Cities and innovation - draft

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SMART CITIES: CONTEXT, POLICY AND GOVERNMENT: LECTURE 6

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What you've covered so far …

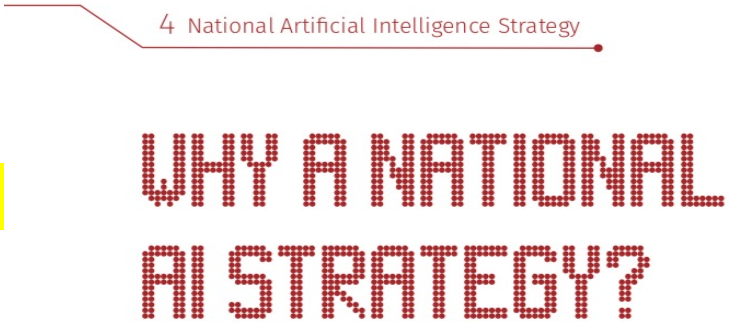
- Term 1: socio-spatial framework to think about cities
- Term 2: applying this to smart cities
  - History of smart urbanism
  - Smart city players: policy development, policy mobilities
  - How citizens do (or don't) fit in
- Today: cities and innovation, the basics
- Next lectures: strategy and policies; challenges

Why urban innovation?

Cities matter for innovation. Urban areas help generate new ideas and new tech used in smart cities. How does that happen? What threatens it?

Smart cities need to be innovative. What can policymakers do to help?

Who are the winners and losers from smart cities, and urban innovation policies?



Structure

- **Lecture 6 – overview** of cities, technology, innovation
  - **Part 1:** definitions + key frameworks
  - **Part 2:** theory + evidence, case studies
  - **Part 3:** possible futures
  - **Seminar**: innovation, remote working and the future of cities
- **Coming up**
  - **Lecture 7 – strategy + policy tools** for urban innovation
  - **Lecture 8** – **challenges** for smart cities, innovation policies

Part 1: overview

Defining innovation

- **Innovation is a multi-stage process:** ideas generation + commercialisation into products, services + diffusion in society (Fagerberg 2005)

- **Innovation involves many actors.** Firms, entrepreneurs and inventors are central to innovation, but other institutions, regulations and norms also shape innovative activity

- **Some ideas matter more than others. Key class of ideas = General Purpose Technologies.** Very widely used. Building blocks = enable other innovation (Bresnahan 2010)

General Purpose Technologies

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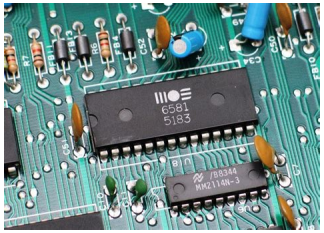

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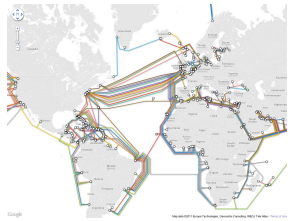

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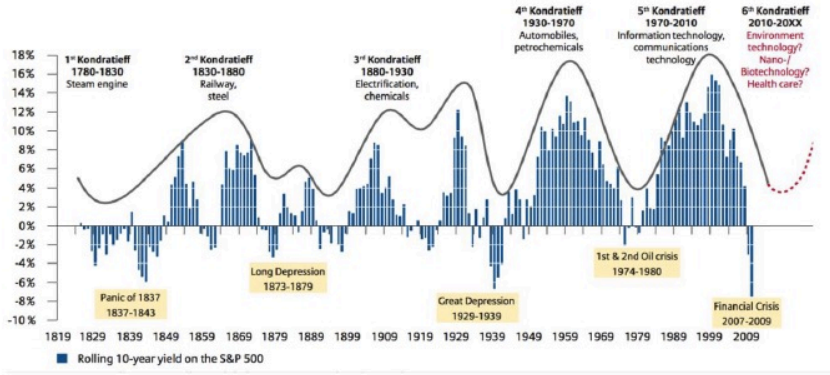
=> “Smart City”

