

# America, China, and Innovation in the 21<sup>st</sup> Century

**Lee Branstetter**

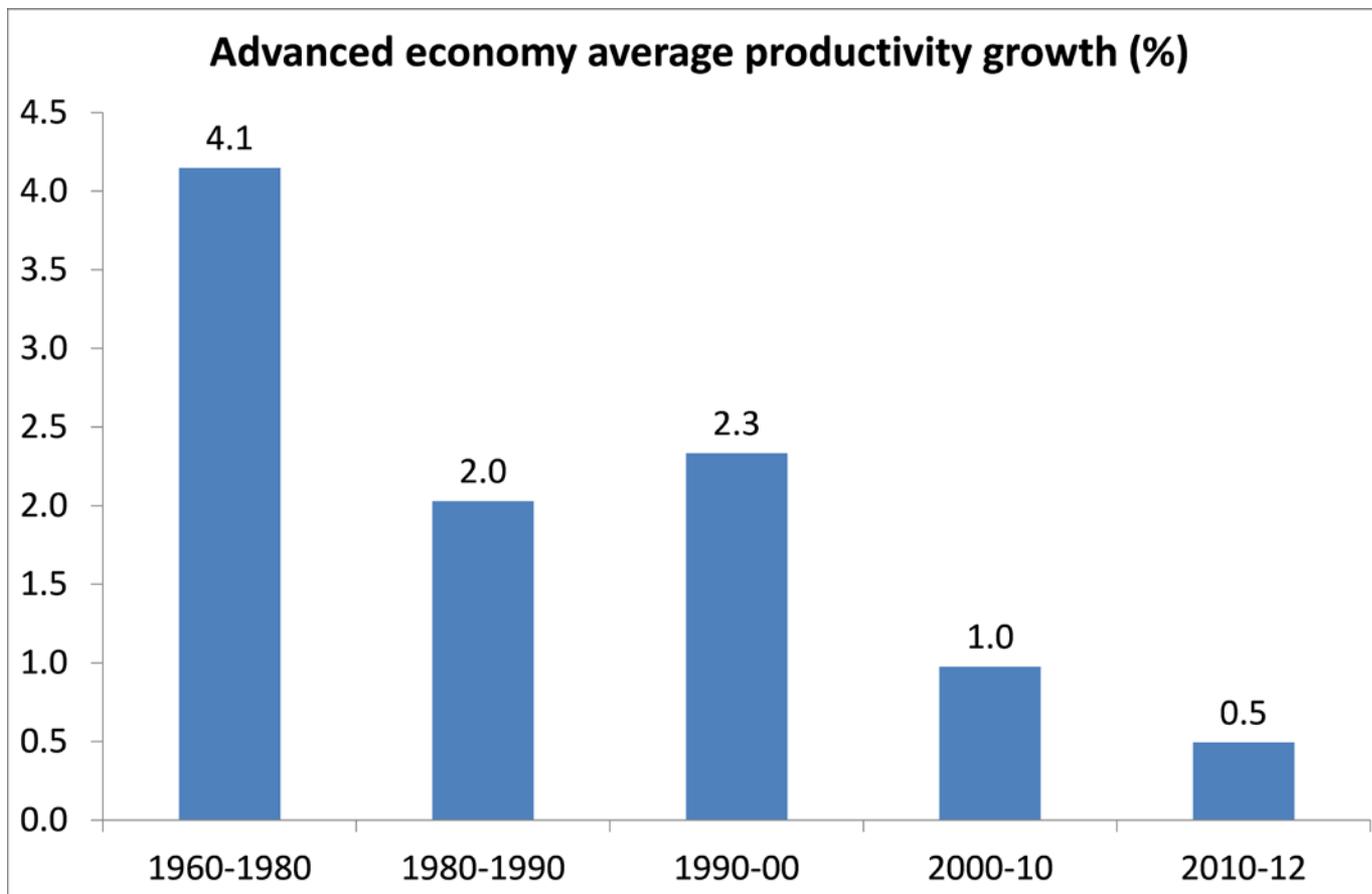
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Research Associate, NBER**

**September 17, 2018**

# **It is vital and possible to avoid a damaging “tech war” between the U.S. and China**

- **Full engagement of China’s immense reservoir of human talent is likely to be necessary to avoid a permanent innovation slowdown at the global level.**
- **China’s long-term innovation potential can best be realized through a globally connected, market-driven innovation system.**
- **Policies to promote global connection and the role of markets will also limit foreign concern about China’s rise as an innovation superpower.**
- **Policy changes in China will be required to achieve this positive-sum outcome.**

