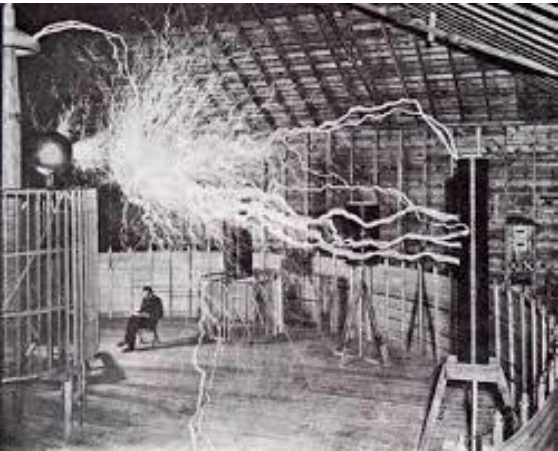


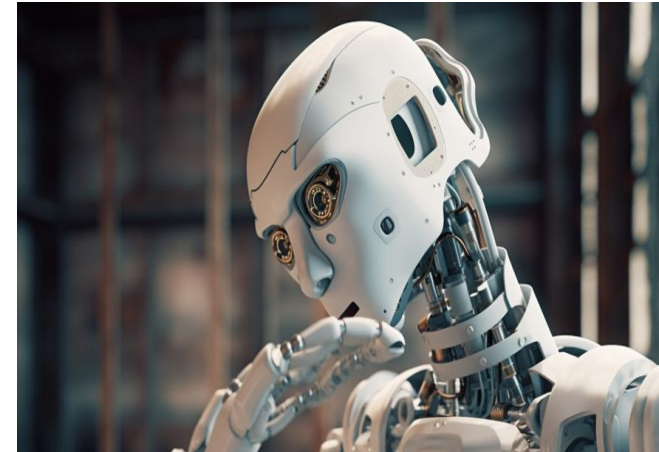
# Productivity, Innovation, and the Future of Growth



**John Van Reenen,**  
**LSE Ronald Coase School Professor**  
**Digital Fellow, MIT**

**Royal Economic Society**  
**Annual Conference 2026**

**Newcastle, July 8th 2026**



# Caveat Emptor

- In July 2024, I became Chair of the Council of Economic Advisers then Senior Adviser on growth to UK Chancellor Rachel Reeves
- Since April 2026, I have not been in government and speak solely in a personal capacity

# Outline: The Challenges

- **UK Growth**
- Climate Change: Cleaning up Innovation
- National Security: Defending Innovation
- Inequality: Finding the Lost Innovators
- AI: Managing Innovation
- Politics of Innovation Policy

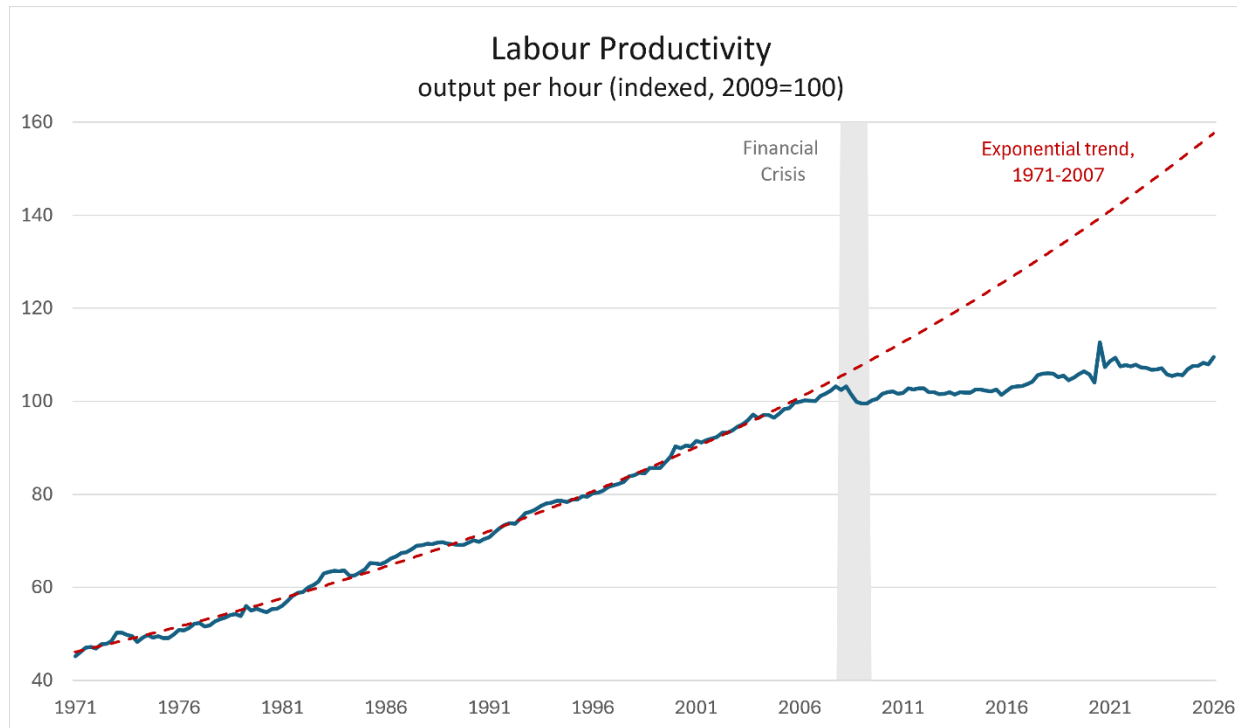
Philippe Aghion



# The Growth Challenge

# UK Productivity Growth: Post Financial Crisis Slowdown

## Labour Productivity (Output per hour)

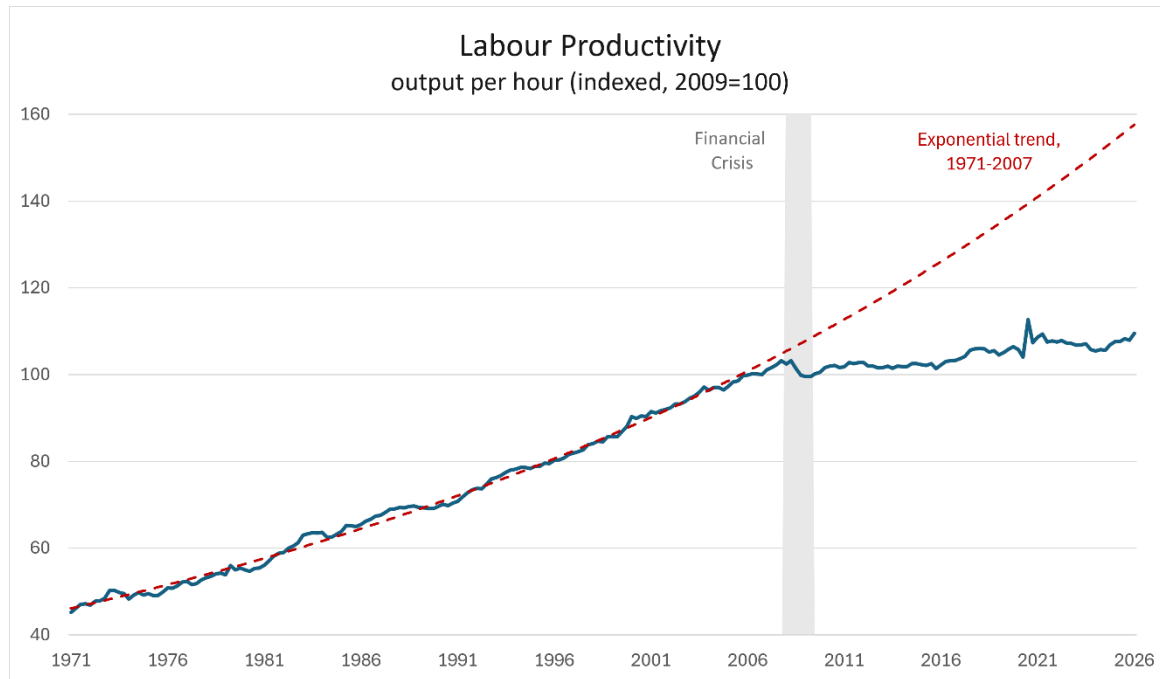


Productivity would be 44% higher based on pre-crisis trend

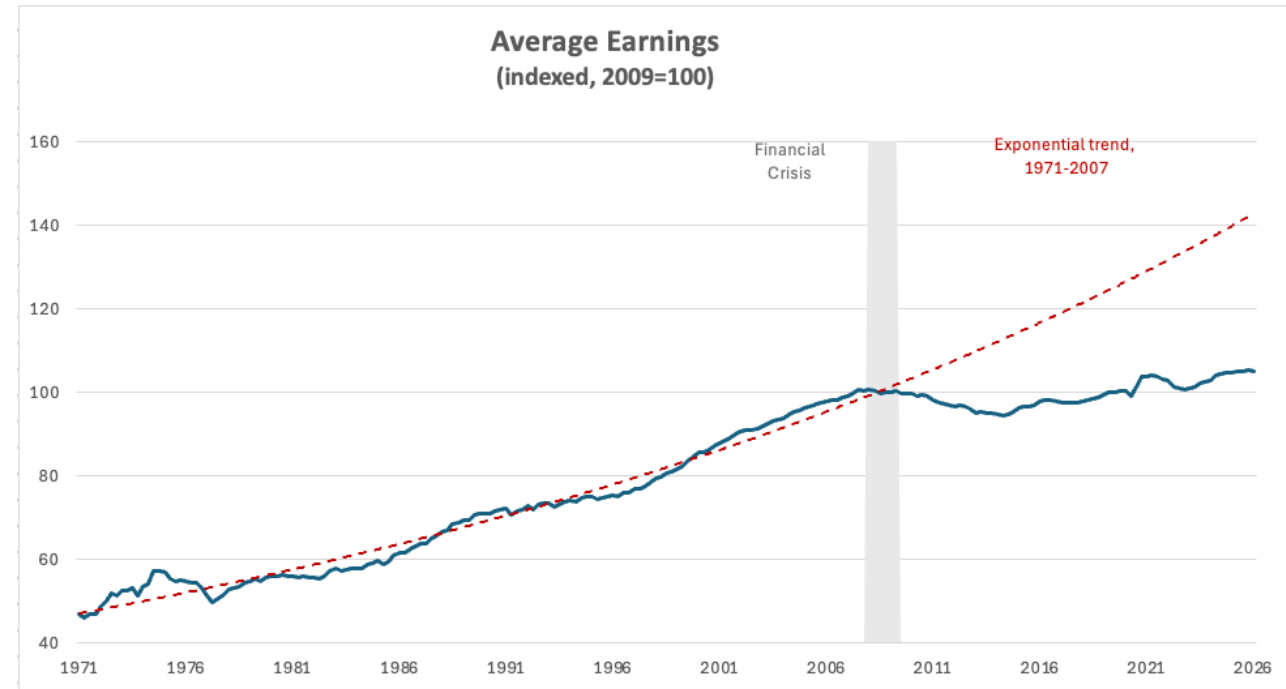
**Notes:** Authors' (CEP/POID) calculations using ONS data. Real terms, whole economy, seasonally adjusted. Productivity uses value added as numerator. RTI Employment and HMRC Self-Employed (with LFS hours adjustment) after 2015 & LFS workers before. Exponential trend. (2.3% annualised growth pre 2008 vs. 0.4% afterwards).

# Earnings follow Productivity Growth

## Labour Productivity (Output per hour)



## Average Weekly Earnings



**Notes:** Authors' (CEP/POID) calculations using ONS data. Real terms, whole economy, seasonally adjusted. Productivity uses value added as numerator. RTI Employment and HMRC Self-Employed (with LFS hours adjustment) after 2015 & LFS workers before. Exponential trend. (2.3% annualised growth pre 2008 vs. 0.4% afterwards). Average Weekly Earnings after 2000 and Average Earnings Index series before.

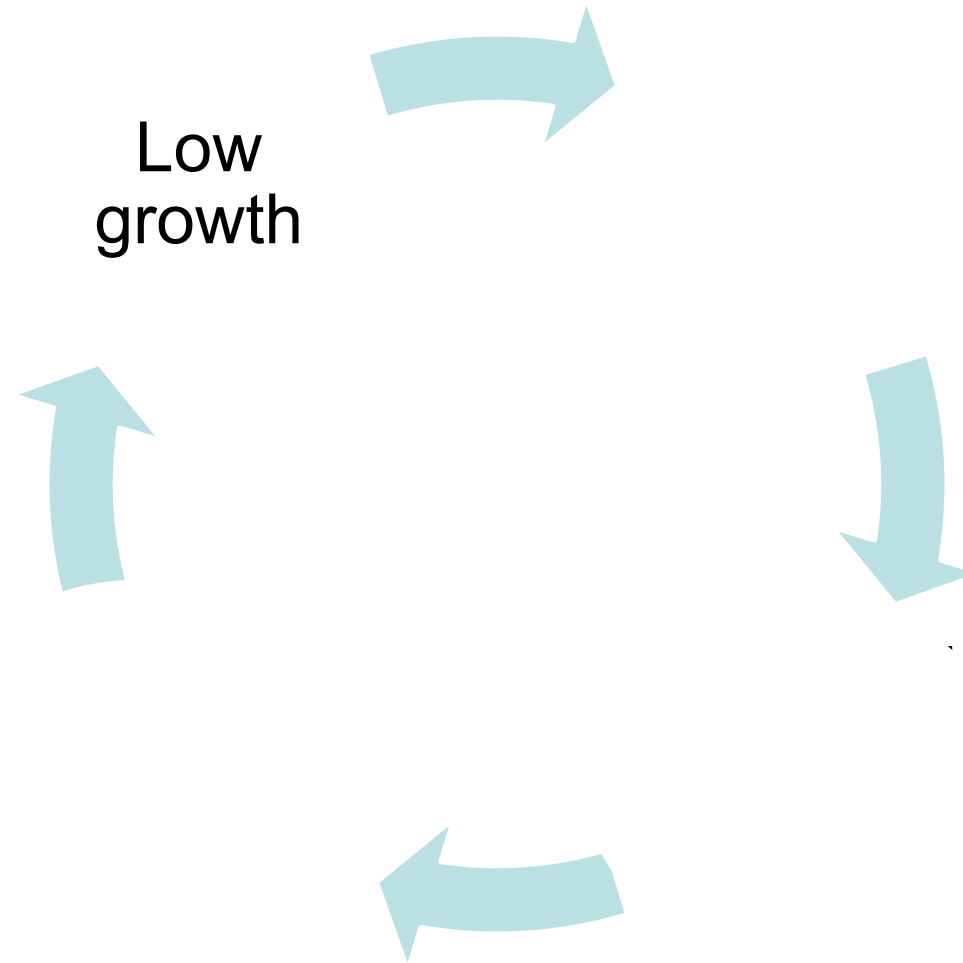
# Slow Productivity Growth a Global Problem

- Since the global financial crisis, growth has slowed across OECD
  - Productivity growth halved in Europe and in US
  - Better than the UK, but still pretty bad

|           | <b>Eurozone</b> | <b>US</b> |
|-----------|-----------------|-----------|
| 1995-2007 | 1.3%            | 2.2%      |
| 2010-2024 | 0.6%            | 1.1%      |

