

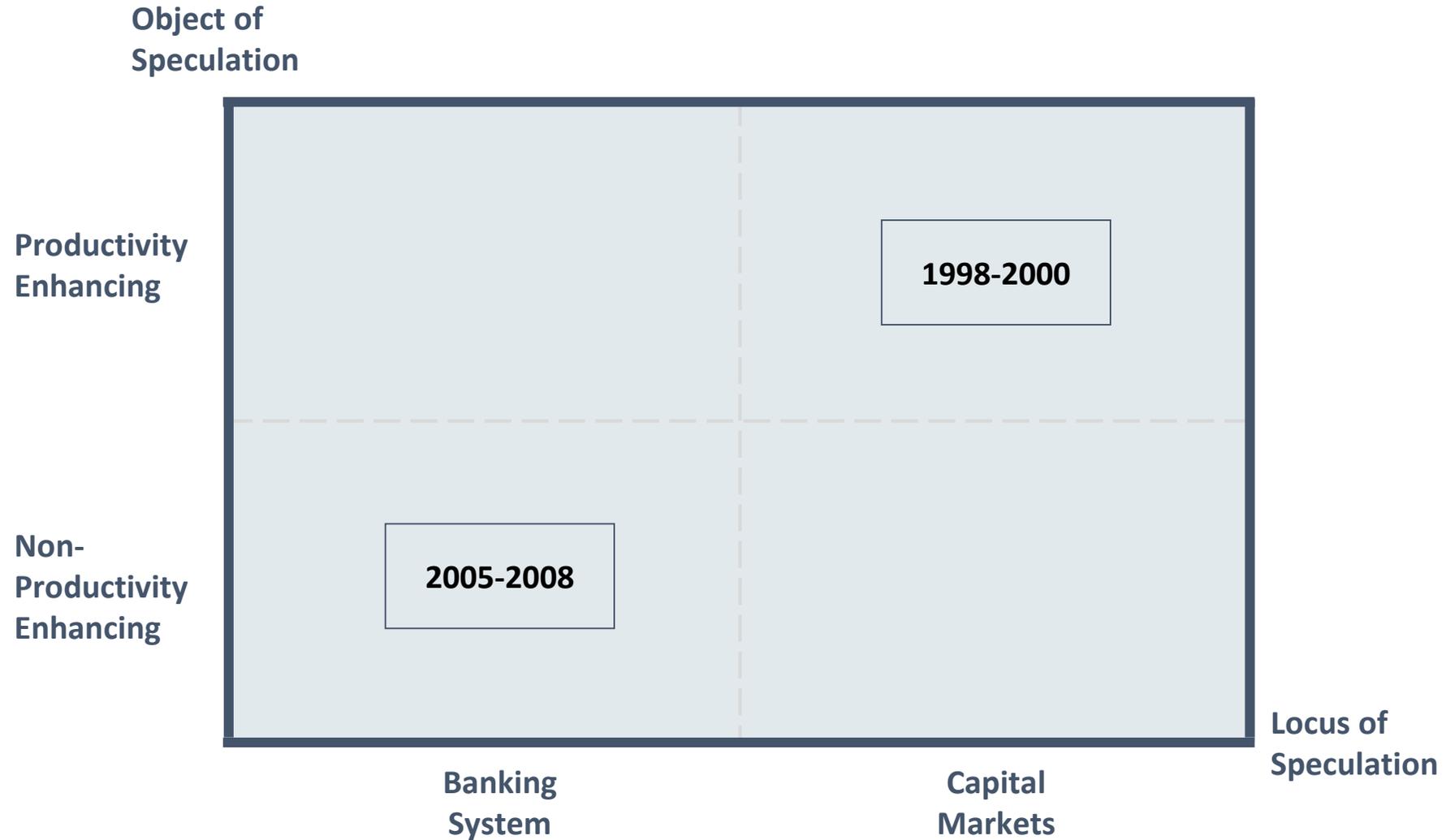
Doing Capitalism on the Dark Side of the Three-Player Game

W. H. Janeway, Ph.D.

Cambridge University/Warburg Pincus

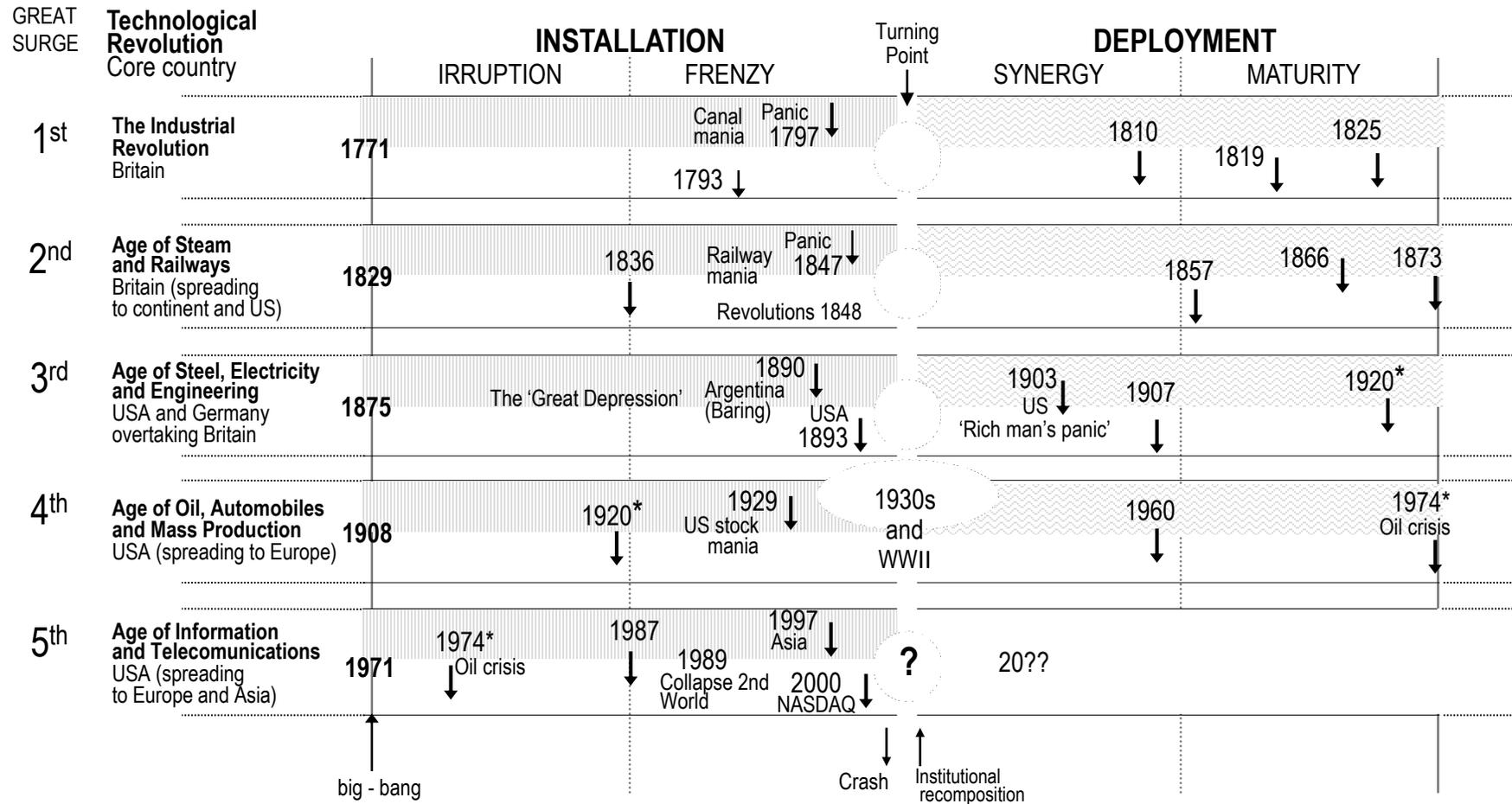
24 May 2018

Productive versus Unproductive Bubbles



Five successive surges, recurrent parallel periods and major financial crises

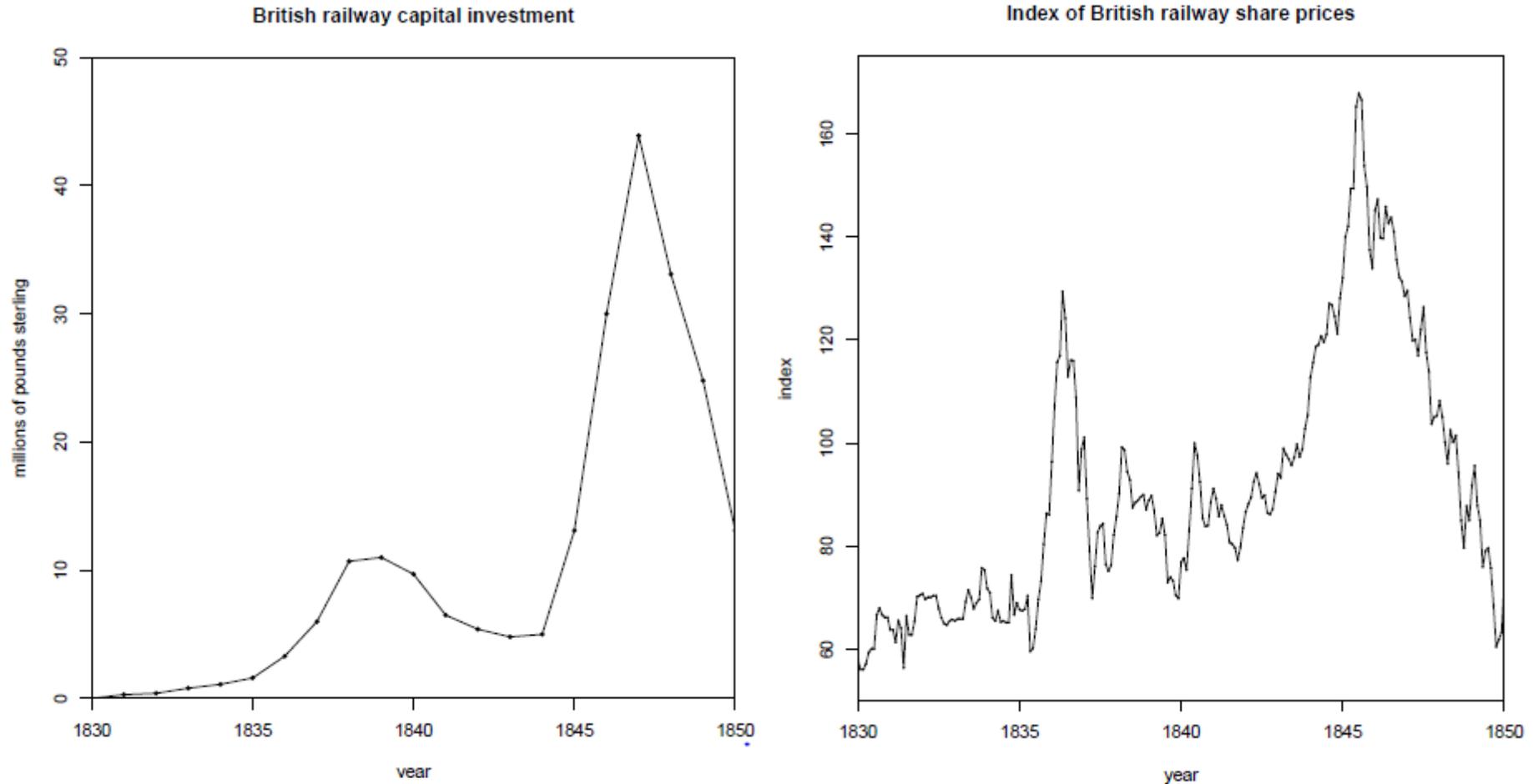
Source: C. Perez , *Technological Revolutions and Financial Capital*



Note: * Observe phase overlaps between successive surges.

