The Case for Growth: Threats, Opportunities and Climate Change

SNS, Stockholm

September 14th, 2022

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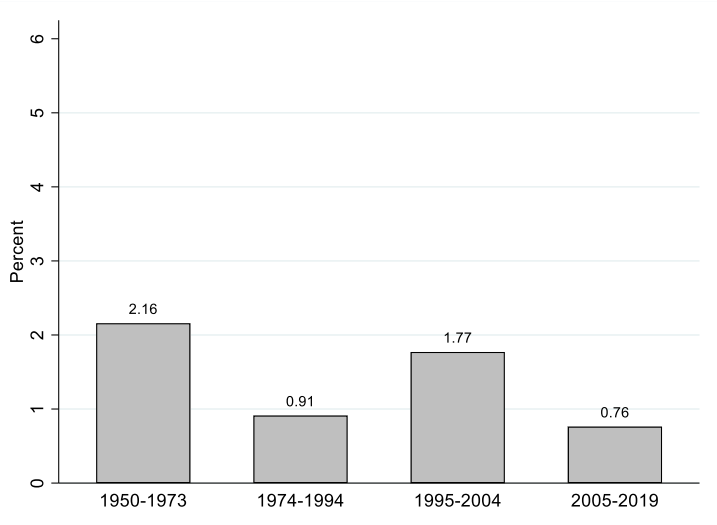
LSE and MIT

Summary

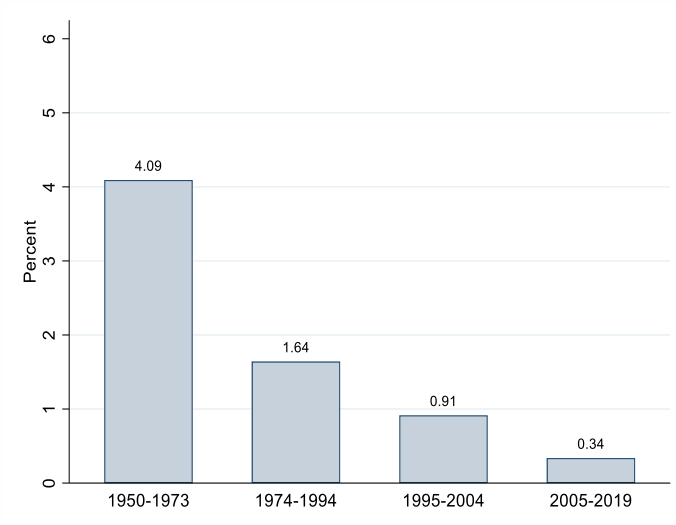
- World faces severe **growth threats** arising from Pandemic & Ukraine crises, but even before these crises, there was global problem of **low productivity growth** since (at least) the 2008-9 Financial Crisis

Productivity problems started long before COVID: Total Factor Productivity (TFP) growth 1950-2019: US, Euro-area and UK

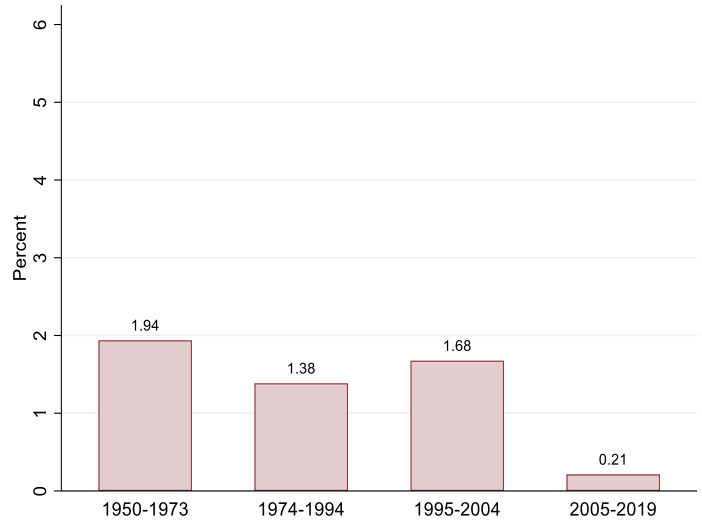
A. United States



B. Euro Area



C. United Kingdom



Source: Teichgraber & Van Reenen (2022) Updated data from Bergeaud, Cette, and Lecat (2016). Data publicly available at: http://www.longtermproductivity.com/

Notes: Average annual TFP growth in the US (panel A), Euro-area (panel B), and UK (panel C). Insufficient data for whole Euro-area so Germany, France, Italy, Spain, Netherlands, and Finland are used.

Summary

- World faces severe **growth threats** arising from Pandemic & Ukraine crises, but even before these crises, there was global problem of **low productivity growth** since (at least) the 2008-9 Financial Crisis
- These threats create opportunities for new policy framework focused on equitable and environmentally **sustainable growth**
  - Climate Change requires green innovation
  - Defense spending can have civilian spin-offs
  - COVID vaccines show how quickly this can happen
- **Innovation and Diffusion** of better *technologies* and *management practices* are key
- We know much about *what* to do. Main challenge is political *will*
  - Need to join up in new **Marshall Growth Plan**
  - Frame around missions on **climate, defense & health**

OUTLINE OF TALK

Threats and Opportunities

Productivity:

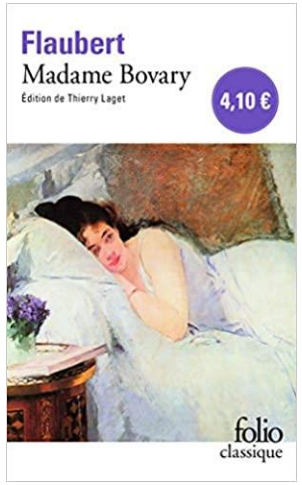
1. **Innovation Policies**
2. Diffusion Policies

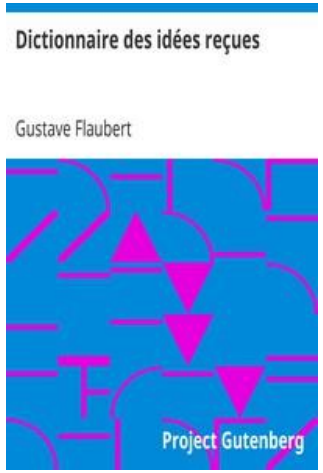
Why should the government subsidize innovation?

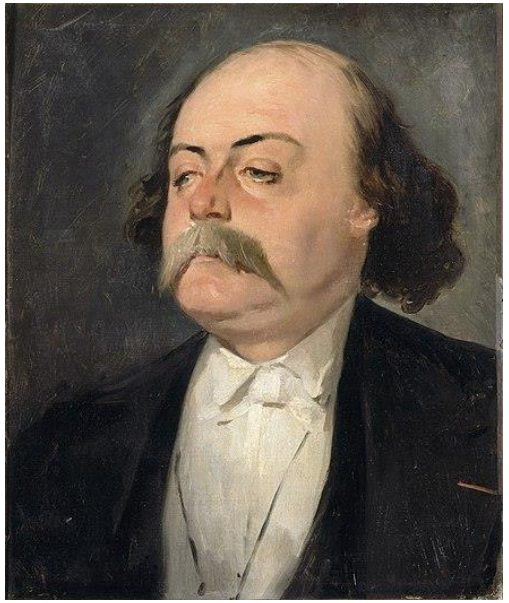
- **Multiple market failures:**
  - Firms doing R&D only capture small part pf the benefits (knowledge spillovers)
  - Credit markets supply insufficient finance, especially for SMEs

Le Dictionnaire des idées reçues (Dictionary of Received Ideas) by Gustave Flaubert (1911)

Inventors - “All die in the poor house. Someone else profits from their discoveries, it’s not fair”







Why should the government subsidize innovation?

- **Multiple market failures:**
  - Firms doing R&D only capture small part pf the benefits (knowledge spillovers)
  - Credit markets supply insufficient finance, especially for SMEs

- **Empirical evidence suggests social return to innovation at least three times larger than private returns**
  - Bloom, Shankerman & Van Reenen (2013); Lucking, Bloom and Van Reenen (2020); Jones & Summers (2022)

Innovation Policy: The “Lightbulb” Table

(1)	(2)	(3)	(4)	(5)	(6)
Policy	**Quality of evidence**	**Conclusiveness of evidence**	**Benefit - Cost**	**Time frame:**	**Effect on inequality**

Source: Bloom, Van Reenen and Williams (2019, *Journal of Economic Perspectives*)

Innovation Policy: The "Lightbulb" Table

(1) Policy	(2) Quality of evidence	(3) Conclusiveness of evidence	(4) Benefit - Cost	(5) Time frame:	(6) Effect on inequality
Direct R&D Grants	Medium	Medium	💡💡	Medium-Run	↑
R&D tax credits	High	High	💡💡💡	Short-Run	↑
Patent Box	Medium	Medium	Negative	n/a	↑

"Demand"

Source: Bloom, Van Reenen and Williams (2019, *Journal of Economic Perspectives*)