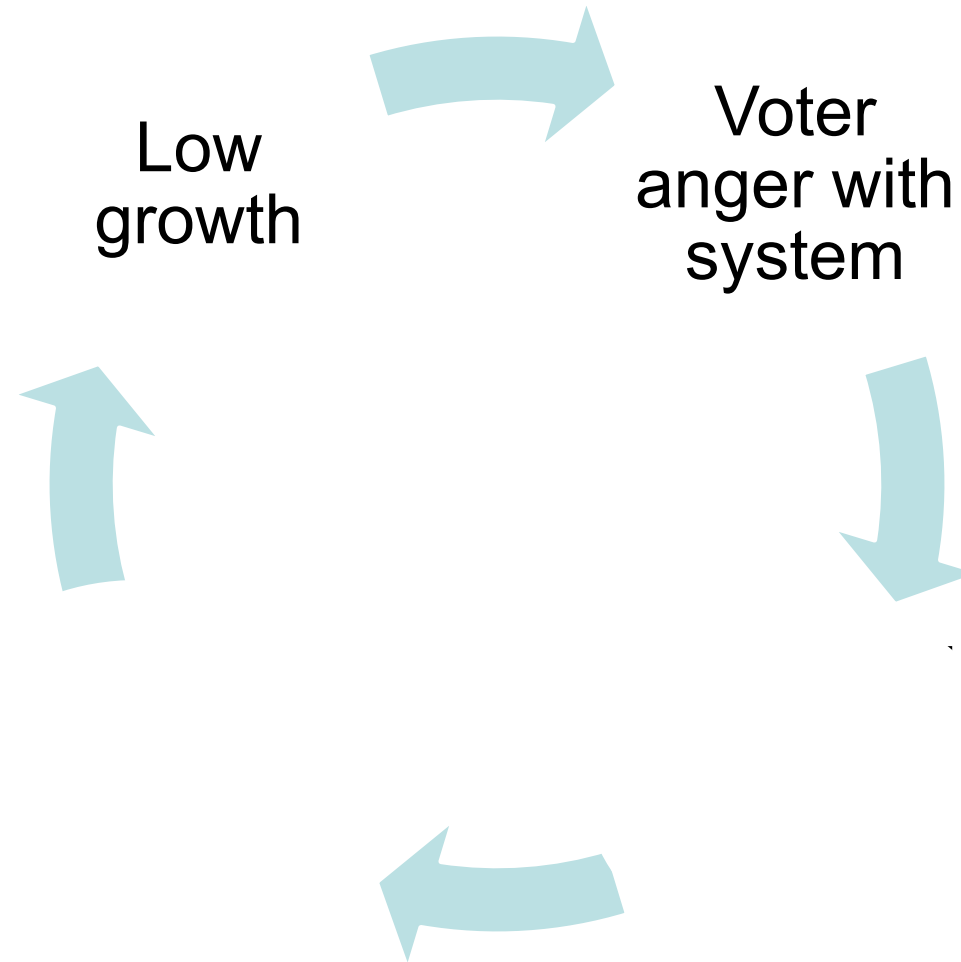
**Notes:** GDP per hour annual growth, Whole Economy, Bergeaud (2026)

# The Populist Policial Economy Doom Loop

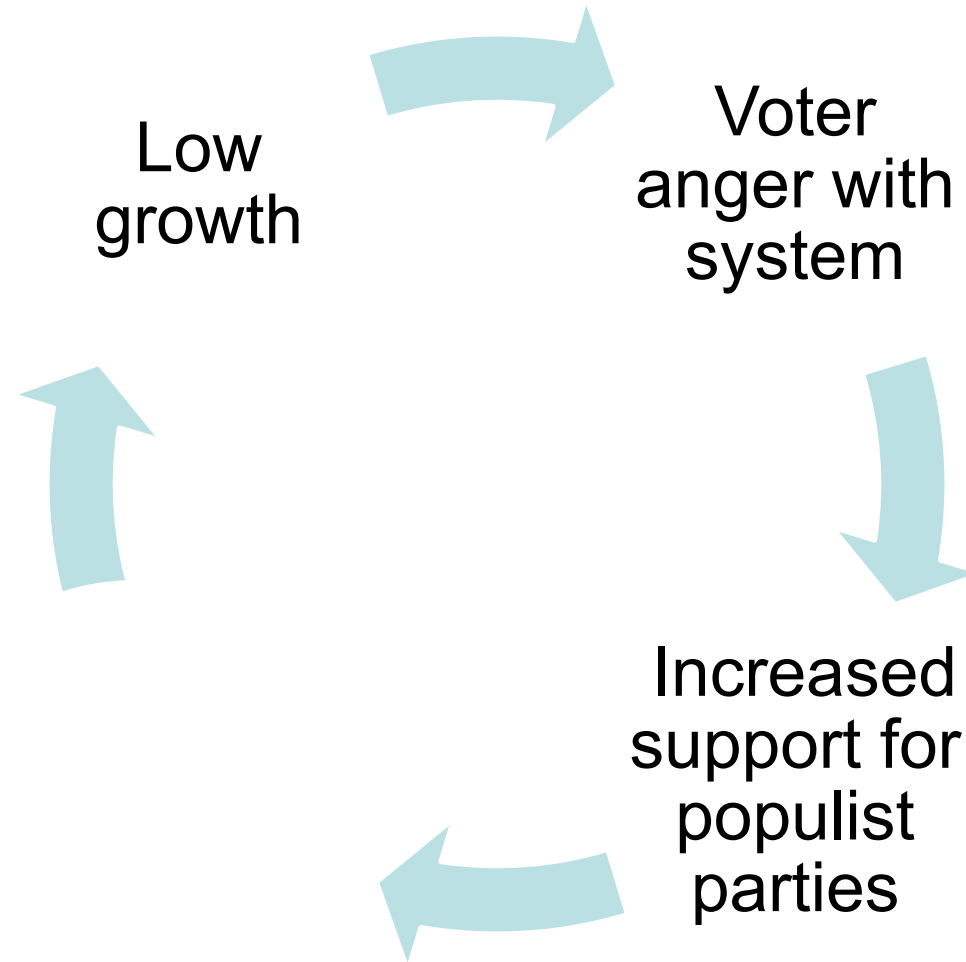




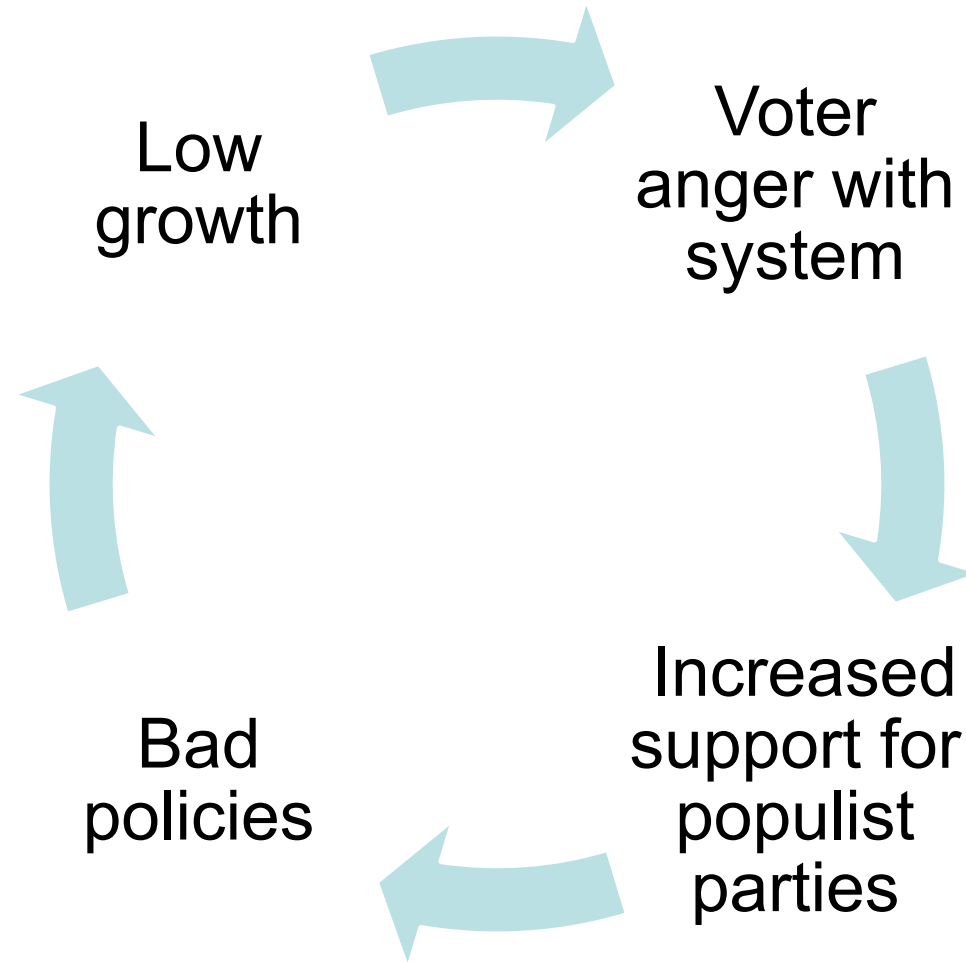
# The Populist Political Economy Doom Loop



# The Populist Political Economy Doom Loop

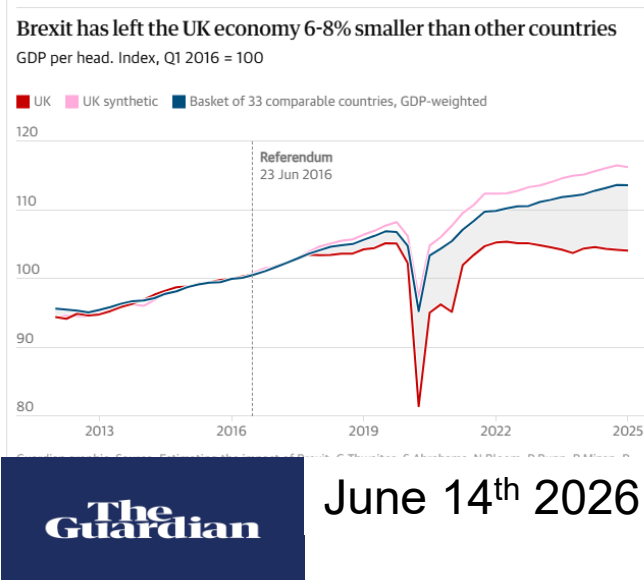


# The Populist Political Economy Doom Loop



# The Populist Policial Economy Doom Loop

## Case Study of Brexit



Low  
growth

Voter  
anger with  
system



Bad  
policies

Increased  
support for  
populist  
parties



# I won't say "I told you so", but.....

JOHN VAN REENEN  
*Massachusetts Institute of Technology*

## *Brexit's Long-Run Effects on the U.K. Economy*

 Brookings Institution Press

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Brexit's Long-Run Effects on the U.K. Economy

Author(s): JOHN VAN REENEN

Source: *Brookings Papers on Economic Activity*, (FALL 2016), pp. 367-383

Published by: Brookings Institution Press

**ABSTRACT** What will be the long-run economic effects of the United Kingdom's decision to leave the European Union—informally known as Brexit? Compared with remaining in the European Union, there will inevitably be higher trade costs with the rest of Europe, which accounts for about half of all U.K. trade. This will mean lower trade and foreign investment, and thus lower average U.K. incomes. These trade costs will arise from some combination of tariff and non-tariff barriers, and will be larger if there is a “hard Brexit,” whereby the United Kingdom would leave the Single Market and trade under World Trade Organization rules, rather than a “soft Brexit” option of staying in the Single Market (like Norway). Calculations using a standard multicountry, multisector, computable general equilibrium model show welfare losses of 1.3 to 2.6 percent, but dynamic models that incorporate productivity effects suggest that these could rise to 6.3 to 9.5 percent. Brexit's supposed benefits—such as lower immigration, better regulations, and more trade deals with non-EU countries—would do little or nothing to offset these losses. It seems unlikely that voters were fully aware of the magnitude of these costs at the time of the vote.

**We told you so!**

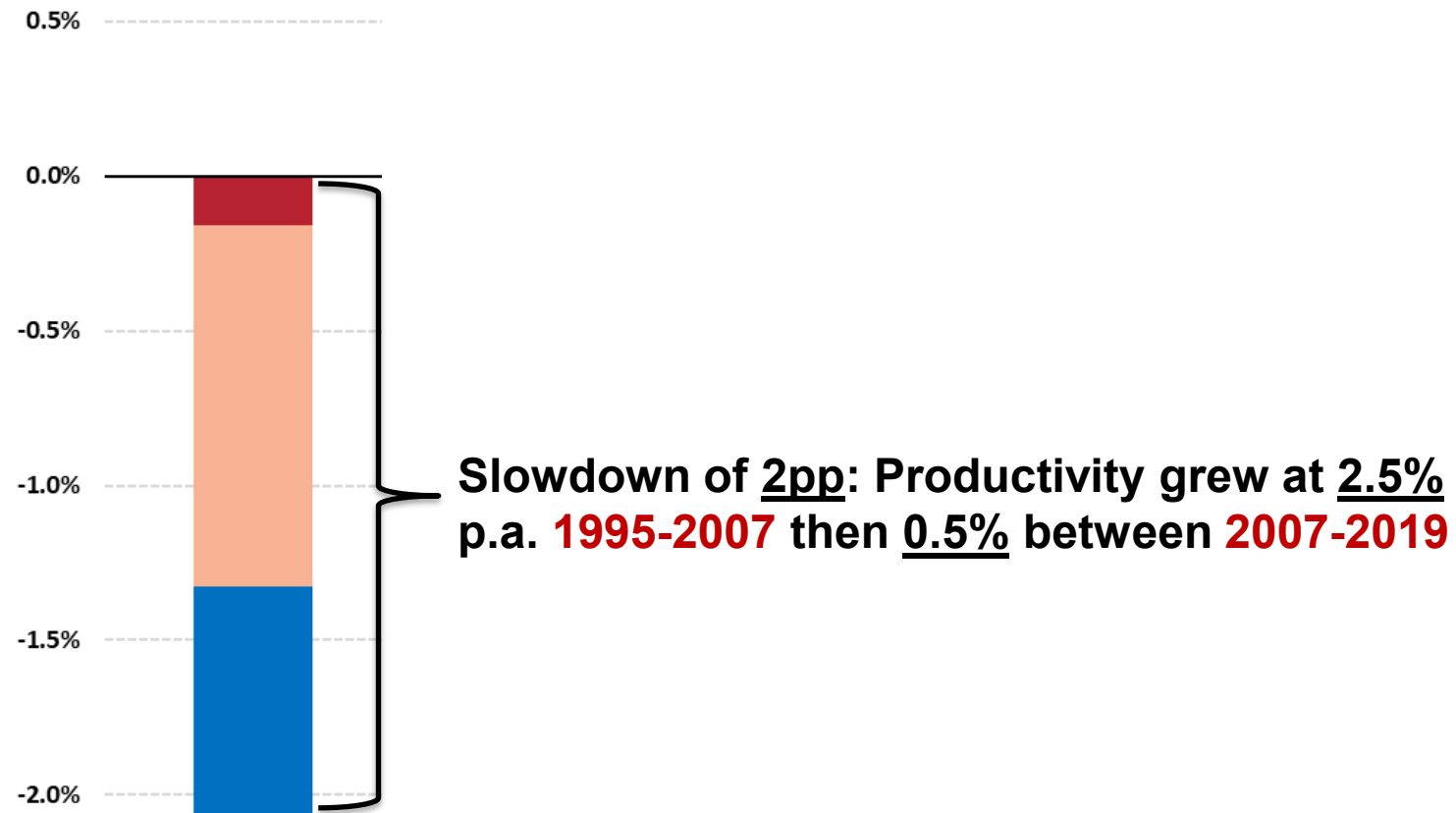
JOHN VAN REENEN  
*Massachusetts Institute of Technology*