Source: Dates of crises are from Kindleberger (1978:1996), Appendix B

Infrastructure Investment/Financial Speculation



Source: A. Odlyzko, "Collective hallucinations and inefficient markets: The British Railway Mania of the 1840s," available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1537338

The R&D Boom of the Late 1990s

(Brown, Fazzari and Petersen "Financing Innovation and Growth")

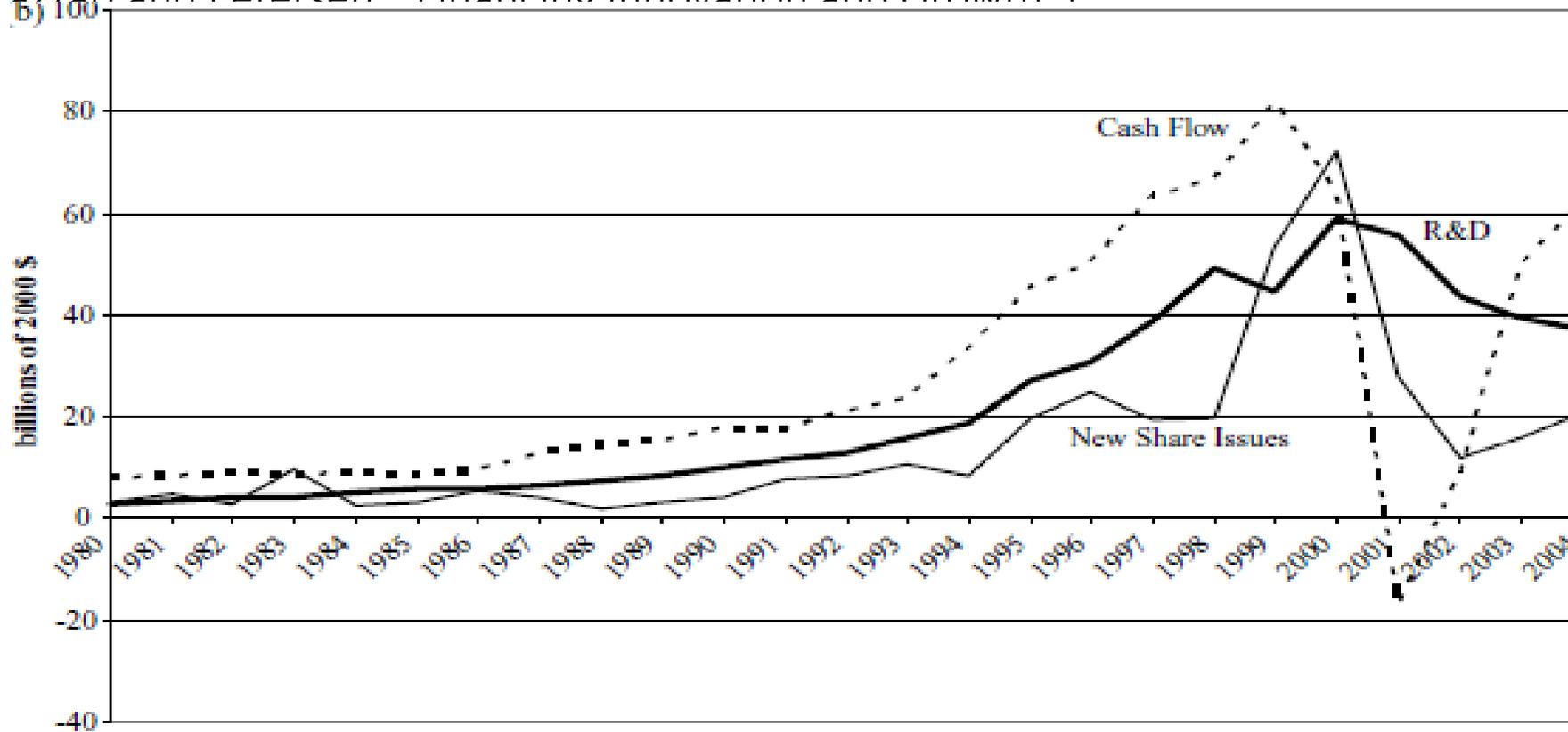
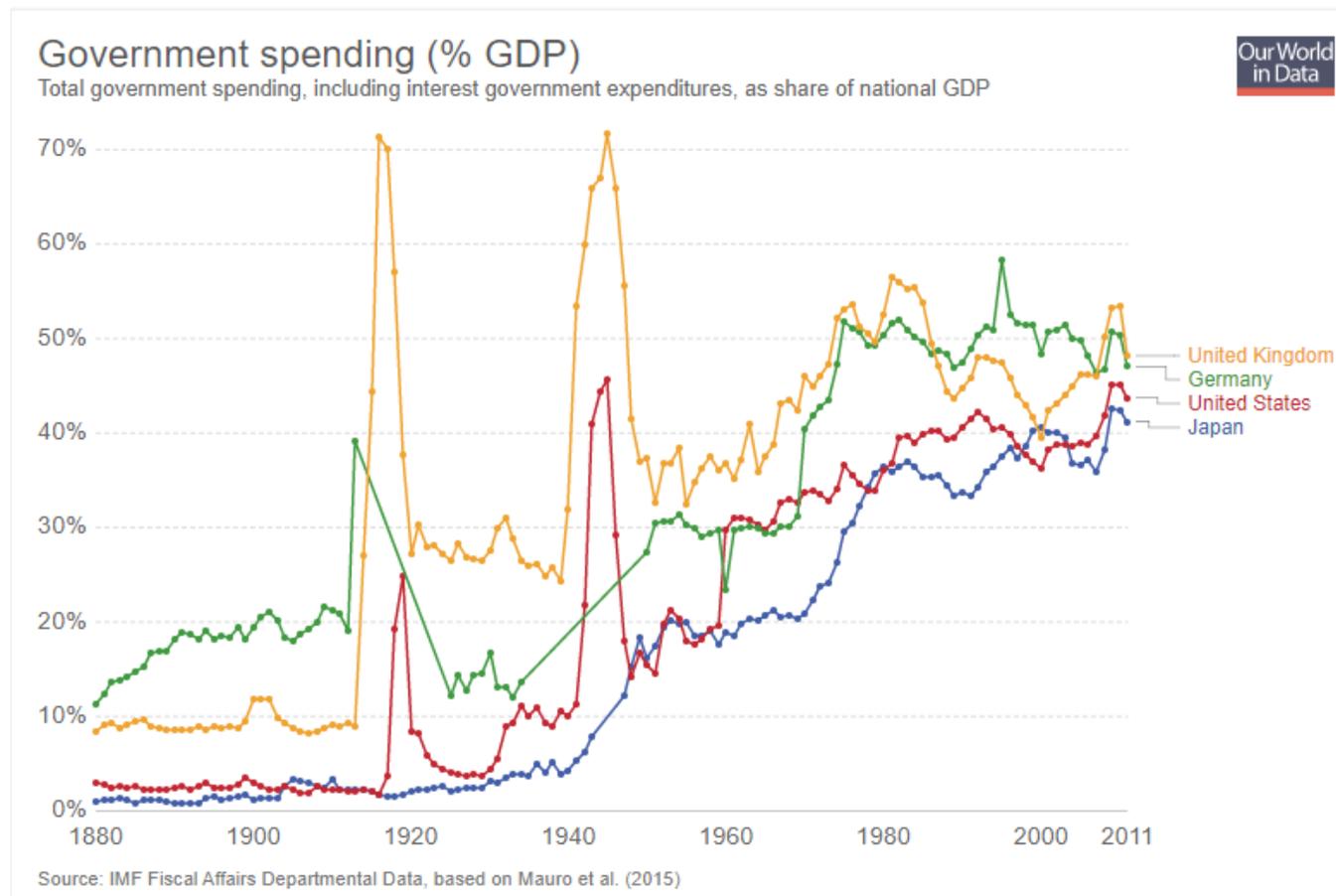


Figure 2b. High-tech R&D, cash flow, and new share issues (young firms). The sample is all young high-tech firms with coverage in Compustat. A firm is classified as young for the first 15 years following the year it first appears in Compustat with a stock price. The high-tech industries are SICs 283, 357, 366, 367, 382, 384, and 737. The heavy line plots the sum of R&D for all young high-tech firms, the dashed line plots the sum of gross cash flow, and the thin line plots the sum of net new stock issues with negative net issues set equal to zero.