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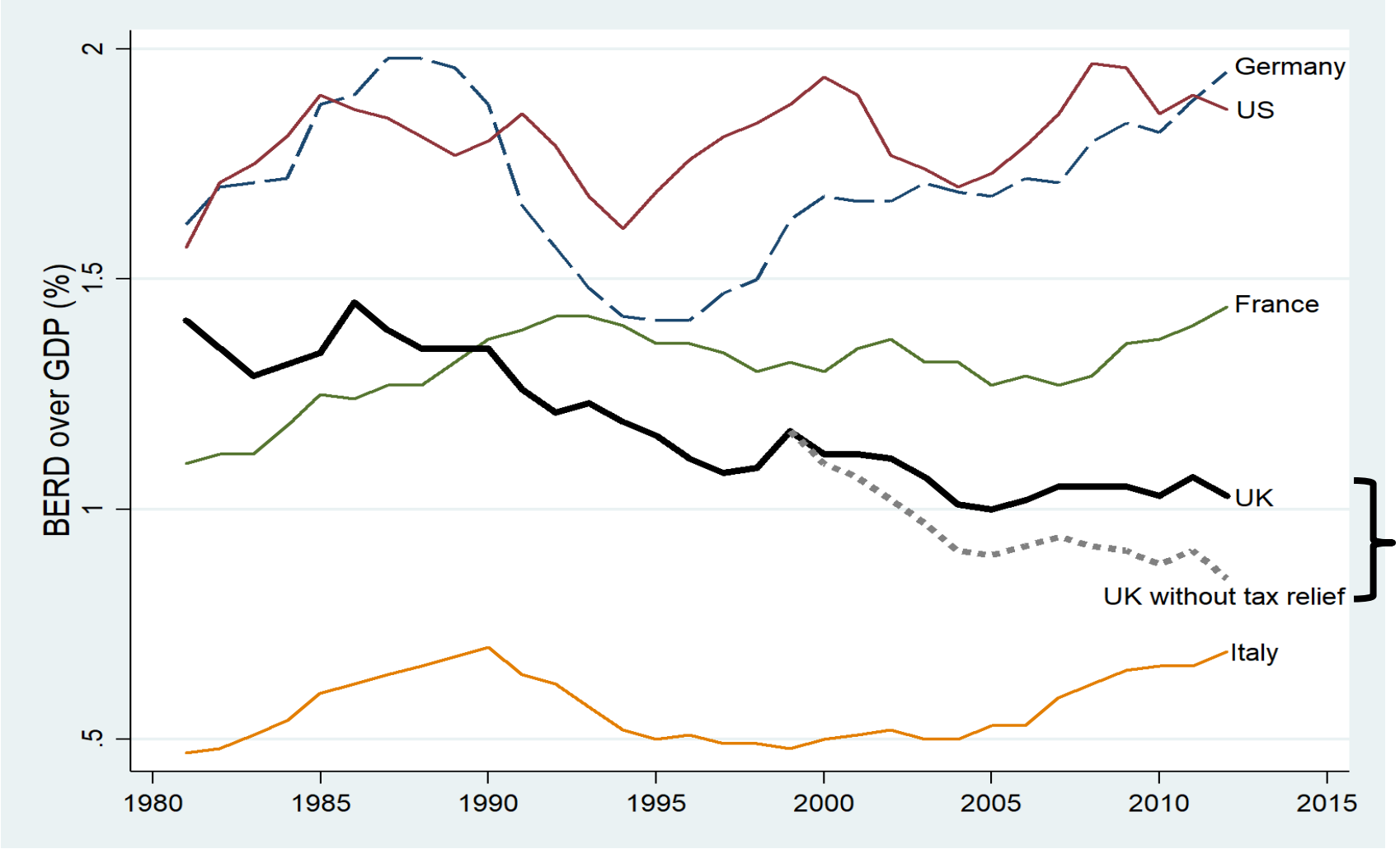
Patent Box	Medium	Medium	Negative	n/a	↑
Skilled Immigration	High	High	💡💡💡	Short to Medium-Run	↓
Universities: incentives	Medium	Low	💡	Medium-Run	↑
Universities: STEM Supply	Medium	Medium	💡💡	Long-Run	↓
Exposure Policies	Medium	Low	💡💡	Long-run	↓
Trade and competition	High	Medium	💡💡	Medium-Run	↑

"Demand"

"Supply"

Source: Bloom, Van Reenen and Williams (2019, *Journal of Economic Perspectives*)

Example: UK Business R&D/GDP ratio about 13% higher due to R&D tax policy

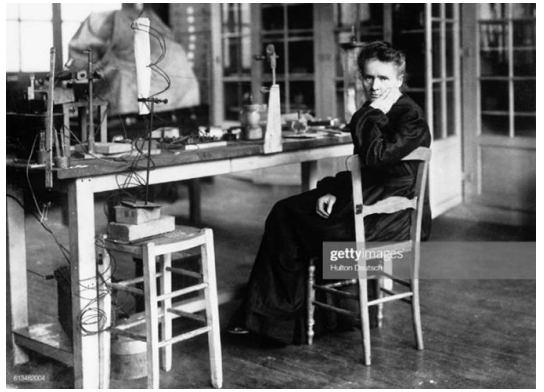


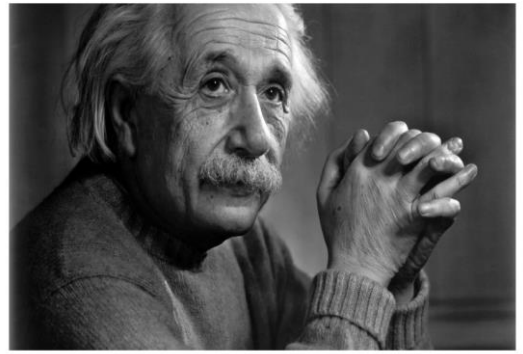
Source: Dechezleprêtre, Einiö, Martin, Nguyen and Van Reenen (2022). **Note:** The data is from OECD MSTI. The dotted line ("UK without tax relief") is the counterfactual R&D intensity in the UK that we estimate in the absence of the R&D Tax Relief Scheme.

Innovation Policies II: Human Capital

- R&D tax credits
- Direct government grants
- **Human capital supply**
  - Problem with tax and grants is that they subsidize *demand*. If supply side inelastic, the effect is to just drive up price of R&D (scientist wages) rather than volume of R&D
  - Increasing human capital more effective: directly increases innovation and reduces cost of R&D (reduces inequality)
- Competition and trade policy

Successful Innovation Policies II





- R&D tax credits
- Direct government grants
- **Human capital supply**
  - Expanding STEM workforce
  - Universities
  - Immigration
  - **“Lost Einsteins & Marie Curies”:** Few women, minorities & kids from low-income families in inventor pool = big loss of talent (Bell, Chetty, Jaravel, Petkova & Van Reenen, 2019a,b)
- Competition and trade policy

OUTLINE OF TALK

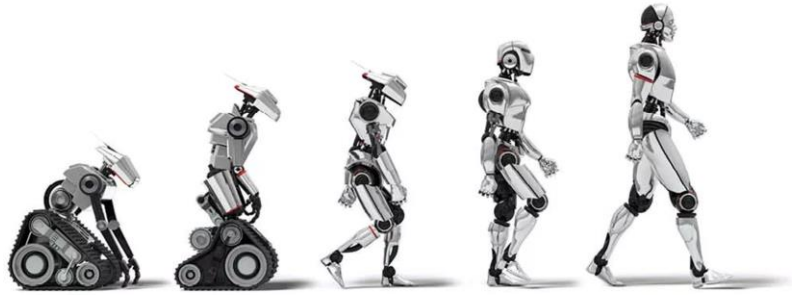
Threats and Opportunities

Productivity:

1. Innovation Policies
2. **Diffusion Policies**

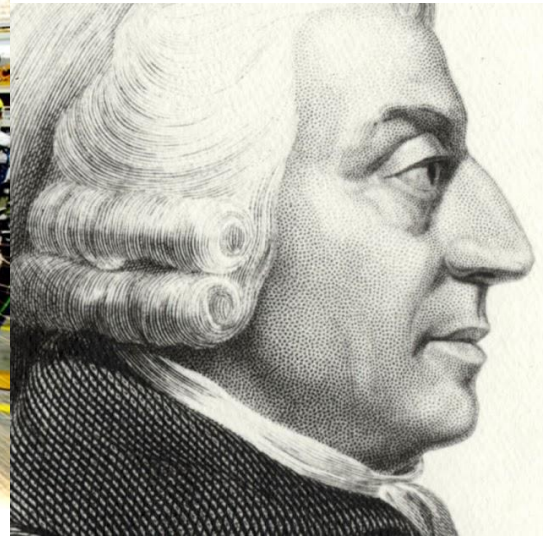
Two fundamental aspects of diffusion

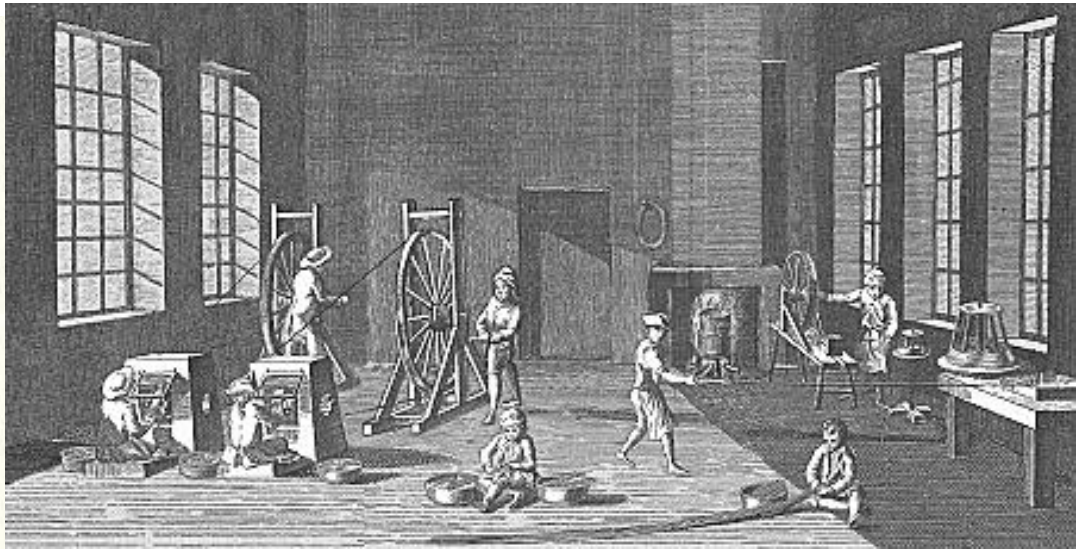
- **Technology**



- **Management practices**

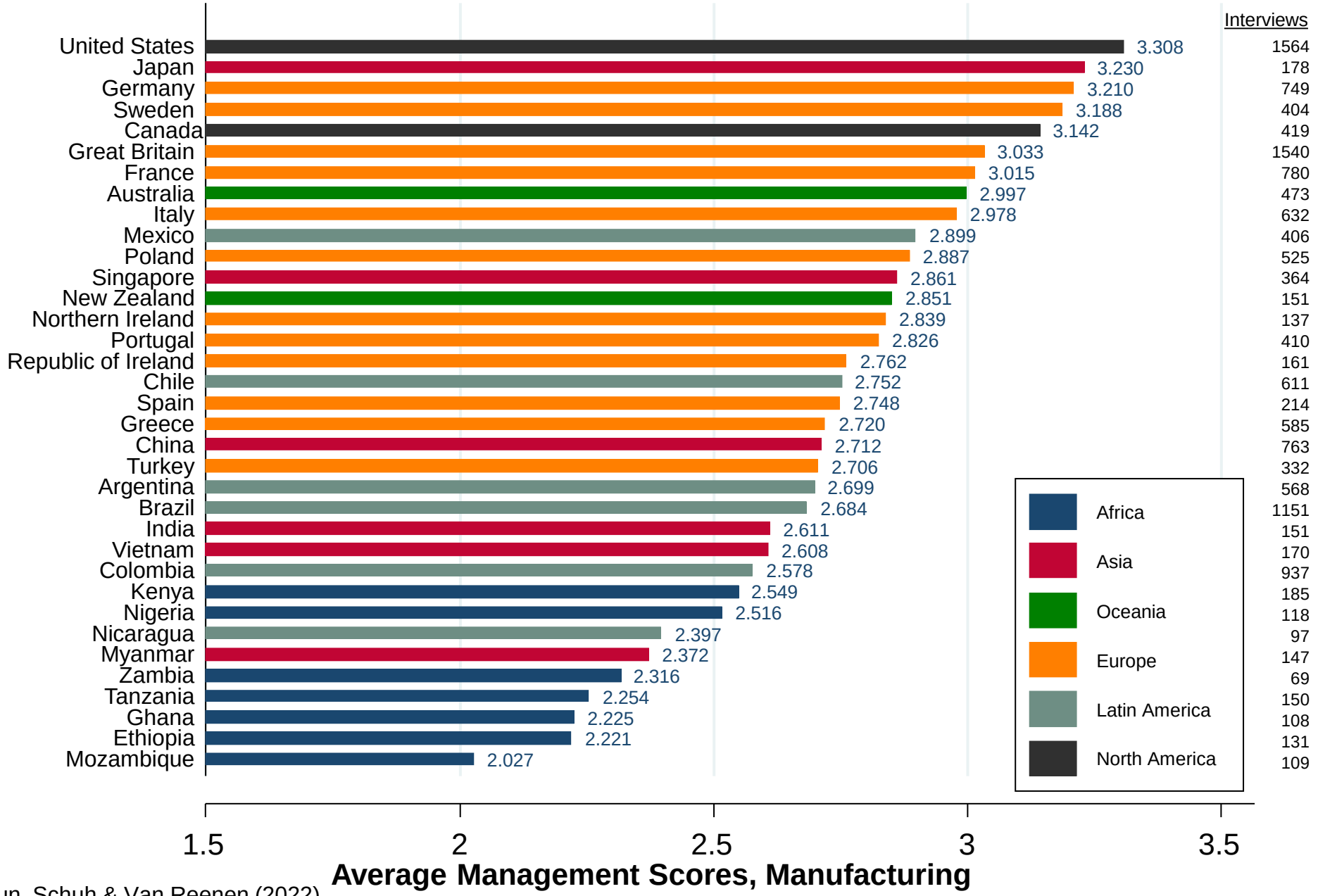
Toyota Plant





Adam Smith and the Pin Factory

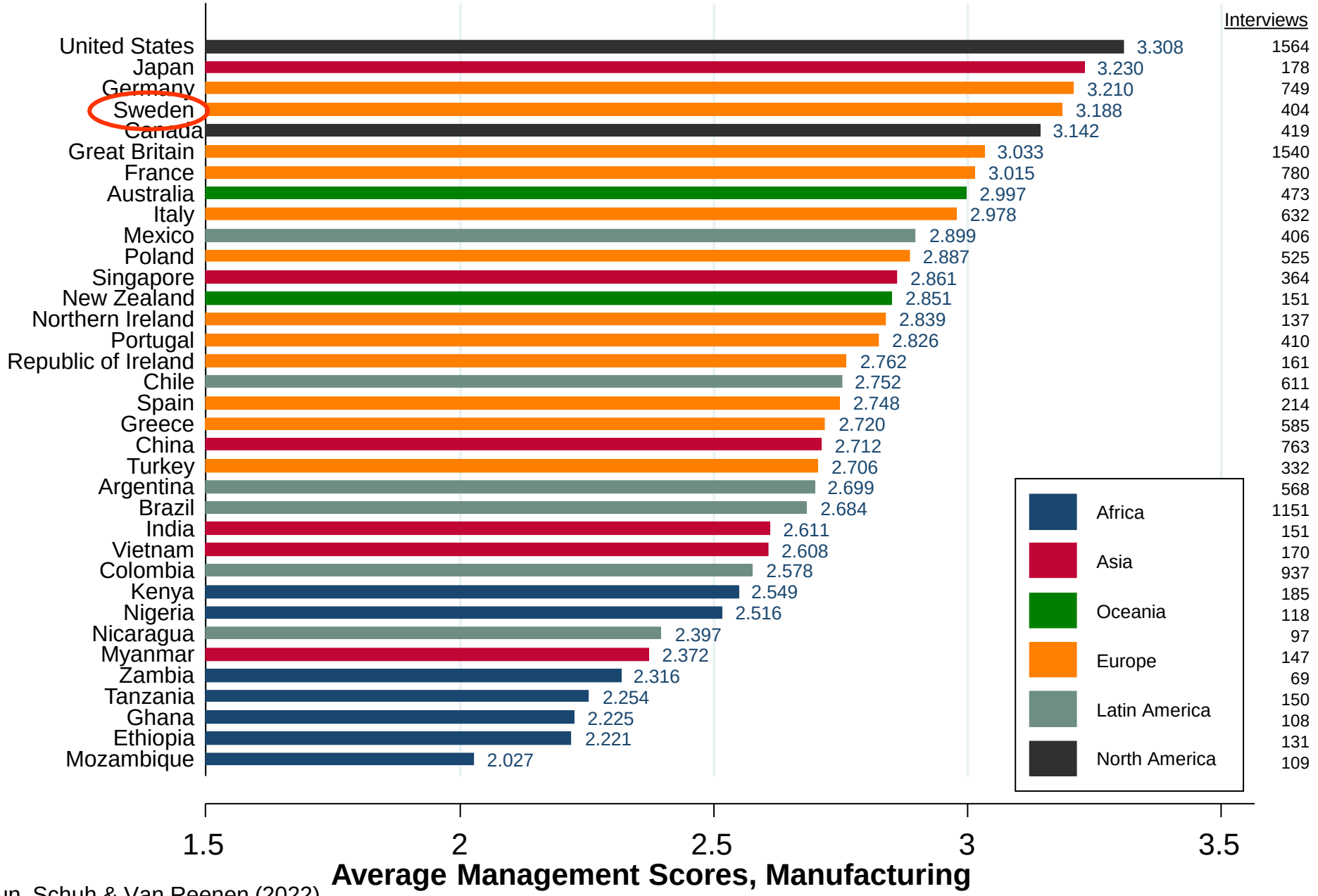
Average Management Scores by Country



Source: Bloom, Sadun, Schuh & Van Reenen (2022).

Note: Unweighted average management scores; # interviews in right column (total = 15,489); all waves pooled (2004-2014)

Average Management Scores by Country



Source: Bloom, Sadun, Schuh & Van Reenen (2022).