## *Brexit's Long-Run Effects on the U.K. Economy*

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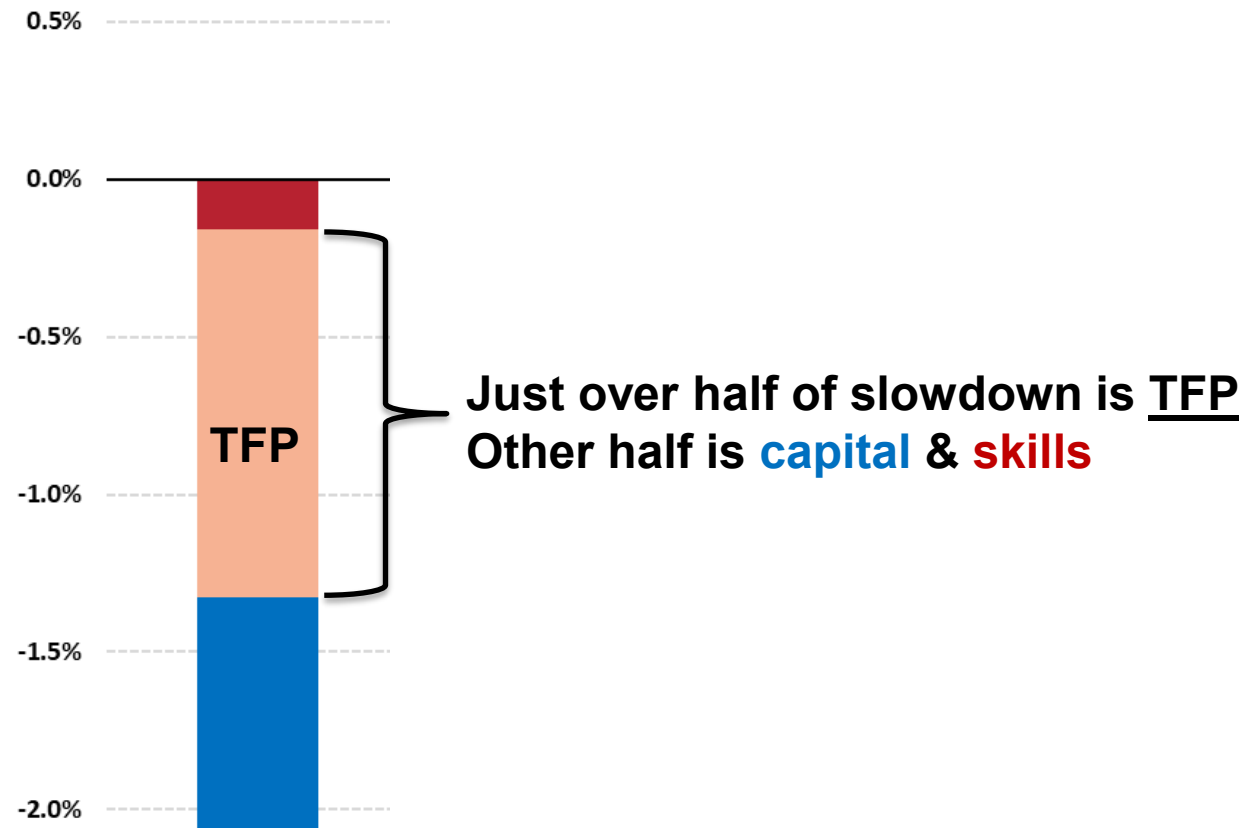
# Accounting for the slowdown in UK Productivity Growth pre vs. post Global Financial Crisis



**Note:** Comparison of market-economy GDP per hour growth 2019-2007 vs. 2007-1995. EUKLEMS & INTANProd 2023 release; OECD (2014) and other sources.

**Source:** Van Reenen and Yang (2024), [https://www.productivity.ac.uk/wp-content/uploads/2024/07/IPM\\_46\\_VanReenen.pdf](https://www.productivity.ac.uk/wp-content/uploads/2024/07/IPM_46_VanReenen.pdf)

# Accounting for the ~2pp per year slowdown in UK Productivity Growth after Global Financial Crisis

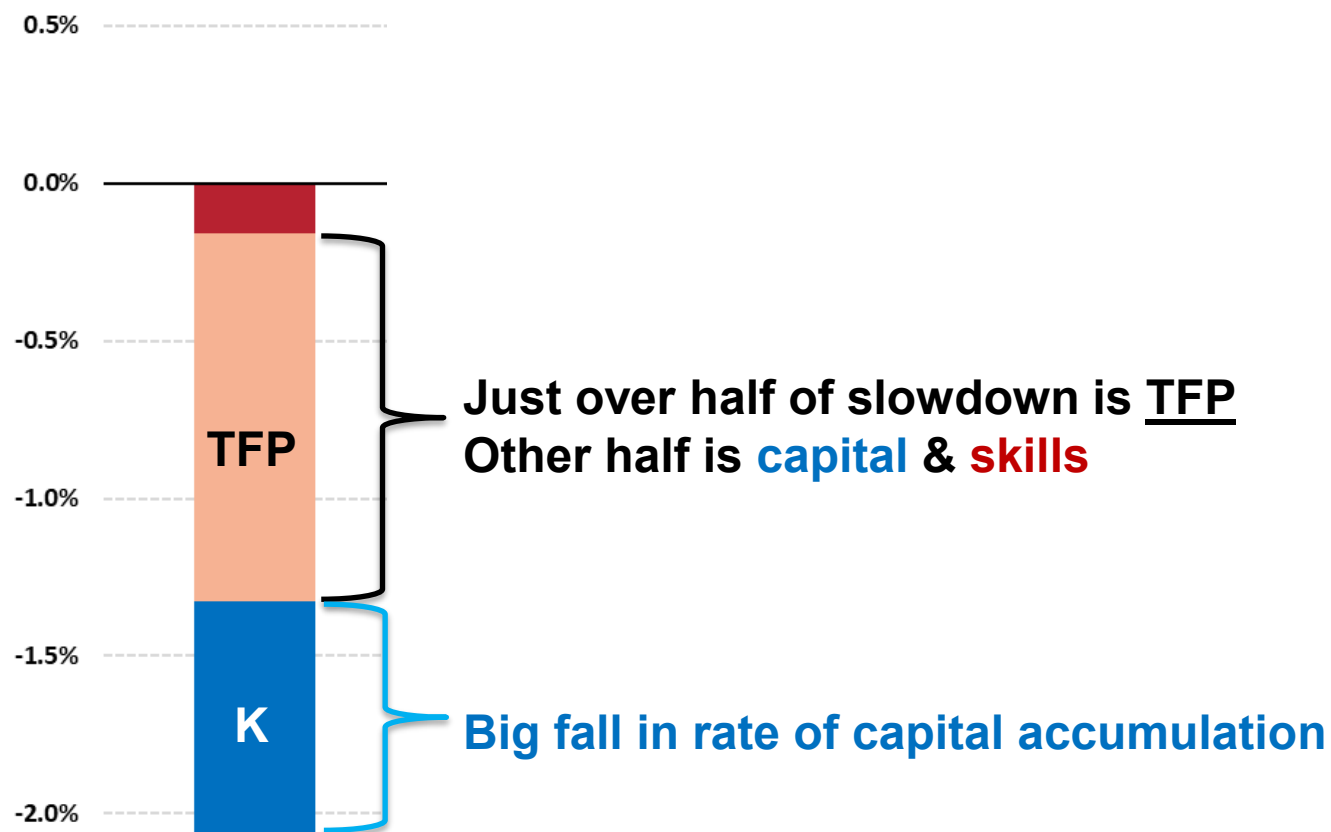


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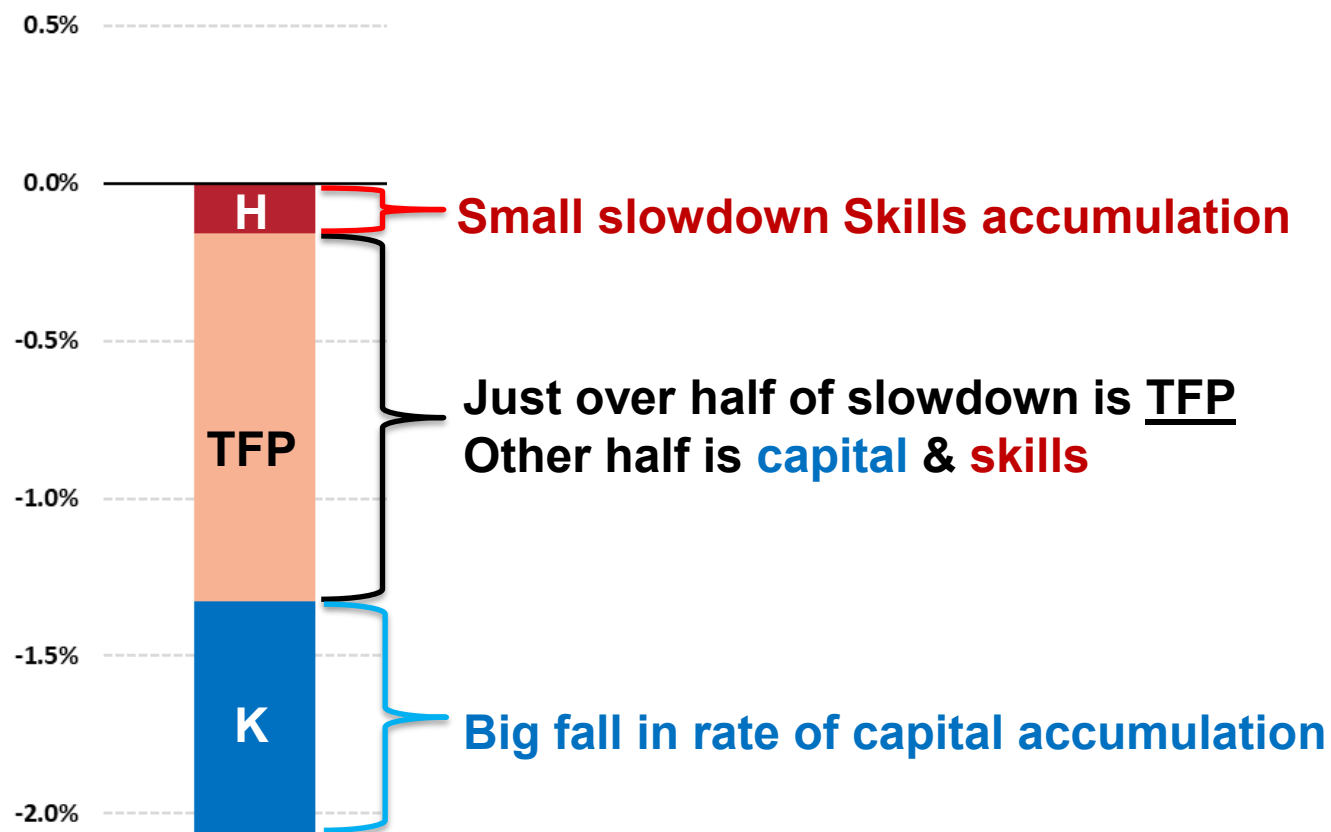
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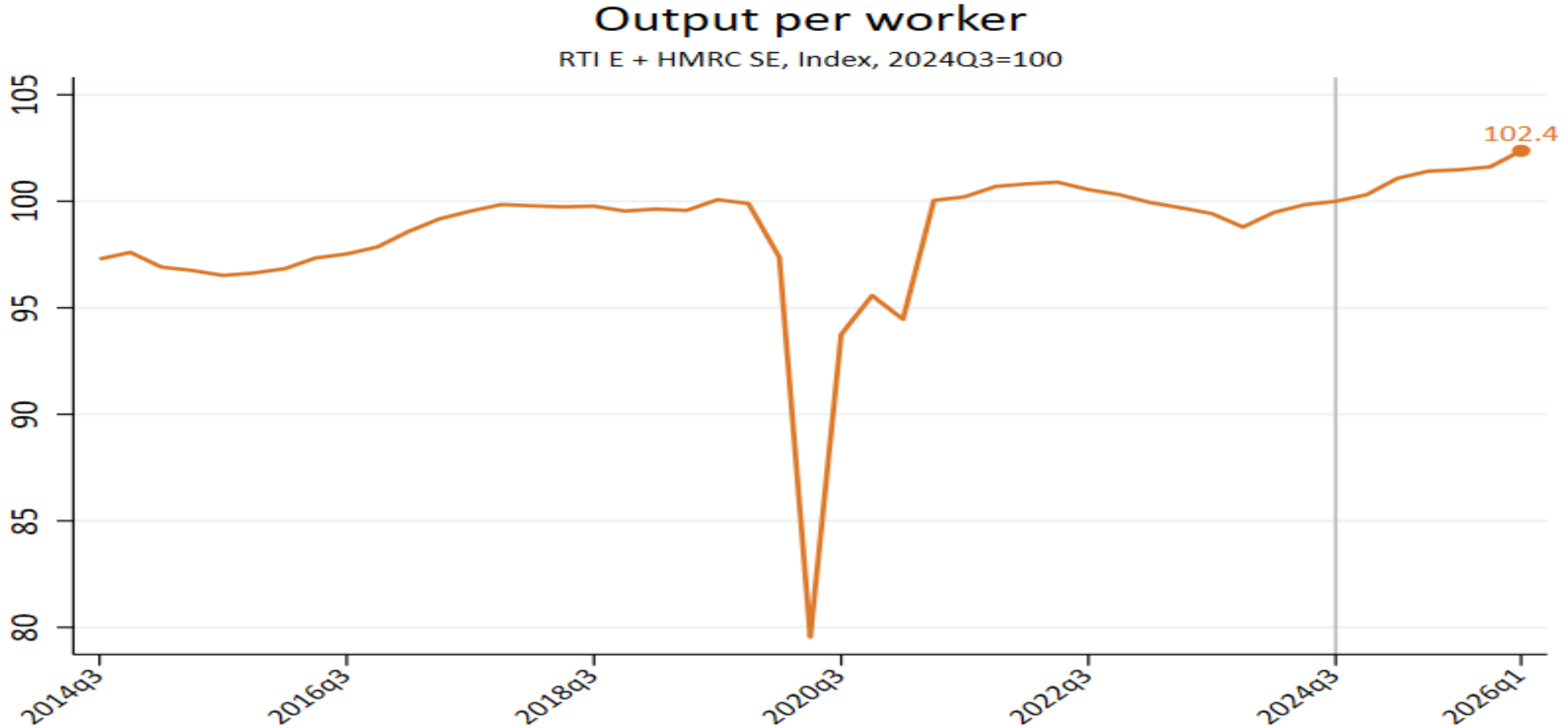
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# Raising Capital Investment

- Public investment usually first thing cut in crisis - little noticed by voters
- In 2024 & 2025, government chose to **raise** by £120bn over previous plans, rather than do the usual thing and cut
  - Facilitated by tougher & better **fiscal rules** on current spending
- Private Sector Investment
  - Streamlining planning
  - National Wealth Fund, British Business Bank, etc.
  - Pension Fund Reform
- Today on raising **TFP growth**
  - Innovation ↑ , Diffusion ↑ , Reallocation ↑

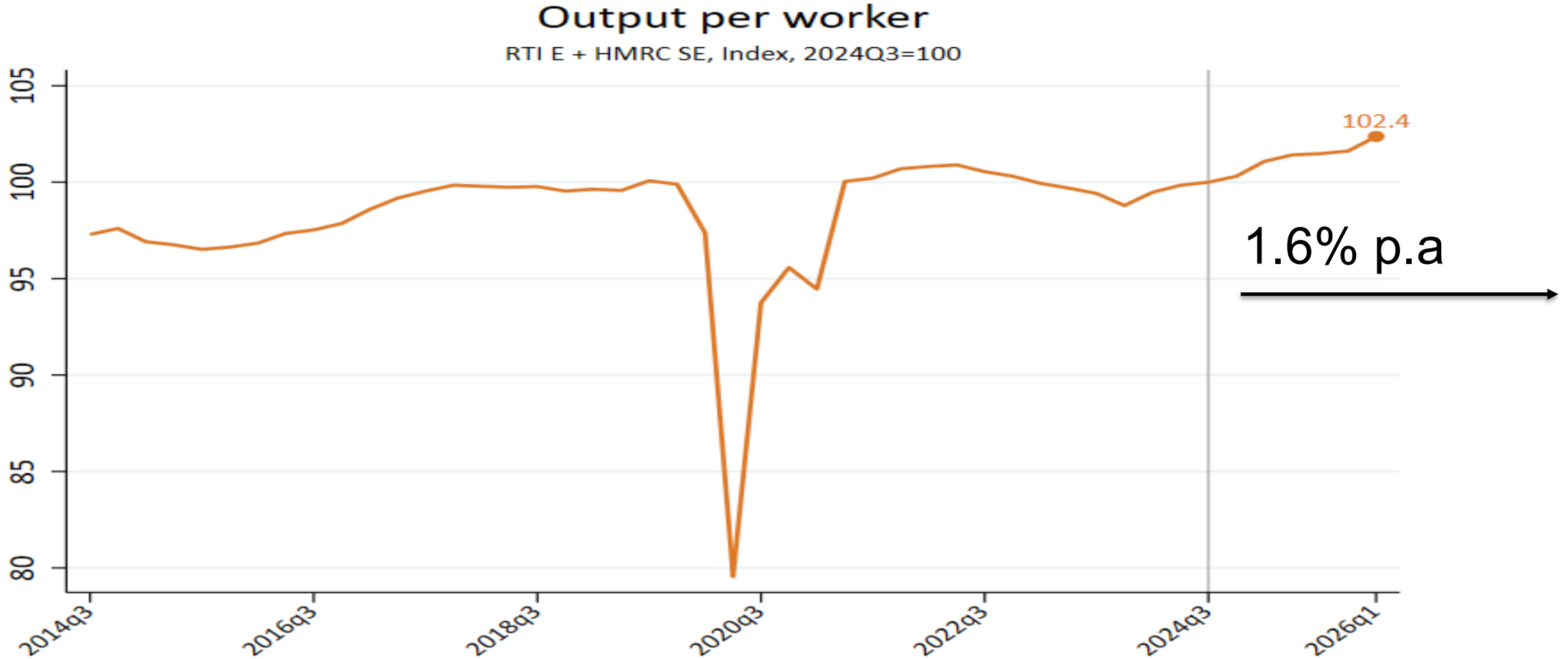
Aside: Reasons to be Cheerful? Some recent good news...