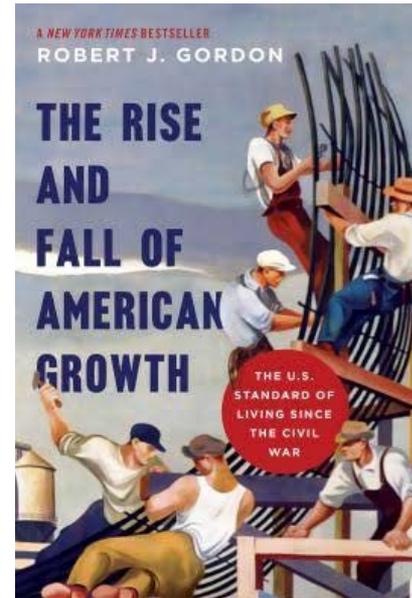
# A serious productivity slowdown appears to afflict all advanced economies...



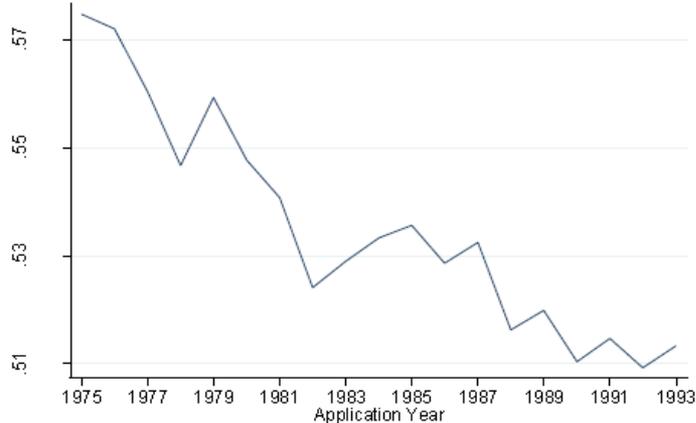
# Frontier economic research suggests diminishing returns to R&D investment...



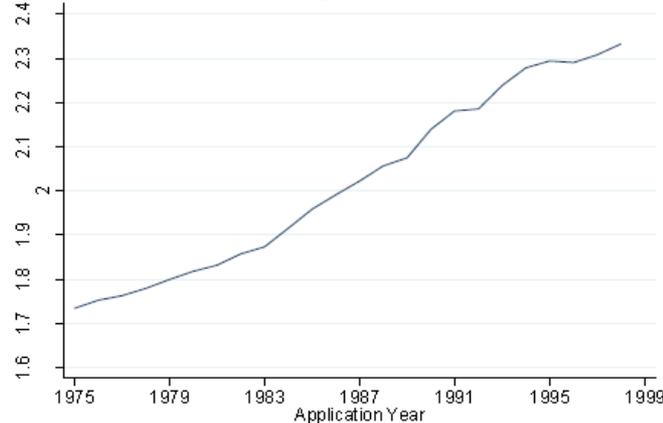
Robert J. Gordon, Professor  
Northwestern University



Trend in Field Jump for 'Fast' Innovators



Trends in Average Inventors Per Patent



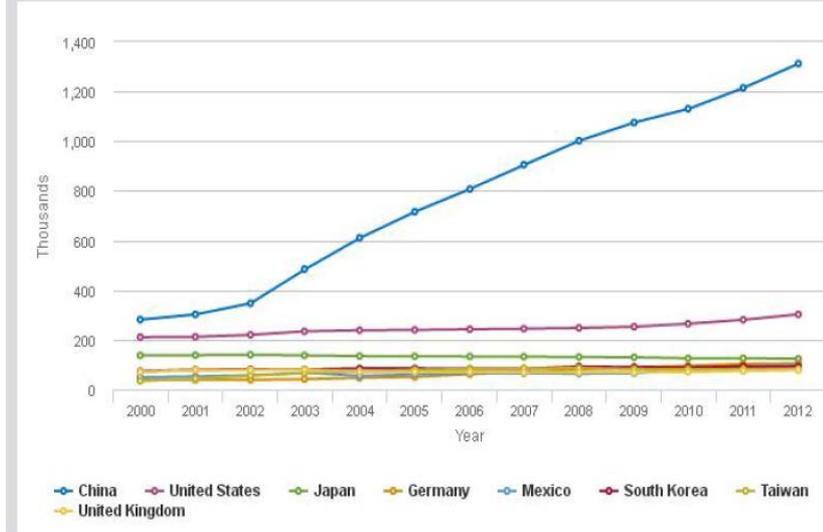
Ben Jones<sup>4</sup>

# Can China save the world from the specter of diminishing returns?

- China (and the rest of the developing world) have played a limited role in global innovation over the past several decades.
- This situation is changing rapidly.
- Freeman (2006) and Freeman and Huang (2015) describe the mobilization of engineering and scientific human resources underway in emerging markets
- Can Asian talent revive the global innovation machine?