The Three-Player Game: Alternative Configurations

From this dynamic and unstable configuration of political, economic and financial forces ... has emerged a world in which **state investment in fundamental research induces financial speculation to fund construction of transformational technological infrastructure, whose exploitation, in turn, raises living standards for everyone** dependent on the productivity of the market economy. But the three-player game is also responsible for a world in which **bubbles and crashes in the financial system spill over and liquidate both the employed and their employers, generating appeals to the political process for redress and relief.** In yet another version, we find ourselves in a world where **“malefactors of great wealth” – to invoke Theodore Roosevelt’s epithet – are able to exploit the political process in order to preserve and protect their exploitation of the market economy.**

Public Sector Share of National Economy



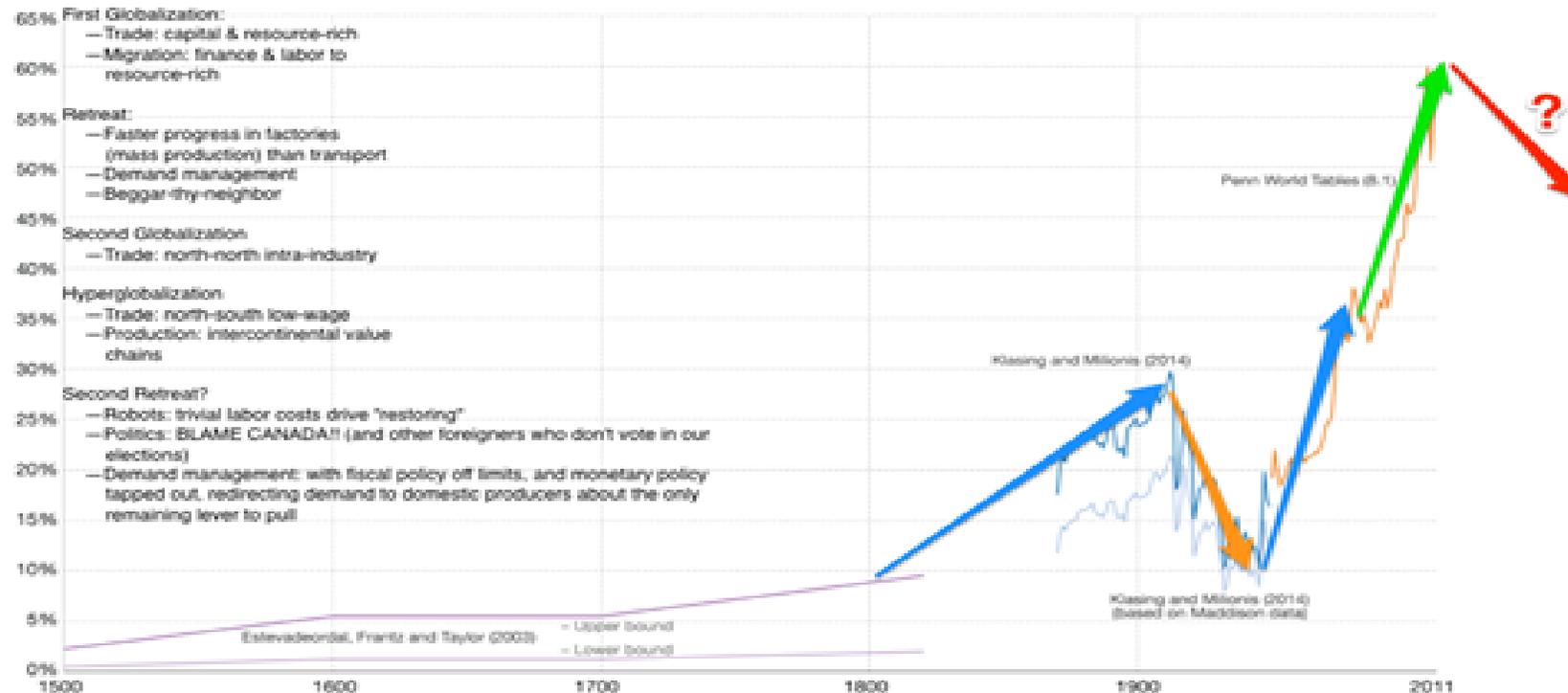
The Two (Modern) Globalizations

Courtesy of Brad Delong:

Globalization over 5 centuries (1500-2011)

Shown is the sum of world exports and imports as a share of world GDP (%)

The individual series are labeled with the source of the data



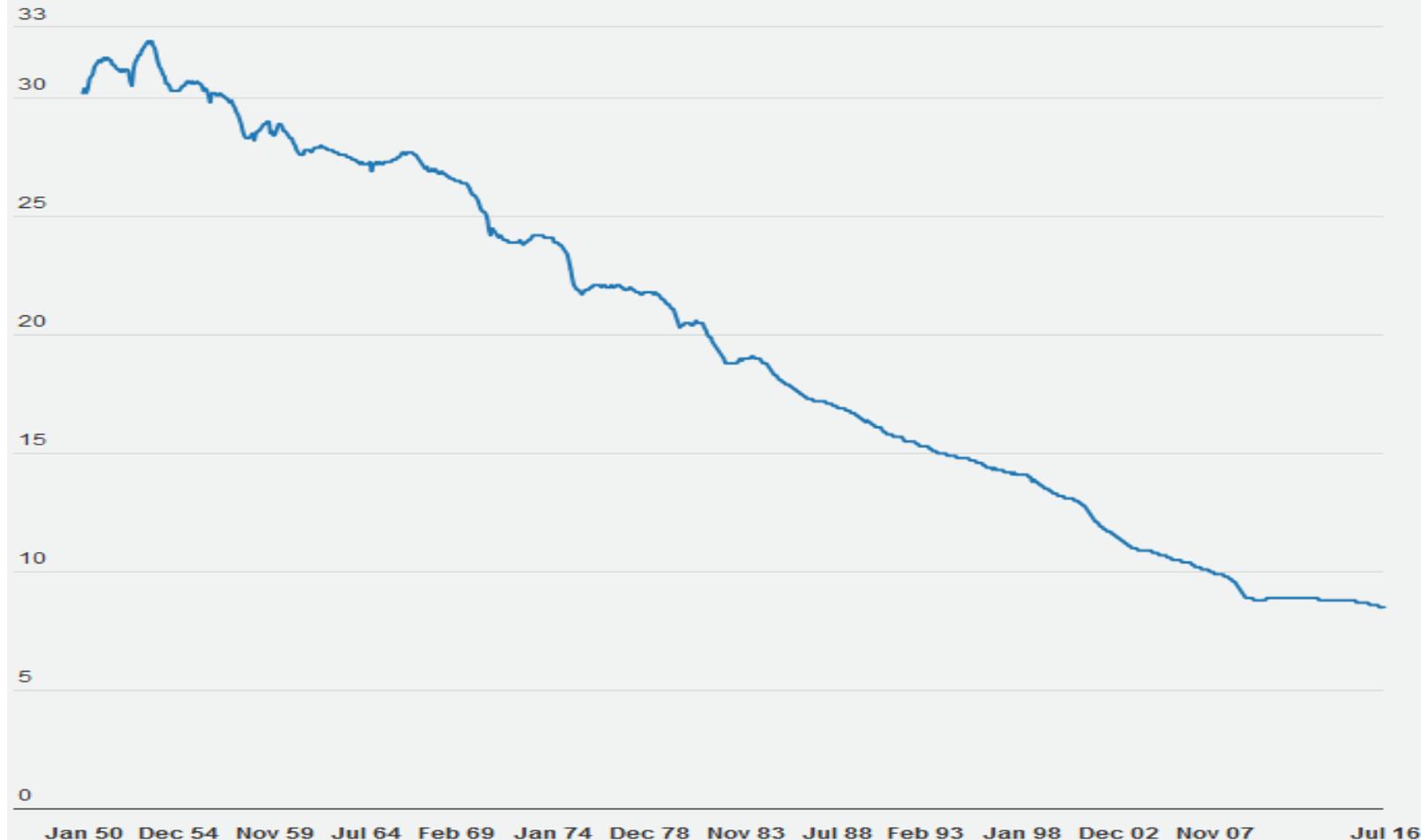
Data sources: Kasing and Milions (2014), Esteve-deordal, Frenzt and Taylor (2003) and the Penn World Tables Version 8.1
 The interactive data visualization is available at OurWorldinData.org. There you find the raw data and more visualizations on this topic.

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Economics of Trade Globalization-1

