
2.25
2.08
1.63
1.16
1.16
1.02
1.01
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Soft Costs—Others (PII, Land Acquisition, Transmission Line, Sales Tax, Overhead and Profit)
Soft Costs—Install Labor
Hardware BOS—Structural and Electrical Components
Inverter
Module
Additional Costs from Model Updates*

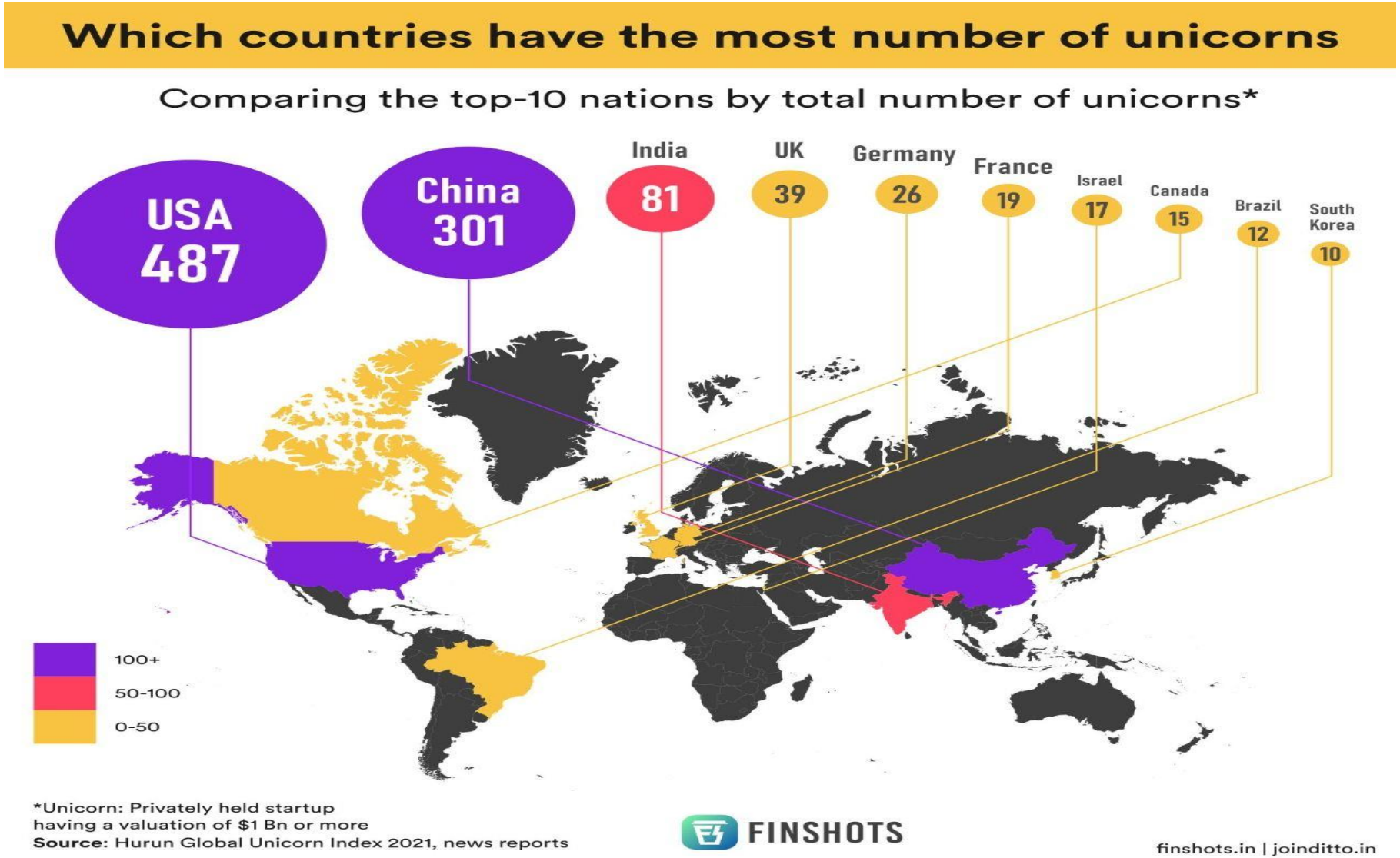
Semiconductor Evolution



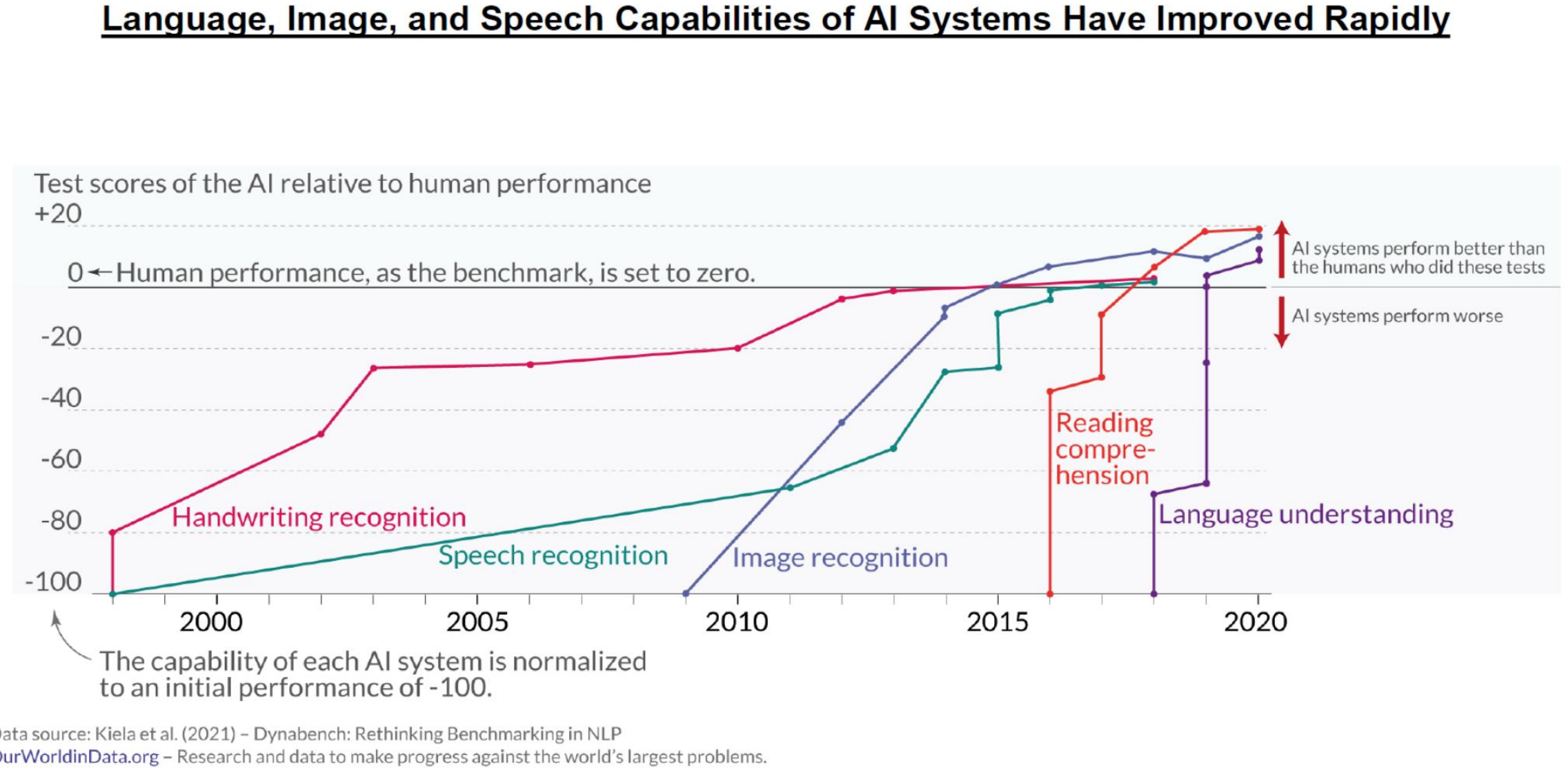
3D Structure of Proteins DeepMind

An artificial intelligence (AI) network developed by Google AI offshoot DeepMind has made a gargantuan leap in solving one of biology's grandest challenges – determining a protein's 3D shape from its amino-acid sequence.

Globalization of Tech Entrepreneurial Activity



AI Breakthroughs: Jas Sekhon: Bridgewater



Data source: Kiela et al. (2021) – Dynabench: Rethinking Benchmarking in NLP
OurWorldinData.org – Research and data to make progress against the world's largest problems.