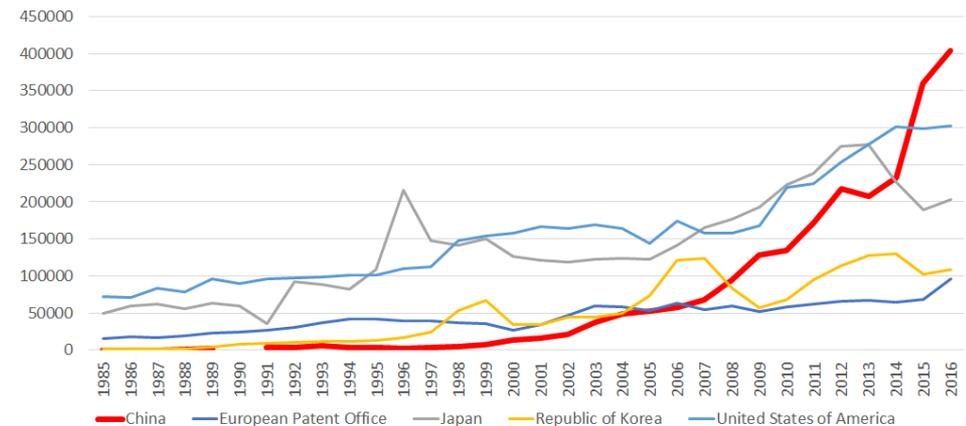
Figure 2-29

First university natural sciences and engineering degrees, by selected country: 2000–12



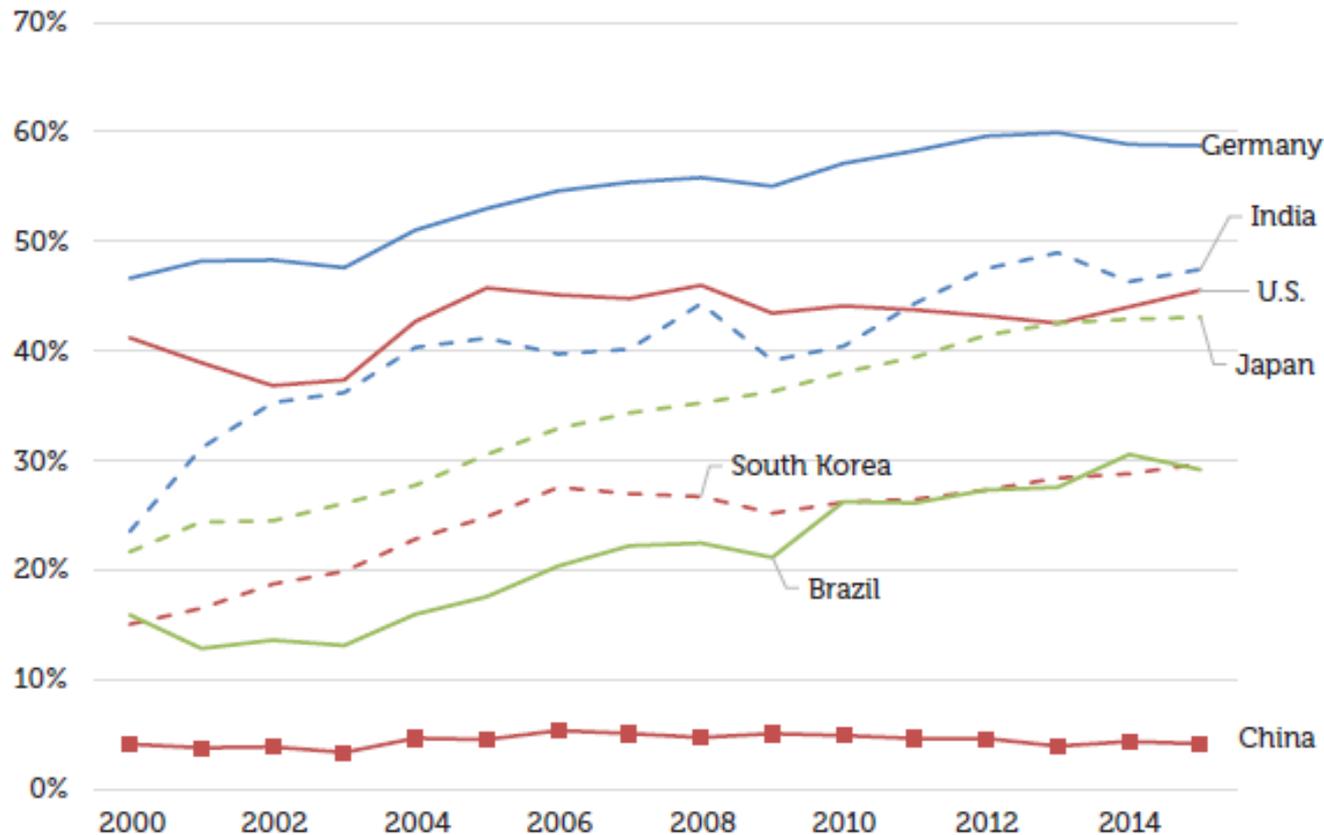
NOTE: Natural sciences include agricultural sciences; biological sciences; computer sciences; earth, atmospheric, and ocean sciences; and mathematics.