Manufacturing Share of Nonfarm Employment

BLS Payroll Concept

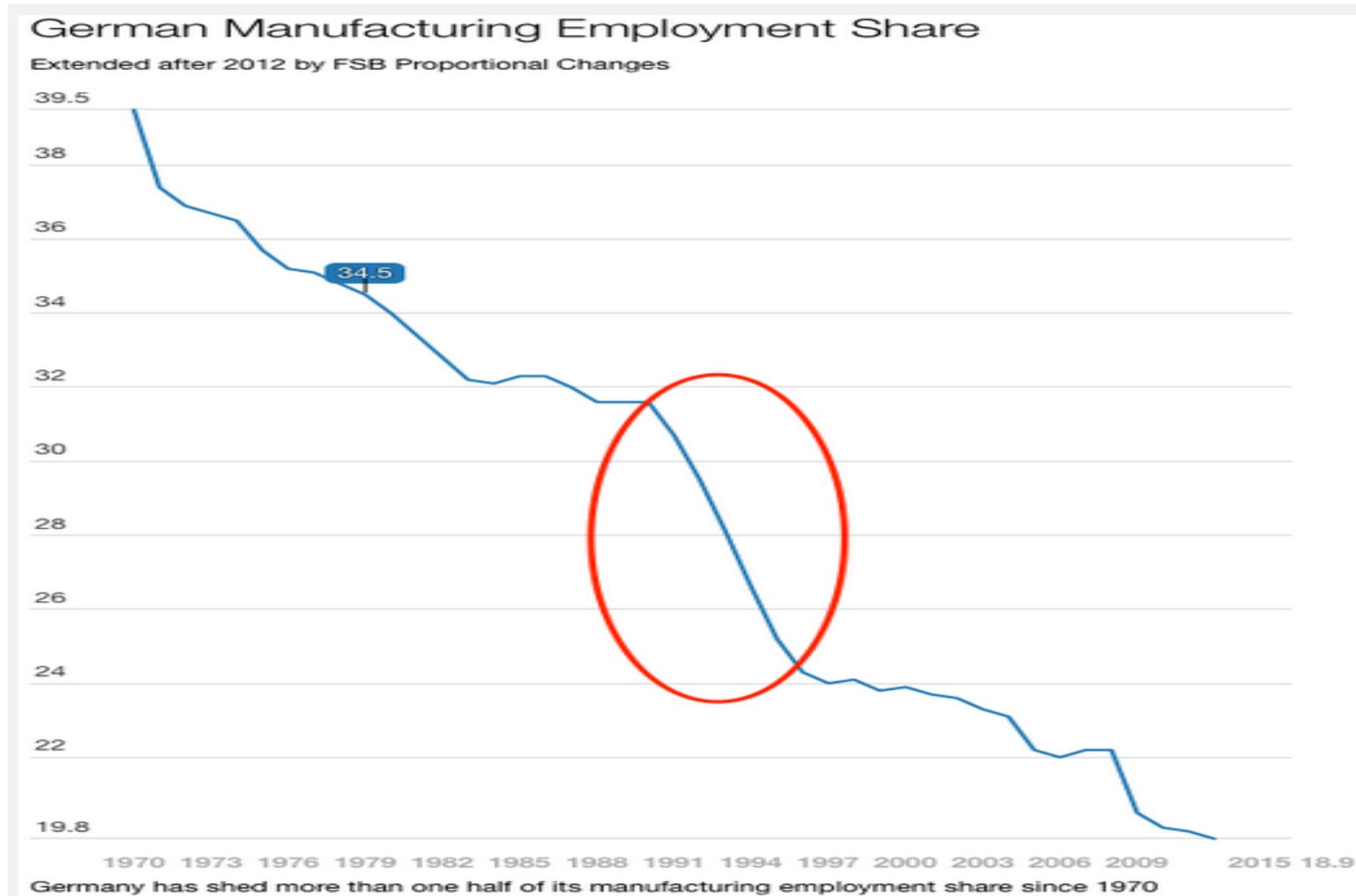


The share of manufacturing jobs in all nonfarm employment is little more than a quarter of what it was at the start of the 1950s

Source: Econmagic.com [Get the data](#)

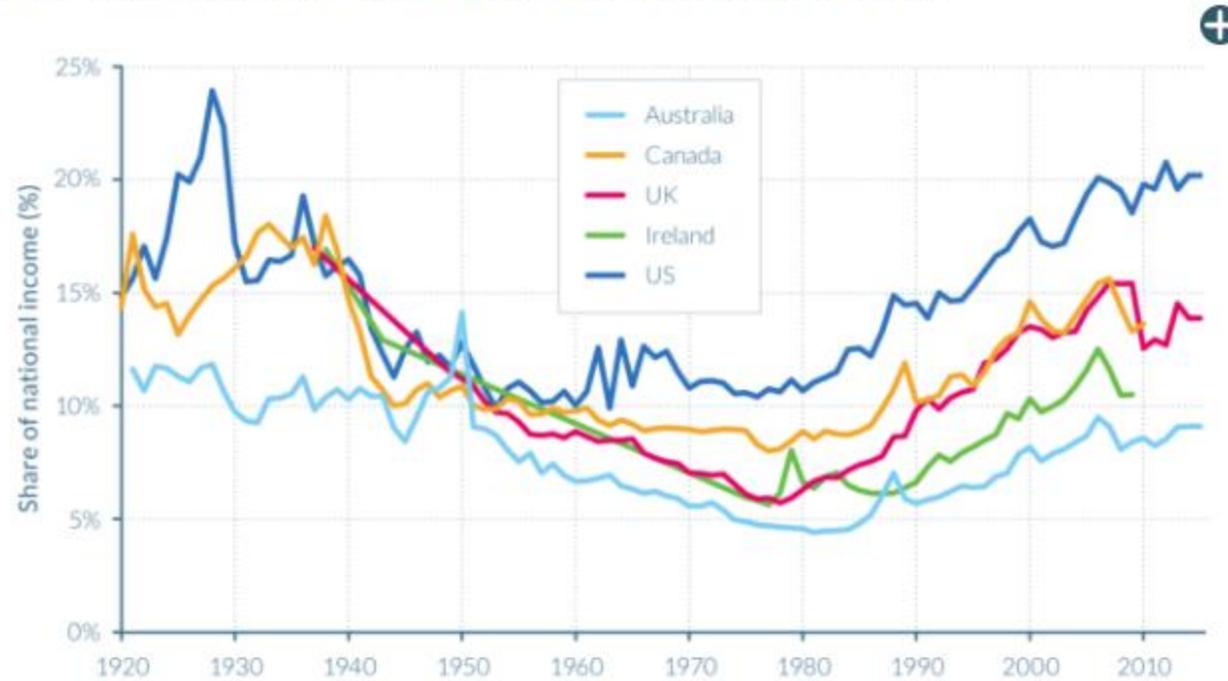


Economics of Trade Globalization-2



Income Inequality in the Anglophone World

Top 1% national income share in Anglophone countries, 1920-2015



Source: Novokmet, Piketty & Zucman (2017). See wir2018.wid.world/methodology.html for data series and notes.

In 2014, 20% of national income was received by the Top 1% in the US.

Obama's OSTP-1



The image shows a screenshot of the White House Office of Science and Technology Policy (OSTP) website. The top navigation bar is dark blue with the White House logo and text: "the WHITE HOUSE PRESIDENT BARACK OBAMA". Navigation links include "BRIEFING ROOM", "ISSUES", "THE ADMINISTRATION", and "1600 PENN". A search bar is on the right. Below the navigation bar is a breadcrumb trail: "Home • The Administration • Office of Science and Technology Policy". The main header features the OSTP seal and the text "Office of Science and Technology Policy". A secondary navigation bar contains links: "About", "Pressroom", "OSTP Blog", "Divisions", "Initiatives", "R&D Budgets", "Resource Library", "NSTC", "PCAST", and "Contact". The main content area has a dark blue background with the text "SCIENCE, TECHNOLOGY and INNOVATION" in white. Below this is a quote: "Whether it's improving our health or harnessing clean energy, protecting our security or succeeding in the global economy, our future depends on reaffirming America's role as the world's engine of scientific discovery and technological innovation." attributed to "– President Barack Obama". To the right of the text is a photograph of President Barack Obama and Vice President Joe Biden walking down a hallway in the White House.

the **WHITE HOUSE**
PRESIDENT BARACK OBAMA

BRIEFING ROOM | ISSUES | THE ADMINISTRATION | 1600 PENN

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 Office of Science and Technology Policy

About | Pressroom | OSTP Blog | Divisions | Initiatives | R&D Budgets | Resource Library | NSTC | PCAST | Contact

SCIENCE, TECHNOLOGY
and **INNOVATION**

Whether it's improving our health or harnessing clean energy, protecting our security or succeeding in the global economy, our future depends on reaffirming America's role as the world's engine of scientific discovery and technological innovation.

– President Barack Obama



Obama's OSTP-2

FEATURED TOPICS

CLIMATE CHANGE:



Climate change represents one of the greatest challenges of our time. The impacts of climate change are already being felt across the United States and around the world, increasing the frequency and severity of natural disasters, causing harm to both human and ecological health, and threatening our property, infrastructure, national security, and overall quality of life. While no single step can reverse the effects of climate change, the President has taken unprecedented action to address this critical issue, including outlining a comprehensive strategy to mitigate, prepare for, and lead global efforts to fight climate change under the Climate Action Plan; limiting carbon pollution from power plants under the Clean Power Plan; and leading a historic trip to the Arctic to raise awareness of the impacts of climate change. Learn more:

- White House: Energy, Climate Change, and Our Environment
- Climate Action Plan
 - Fact Sheet
 - Progress Report
- Clean Power Plan
 - Fact Sheet
- White House: President Obama's Trip to Alaska
- Fact Sheet: U.S. Leadership and the Historic Paris Agreement to Combat Climate Change
- National Climate Assessment

OPEN GOVERNMENT AND OPEN DATA:



The Obama Administration believes that responsible openness in government and data strengthens our democracy, fuels innovation, and promotes efficiency, effectiveness, and accountability. On his first day in office, President Obama signed a Memorandum on Transparency and Open Government, directing the development of an Open Government Directive to instruct executive departments and agencies to take specific actions to advance the principles of transparency, participation, and collaboration. Since then, the Obama Administration has continued to drive progress on these principles, including through the release of an Executive Order on making open and machine-readable data the new default for government information, and issuing a periodically updated Open Government National Action Plan. Learn more:

- White House: Open Government Initiative
- OSTP: Promoting Open Data, Open Science, and Open Government
- Presidential Memorandum: Transparency and Open Government
- Open Government Directive
- Executive Order: Making Open and Machine Readable the New Default for Government Information

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Trump's OSTP



Office of Science and Technology Policy



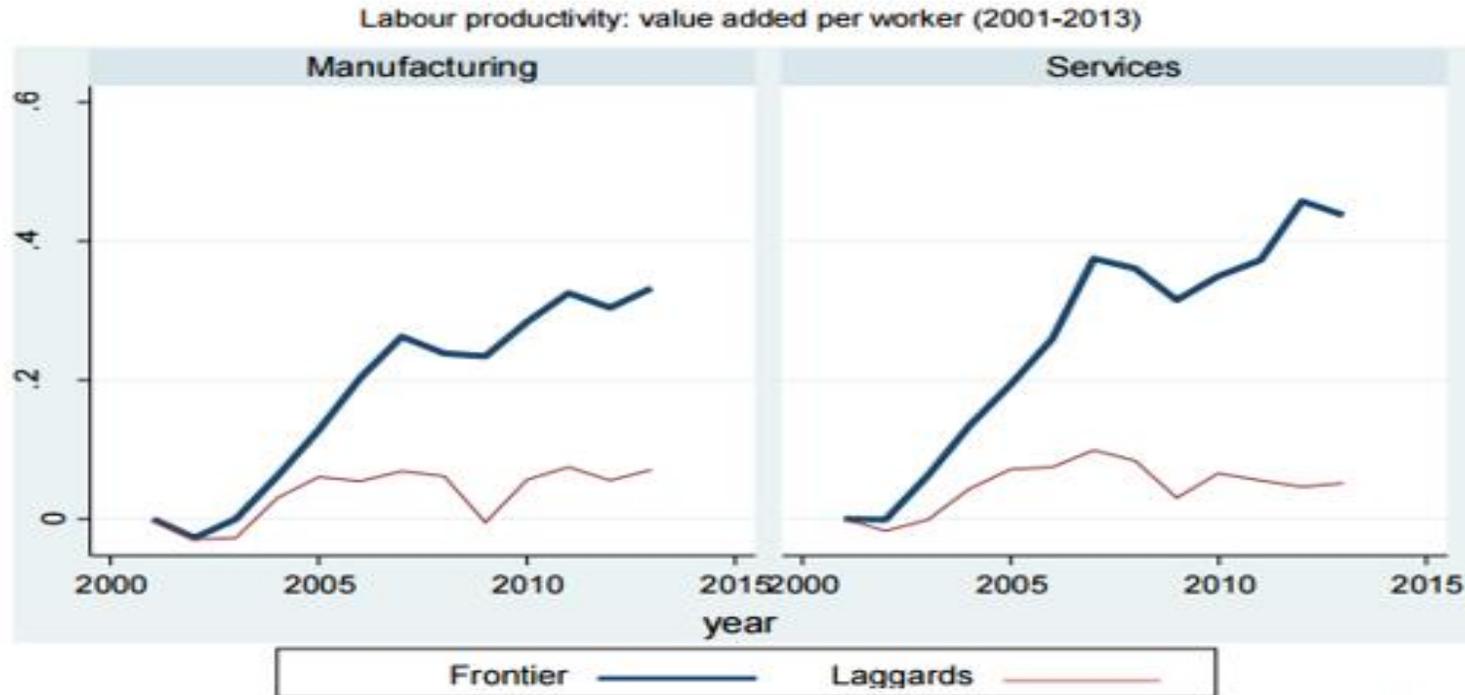
In 1976, Congress established the White House Office of Science and Technology Policy (OSTP) to provide the President and others within the Executive Office of the President with advice on the scientific, engineering, and technological aspects of the economy, national security, homeland security, health, foreign relations, the environment, and the technological recovery and use of resources, among other topics.

