



Programme on
Innovation and Diffusion

The Case for Growth: Threats, Opportunities and Climate Change

LSE Environment Week
September 21st, 2022

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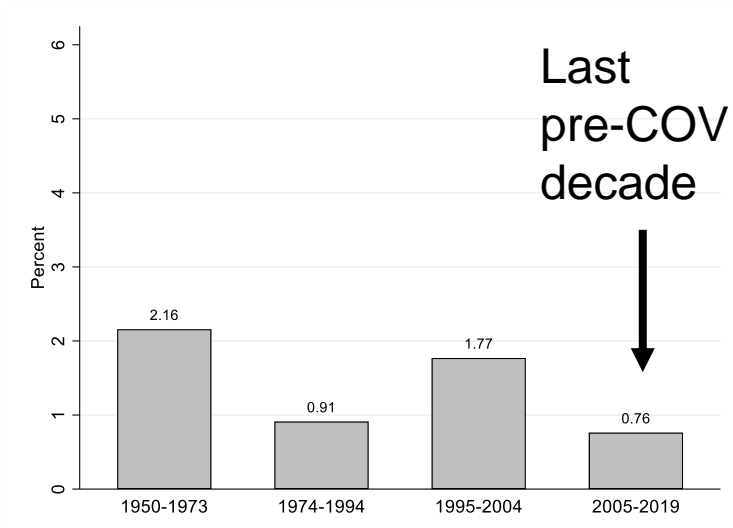
Summary

- Multiple Crises
 1. **Climate** crisis
 2. **Cost of living** crisis in wake of Pandemic and Ukraine invasion
 3. **Growth** crisis. Global problem of **low productivity growth** since (at least) the 2008-9 Financial Crisis
- Major threats, but also an opportunity to craft policies to foster growth and mitigate climate change
 - A “win-win” to tackle two market failures?

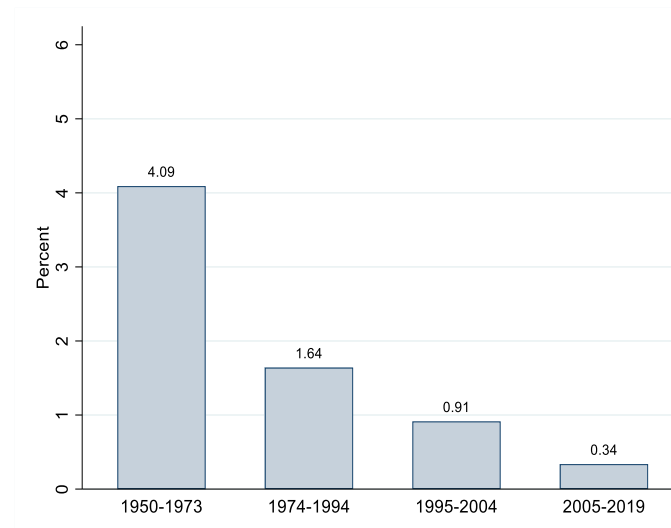


Productivity problems started long before COVID: Total Factor Productivity (TFP) growth 1950-2019: US, Euro-area and UK

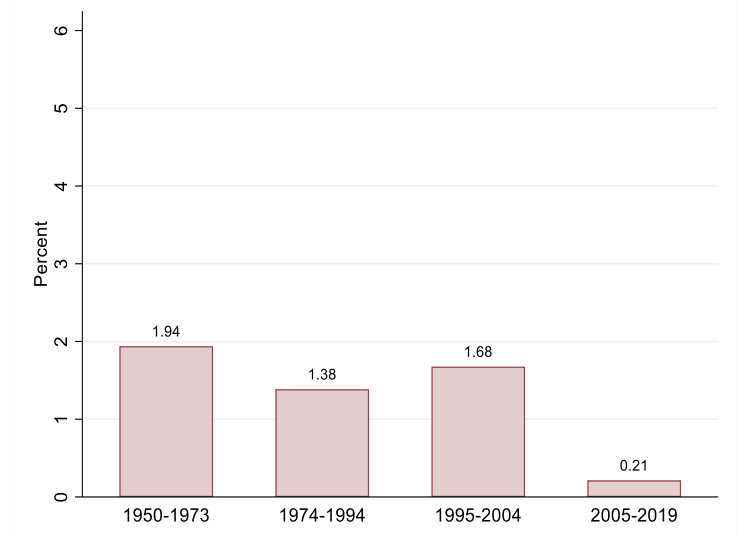
A. United States



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.