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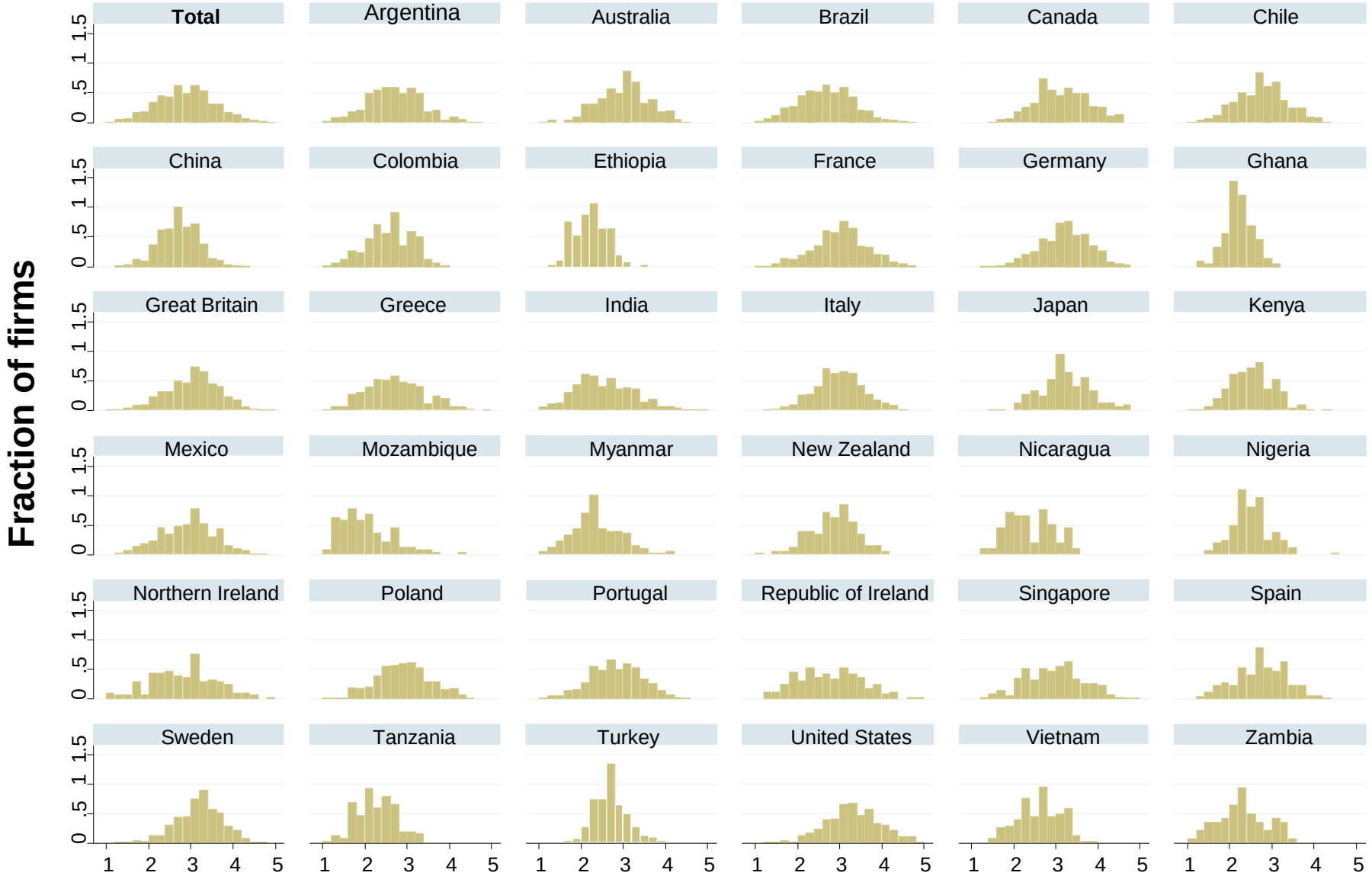
Management also varies heavily within countries



Source: Scur, Sadun, Van Reenen, Lemos and Bloom (2021)

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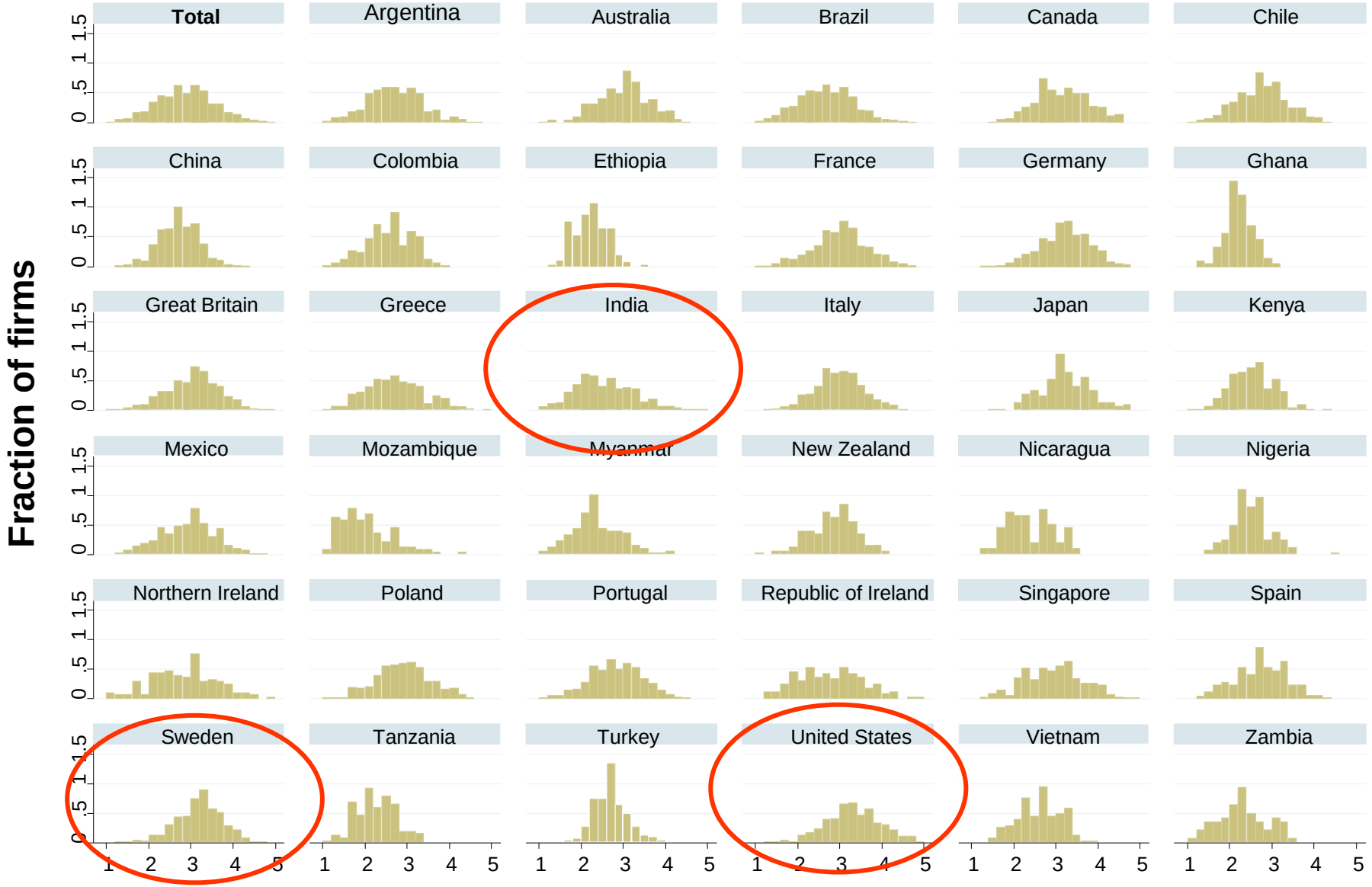
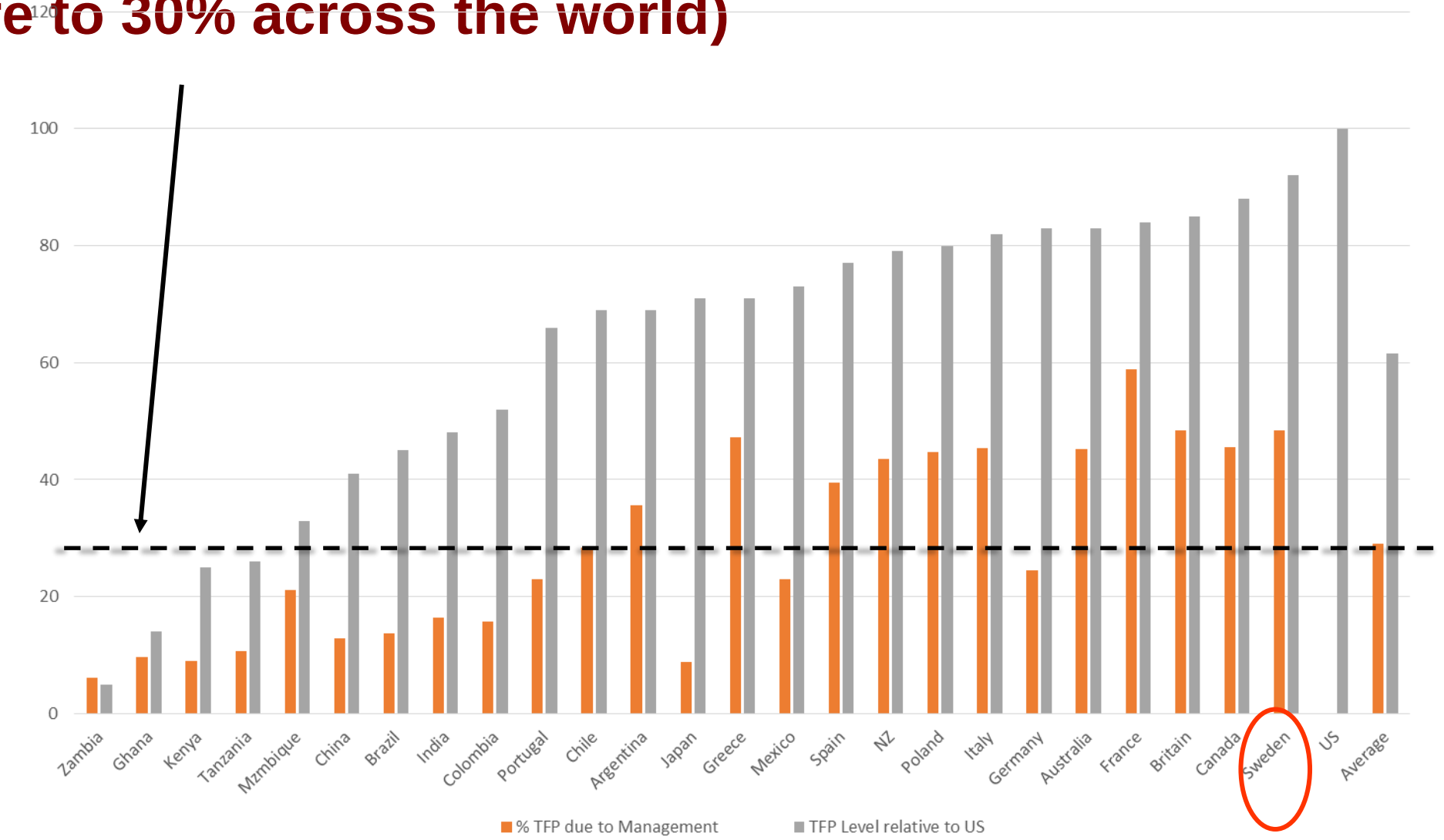