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☰ IN THIS SECTION

OSTP also leads interagency science and technology policy coordination efforts, assists the Office of Management and Budget with an annual review and analysis of Federal research and development in budgets, and serves as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the Federal Government.

The Best versus the Rest: OECD

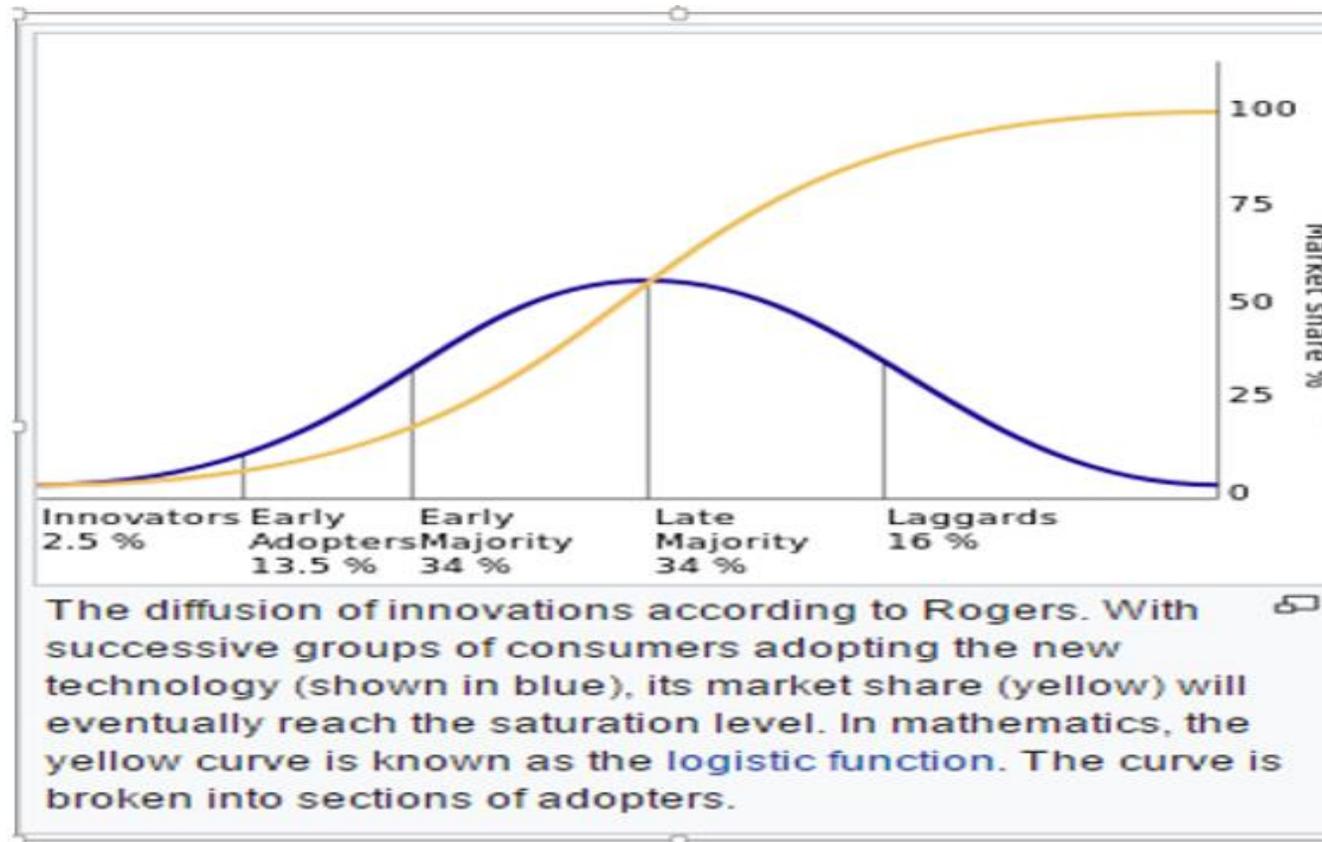


Notes: the global frontier is measured by the average of log labour productivity for the top 5% of companies with the highest productivity levels within each 2-digit industry. Laggards capture the average log productivity of all the other firms. Unweighted averages across 2-digit industries are shown for manufacturing and services, normalized to 0 in the starting year. The time period is 2001-2013. The vertical axes represent log-differences from the starting year: for instance, the frontier in manufacturing has a value of about 0.3 in the final year, which corresponds to approximately 30% higher in productivity in 2013 compared to 2001. Services refer to non-financial business sector services. See details in Section 3.3.

Source: Authors' calculations based on the recent update of the OECD-Orbis productivity database (Gal, 2013).

D. Andrews, Criscuolo C., and P. N. Gal, "The Best versus the Rest: the Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy," OECD, December 2016, available at http://www.oecd-ilibrary.org/economics/the-best-versus-the-rest_63629cc9-en;jsessionid=9ag8ukcclm7fb.x-oecd-live-03

Diffusion



https://en.wikipedia.org/wiki/Diffusion_of_innovations

See: D. Comin and Hobujn, "An Exploration of Technology Diffusion," *American Economic review*, 100 (12/2010): 2031-2059

The Diffusion of Electrification

“Certainly, the transformation of industrial processes by the new electric power technology was a long-delayed and far from automatic business. It did not acquire real momentum in the United States until after 1914-17, when regional utility rates for electricity were lowered substantially...and central station generating capacity came to predominate over generating capacity in isolated industrial plants.

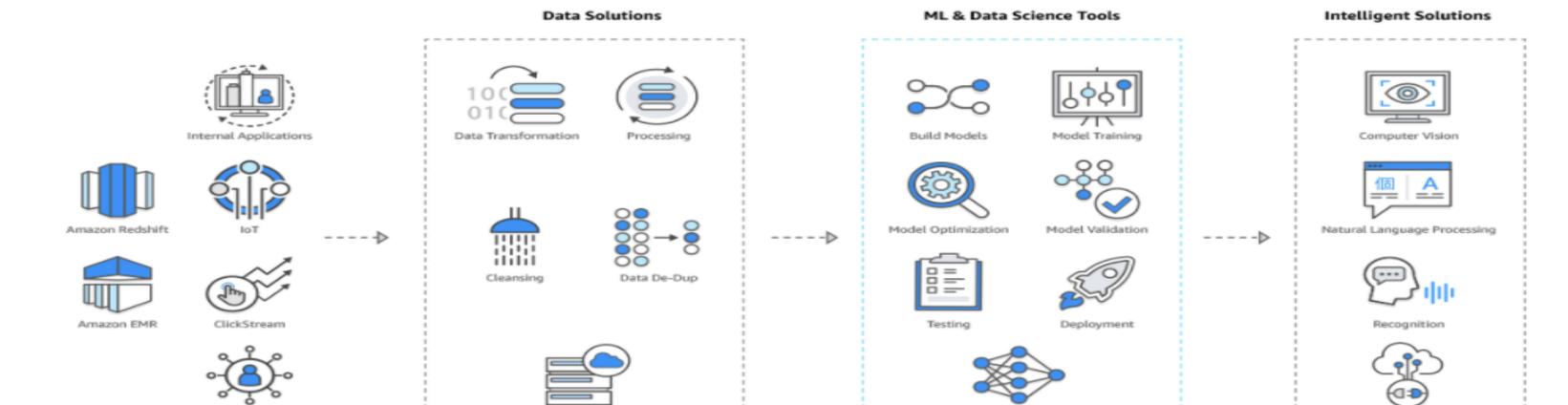
“In 1900 contemporary observers well might have remarked that the electric dynamos were to be seen “everywhere but in the productivity statistics.”