Why productivity growth matters

- Productivity: producing more output with the same inputs
- Does not necessarily mean faster depletion of natural resources
 - Productivity growth means we can create the same or more output using **less** energy resources.
 - De-growth **not** a prerequisite for green transition
- Higher productivity creates a larger economic pie – can be used to help mitigate climate and enjoy more leisure (more with less)
- **Example:** over long-run pay growth tends to follow productivity growth
 - UK example



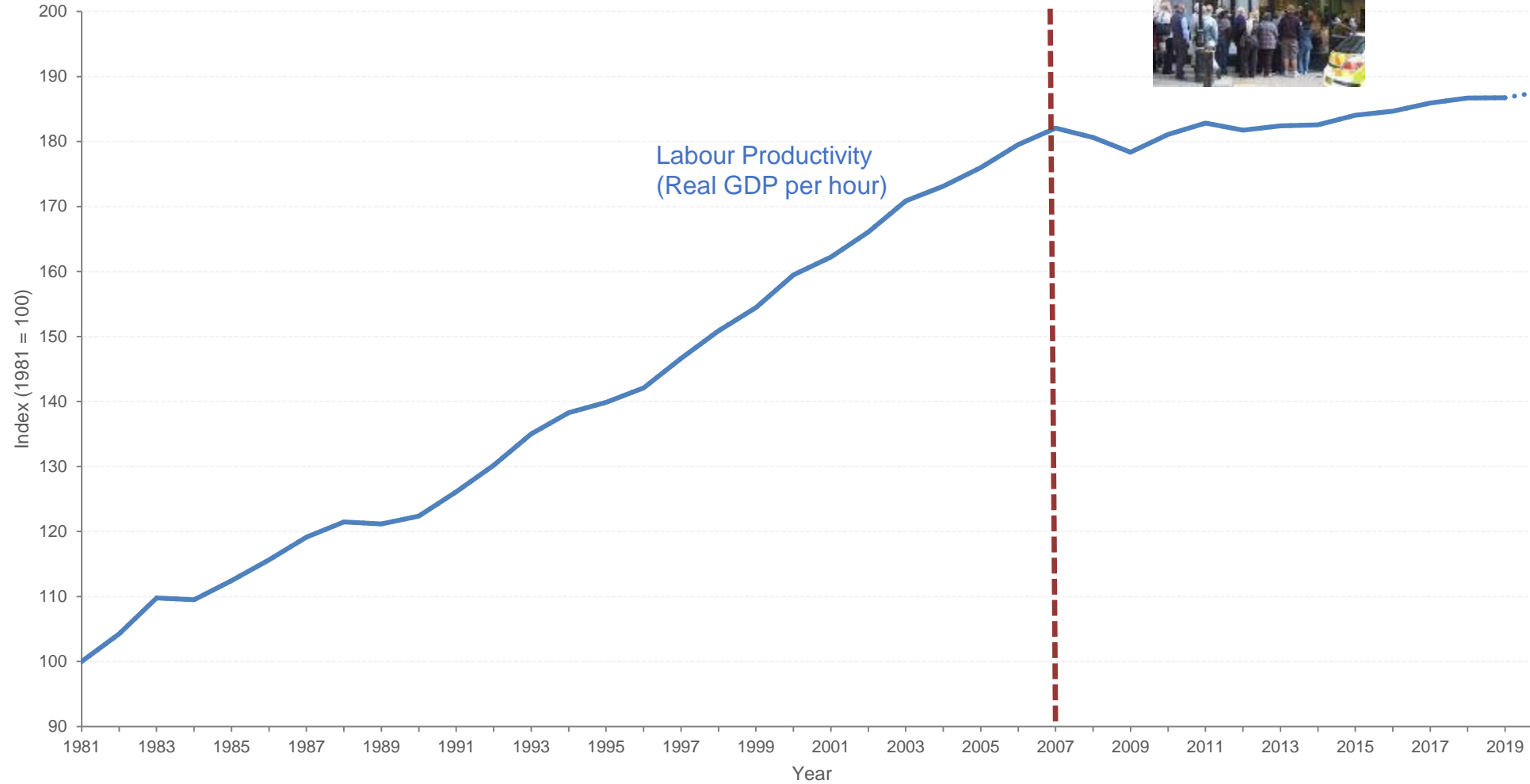
UK labour productivity in increased by about 87% over last four decades (1981-2019)