# UK Productivity Growth has rebounded in recent years



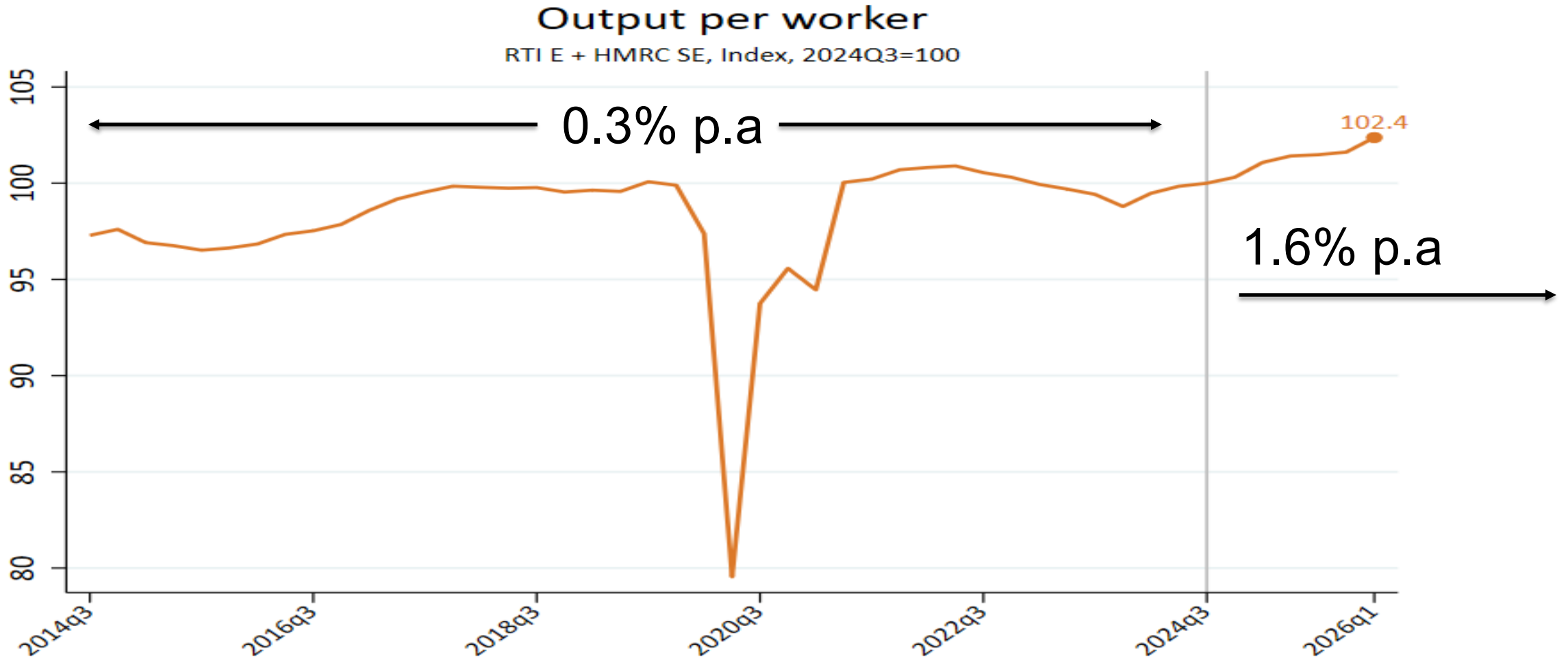
**Source:** Barbas et al (2026). Productivity is value added per worker (after inflation). Based on administrative RTI data (RTI Employees + HMRC Self-Employed).

# UK Productivity Growth has rebounded in recent years



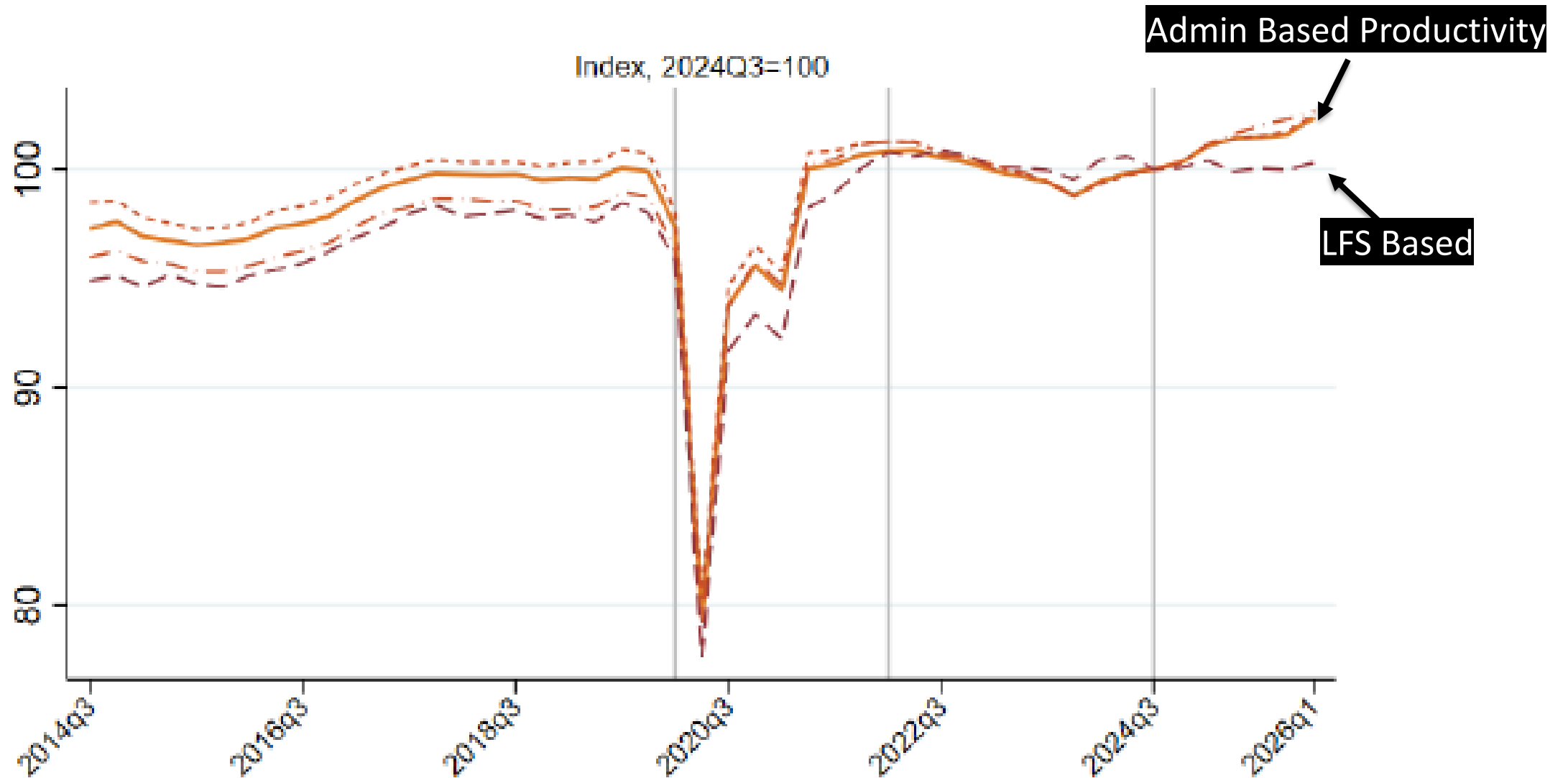
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# UK Productivity Growth has rebounded in recent years



**Source:** Barbas et al (2026). Productivity is value added per worker (after inflation). Based on administrative RTI data (RTI Employees + HMRC Self-Employed).

# This rebound has been disguised due to problems with LFS



**Source:** Barbas et al (2026). Productivity is value added per worker (after inflation). “Admin Based Productivity” (solid orange line) is based on administrative RTI data (RTI employees + HMRC self-employed). Red dotted line is LFS survey based (both for employees and self-employed).



# Potential Causes of UK Productivity Rebound

- Early positive policy impacts – uplift to public investment, planning reforms, etc.

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- Early positive policy impacts – uplift to public investment, planning reforms, etc.
- First signs of AI impact?
  - Strongest productivity growth in ICT industry
  - Similar jump in US recently (US/UK mid-90s pick-up driven by IT boom: déjà vu)

# Potential Causes of UK Productivity Rebound

- Early positive policy impacts – uplift to public investment, planning reforms, etc.
- First signs of AI impact?
  - Strongest productivity growth in ICT industry
  - Similar jump in US recently (US/UK mid-90s pick-up driven by IT boom: déjà vu)
- Labour costs rising due to higher minimum wage & Employer National Insurance (NI) means shakeout of low productivity/wage jobs?
  - **Note:** NI increases were needed to finance public services, given manifesto, **not** to reallocate workers away from low productivity sectors.
  - Unlikely to be main force
    - Productivity hike mainly due to faster growth in output, not lower jobs growth
    - Composition effects (age, education, low wage, industry) etc. explains little
    - Capital investment major contributor

# Outline

- UK Growth
- **Climate Change: Cleaning up Innovation**
- National Security: Defending Innovation
- Inequality: Finding the Lost Innovators
- AI: Managing Innovation
- Politics of Innovation Policy

# ***Lessons from China?***

**A case Study of Solar Industrial Policy**

# Ray of Hope? China and the Rise of Solar Energy

CEPR RPN, June 2026

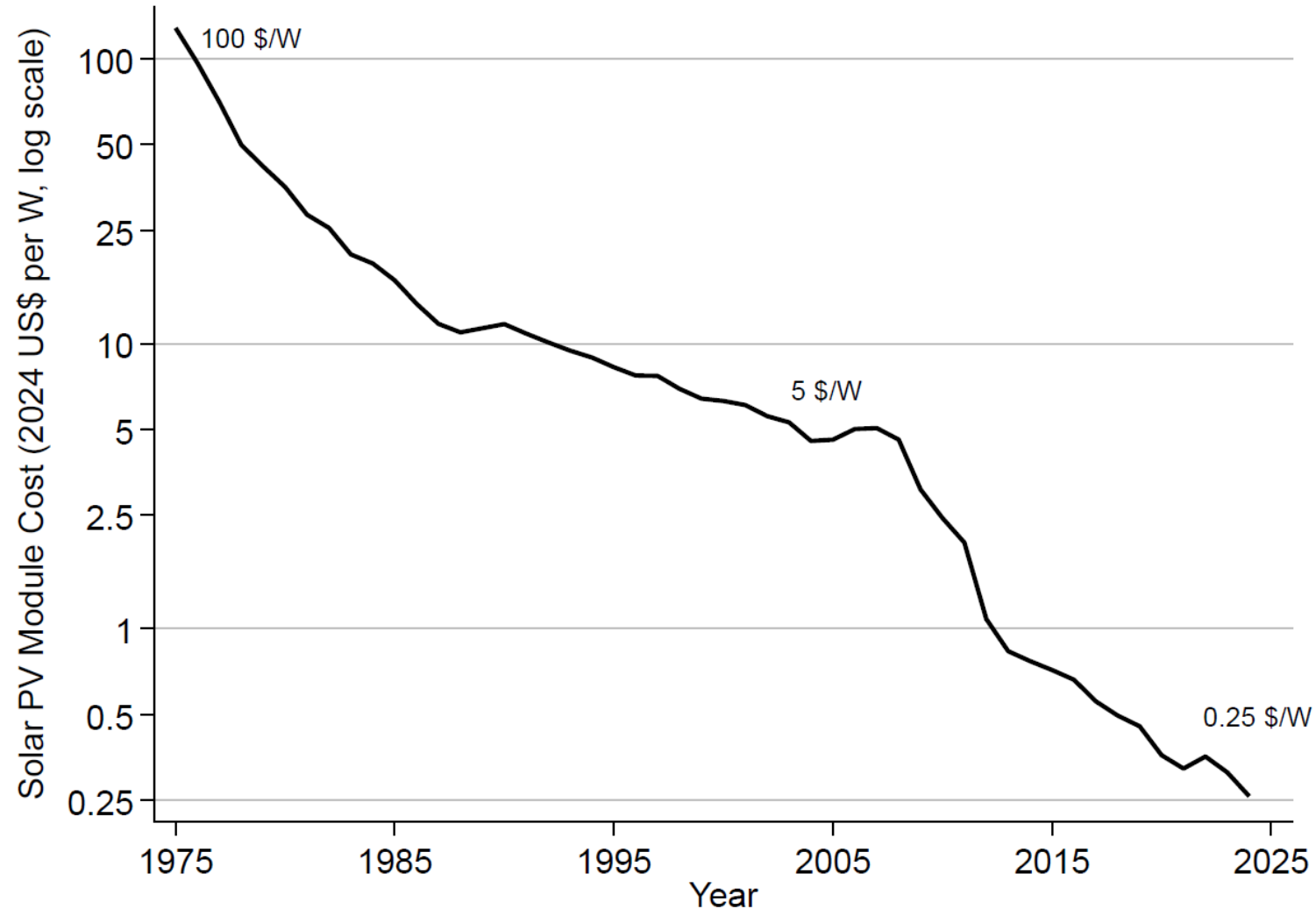
Ignacio Banares-Sanchez<sup>1</sup>, Robin Burgess<sup>1 2</sup>, David Laszlo<sup>1</sup>,  
Pol Simpson<sup>1</sup>, **John Van Reenen**<sup>1 2</sup>, Yifan Wang<sup>1</sup>