(P. A. David, “The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox,” *American Economic Review*, May 1990, p. 355)

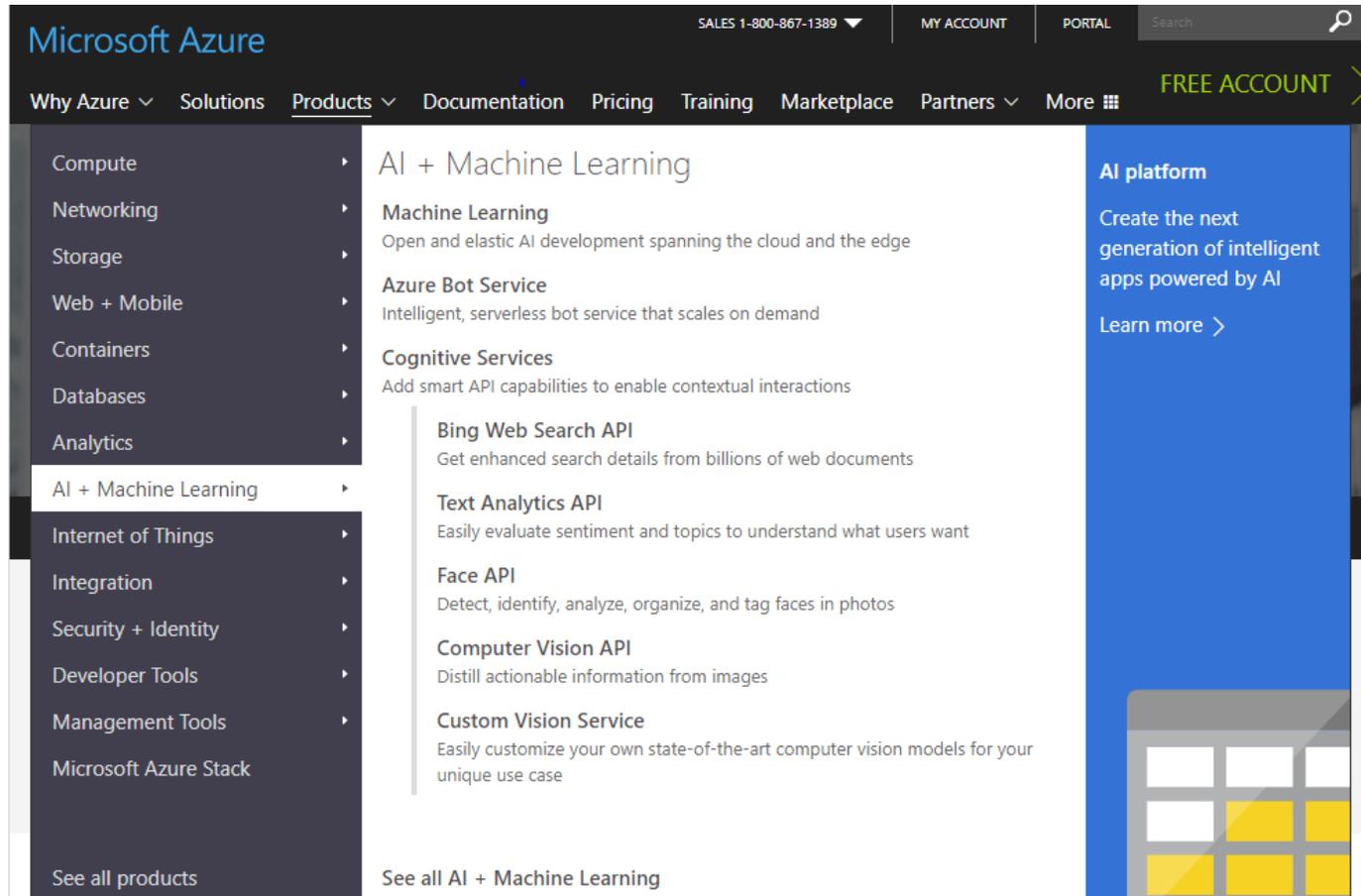
Amazon Web Services: Machine Learning

The screenshot shows the top navigation bar of the AWS Machine Learning page. It includes the AWS logo, a 'Menu' button, 'Contact Sales' and 'More' links, 'English' and 'My Account' dropdowns, and a 'Create an AWS Account' button. Below the navigation is a dark banner with the text 'Build intelligent applications with machine learning and data science software.' and three main categories: 'Data Solutions', 'ML & Data Science Tools', and 'Intelligent Solutions'.

Machine learning and cognitive applications are the next phase of digital transformation. The ability to build and leverage applications that learn on their own is a powerful idea that is only beginning to manifest itself. For AWS customers, machine learning is a new frontier in which you can increase efficiency and productivity of your businesses. Capturing the potential of machine learning applications requires innovation in technologies and business models, as well as investment in new capabilities and talent. You can now look to AWS Marketplace to help find, buy and deploy Machine Learning and AI software solutions from popular software vendors.



Microsoft Azure: AI and Machine Learning



The screenshot displays the Microsoft Azure website's navigation and content structure for AI and Machine Learning. At the top, the Microsoft Azure logo is on the left, and navigation links for 'SALES 1-800-867-1389', 'MY ACCOUNT', 'PORTAL', and a search bar are on the right. Below this is a secondary navigation bar with links for 'Why Azure', 'Solutions', 'Products', 'Documentation', 'Pricing', 'Training', 'Marketplace', 'Partners', and 'More', along with a 'FREE ACCOUNT' button. The main content area is divided into three columns. The left column is a dark sidebar menu with categories like 'Compute', 'Networking', 'Storage', 'Web + Mobile', 'Containers', 'Databases', 'Analytics', 'AI + Machine Learning' (highlighted), 'Internet of Things', 'Integration', 'Security + Identity', 'Developer Tools', 'Management Tools', and 'Microsoft Azure Stack'. The middle column is titled 'AI + Machine Learning' and lists sub-sections: 'Machine Learning' (Open and elastic AI development), 'Azure Bot Service' (Intelligent, serverless bot service), 'Cognitive Services' (Add smart API capabilities), and a list of APIs: 'Bing Web Search API', 'Text Analytics API', 'Face API', 'Computer Vision API', and 'Custom Vision Service'. The right column is a blue banner for the 'AI platform' with the text 'Create the next generation of intelligent apps powered by AI' and a 'Learn more' link. At the bottom of the right column is a grid icon with yellow highlights.

Microsoft Azure

SALES 1-800-867-1389 MY ACCOUNT PORTAL Search

Why Azure Solutions Products Documentation Pricing Training Marketplace Partners More FREE ACCOUNT

Compute
Networking
Storage
Web + Mobile
Containers
Databases
Analytics
AI + Machine Learning
Internet of Things
Integration
Security + Identity
Developer Tools
Management Tools
Microsoft Azure Stack
See all products

AI + Machine Learning

Machine Learning
Open and elastic AI development spanning the cloud and the edge

Azure Bot Service
Intelligent, serverless bot service that scales on demand

Cognitive Services
Add smart API capabilities to enable contextual interactions

Bing Web Search API
Get enhanced search details from billions of web documents

Text Analytics API
Easily evaluate sentiment and topics to understand what users want

Face API
Detect, identify, analyze, organize, and tag faces in photos

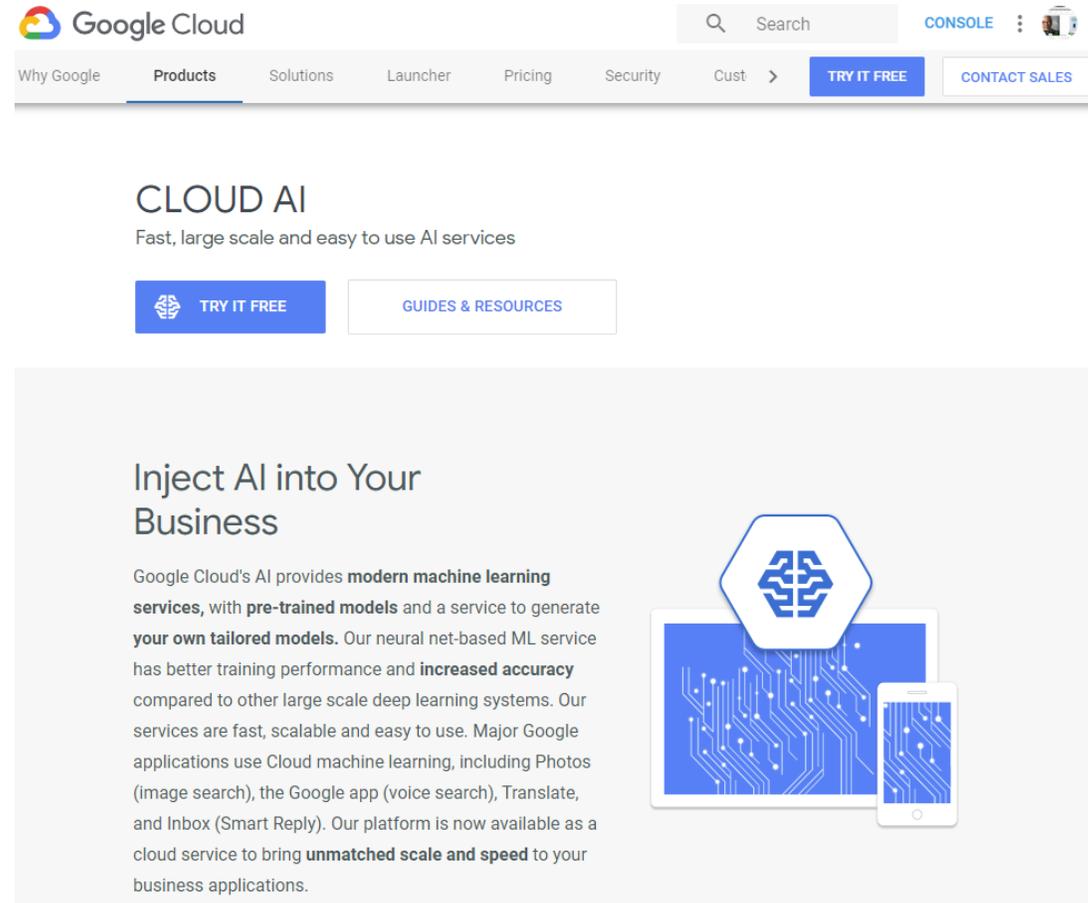
Computer Vision API
Distill actionable information from images

Custom Vision Service
Easily customize your own state-of-the-art computer vision models for your unique use case

See all AI + Machine Learning

AI platform
Create the next generation of intelligent apps powered by AI
Learn more

Google Cloud: AI



The image is a screenshot of the Google Cloud AI website. At the top, the Google Cloud logo is on the left, and a search bar with the text "Search" is on the right. Below the logo is a navigation menu with links for "Why Google", "Products", "Solutions", "Launcher", "Pricing", "Security", and "Cust". To the right of the menu are two buttons: "TRY IT FREE" and "CONTACT SALES".

The main content area features the heading "CLOUD AI" followed by the subtext "Fast, large scale and easy to use AI services". Below this are two buttons: "TRY IT FREE" (with a brain icon) and "GUIDES & RESOURCES".

The lower section is titled "Inject AI into Your Business". It contains a paragraph of text describing Google Cloud's AI services, including machine learning, pre-trained models, and tailored models. To the right of the text is an illustration of a laptop and a smartphone, both displaying circuit-like patterns, with a hexagonal icon containing a brain symbol above them.

Google Cloud's AI provides **modern machine learning services**, with **pre-trained models** and a service to generate **your own tailored models**. Our neural net-based ML service has better training performance and **increased accuracy** compared to other large scale deep learning systems. Our services are fast, scalable and easy to use. Major Google applications use Cloud machine learning, including Photos (image search), the Google app (voice search), Translate, and Inbox (Smart Reply). Our platform is now available as a cloud service to bring **unmatched scale and speed** to your business applications.