Source: ONS

Notes: Labour productivity is defined as real GDP (using the GDP deflator) divided by total hours worked.

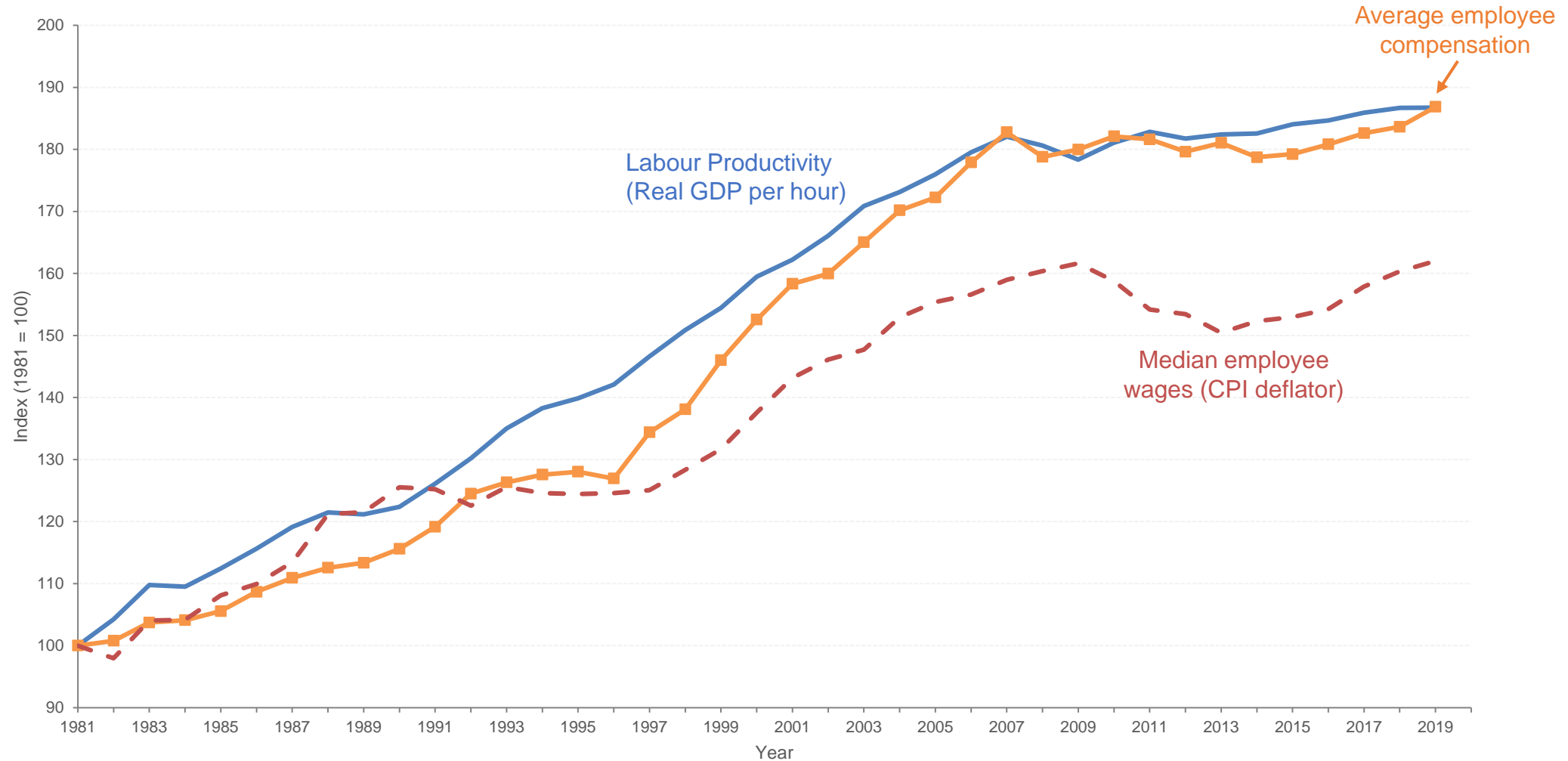
...But productivity growth slowed down a lot after the Global Financial Crisis