Counts of patent grants by year



# There are many reasons to doubt the quality of China's Great Wall of patents...

Percentage of Domestic Patents Filed Abroad



Source: World Intellectual Property Organization.

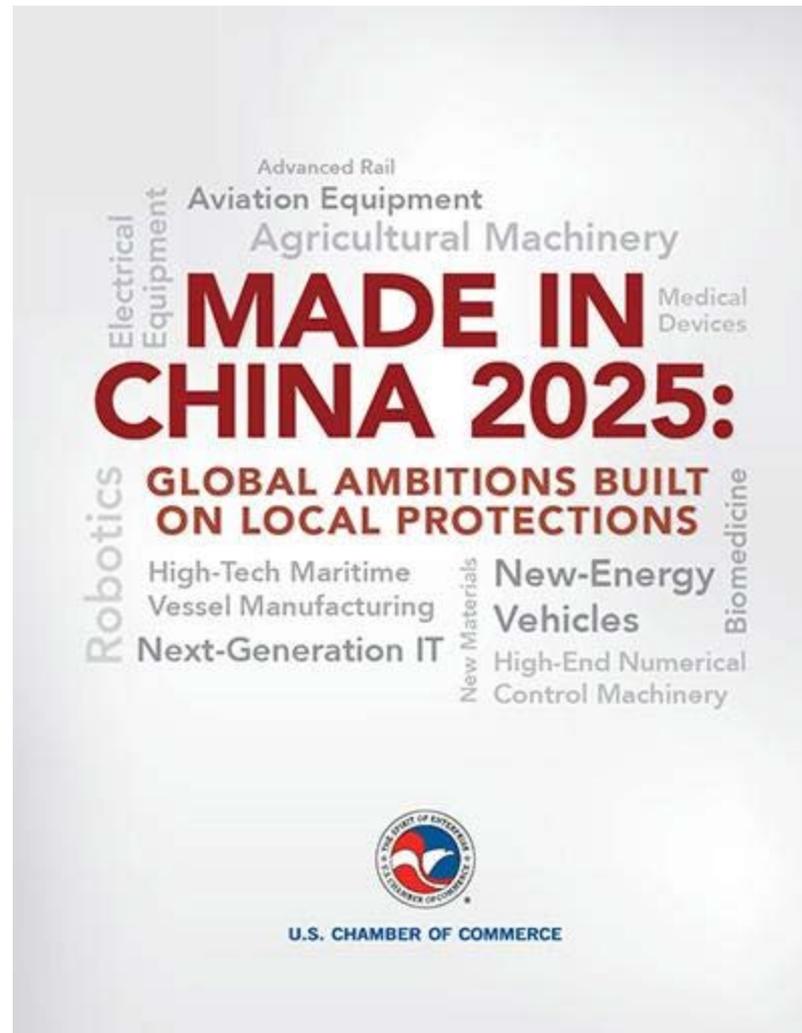
# There are gains from trade in ideas!

- The quantity and quality of ideas patented by indigenous Chinese firms abroad appears to lag the quality of ideas patented by Chinese engineers working for MNCs.
- But the quality of ideas patented abroad by Chinese engineers working for MNCs appears to have converged to – or exceeded -- the quality of the inventions MNCs produce at home!
- Successful frontier innovation requires the accumulation of a vast array of skills that will take time for indigenous firms to accumulate.
- But bringing the immense talent of Chinese engineers into the R&D systems of MNCs can produce frontier innovation today.
- China – and the world – can benefit from the kind of international trade in ideas abetted by the global R&D networks of MNCs.