The Macro Consequences of the Digital “Superstar” Firms

“(i) there has been a **rise in sales concentration** within four-digit industries across the vast bulk of the U.S. private sector; (ii) **industries with larger increases in product market concentration have experienced larger declines in the labor share**; (iii) **the fall in the labor share is largely due to the reallocation of sales between firms** rather than a general fall in the labor share within incumbent firms; (iv) **the reallocation-driven fall in the labor share is most pronounced in precisely the industries which had the largest increase in sales concentration**; and (v) **these patterns are also present in firm- and industry-level datasets from other OECD countries.**”

Autor, et. al. “The Fall of the Labor Share and the Rise of the Superstar Firms,” MIT Working Paper (2017), Available at <https://economics.mit.edu/files/12979>

Digital Platforms, Competition and Income Distribution

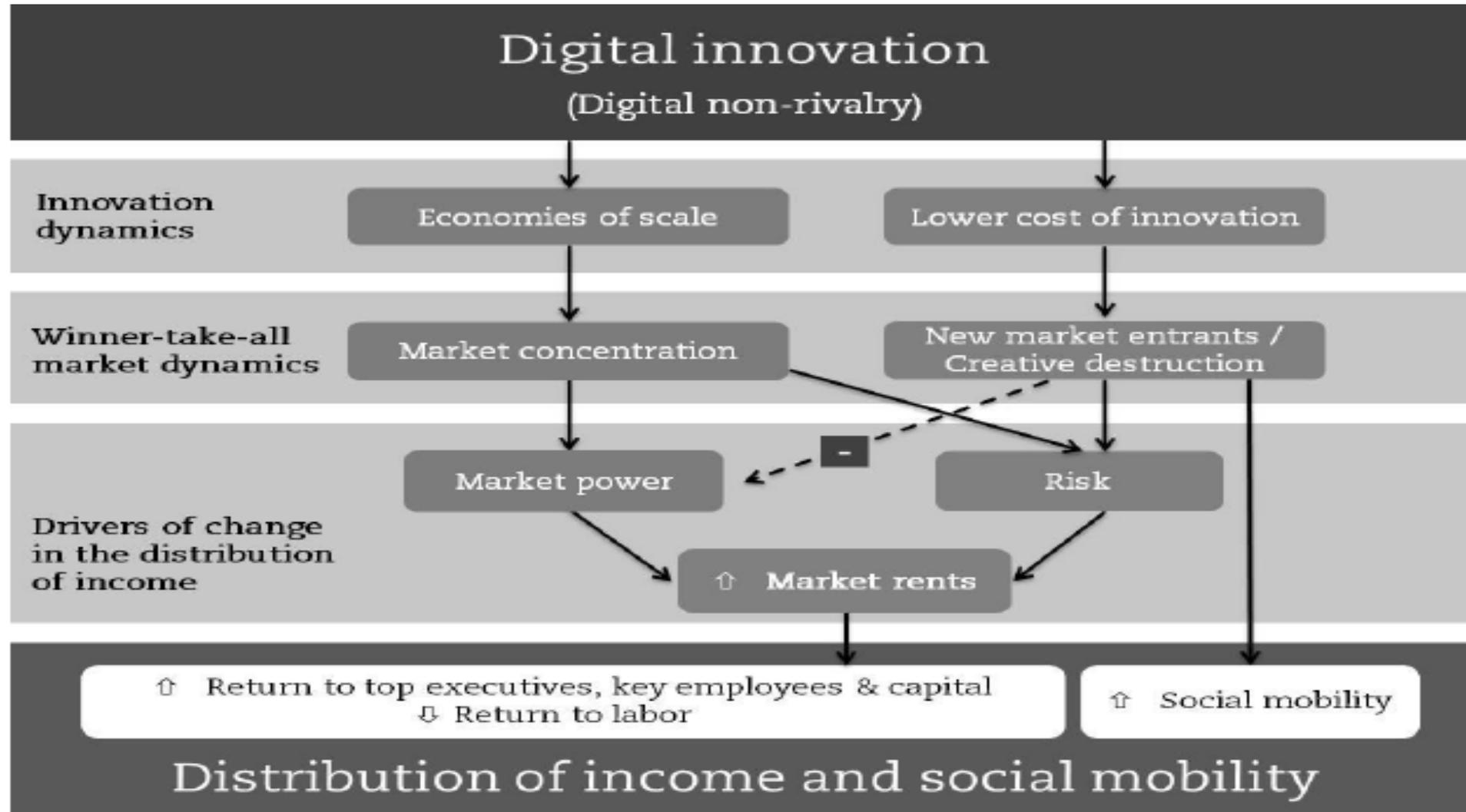
“Internet-based platforms are web sites serving as intermediaries or facilitators between users, or between service suppliers and consumers (such as Facebook, Google, Uber, Amazon and Apple’s iStore). Platforms have a major influence on market competition. There are concerns regarding market competition between platforms, due to their direct reliance on digital innovation, which favors winner-take-all market structures.

Competition authorities around the world have dealt with a few cases involving platforms already, but there is not yet an articulated doctrine on how to deal with them.

“This paper puts forward an understudied mechanism that links digital innovation to changing market structures and, consequently, impacts on the distribution of income. It provides initial evidence pointing to the importance of the mechanism....”

(D. Guellec and C. Paunov, “Digital Innovation and the Distribution of Income,” NBER wp 23897, November 2017, p. 35)

Digital Innovation, Market Structure, Income Distribution



Facebook, Politics and Data Science

“Recent revelations about the abuse of Facebook data and spread of disinformation make clear that social media can have negative ramifications for society. Today the SSRC begins an extraordinary Social Data Initiative at the frontiers of digital culture to examine the problem, explore questions about the responsible use of social network data, and generate insights to inform solutions.

“With the potential to usher in a new paradigm for research collaboration between industry and the academy, Facebook will make data available for the first time to social science researchers via an independent, transparent, peer-review process.

“The SSRC’s role will include helping to form a steering committee of independent scholars to develop a research agenda about social media’s impact on society, beginning with elections, and stewardship of both the independent application and selection processes, as well as the peer-review process. Any proposal submitted through this process must first have been reviewed by a University Institutional Review Board (IRB), federally approved IRB, or international equivalent.”

(“Statement of Alondra Nelson, President of the SSRC,” available at <https://www.ssrc.org/programs/view/social-data-initiative/>).

The Unicorn Bubble



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The Global Unicorn Club

Current Private Companies Valued At \$1B+
(including whisper valuations)

Total Number of Unicorn Companies: **234**

Total Cumulative Valuation: **~ \$800B**



The State of the Software Industry Today: The Entrepreneurial Risks

“Given that SaaS-driven start-ups need at least five times as much risk equity to reach positive cash flow, the post-Bubble decline in the U.S. IPO market has differentially affected enterprise software ventures....

- Technology Risk: “When I plug it in, will it light up?”
- Market Risk: “Who will pay to buy it if it does work?”
- Financing Risk: “Will the capital be there to fund the venture to positive cash flow?”
- Business Risk: “Will the team manage the transition from start-up to sustainable business, especially given the challenge of building an effective channel to the market?”

The Venture Capitalist's Question

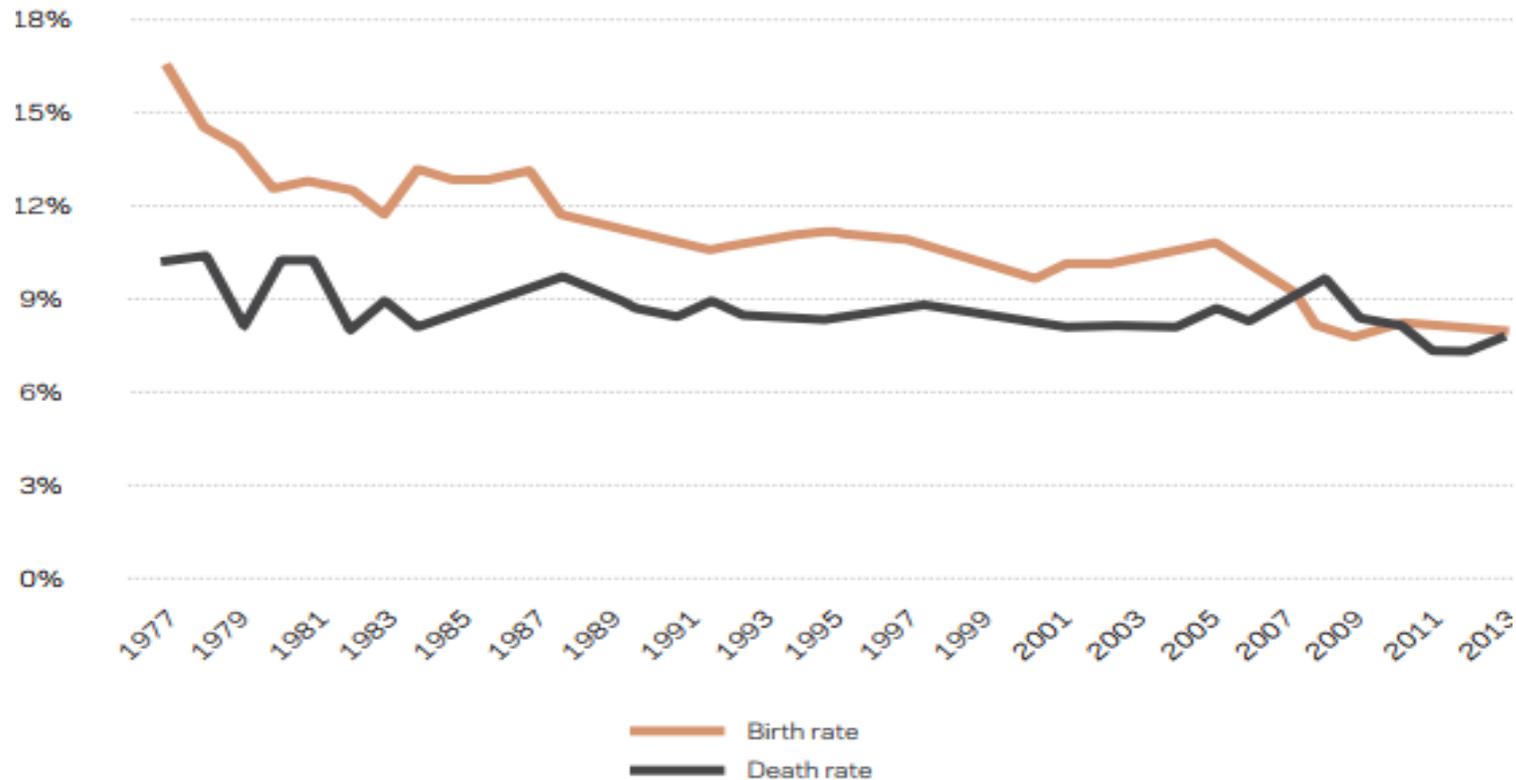
- The Technology does Light up – *Do we sell now?*
- We have three credible customers who will testify that they bought our offering and will buy more – *Do we sell now?*
- We have access to another round of funding but it will be dilutive and Business Risk looms – *Do we sell now?*