Source: Scur, Sadun, Van Reenen, Lemos and Bloom (2021)

About half of Swedish-US TFP gap is related to management (compare to 30% across the world)



Source: Bloom, Sadun & Van Reenen "Management as a Technology"

Notes: TFP gaps from Penn World Tables; fraction accounted for by management uses the weighted average management scores and an assumed 10% impact of management on TFP

Management policies Toolkit

L = Low; Not politically easy
M = medium
H = Highly possible

Policy type	Strength of evidence	Policy Net benefit (out of 5)	Difficulty of implementation	Time frame
Structural				
Competition	H		M	medium
Trade and FDI	H		L	medium
Education	M		M	long
Deregulation	M		L	medium
Governance	M		M/L	long
Direct				
Training - consulting	H		H	short
Training - formal classroom	M		H	medium
Information/benchmarking	L/M		H	medium

Source: Scur, Sadun, Van Reenen, Lemos & Bloom (2021)

OUTLINE OF TALK

Threats and Opportunities

Productivity

Climate Change

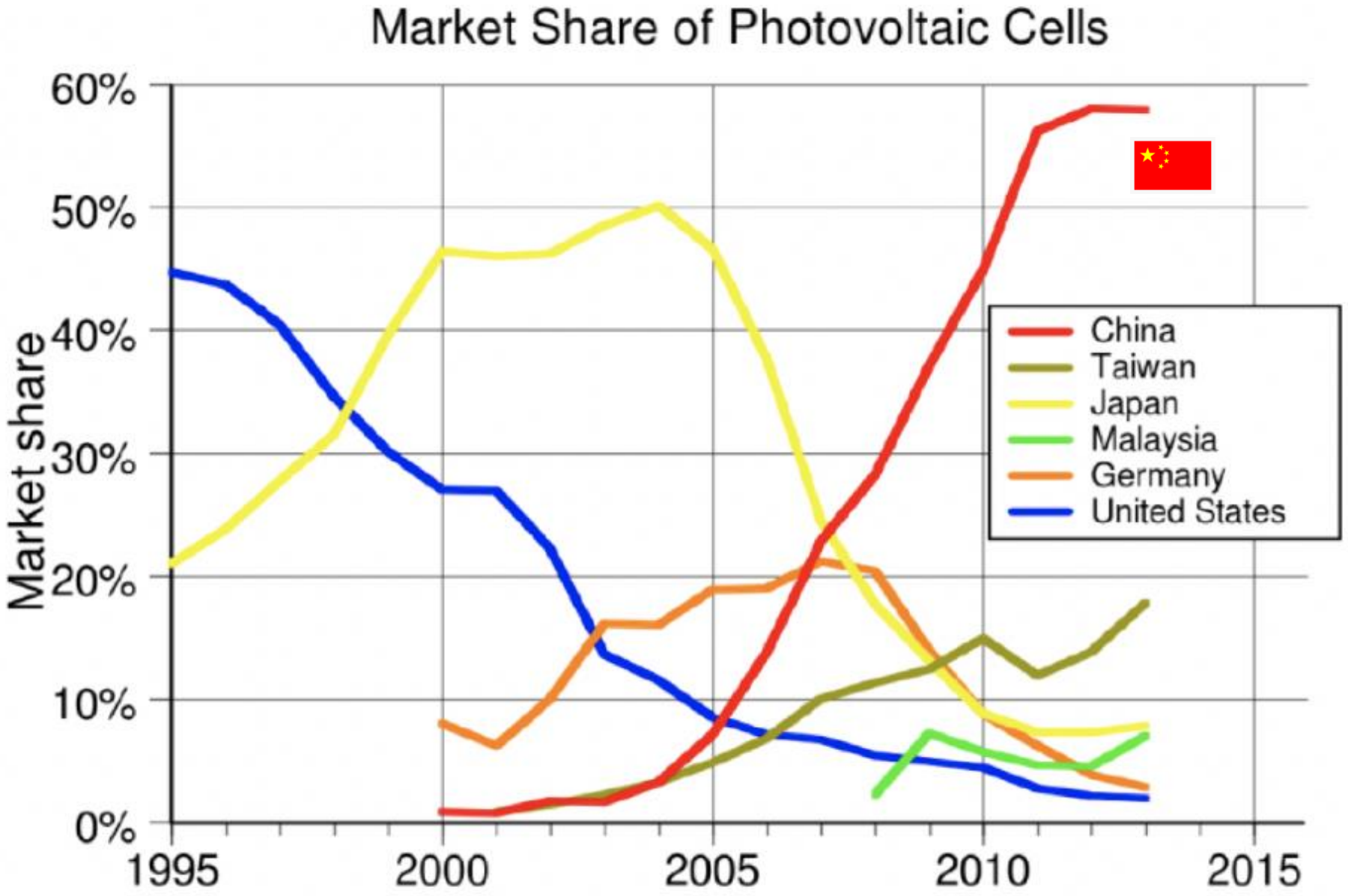
The Political Challenge

Climate Change policies

- All countries want to see global emissions fall, but incentive is to free-ride off the efforts of others
- Need green innovation as carbon tax + regulation insufficient (even if politically feasible)
- Can policy direct this kind of technical change? e.g. Acemoglu et al (2012, 2016, 2022): energy; Aghion et al (2016): vehicles
- Can industrial policy benefit a country as well as world?
  - Burgess and Van Reenen (2022): "**Solar"**

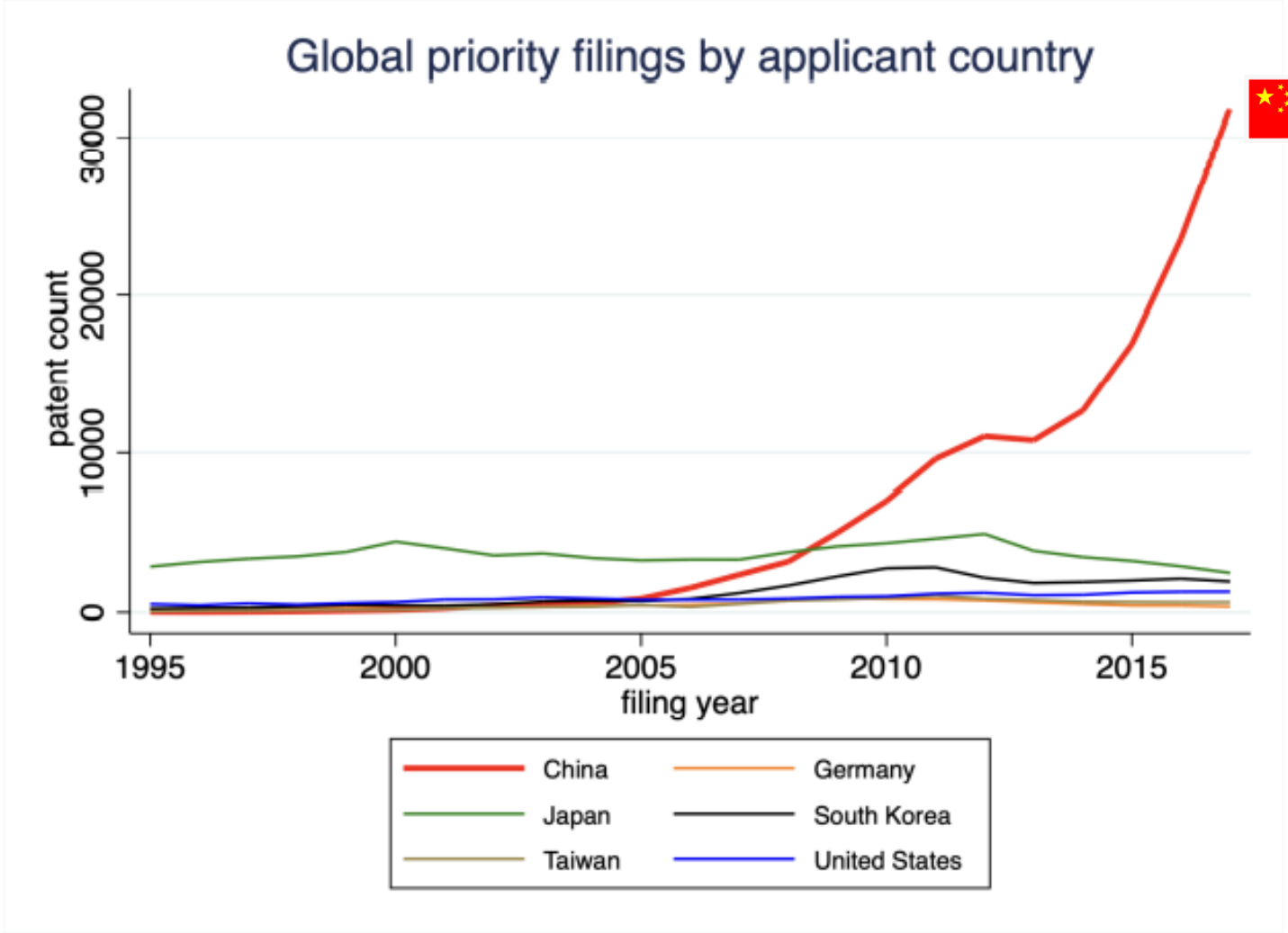
Some Good news: The rapidly falling cost of solar energy