<sup>1</sup> London School of Economics      <sup>2</sup> CEPR

May 17, 2026

# Cost of solar has fallen dramatically

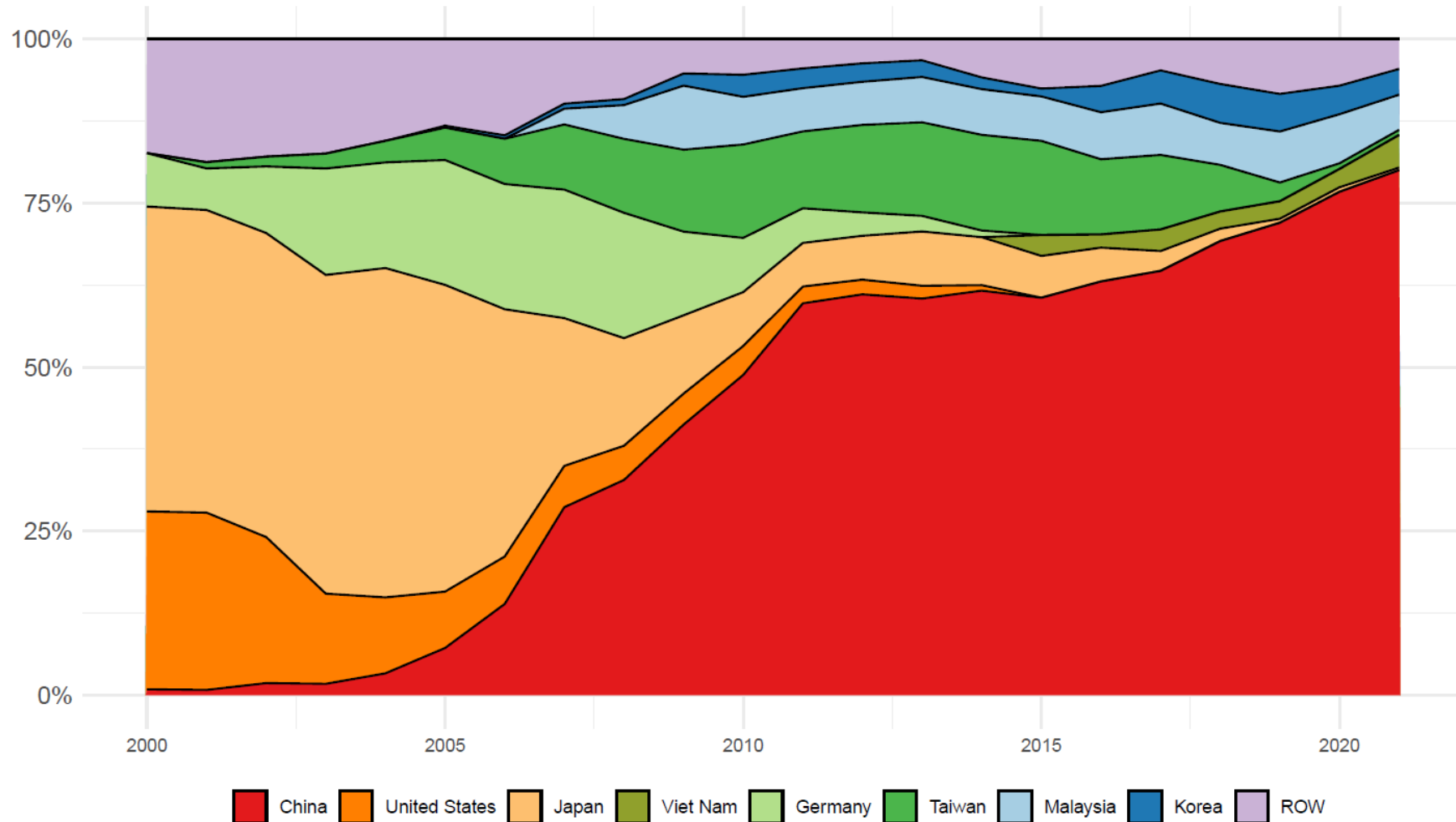
**Figure:** Global average price of solar PV modules (in 2024 US\$ per Watt)



Source: Our World in Data, LaFond et al. (2017) & IRENA Database

# China's global share of solar production rose from near zero to more than 80 % in 2021

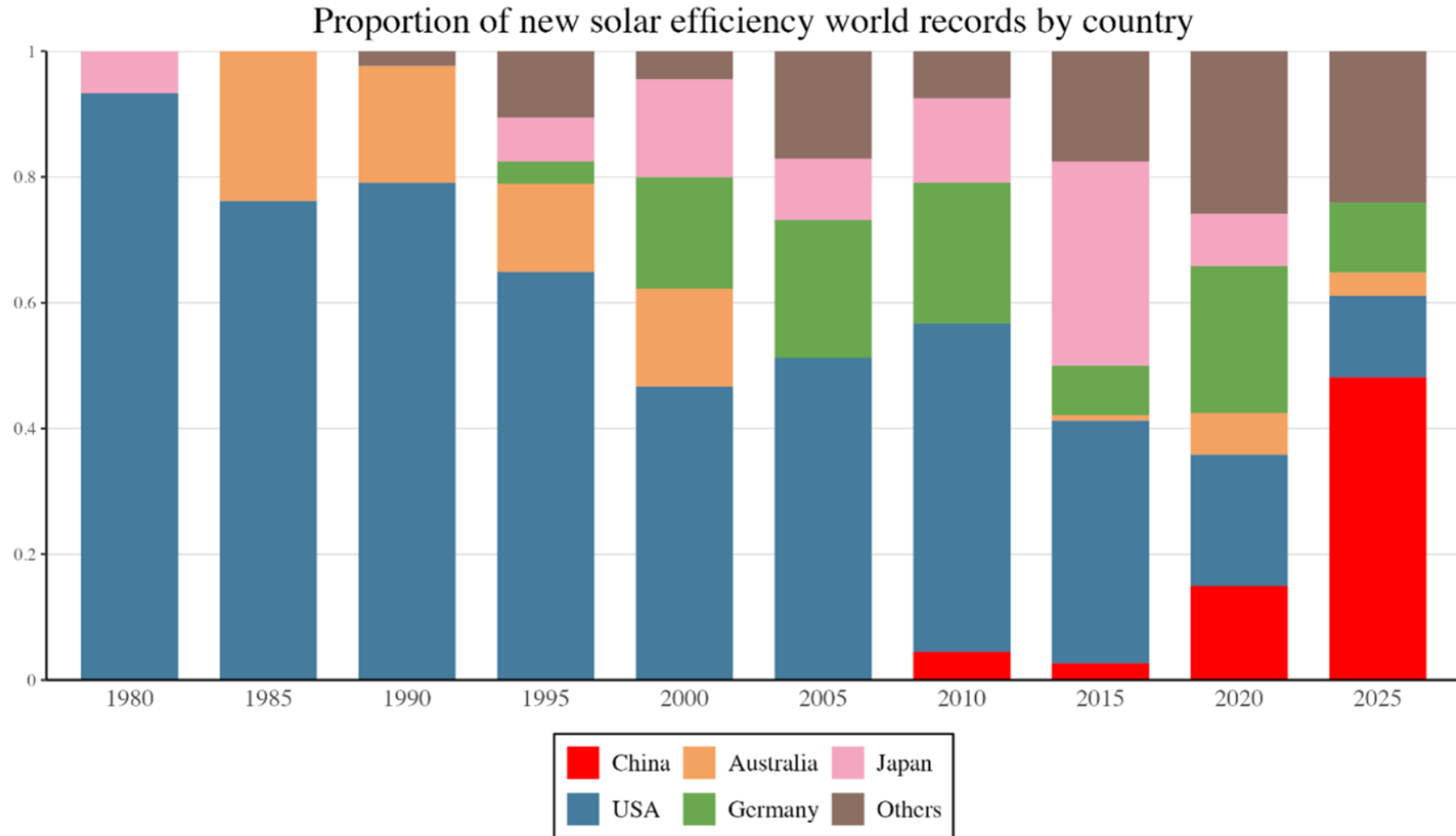
**Figure:** Share of Annual Solar Photovoltaics Cell Production in Leading Countries, 2000-2021



Source: International Energy Agency (IEA) & Earth Policy Institute



# China is innovating not just imitating: Technological Frontier



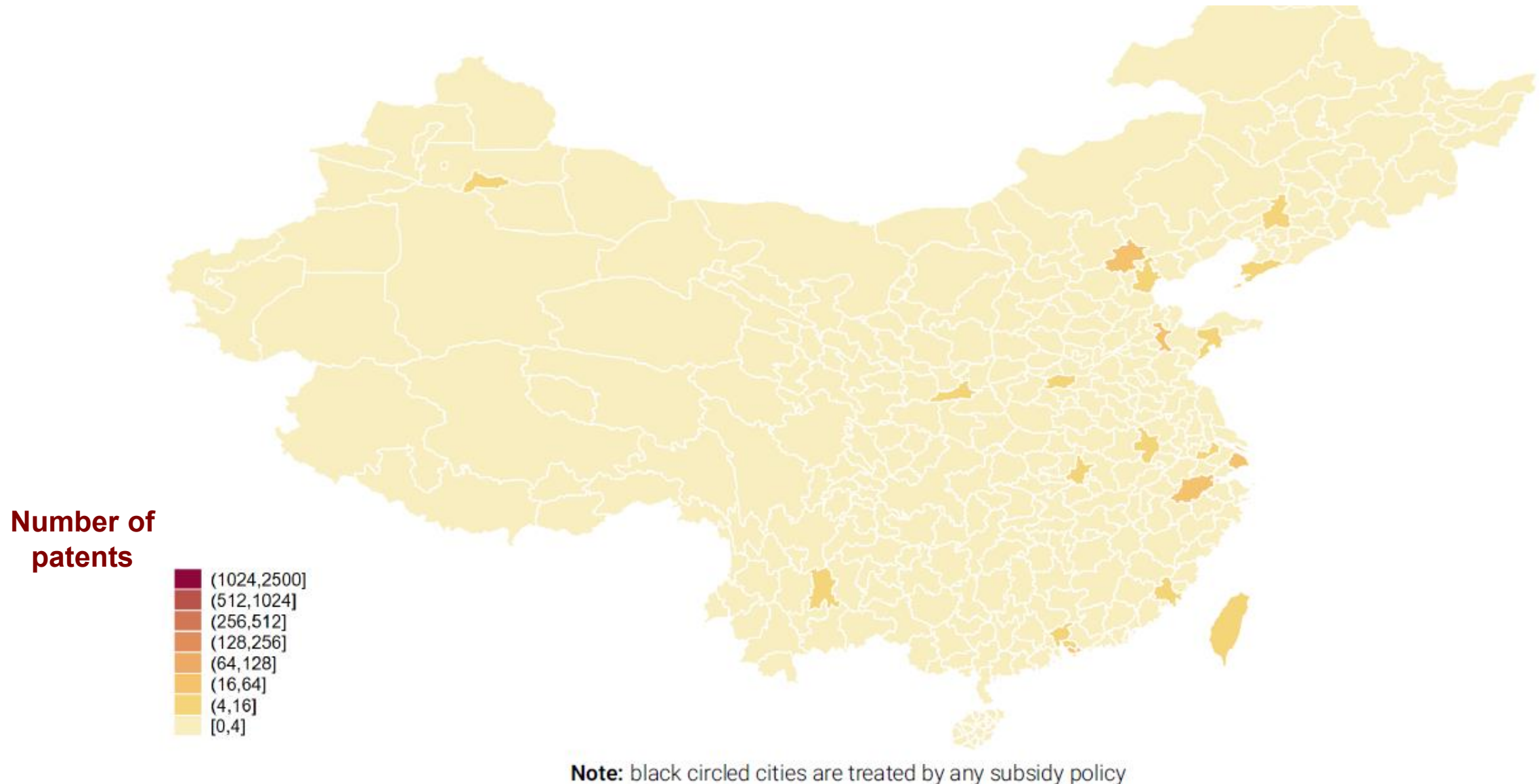
Source: Solar World Record Database (<https://www.nrel.gov/pv/cell-efficiency>)

**Note:** Year refers to average over previous 5 years, so "2025" refers to competitions between 2021 and 2025, etc.

# What we do

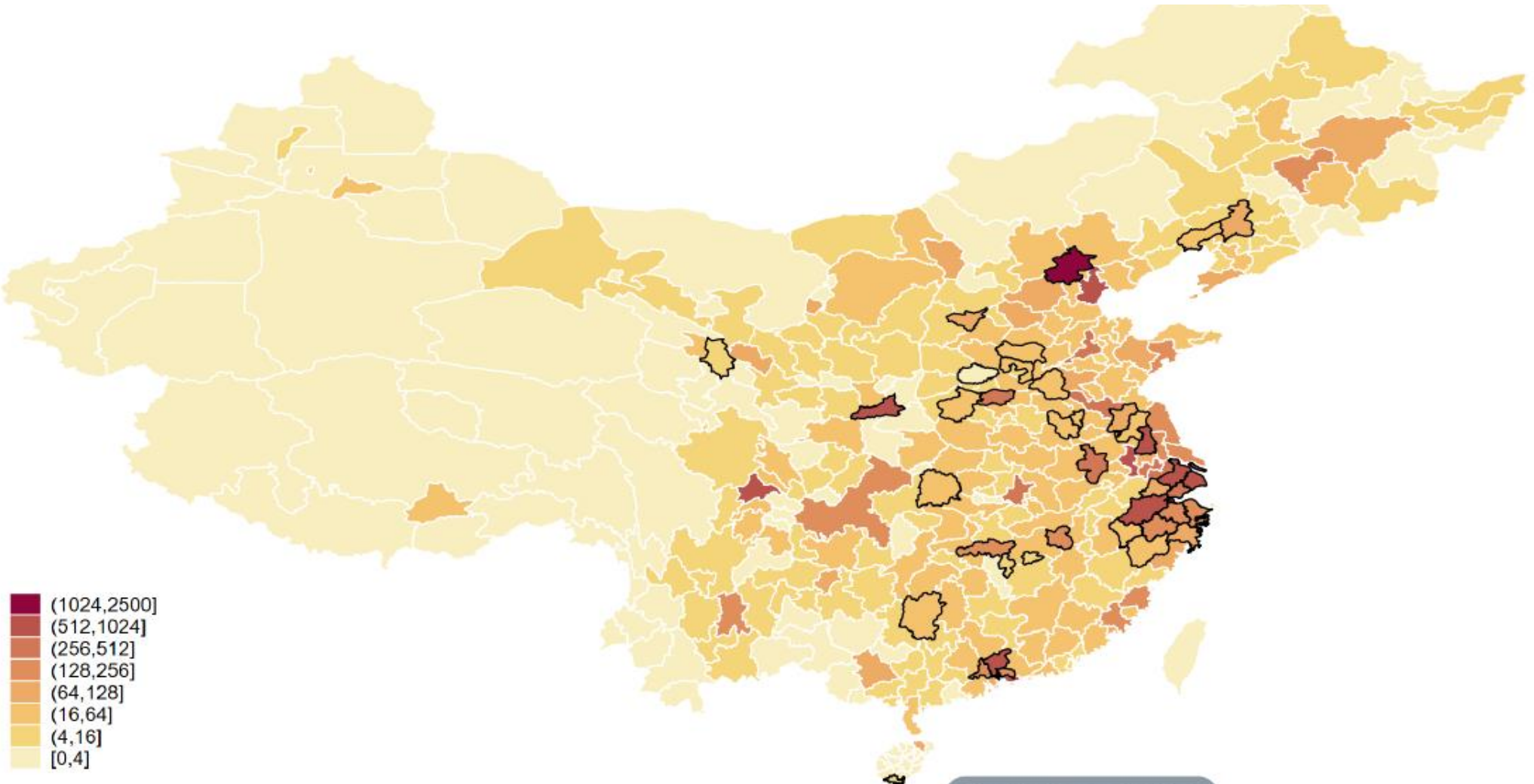
- Evaluate role of Chinese **solar industrial policy** to the growth of industry, innovation & fall in prices
- Construct panel data on universe of solar firms in China
- China's model of development led by **local city-region leaders** competing to grow, partly via career concerns
- So, exploit staggered introduction of city-region policies
  - Focus on three subsidies: (i) Demand (e.g., feed-in-tariffs & installation), (ii) Production and (iii) R&D