# **Policy prescriptions to maximize innovative output and minimize conflict with the West**

- **Public investment in basic science and STEM education.**
- **A patent system that provides effective protection of real innovation, whether the inventor is foreign or domestic.**
- **An end to China's digital protectionism.**
- **An end to China's forced technology transfer policies.**
- **An open, level playing field for innovators that does not discriminate on the basis of industry, nationality, or firm ownership.**
- **A willingness to rely on the market to identify technological opportunity.**

# Xi Jinping's administration has instead adopted an aggressive industrial policy...



# This policy threatens to exacerbate trade tensions with China's main trading partners...



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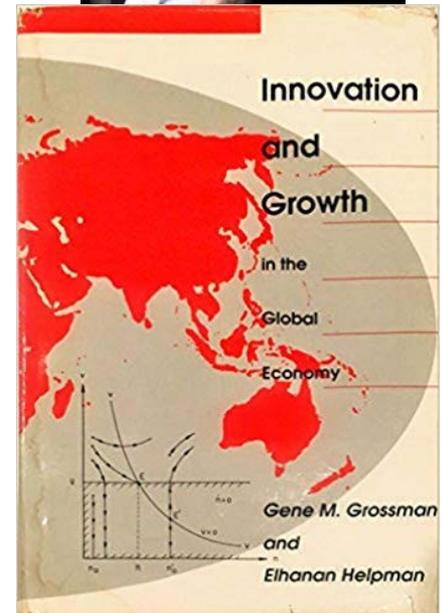
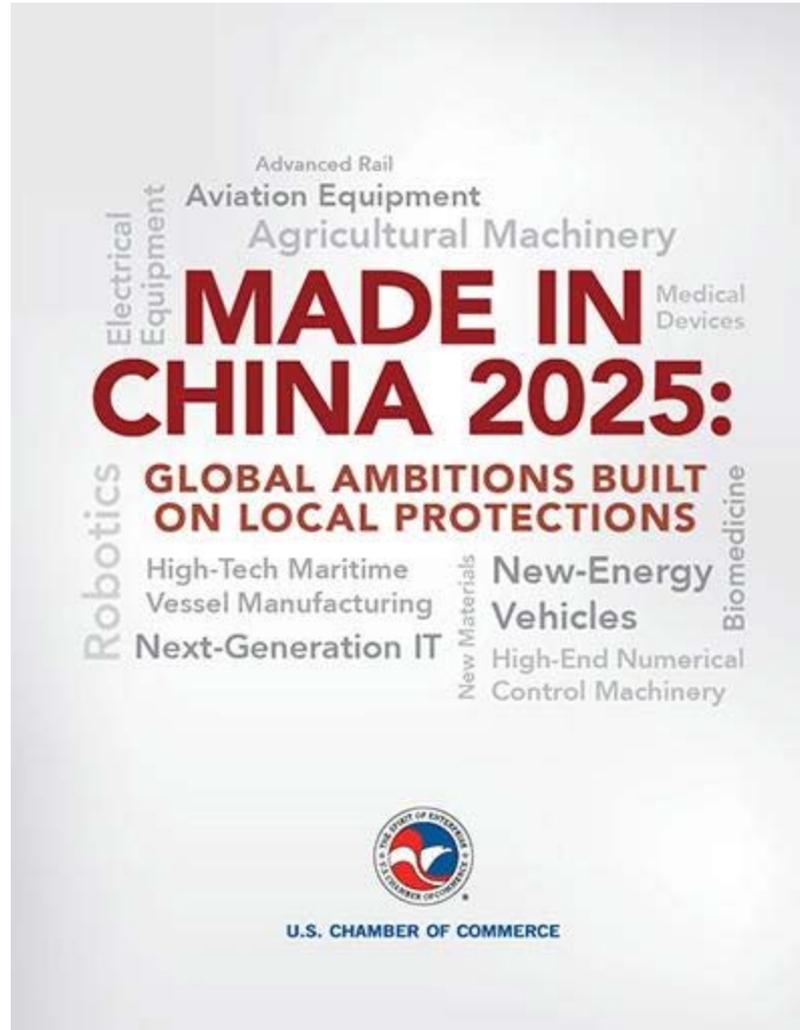
Advanced Rail  
Aviation Equipment  
Agricultural Machinery  
Medical Devices  
**MADE IN CHINA 2025:**  
GLOBAL AMBITIONS BUILT ON LOCAL PROTECTIONS  
Biomedicine  
New-Energy Vehicles  
High-End Numerical Control Machinery  
High-Tech Maritime Vessel Manufacturing  
Next-Generation IT  
New Materials  
Robotics  
Electrical Equipment

U.S. CHAMBER OF COMMERCE

And, at least in theory, it could actually distort global trade and depress innovation...