Rapid Growth in importance of China in Solar Production



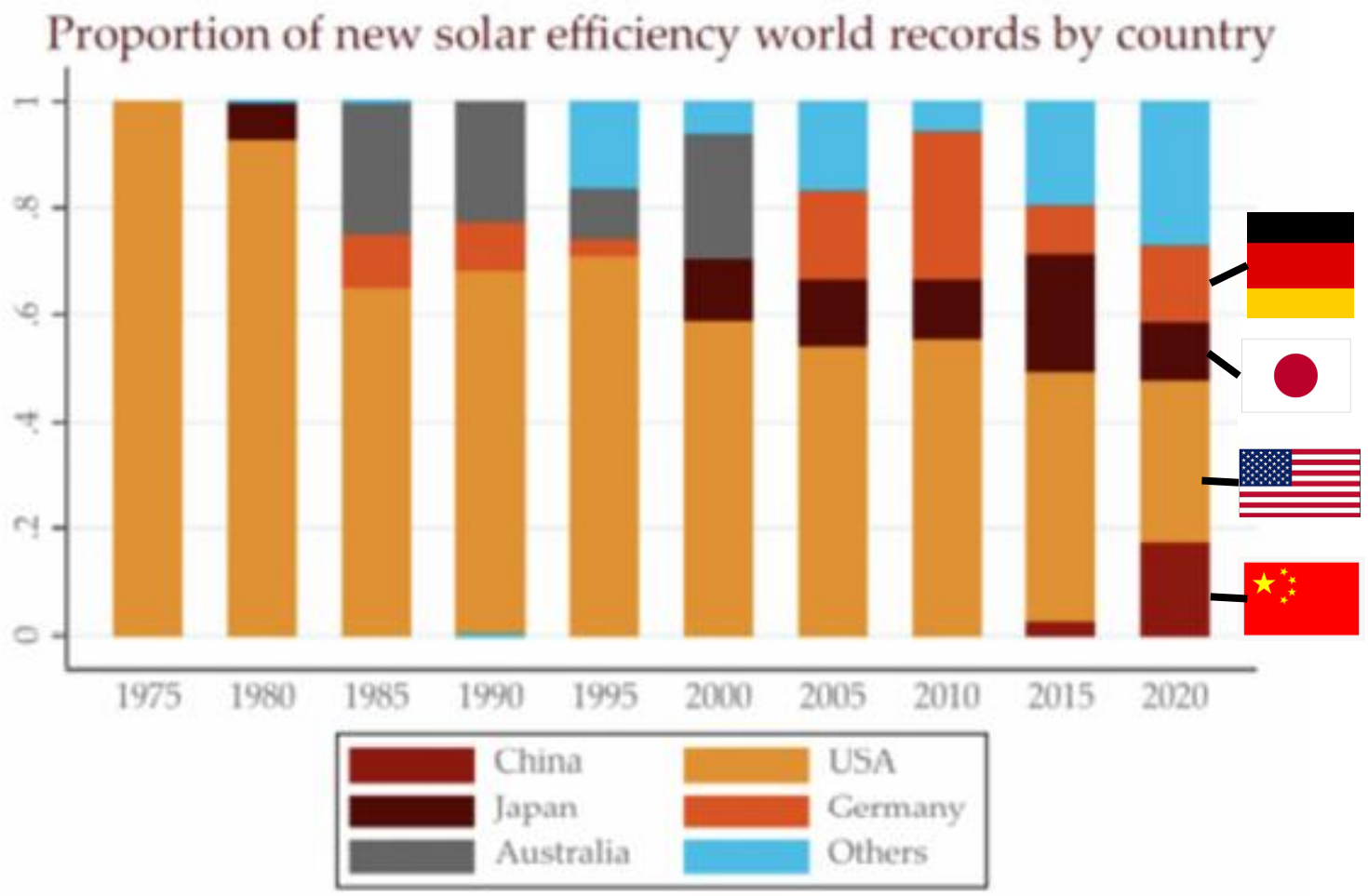
Source: World's largest solar PV producers: China, Taiwan, US, Japan, Germany, & Malaysia (1995-2013). Data sources are IEA-PVPS and Earth Policy Institute

China is not just imitating: Also producing innovations



Source: PATSTAT database

China expanding presence at the Solar technology frontier



Data

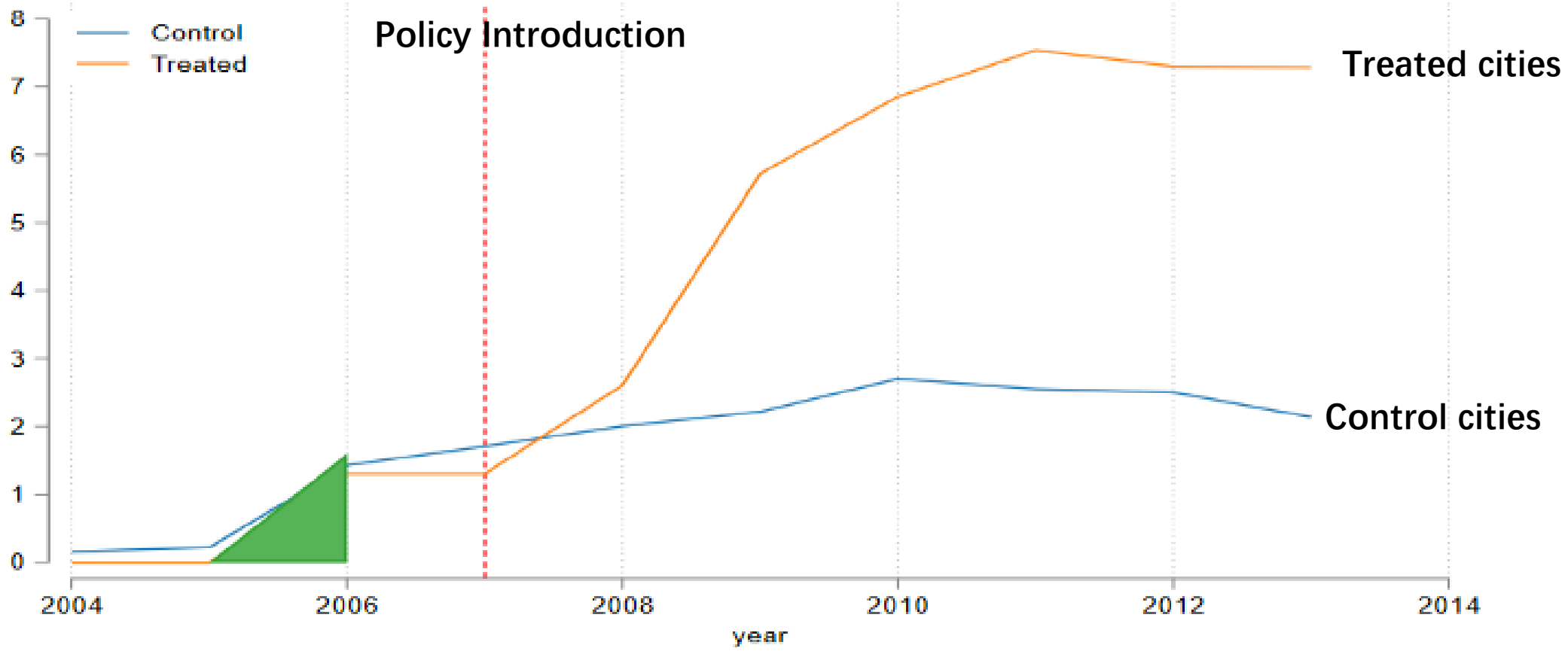
- Firm level **capacity, production, input** data from ENF & ASIE from 2004 on all solar firms (aggregated to city-year level); exports from Customs data

- **Solar patent data**: State Intellectual Property Office of China (SIPO) 2000 to 2019. Aggregated to city level

- **Policy data:** PKUlaw, All solar related policies from 2004 to 2021 at city, province and national levels