# 2004: Solar innovation (shaded) & policies (none!), across all 358 Chinese city-regions



# 2019: Solar innovation (shaded) & policies (lots!), across all 358 Chinese city-regions

Number of  
patents



**Note:** black circled cities are treated by any subsidy policy

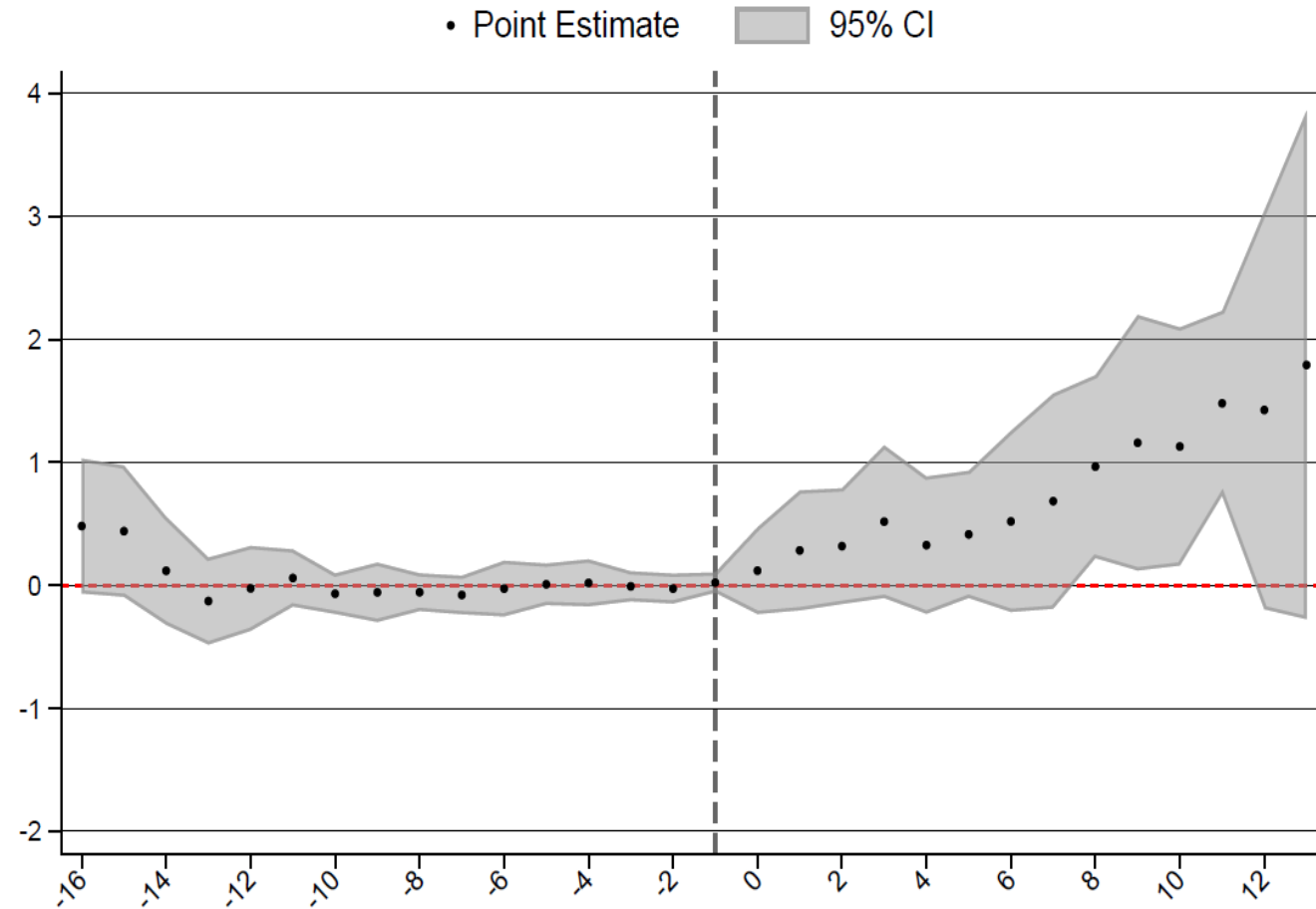
Spatial Concentration

# What we find

- **At local level of city:**

- **Production and innovation subsidies** substantially raised innovation, output, exports, net entry, etc.
- **Demand subsidies** had much smaller effects on economic outcomes, but did reduce pollution (e.g., PM<sub>2.5</sub>)

# Results: Patents, Any subsidy



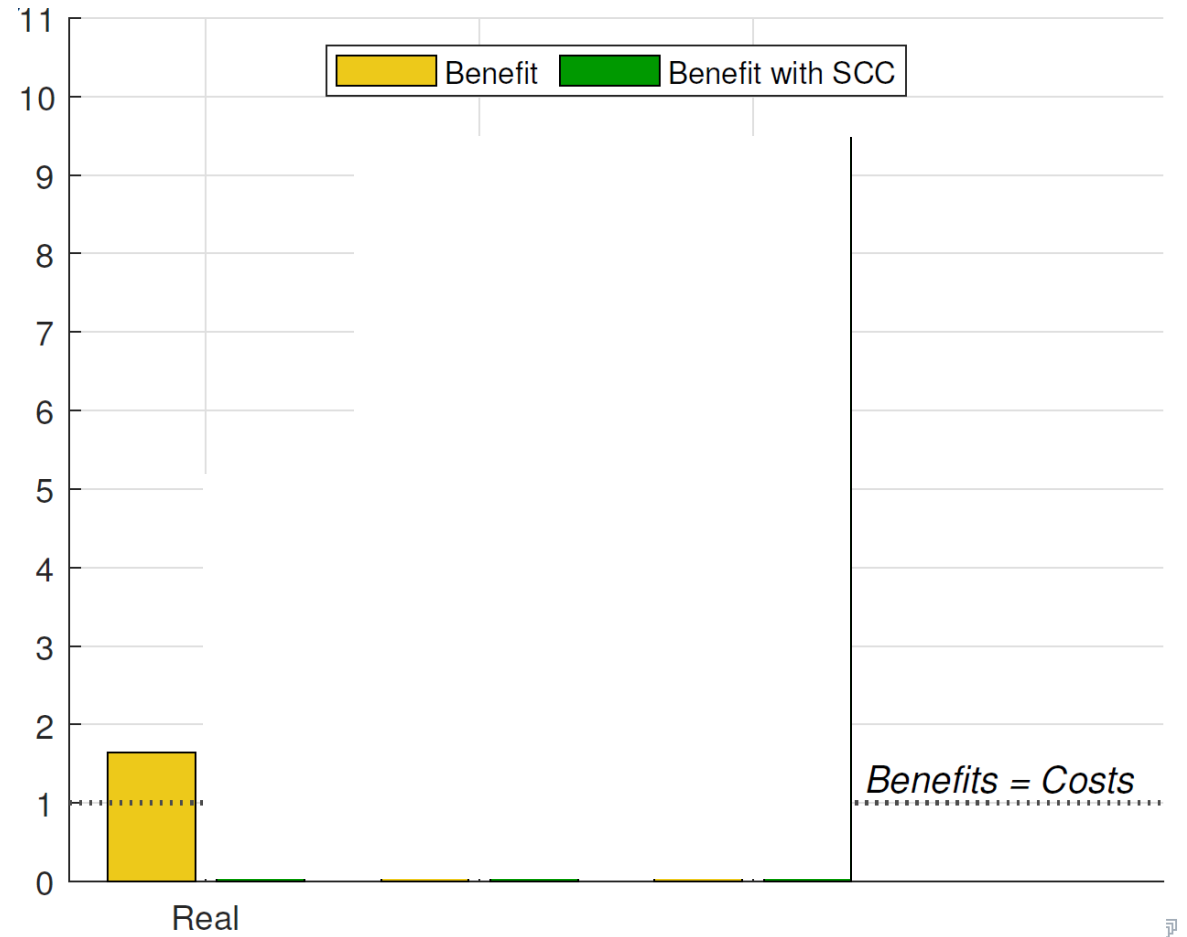
**Notes:** SDID on 358 cities with 43 treated. Cohort-year specific ATTs aggregated into event studies. Outcome: LHS of patents by solar firms in a city-year.

Treatment is any subsidy. 95% SE cluster bootstrapped by city.

# What we find (using estimates to discipline structural model)

- **At national level:**
  - Policies responsible for 40-50% of change in Chinese solar **innovation**, output & global price fall

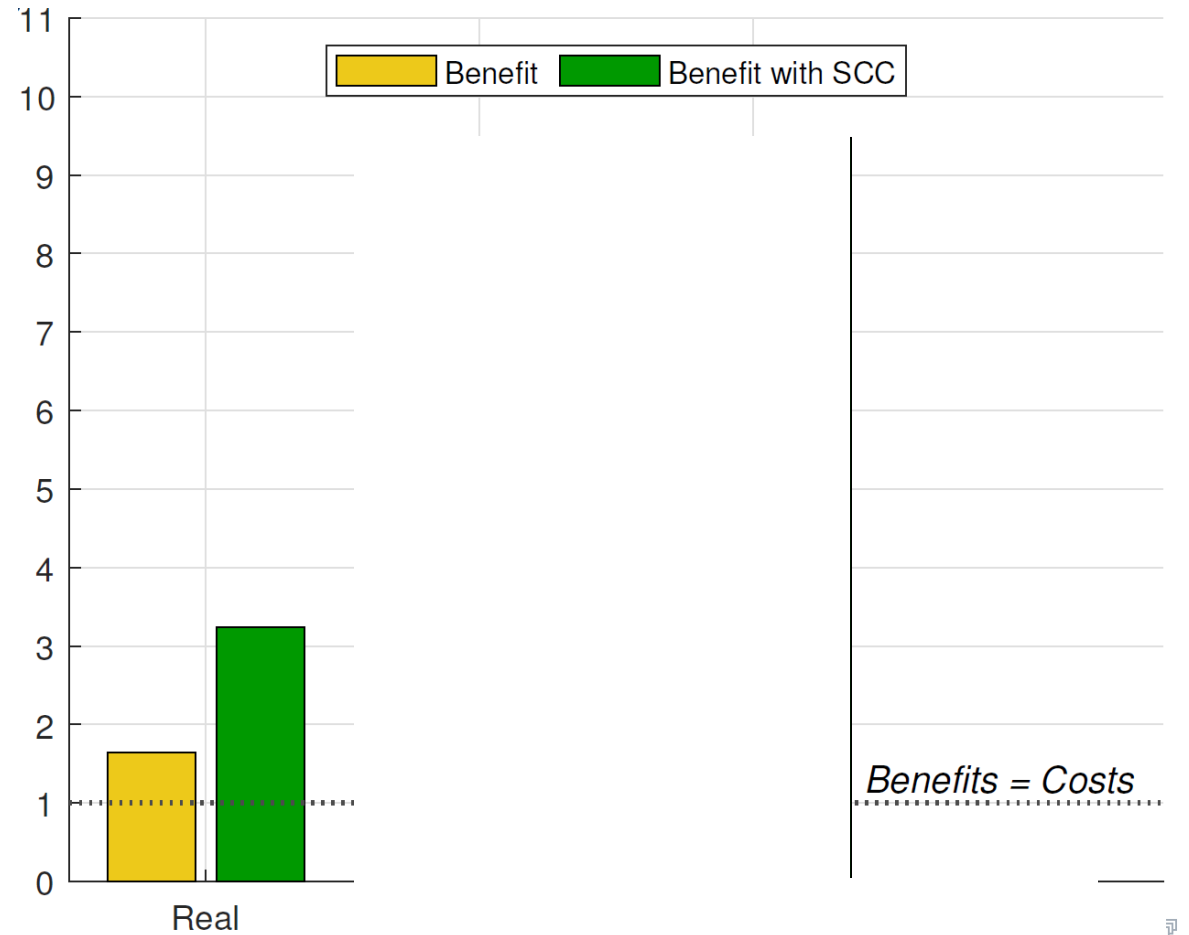
# High Social Benefit-Cost Ratio of Chinese Solar Industrial Policy



1. \$1 of subsidy increased welfare of Chinese citizens by \$1.65

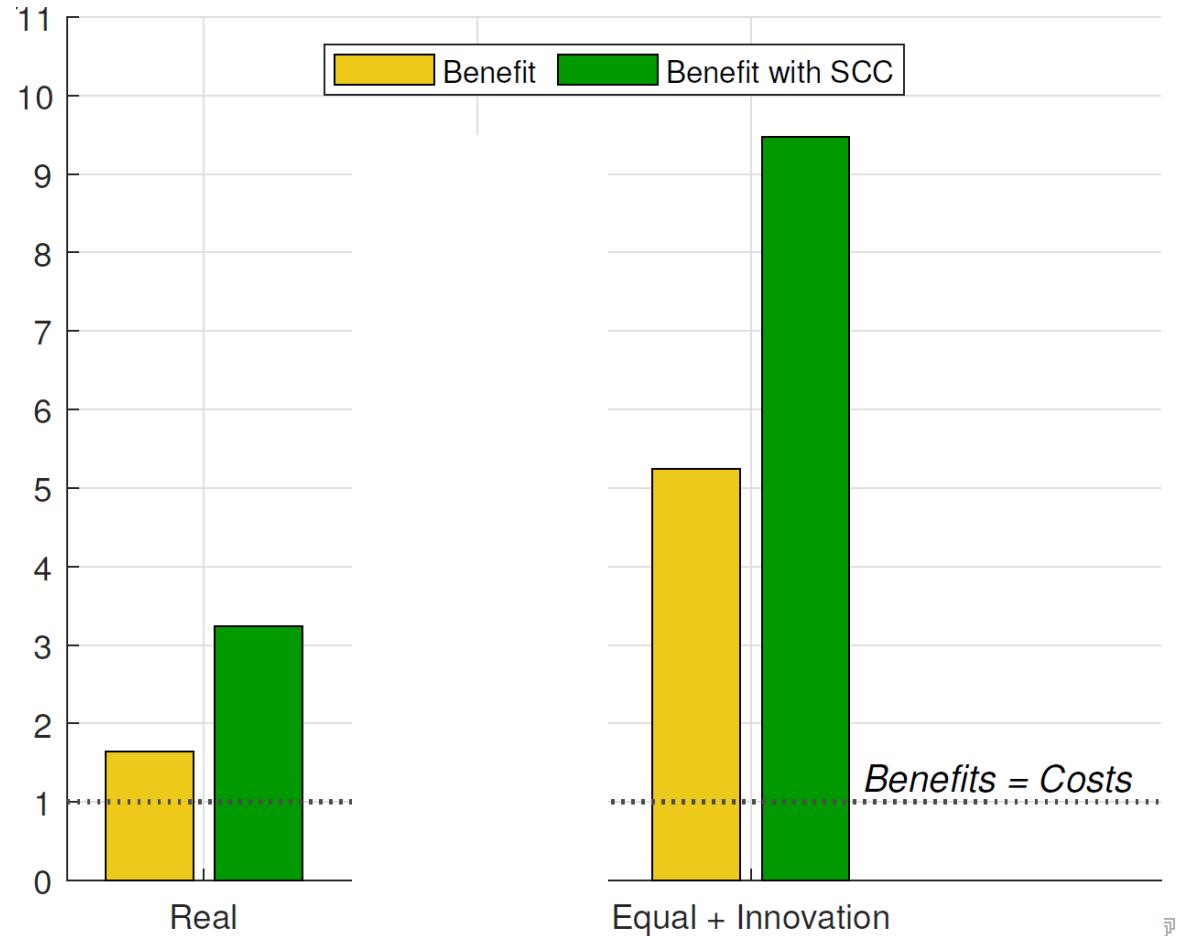


# High Social Benefit-Cost Ratio of Chinese Solar Industrial Policy



1. \$1 of subsidy increased welfare of Chinese citizens by \$1.65
2. Including a (low) Social Cost of Carbon **doubles** these benefits

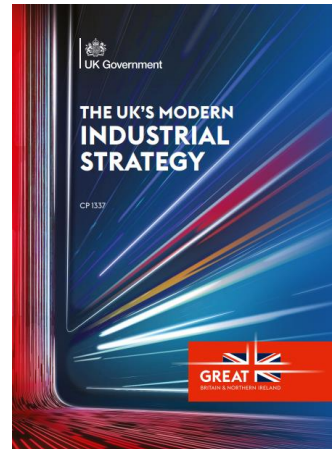
# High Social Benefit-Cost Ratio of Chinese Solar Industrial Policy



1. \$1 of subsidy increased welfare of Chinese citizens by \$1.65
2. Including a (low) Social Cost of Carbon **doubles** these benefits
3. An 'innovation heavy' subsidy program would have delivered much greater benefits

# Why this matters for UK, EU (and rest of world)

- **A green policy that benefits local people, even ignoring climate change**
  - More politically sustainable than just regulation & carbon tax
- **A well-designed industrial strategy can be very effective**
  - **Decentralized:** use local knowledge & expertise
  - **Innovation critical:** High tech with market failure of high learning externalities (not old classic ind policy sectors)
  - Focus on area's actual/latent **comparative advantage**