Source: ONS

Notes: The dotted line extends the blue line to include 2020 COVID period.

And average employee pay growth also stagnated



Source: ONS, LFS, and OECD

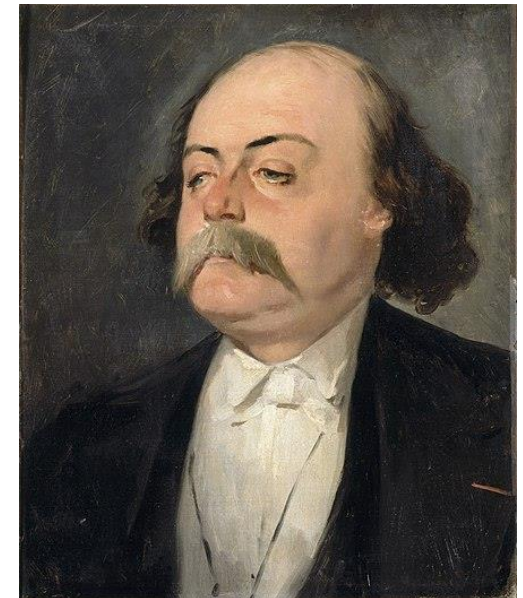
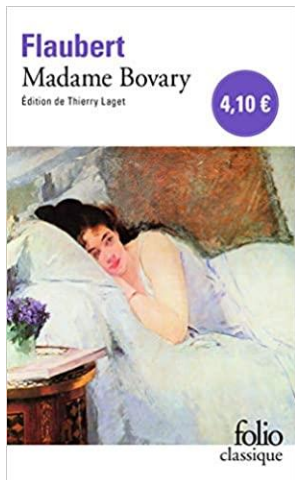
Notes: Employee compensation = Employee wages + non-wage compensation (employers' NI contributions, employers' pension contributions...). Median wages are deflated with the CPI deflator, all other series with the GDP deflator.

Why should the government subsidize innovation?

- **Multiple market failures:**
 - Firms doing R&D only capture small part of 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?

- **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*)

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Direct R&D Grants	Medium	Medium	🔦 🔦	Medium-Run	↑
R&D tax credits	High	High	🔦 🔦 🔦	Short-Run	↑
Patent Box	Medium	Medium	Negative	n/a	↑