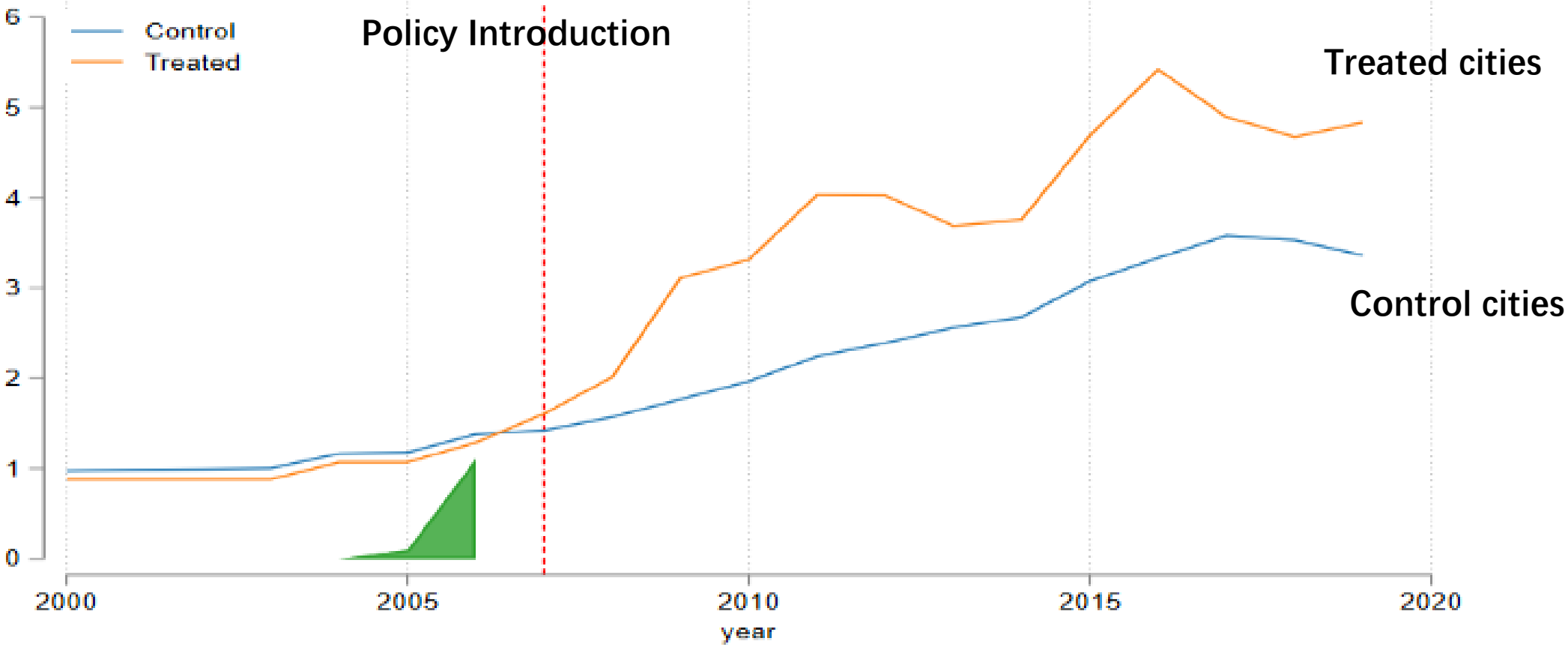
- **City level economic data**: population and GDP from the statistics yearbooks.

Increase in Total Solar Output after Chinese cities introduces a solar policy in 2007



Notes: Estimates of solar policies at city level using Synthetic Diff-In-Diffs (Arkhangelsky, Athey, Hirshberg, Imbens and Wager: SDID/AAHIW, 2021). Dependent variable is log(Solar Cell Capacity). No controls. 2007 treatment only. Green triangle shows weighting of pre-policy periods.

Increase in Patenting after a city is treated in 2007 (longer lags than than solar output), 2004-2019



Notes: Estimates of solar policies at city level using SDID (AAHIW, 2021). Dependent variable is asinh(Patent Count). No controls. 2007 treatment only

Implications

- Solar policies around the world influence innovation incentives (e.g. German feed-in tariffs in 2000s)
- Chinese Industrial policy massively increased supply, lowered prices and subsidized innovation
- If it benefited China as well as world, then suggests active industrial can help (e.g. US recent action under Biden)
- Lessons for other clean technologies: Wind, Hydrogen, etc.?

OUTLINE OF TALK

Threats and Opportunities

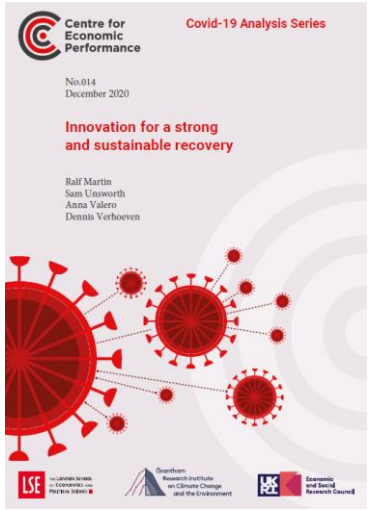
Productivity

Climate Change

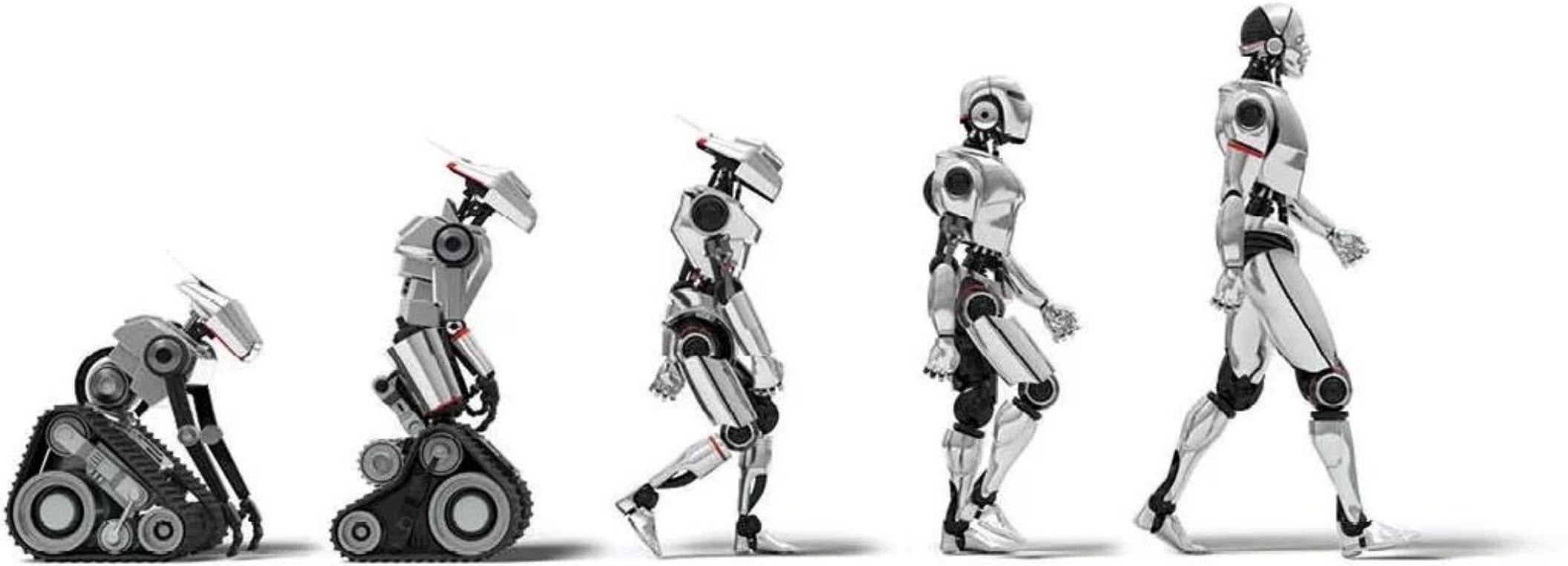
The Political Challenge

A New Marshall for Growth

- Big threats, but also opportunities for creative policies, especially around innovation
- We know much about what can be achieved evidence: e.g.:
  - *Structural* (**competition**, trade, skills, tax & subsidies; infrastructure, etc.)
  - *Direct* (e.g. management information and training)
- Country-specific plans based on best evidence:
  - Toolkits for innovation & management policy
- Bind together in a **mission**:
  - Climate Change; Defense; Healthcare



THANKS!



Some Further Reading (and viewing)

"Innovation Policies to Boost Productivity" (2020) Hamilton Policy Proposal 2020-13 https://www.hamiltonproject.org/assets/files/JVR_PP_LO_6.15_FINAL.pdf webinar

"A Toolkit of Policies to promote Innovation" (Nick Bloom, Heidi Williams and John Van Reenen), *Journal of Economic Perspectives* *(2019)* 33(3) 163–184 http://cep.lse.ac.uk/pubs/download/dp1634.pdf

"Why Do We Undervalue Competent Management" (Raffaella Sadun, Nick Bloom and John Van Reenen) *Harvard Business Review* (2017), September-October

"Measuring and Explaining Management practices across firms and nations" (Nick Bloom and John Van Reenen) *Quarterly Journal of Economics* (2007) 122(4), 1351–1408.