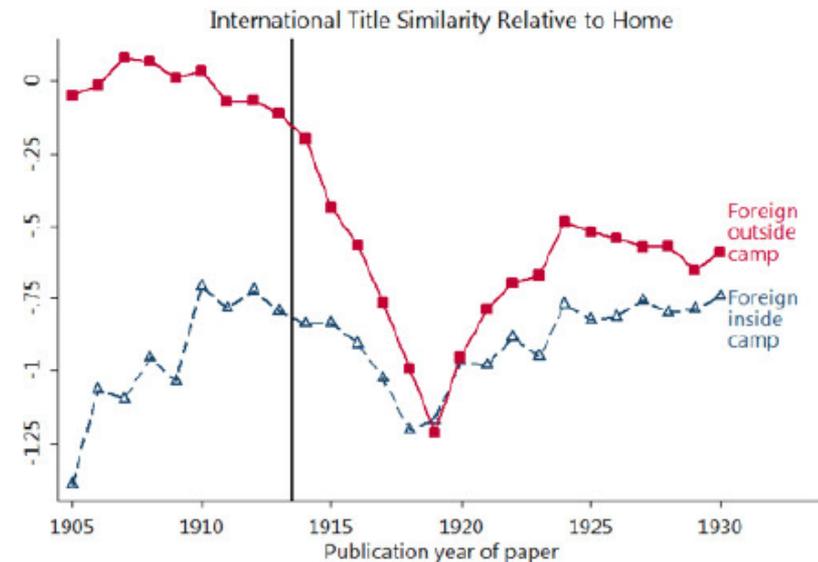
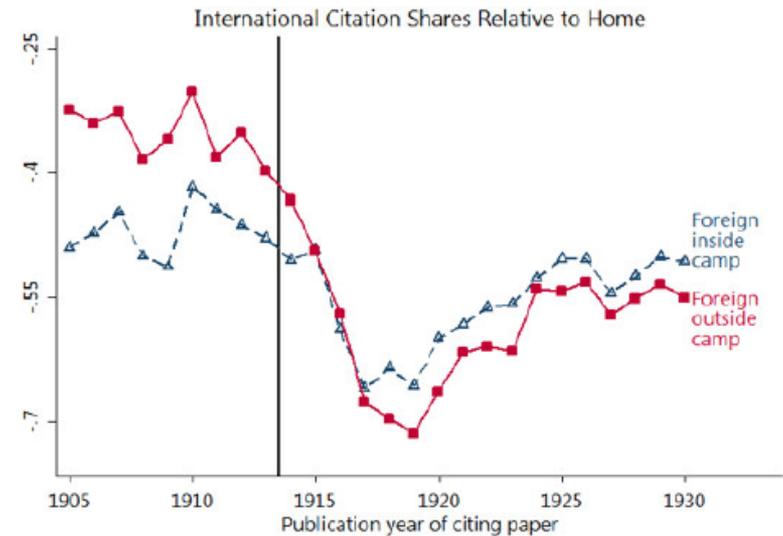


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# The global scientific community has fragmented before...

- During and after WWI, Allied scientists boycotted “Central” scientists...
- Leading to a fragmentation of the scientific community, a decline of knowledge flows, and a decline in the rate and quality of innovation.
- Given the challenges that confront humanity, it is incumbent upon us to avoid a repetition of this history.



# Supplemental Slides

# Policy choices can have enduring consequences...

## **Brutus:**

There is a tide in the affairs of men.  
Which, taken at the flood, leads on to fortune;  
Omitted, all the voyage of their life  
Is bound in shallows and in miseries.  
On such a full sea are we now afloat,  
And we must take the current when it serves,  
Or lose our ventures.