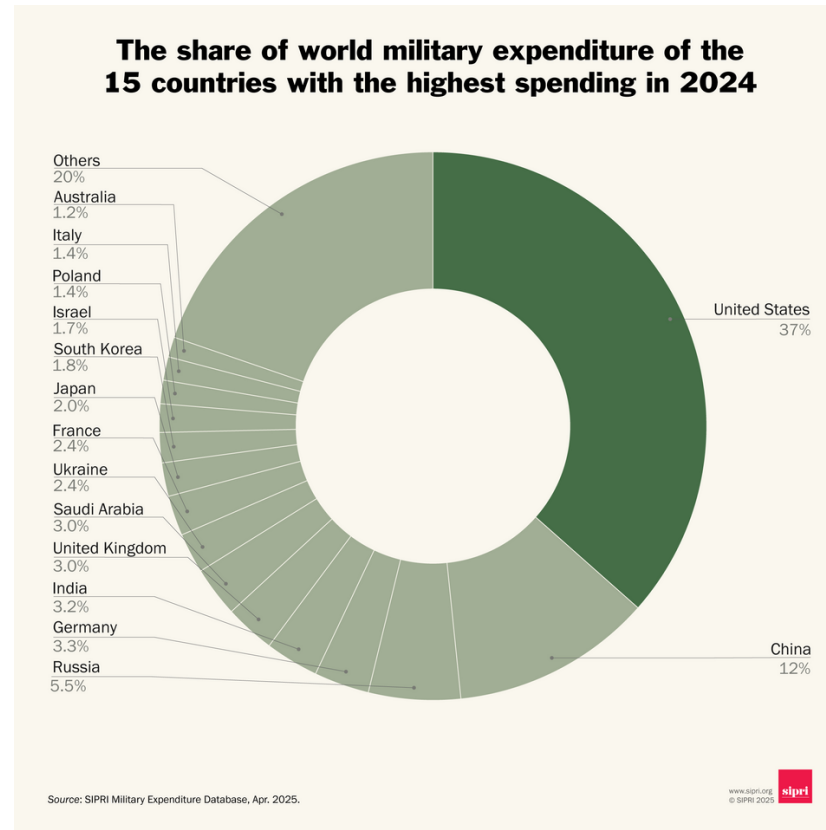
# Outline

- UK Growth
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***Security:***  
**Defending Innovation**

# The need to raise defence spending

- Era of geopolitical instability
  - Russia's invasion of Ukraine & threats to Europe
  - Increased conflict in Middle East
  - US distancing itself from NATO & European defence



# Historically, military necessity has been the mother of invention

- **Dual-use** aspect of frontier defense technology: large spillovers to private sector
  - e.g., GPS, cryptography, nuclear power, jet engines, Internet....
- But can we go from story-telling to hard evidence?



# Govt Defence R&D (Moretti, Steinwender & Van reenen, 2025)

**Data:** Industry panel (UK + 25 OECD countries over 23 years) & French panel data of >12k firms 1980-2015.

**Empirical Strategy:** Impact of defence R&D directly & also as IV shifter for total govt. R&D

## **Findings:**

- Strong evidence for crowd-in of private R&D by public R&D
- Positive impacts on domestic (& international) productivity growth
- Recent **macro studies** confirm these results (e.g., Fieldhouse & Mertens, 2023; Gavanni et al., 2026)

**Secondary Policy Question:** Is non-defence better use of marginal £ of R&D? Wrong question!



# How to improve R&D procurement?

- Traditional approach to defence R&D procurement in US, UK (& most countries) is top-down & highly centralized (DARPA is exceptional)
- In 2018, **US Air Force** reformed elements of R&D procurement (SBIR)
- New **OPEN** Topics program ran alongside the older centralized & highly specified **Conventional** program
- Open is a decentralized innovation model
  - Competitions asked firms what innovation **they** thought would be beneficial to military

# Findings of Howell et al (2025) evaluation of OPEN program

## Data:

- Admin data on >21k applications & evaluation scores of SBIR proposals 2003-19 & outcomes through 2021

## Findings:

- Open Program attracted more **new entrants** – e.g. young firms from Silicon Valley who had never applied for SBIR in the past
- RDD: **Open has better outcomes than Conventional program**
  - More tech adoption by military; Patenting; VC Funding, etc.
  - Conventional increases chances of winning future contracts creating lock-in & persistent dominance

# Tech adoption 10 percentage points higher in Open program. Zero Effect for Conventional program

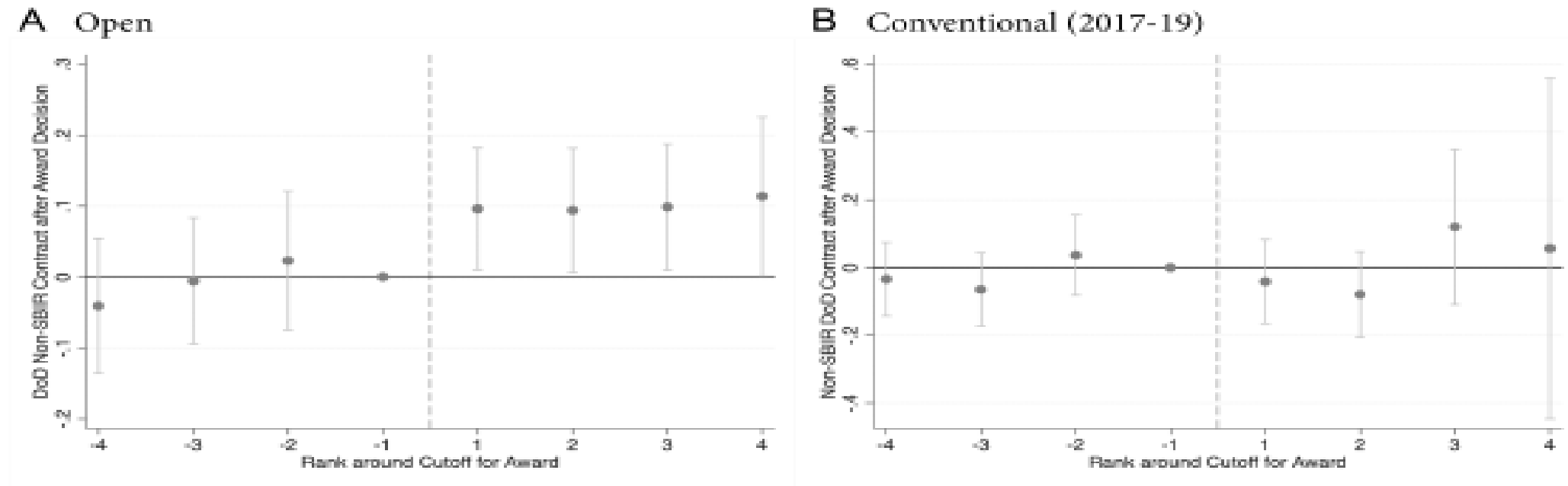


FIG. 3.—Probability of technology adoption (DoD non-SBIR contract) by rank around cutoff. The figure shows the probability that an applicant firm had any non-SBIR DoD contracts valued at more than \$50,000 after the award decision. The x-axis shows the applicant's rank around the cutoff for an award. A rank of 1 indicates that the applicant had the lowest score among winners, while a rank of  $-1$  indicates that the applicant had the highest score among losers. We plot the points and 95% confidence intervals from a regression of the outcome on a full complement of dummy variables representing each rank as well as fixed effects for the topic. The omitted group is rank =  $-1$ . We include first applications from 2017 to 2019.

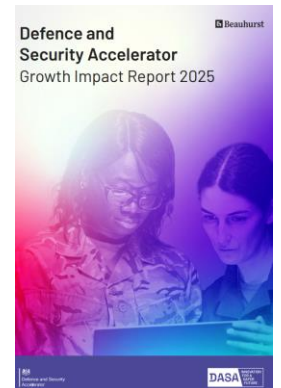
# Why was OPEN approach to R&D procurement so successful?

## Mechanism:

- Mainly through **bottom-up** innovation: **less tightly specified**
- And through selection of young firms

## Implications:

- Open being rolled out across other parts of US federal government
- UK DASA part of Defence Innovation has similar model – needs to be scaled up



# Summary on Defence Policy

- Defence spending must rise – implies higher **taxes** & cutting other **current** spending areas
- Use defence spending in pro-growth way:
  - Increase % to R&D & innovation
  - Use budget better.
    - More open & decentralized approach to R&D
    - Co-ordinating with EU (see Draghi Report)

# Outline

- UK Growth
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***Inequality:***  
**Finding the Lost Innovators**

# Boosting innovation and reducing inequality

- Hard to reduce inequality in the context of slow growth



# Boosting innovation and reducing inequality

- Hard to reduce inequality in the context of slow growth
  - Not enough rich people to go around...

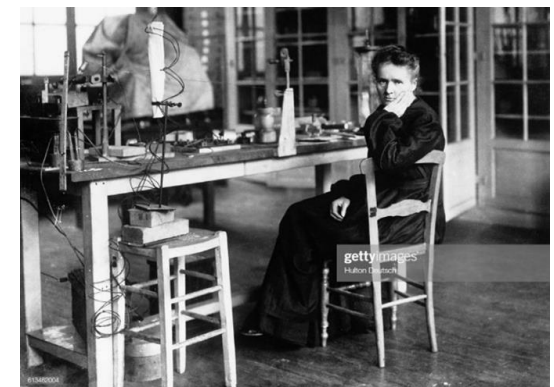
# Boosting innovation and reducing inequality

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- **Alternative:** policies to reduce inequality and support growth



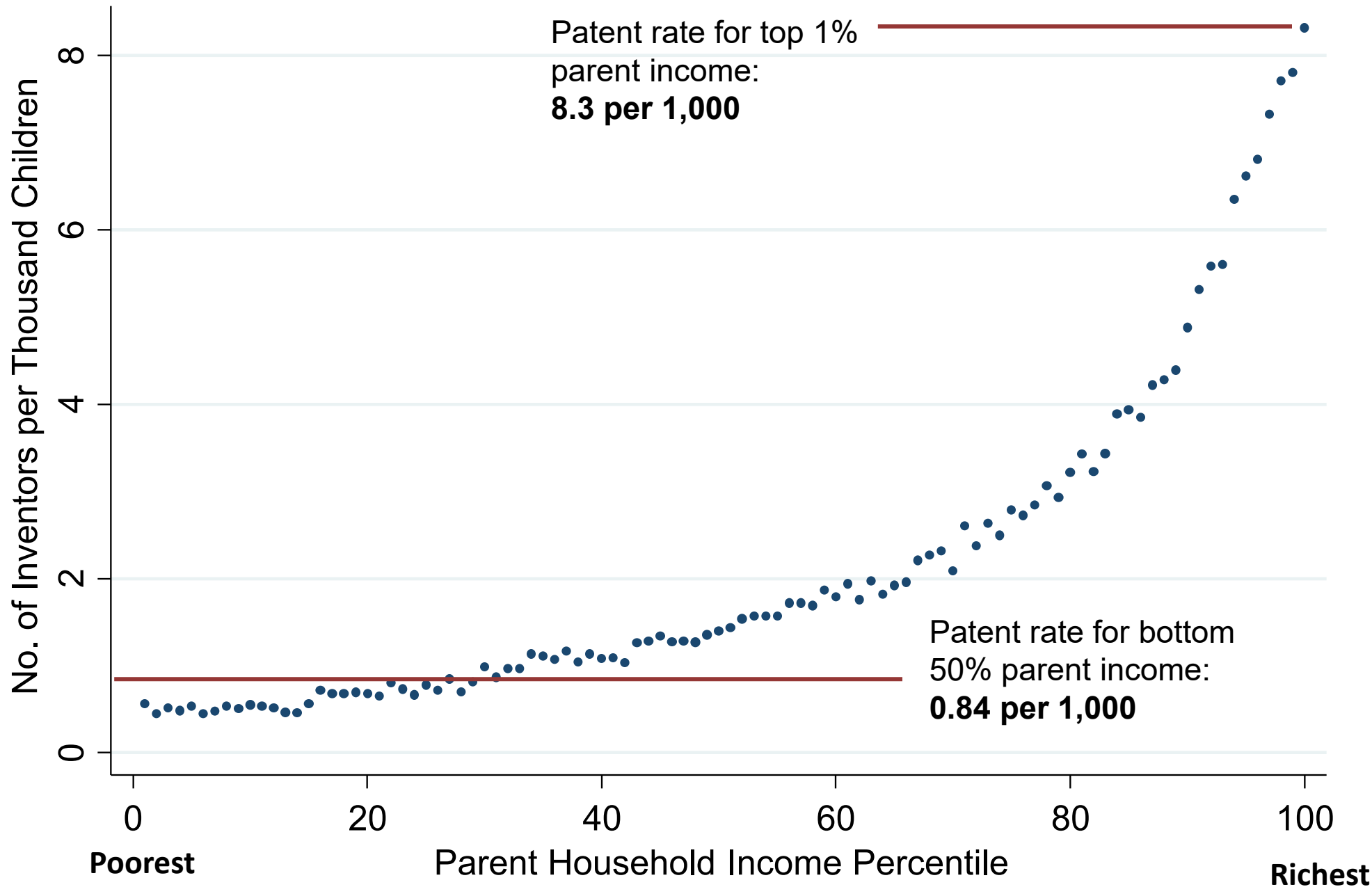
# Boosting innovation and reducing inequality

- Hard to reduce inequality in the context of slow growth
  - Not enough rich people to go around...
- **Alternative:** policies to reduce inequality and support growth
- **Human capital focused innovation policy**
  - Finding & nurturing talented people who typically don't become innovators (e.g., kids from lower income areas & families)
  - 'Lost' Einsteins, Marie Curies & Stephanie Jobs
  - Such policies boost innovation & equality

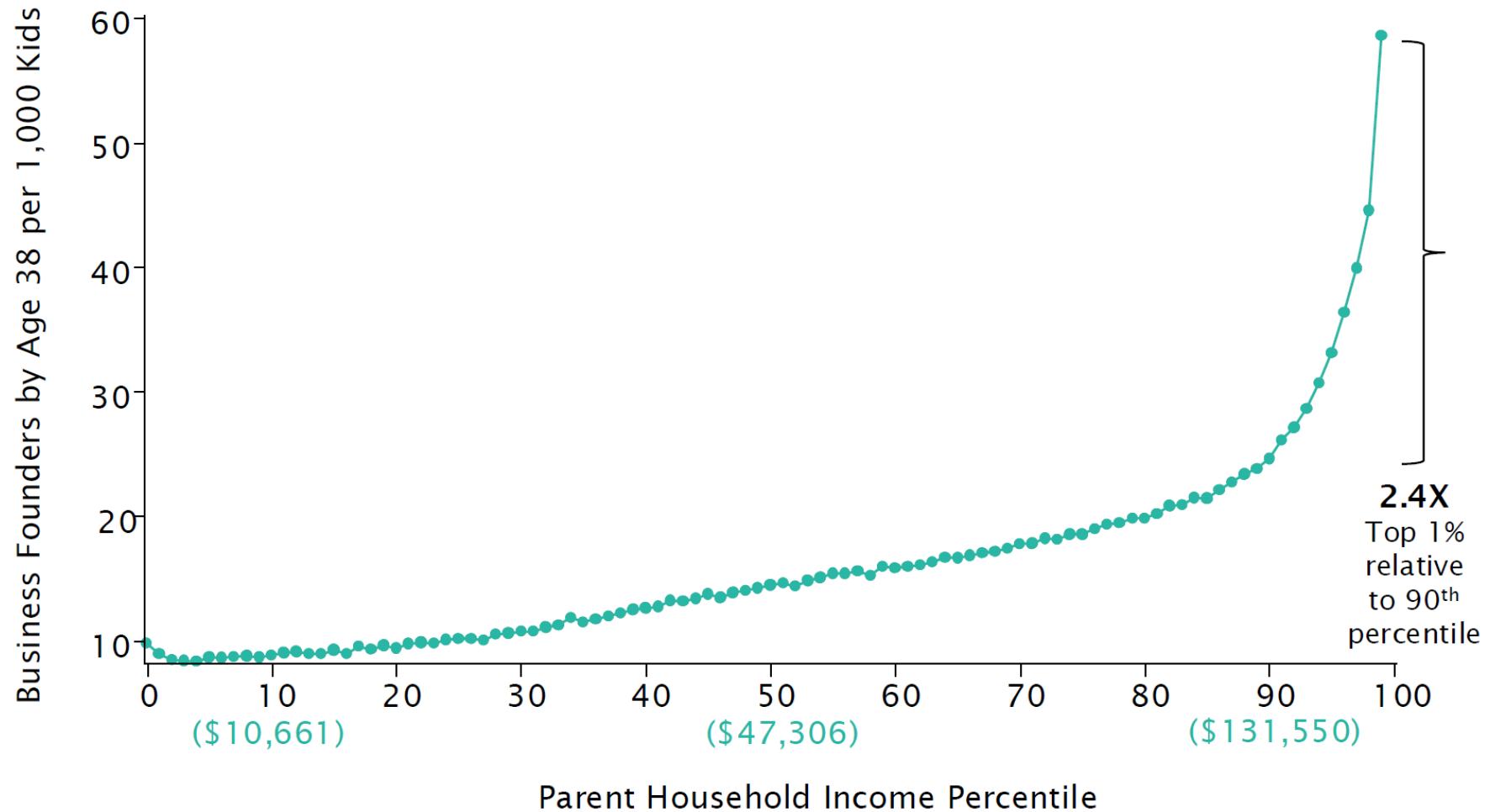


Being born into top 1% makes it 10 times more likely you become an inventor than born in bottom 50%