Political Authority/Market Confidence

“Loss of authority by those charged with directing the state will always undermine the confidence of participants in the markets of financial capitalism. “

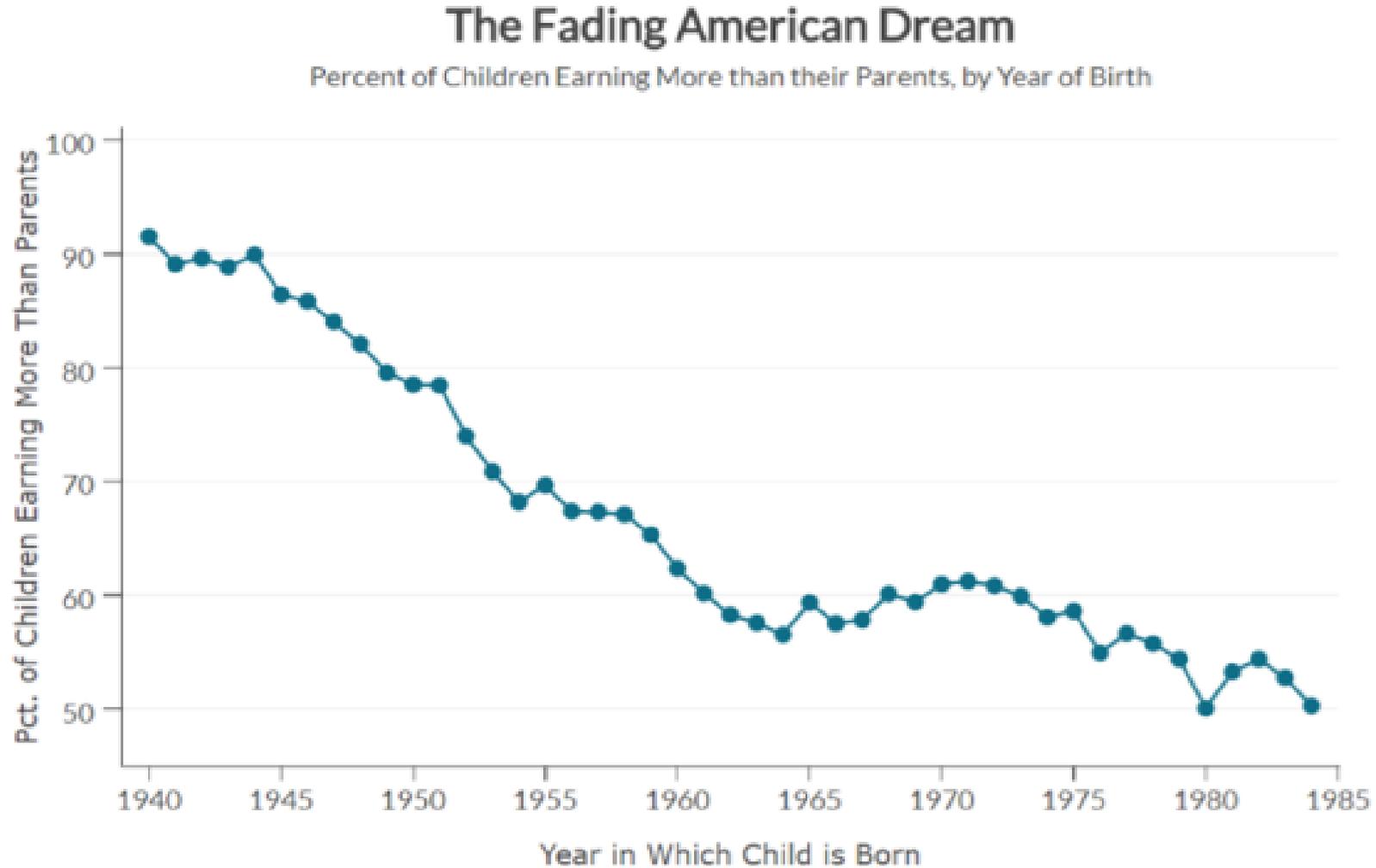
Birth and Death of American Firms

Firm birth (startup) and death rates



(Economic Innovation Group, *Dynamism in Retreat: Consequences for Regions, Markets and Workers*, February 2017, available at <http://eig.org/wp-content/uploads/2017/07/Dynamism-in-Retreat-A.pdf>)

Decline in American Economic Mobility



(Source: "The Equality of Opportunity Project," available at <http://www.equality-of-opportunity.org/>)

\$5 trillion of Net Stock Buybacks: 2006-15

Table 1. Net equity issues by non-financial corporations in the U.S. economy, by decade in 2015 dollars, and as a percent of GDP

	Net equity issues, U.S. non-financial corporations 2015\$ billions	Net equity issues as % of GDP
1946-1955	143.2	0.56
1956-1965	110.9	0.30
1966-1975	316.0	0.58
1976-1985	-290.9	-0.40
1986-1995	-1,002.5	-1.00
1996-2005	-1,524.4	-1.09
2006-2015	-4,466.6	-2.65

Sources: Net equity issues data is the same as in Figure 2, adjusted to 2015 U.S. dollars, using the consumer price index in Council of Economic Advisors, *Economic Report of the President 2017*, January 2017, Table B-10, at http://www.presidency.ucsb.edu/economic_reports/2017.pdf.

“U.S. companies are [buying back their shares at a record pace](#), providing fresh support during a rocky stretch for the stock market when many investors have rushed for the exits.” WSJ 5-11-2018g

“Killing the Golden Goose? The Decline of Science in Corporate R&D”

“Scientific knowledge is believed to be the wellspring of innovation. Historically, firms have also invested in research to fuel innovation and growth. **In this paper, we document a shift away from scientific research by large corporations between 1980 and 2007. We find that publications by company scientists have declined over time in a range of industries. We also find that the value attributable to scientific research has dropped, whereas the value attributable to technical knowledge (as measured by patents) has remained stable.** These effects appear to be associated with globalization and narrower firm scope, rather than changes in publication practices or a decline in the usefulness of science as an input into innovation. **Large firms appear to value the golden eggs of science (as reflected in patents) but not the golden goose itself (the scientific capabilities)....”**

(A. Arora et. al., NBER Working Paper 20902, January 2015, Abstract)

Free Trade is for Winners

“Any power which by means of a protective policy has attained a position of manufacturing and commercial supremacy can (after she has attained it) revert with advantage to a policy of free trade.”

(F. List, *The National System of Political Economy*, trans. Sampson S. Lloyd, 1885 ed. (New York: Augustus M. Kelly, 1966 [1841]), p. 11.)

Chinese Commitment to Renewable Energy

“At the start of 2017, China [announced](#) that it would invest \$360 billion in renewable energy by 2020 and scrap plans to build 85 coal-fired power plants. In March, Chinese authorities reported that the country was already exceeding official targets for energy efficiency, carbon intensity, and the share of clean energy sources. And just last month, China’s energy regulator, the National Energy Administration, rolled out new measures to reduce the country’s dependence on coal.

“These are just the latest indicators that China is at the center of a global energy transformation, which is being driven by technological change and the falling cost of renewables. But China is not just investing in renewables and phasing out coal. It also accounts for a growing share of global energy demand, meaning that its economy’s continuing shift toward service- and consumption-led growth will reshape the resource sector worldwide.”

(World Economic Forum, “How China is leading the renewable energy revolution,” August 29, 2017, available at <https://www.weforum.org/agenda/2017/08/how-china-is-leading-the-renewable-energy-revolution>)

Obama, January 13, 2017: “The Irreversible Momentum of Clean Energy”

Since 2008, the United States has experienced the first sustained period of rapid GHG emissions reductions and simultaneous economic growth on record. Specifically, CO₂ emissions from the energy sector fell by 9.5% from 2008 to 2015, while the economy grew by more than 10%. In this same period, the amount of energy consumed per dollar of real gross domestic product (GDP) fell by almost 11%, the amount of CO₂ emitted per unit of energy consumed declined by 8%, and CO₂ emitted per dollar of GDP declined by 18% (2).

Barack Obama, *Science*, 13 Jan 2017, Vol. 344, Issue 6321, pp. 126-129

Trump, June 1 2017

“...The Paris Climate Accord is simply the latest example of Washington entering into an agreement that disadvantages the United States to the exclusive benefit of other countries, leaving American workers — who I love — and taxpayers to absorb the cost in terms of lost jobs, lower wages, shuttered factories, and vastly diminished economic production.

“Thus, as of today, the United States will cease all implementation of the non-binding Paris Accord and the draconian financial and economic burdens the agreement imposes on our country. This includes ending the implementation of the nationally determined contribution and, very importantly, the Green Climate Fund which is costing the United States a vast fortune.”

The Race for Renewable Energy Domination

Countries/regions with the most governmental renewable energy R&D spending in 2016



* Excluding China and India

Source: Frankfurt School – UNEP Collaborating Centre for Climate & Sustainable Energy Finance

statista

Image: Statista

The Rediscovery of Keynes

“I did not expect to live to see the economics I had absorbed at Cambridge more than forty years ago – the economics of Keynes; of uncertainty at the level of the individual investor, consumer, firm and government; and of consequent instability at the level of the integrated financial economy – again become so relevant and so broadly recognized as such within the discipline.”

The Power of Ideas

“I am sure that the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas. Not, indeed, immediately, but after a certain interval ... But, soon or late, it is ideas, not vested interests, that are dangerous for good or evil.”

(Keynes, *The General Theory*, p. 343.)