*Julius Caesar Act 4, scene 3, 218–224*

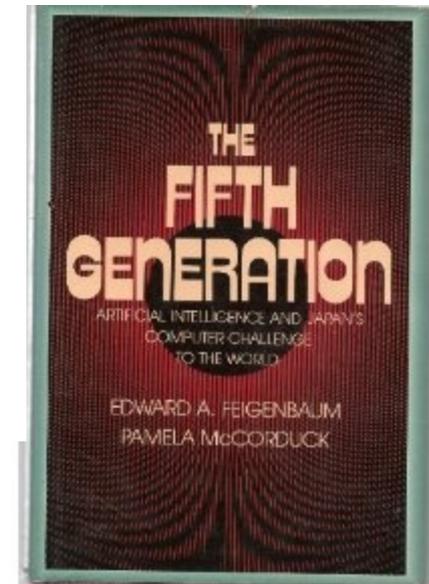
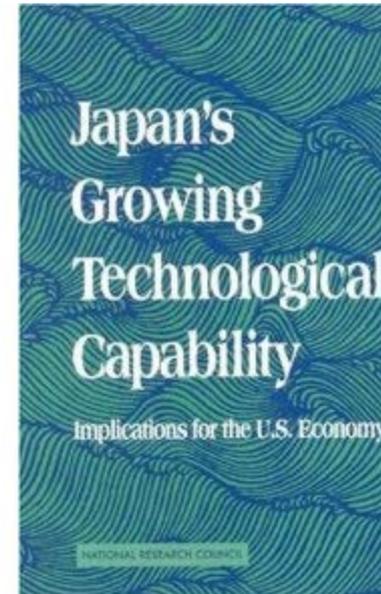
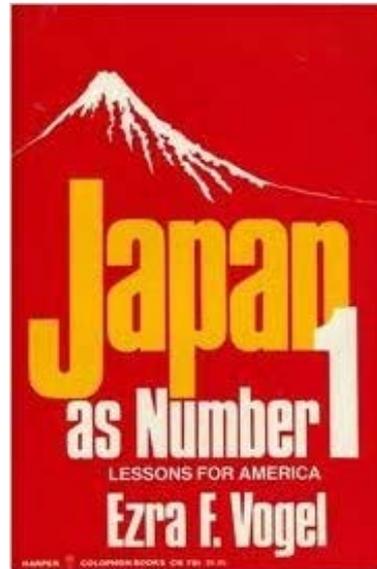
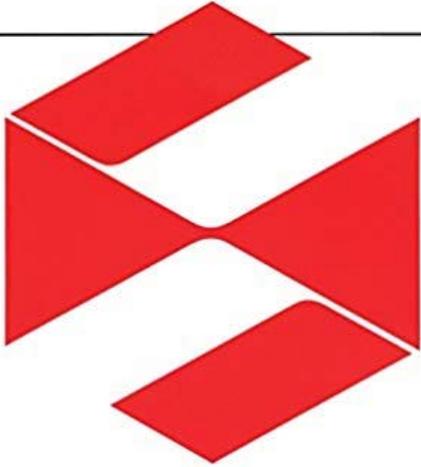
# The history of China's neighbors suggests the limits of industrial policy...

# Japan was once regarded as an innovation superstar...

## MITI AND THE JAPANESE MIRACLE

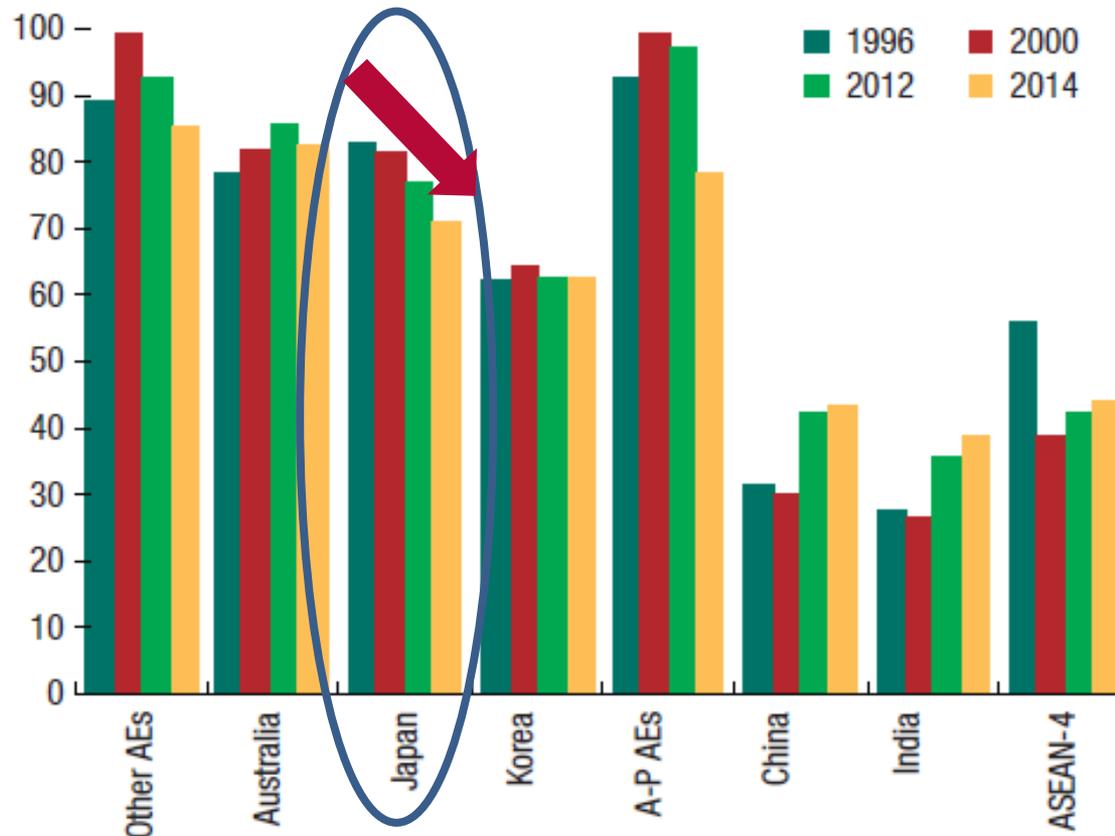
The Growth of Industrial Policy, 1925-1975