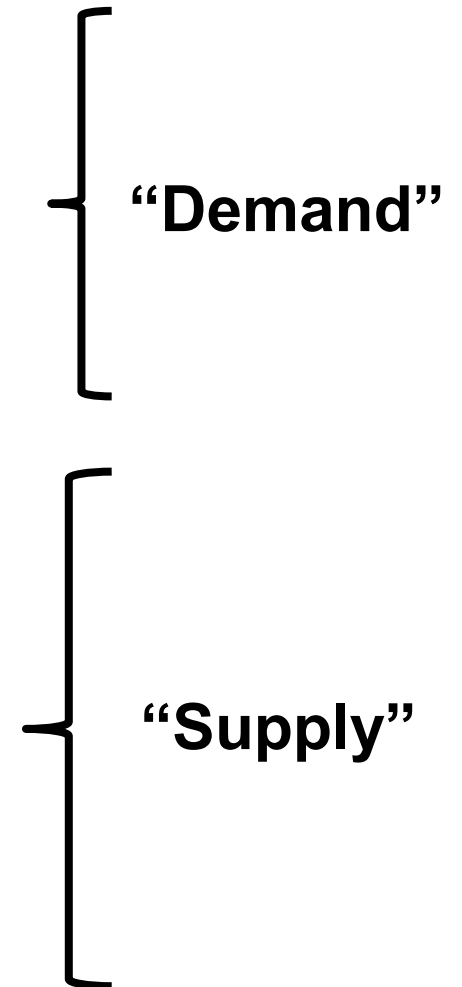
“Demand”



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	↑



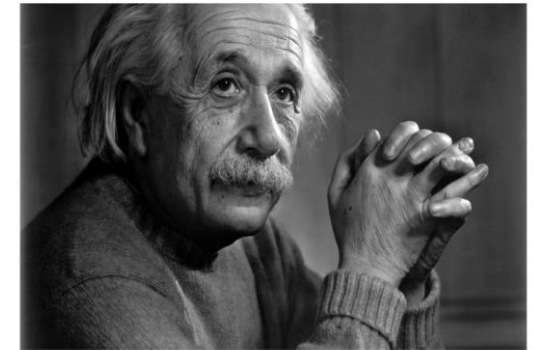
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Innovation Policies II: Human Capital

- 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



Problems with enacting adequate Climate Change policies

- All countries want to see global emissions fall, but temptation is to free-ride off the efforts of others
 - But if all nations do this, then no abatement
- Reluctance to take pain today for benefits tomorrow
 - especially in era of low pay growth
 - and distrust of politicians and experts
- Hard enough in OECD (e.g. Gilet Jaunes), but non-starter asking poorer countries to forgo growth to deal with problem of emissions created by richer countries
- Resistance to carbon taxes and regulations

Climate Change policies

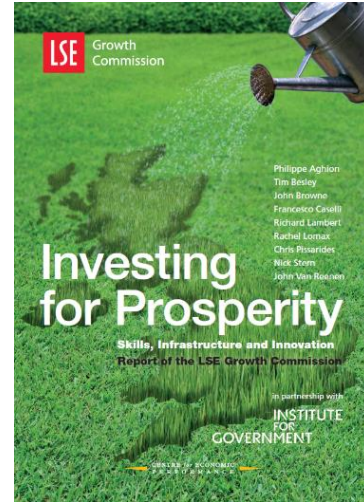
- Even theoretically, carbon tax and regulation by themselves sub-optimal (Acemoglu et al, 2012)
- And high levels of carbon tax are politically infeasible
 - So need more clean innovation and faster adoption of green technologies
- This is a win-win as we have too little innovation in general and too little clean innovation in particular
- I've argued good policy can influence **rate** of innovation
- But can it also **direct** technical change towards clean innovation?

Directing Clean Innovation

- Can policy **direct** technical change towards clean innovation?
Small (but growing) literature suggests “yes”!
 - **Energy:** Acemoglu et al (2016, 2022); Howell (2017)
 - **Vehicles:** Aghion et al (2016)
 - **Healthcare:** Azoulay et al (2019); vaccines example
 - **Defense:** Moretti et al (2022); Howell et al (2022); DARPA
- Could an “industrial policy” around climate both benefit a country (more growth) and the world (fewer emissions)?

A New Marshall Plan for Growth

- Big threats, but also opportunities for creative policies, especially around innovation
- We know much about what can be achieved
- Build Country-specific plans based on best evidence:
 - Examples of toolkits for innovation & management policy
- Bind together in a mission around Climate Change



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>