"Who Becomes an Inventor in America? The Importance of Exposure to Innovation" (Alex Bell, Raj Chetty, Xavier Jaravel, Neviana Petkova and John Van Reenen), http://cep.lse.ac.uk/pubs/download/dp1519.pdf Data *Quarterly Journal of Economics* (2019)134(2) 647–713, New York Times Vox Atlantic Fortune Conversation VoxUS Economist VC Centrepiece INET

"OPENing up Military Innovation: An Evaluation of Reforms to the U.S. Air Force SBIR Program" (Sabrina T. Howell, Jason Rathje, John Van Reenen and Jun Wong), Vox 2021 https://poid.lse.ac.uk/textonly/publications/downloads/poidwp004.pdf

"The Intellectual Spoils of War: Defense R&D, Productivity and Spillovers" (Enrico Moretti, Claudia Steinwender and John Van Reenen) http://cep.lse.ac.uk/pubs/download/dp1662.pdf Vox

Further reading

- "The World Management Survey at 18" (Scur, Sadun, Van Reenen, Lemos & Bloom, 2021), *Oxford Review of Economic Policy* https://poid.lse.ac.uk/textonly/publications/downloads/poidwp002.pdf

- World Management Survey http://worldmanagementsurvey.org/

- "Increasing Difference Between Firms" *Changing Market Structures and Implications for Monetary Policy*, Jackson Hole Symposium (Van Reenen, 2018) 19-65 http://cep.lse.ac.uk/pubs/download/dp1576.pdf NYT NPR

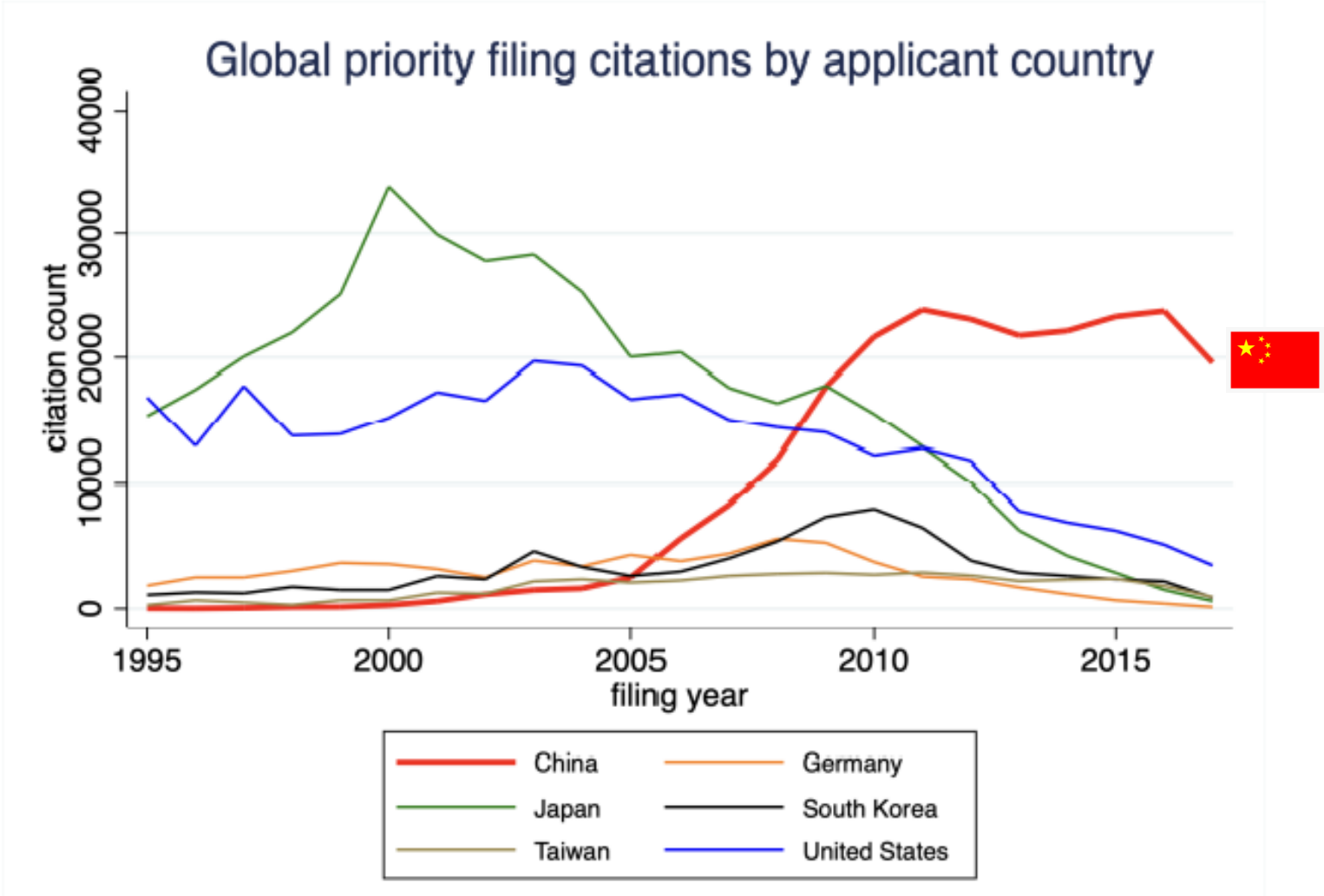
- LSE Growth Commission Final Report (Aghion et al, 2013)

http://www.lse.ac.uk/researchAndExpertise/units/growthCommission/documents/pdf/GCReportSummary.pdf

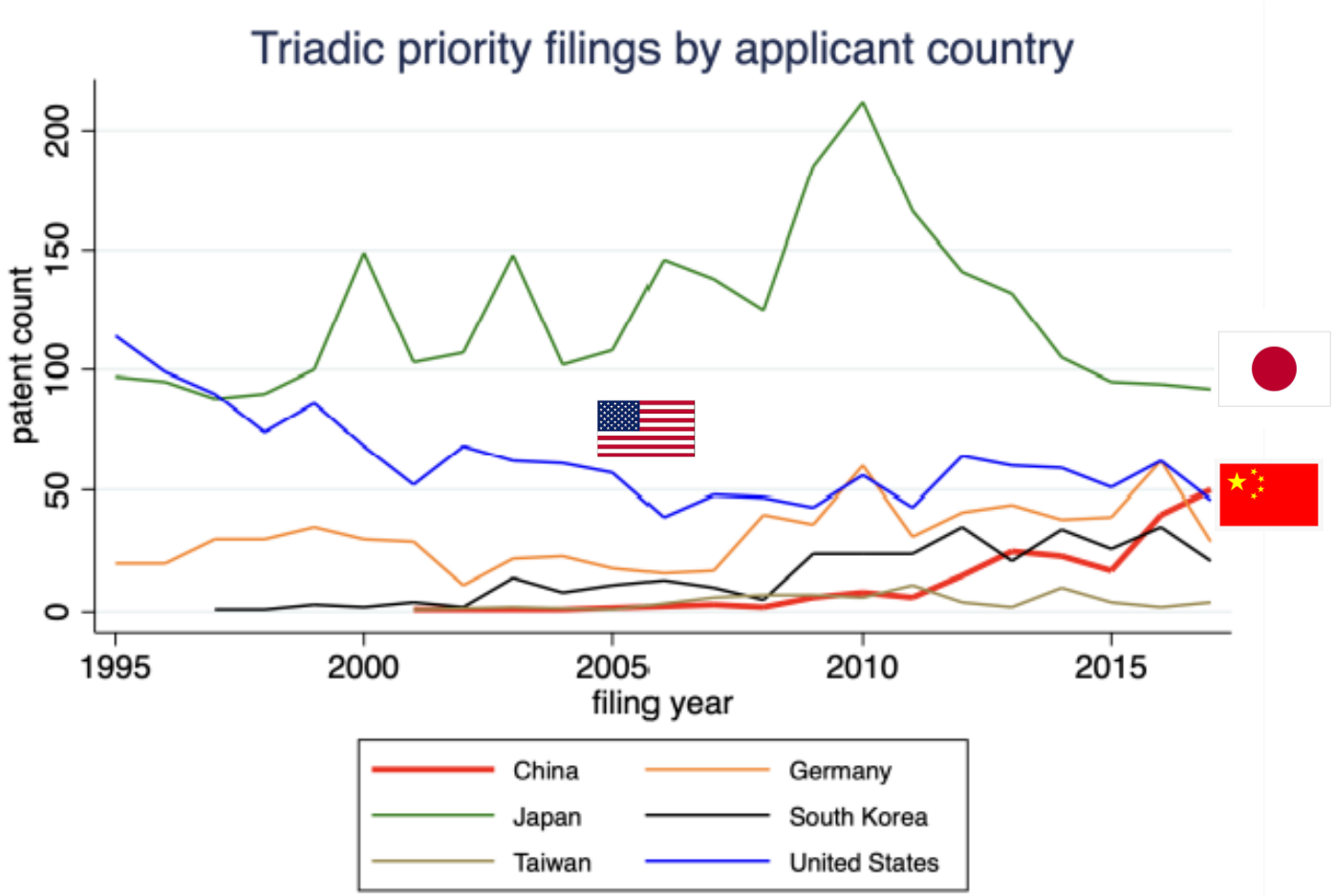
- "Management as a Technology" (Bloom, Sadun and Van Reenen, 2017): http://cep.lse.ac.uk/pubs/download/dp1433.pdf

- "Do Fiscal Incentives increase innovation? An RD Design for R&D" (Antoine Dechezlepretre, Elias Einio, Ralf Martin, Kieu-Trang Nguyen and John Van Reenen), CEP Discussion Paper 1413 Vox, http://cep.lse.ac.uk/pubs/download/dp1413.pdf

Still growth, but China's rise less dramatic weighting by future citations



Still growth, but China's rise less dramatic using Triadic Patents



Source: PATSTAT; Triadic patents = granted in USPTO, EPO and JPO