Digital Transformation

- eCommerce
- Mobile Payments and fintech
- Data as the new collateral
- Secure Digital identity
- Healthcare and inclusive growth patterns
- Ambient Intelligence

Generative AI

- Only the first chapter
- Impact: knowledge economy
  - In terms of jobs and work, think of it as the WFH universe
- A very large productivity surge
  - Some of it (maybe a lot of it) unmeasured
- If the only impact were software/coding, the impact would already be large
- Data and computing power -
- Brynjolfsson et al :
- Breaking the limited domain constraint
- Powerful digital assistants
- Generative AI operating on text, speech, images, video, at the same time, that is in an integrated way – may lead to breakthroughs in robotics
- But that is some distance in the future

ChatGPT

MS

How will Singapore evolve in the next decade?

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Predicting the future evolution of a city like Singapore over the next decade is inherently speculative. However, based on current trends and initiatives, here are some potential areas of development and changes that may occur in Singapore:

1. Sustainable and Smart City: Singapore has been actively working towards becoming a sustainable and smart city. Over the next decade, we can expect further advancements in areas such as green infrastructure, renewable energy adoption, waste management, and efficient urban planning. The city-state will likely continue investing in technology and data-driven solutions to enhance livability, efficiency, and environmental sustainability.
2. Digital Transformation: Singapore has been at the forefront of digital transformation efforts, and this trend is expected to continue. The city will likely see increased integration of technology into various sectors, including finance, healthcare, logistics, and transportation. Initiatives such as the Smart Nation vision will further drive innovation and digitalization across different aspects of daily life.
3. Innovation and Start-up Ecosystem: Singapore has cultivated a vibrant start-up ecosystem in recent years, and this trend is likely to continue. The government will likely provide further support through funding, infrastructure, and regulatory frameworks to encourage entrepreneurship and attract global talent. Singapore's focus on research and development, coupled with its strong intellectual property protection, will likely foster

4. Aging Population: Like many developed countries, Singapore is experiencing an aging population. To address this demographic shift, there will likely be a greater emphasis on healthcare, elderly care services, and infrastructure that caters to the needs of older adults. Technology-enabled solutions, such as telemedicine and remote monitoring, may play a significant role in delivering healthcare services to the elderly.
5. Connectivity and Transportation: Singapore already has a highly efficient transportation system, but there may be further developments in the next decade. This could include expansion of public transportation networks, the adoption of autonomous vehicles, and increased connectivity between different modes of transport. Efforts to reduce congestion and promote sustainable mobility options are expected to continue.
6. International Collaboration: Singapore has a reputation for being an international hub for business, finance, and trade. In the next decade, the city-state is likely to strengthen its ties with other countries and forge new partnerships. This could involve deeper economic integration, trade agreements, and collaborations in sectors such as technology, research, and innovation.

It's important to note that these predictions are speculative and subject to various factors and uncertainties. Singapore's future evolution will depend on the choices made by its government, the global economic landscape, technological advancements, and other social and geopolitical factors.

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GENERATIVE AI AT WORK

Erik Brynjolfsson
Danielle Li
Lindsey R. Raymond

Working Paper 31161
http://www.nber.org/papers/w31161

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 2023

ABSTRACT

We study the staggered introduction of a generative AI-based conversational assistant using data from 5,179 customer support agents. Access to the tool increases productivity, as measured by issues resolved per hour, by 14 percent on average, with the greatest impact on novice and low-skilled workers, and minimal impact on experienced and highly skilled workers. We provide suggestive evidence that the AI model disseminates the potentially tacit knowledge of more able workers and helps newer workers move down the experience curve. In addition, we show that AI assistance improves customer sentiment, reduces requests for managerial intervention, and improves employee retention.

Erik Brynjolfsson
Stanford Digital Economy Laboratory
353 Jane Stanford Way, Office 136
Stanford, CA 94305
and NBER
erik.brynjolfsson@gmail.com

Lindsey R. Raymond
MIT Sloan School of Management
100 Main Street
E62-489
Cambridge, MA 02142
lindsey.r.raymond@gmail.com

Danielle Li
MIT Sloan School of Management
100 Main St, E62-484
Cambridge, MA 02142
and NBER
d_li@mit.edu