Source:  
Bell,  
Chetty,  
Jaravel  
Petkova, &  
Van  
Reenen  
(2019)



## Entrepreneurship Rates as a function of parental income



**Source:** Chetty, Dossi, Van Reenen, Zidar & Zwick (2026)

# Some Lost Innovation Policies

- Early ability matters (particularly for inventors), but only accounts for a small part of the parental income effect
- For **inventors**, childhood exposure to innovation matters a lot
- For **entrepreneurs**, youth labour market experience most

# Some Lost Innovation Policies

- **Education policies**
  - Information/exposure treatments (Breda et al., 2023)
  - Support for talent in low-income schools (e.g., Card and Giuliana, 2016; Cohodes, 2020)
- **Mentorship/internship programs** (early labour market experience critical, esp. for entrepreneurship)
- Talent Competitions (e.g., Olympiads, Conrad Inventor Education, etc.)
- Scale-Up finance (e.g., British Business Bank)

# Outline

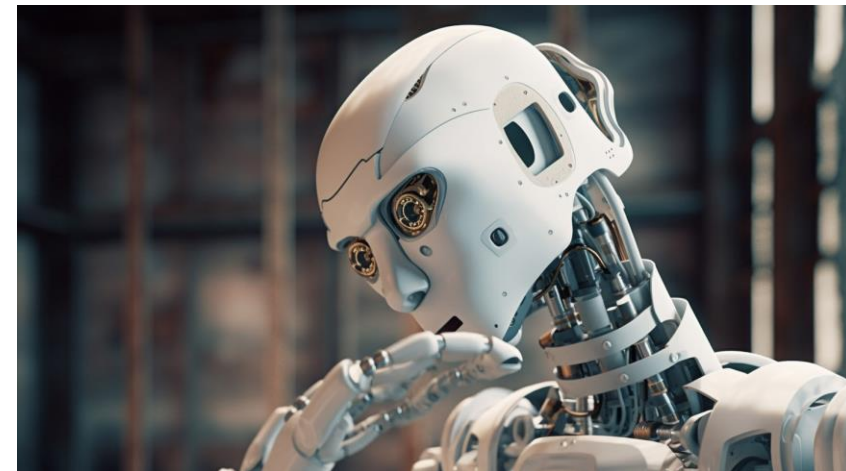
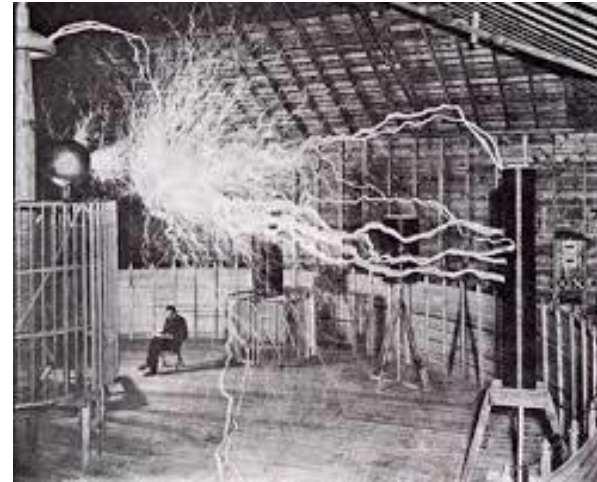
- UK Growth
- Climate Change: Cleaning up Innovation
- National Security: Defending Innovation
- Inequality: Finding the Lost Innovators
- **AI: Managing Innovation**
- Politics of Innovation Policy



# *AI:* **Managing Innovation**

# AI: Technology & management

- **Complementarity:** Need to change work organization/management to make best use of General Purpose Technologies (electricity, computers, AI, ... )



# Technology, management & complementarities

- Historically, macro productivity impacts of major new technologies have taken decades (David, 1990)



Paul David

# Technology, management & complementarities

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- Case studies & econometric work shows huge variation in returns from digital technologies (Stiroh, 2010)
- Much evidence of technology & managerial practice complementarity
  - Bloom, Sadun & Van Reenen (2012) found half of US-EU gap in productivity growth 1995-2003 was due to this

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- Is AI different than previous GPTs?

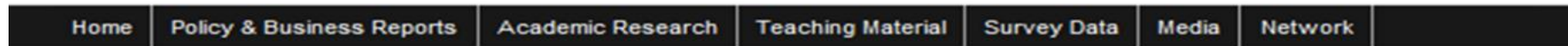
# AI: Complementarities with management practices

- Some large AI effects in detailed micro studies like customer support, professional writing & consulting (Fruits & Stout, 2026 survey)
  - But small/unclear impacts at higher level of overall firm, industry & economy wide
- **Demirer et al.**, (2026) on software coding:
  - Huge AI related productivity increases at lowest level of coding
  - But these dissipate at higher level: small at product launch stage
  - Why? More **managerial** input (co-ordination, verification, authority, etc.) needed the further up the production process

# World Management Survey (~25k interviews since 2004, 38 countries)



<http://worldmanagementsurvey.org/>



## Featured publications

- » [Why do management practices differ across firms and countries?](#)
- » [Management Practice and Productivity: Why They Matter](#)
- » [Management in Healthcare: Why good practice really matters](#)

Benchmark your manufacturing firm, hospital, school, or retail outlet against others in your country, industry or size class.

**Benchmark your organization**

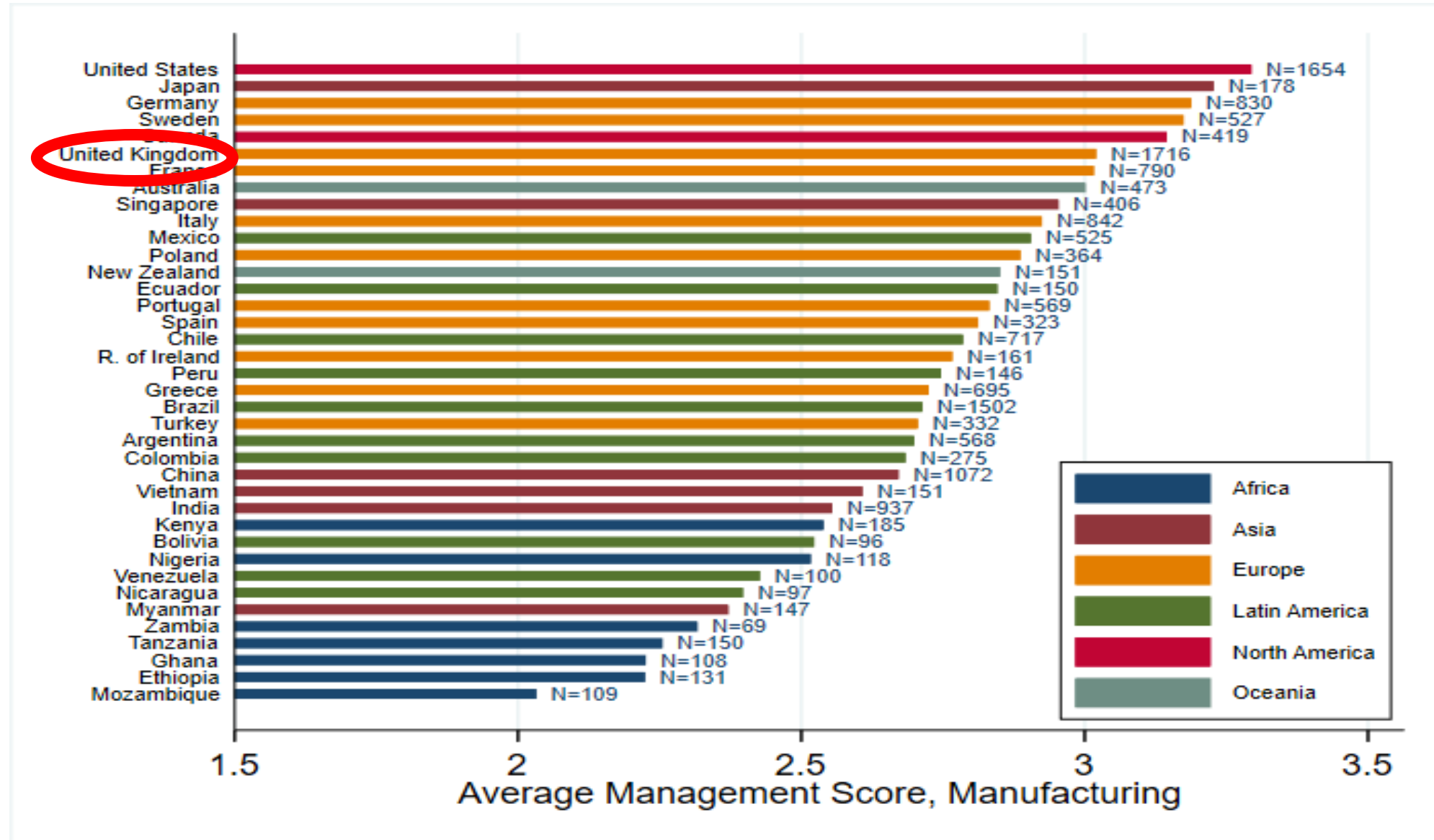
Management scores across firms  
WMS team analyses the distribution of management practices within countries by type.



- Medium sized manufacturing firms (50-5,000 workers, median≈250); Now extended to Retail, Hospitals, Schools, Universities, Civil Service, etc.
- MOPS partnerships with National Statistical Agencies (Scur et al., 2024)



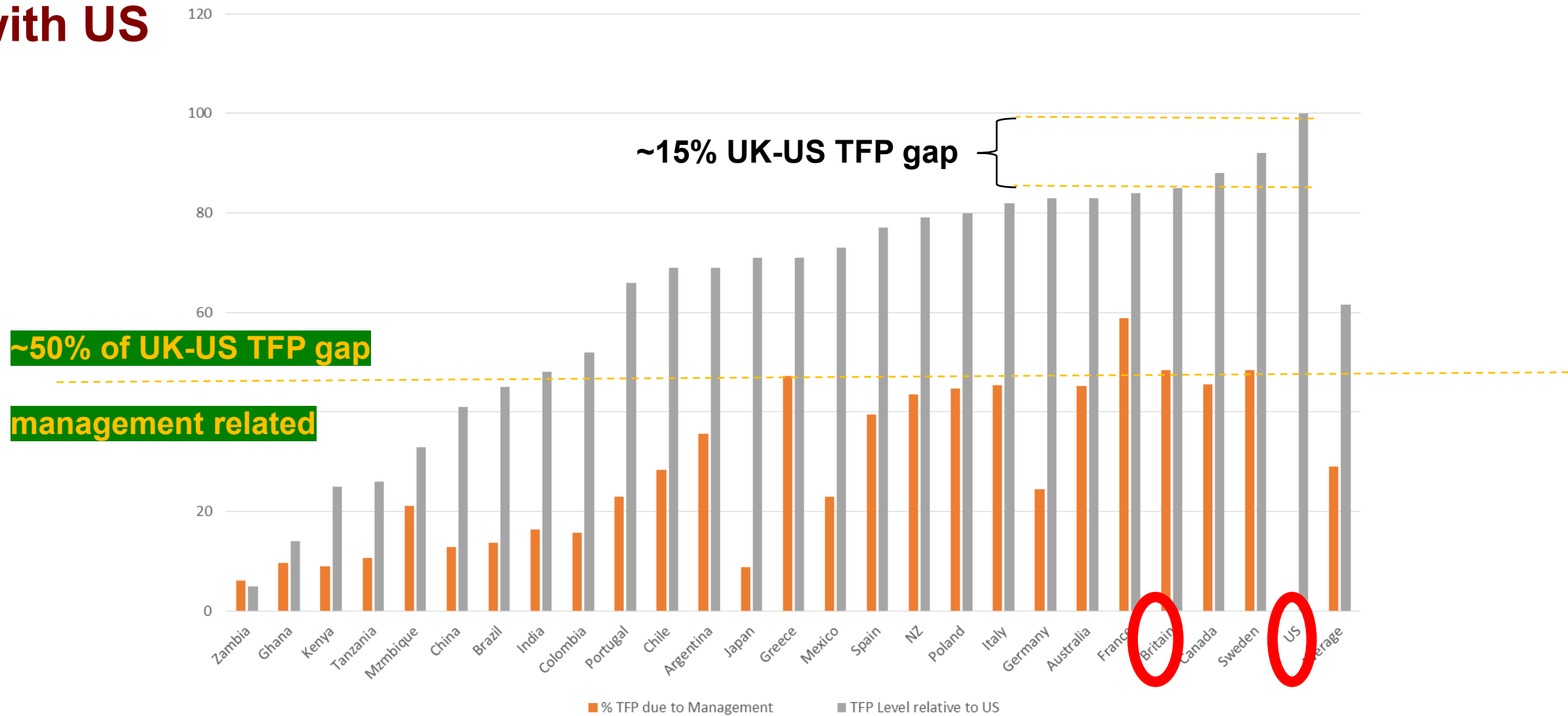
# WMS Management Scores across Countries



**Note:** Unweighted average management scores; # interviews in right column (total = 17,783); all waves pooled (2004-2022); Scur et al (2024)



# Poor Management accounts for just under half of UK productivity gap with US



Source: Schuh et al., (2026)

Notes: Productivity = TFP from Penn World Tables;

# Current AI growth Policies

- 2025 Spending Review: £2.1bn for AI
- Good focus on AI production - **But** need more on **diffusion**



# Current AI growth Policies

- 2025 Spending Review: £2.1bn for AI
- Good focus on AI production - **But** need more on **diffusion**
- **Management** boosts productivity directly & indirectly through speeding AI diffusion
- Policies to improve management (Scur et al, 2021, Policy Toolkit)
  - **Structural:** competition, governance, FDI, regulation,
  - **Direct:** consultancy, training & information

# Outline

- UK Growth
- Climate Change: Cleaning up Innovation
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- Inequality: Finding the Lost Innovators
- AI: Managing Innovation
- **Politics of Innovation Policy**

# Politics of Growth Policy

- UK needs to **grow** & surest path to this is through **innovation**
- There are many things we **can** do (Innovation Policy Toolkits & Management Policy Toolkits)
- Major issue is time frame – impacts take time and public mood is impatient
  - But costs are low and pay-offs high
- Vital role for academics in generating evidence, but also in supporting long-run policies

# What is the Way out?

- No easy solutions, but also no alternative – we either act now with purpose or face crisis of populist doom loop
- Many challenges seem to only have costs. But can have innovation benefits with creative policies. My examples:
  - **Climate Change:** green industrial policy
  - **Defence:** Make it R&D heavy & more open
  - **Inequality:** Search out the lost innovation
  - **AI:** Improve diffusion through better management
- **Growth vision around innovation a positive & bold story for the new PM**

**Thanks!**