CHALMERS JOHNSON



# Japan's aggregate TFP level has fallen substantially relative to the U.S...

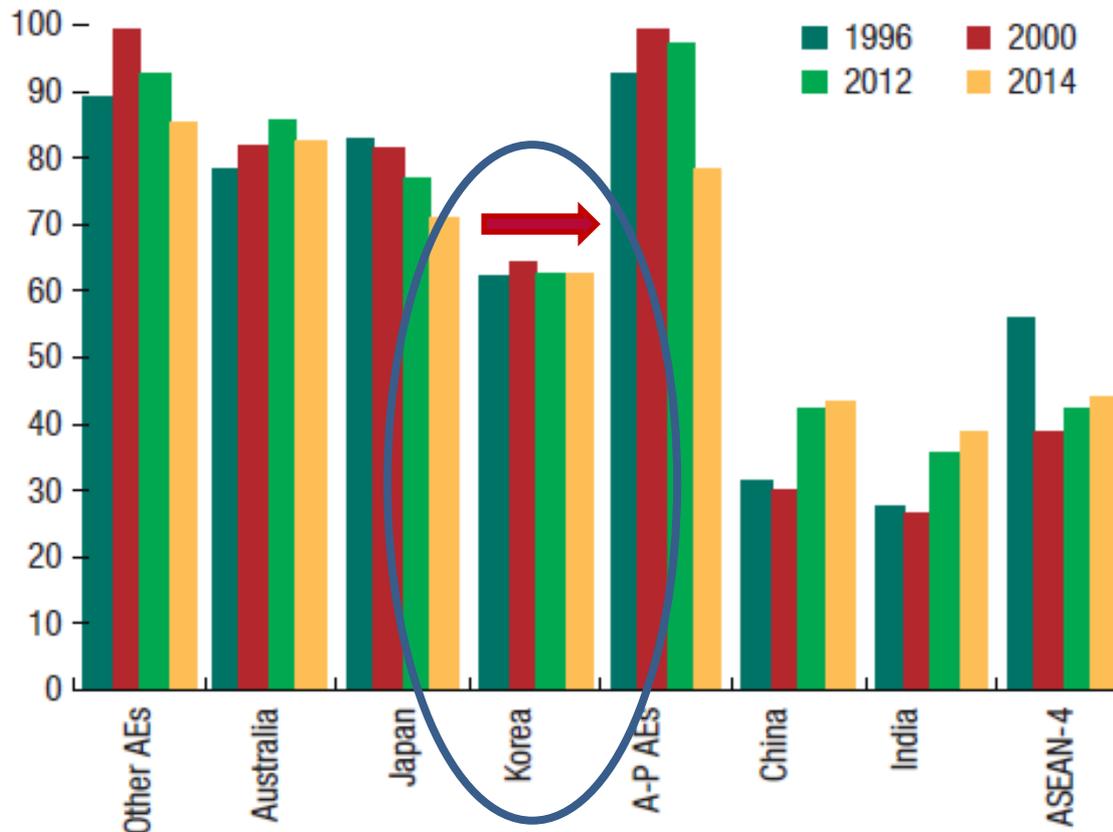
Figure 3.3. Total Factor Productivity Gaps  
(Current purchasing power parity, United States = 100)



Source: IMF (2017)

# And South Korea has shown almost zero TFP convergence over 20 years...

**Figure 3.3. Total Factor Productivity Gaps**  
(Current purchasing power parity, United States = 100)



Source: IMF (2017)

# **These nations are stuck with “innovation systems” that are poorly adapted to their current circumstances...**

- These nations followed a technological development trajectory with some common features.**
- That trajectory led these nations to specialize in a particular “style” of R&D that was appropriate to the circumstances of their high-growth eras...**
- Government policies in these countries exacerbated the concentration of R&D resources in certain sets of activities and organizations.**
- When circumstances changed, innovation systems in these countries struggled to adapt, and research productivity appears to have fallen.**