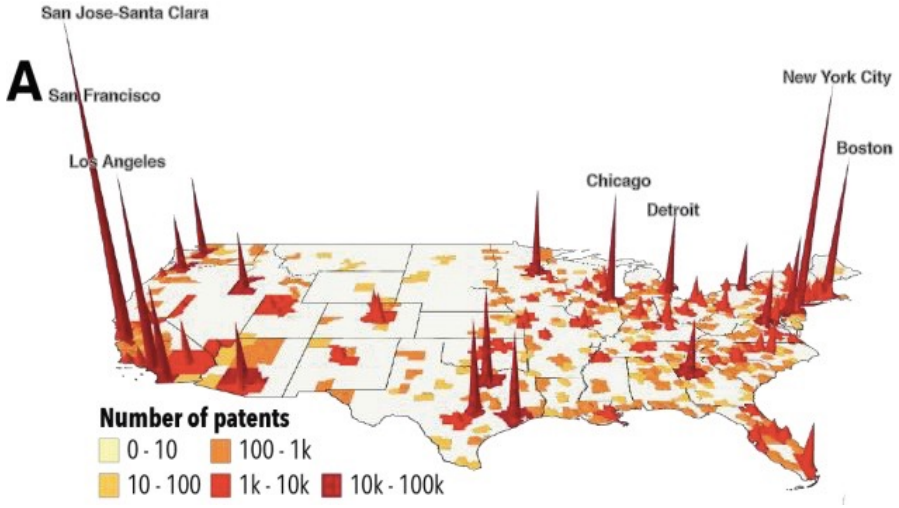
https://en.wikipedia.org/wiki/General-purpose_technology

Innovation and urban growth

- Innovation drives ‘long waves’ of economic growth (Kondratieff 1925)
- Technological revolutions (Perez 2010)



- The economic world is spiky – outsize role of large urban areas in output and innovation (Balland et al 2020)



Innovation and growth

- **Schumpeterian view** – innovation drives long-run growth through creative destruction
  - Winners and losers when new products/services go on the market
  - Entrepreneurs [startups!] are carriers of new ideas (Schumpeter 1939)

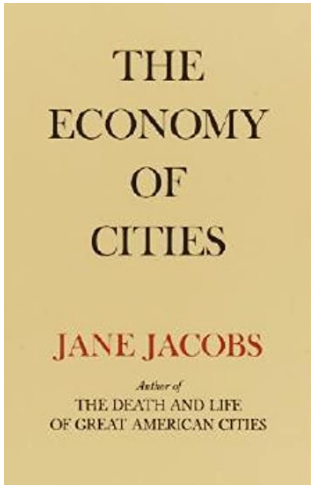
- **Endogenous growth theory** – human capital + research drives growth, through generation and diffusion of new ideas
  - As firms innovate, they become more productive
  - Other firms learn from this; knowledge 'spills over' => growth
  - This allows further investment in R&D, education, etc (Romer 1990)

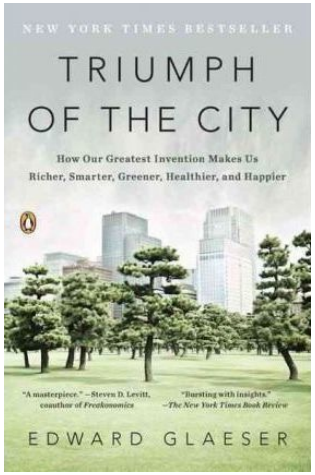
Innovation, growth and cities

- **Urban economics describes the 'microfoundations**': that is, the underlying processes that support innovation

- **Key idea = cities help firms and workers become more productive**. 'Agglomeration economies' make this happen
- This helps drive urban *and national* innovation, entrepreneurship and growth

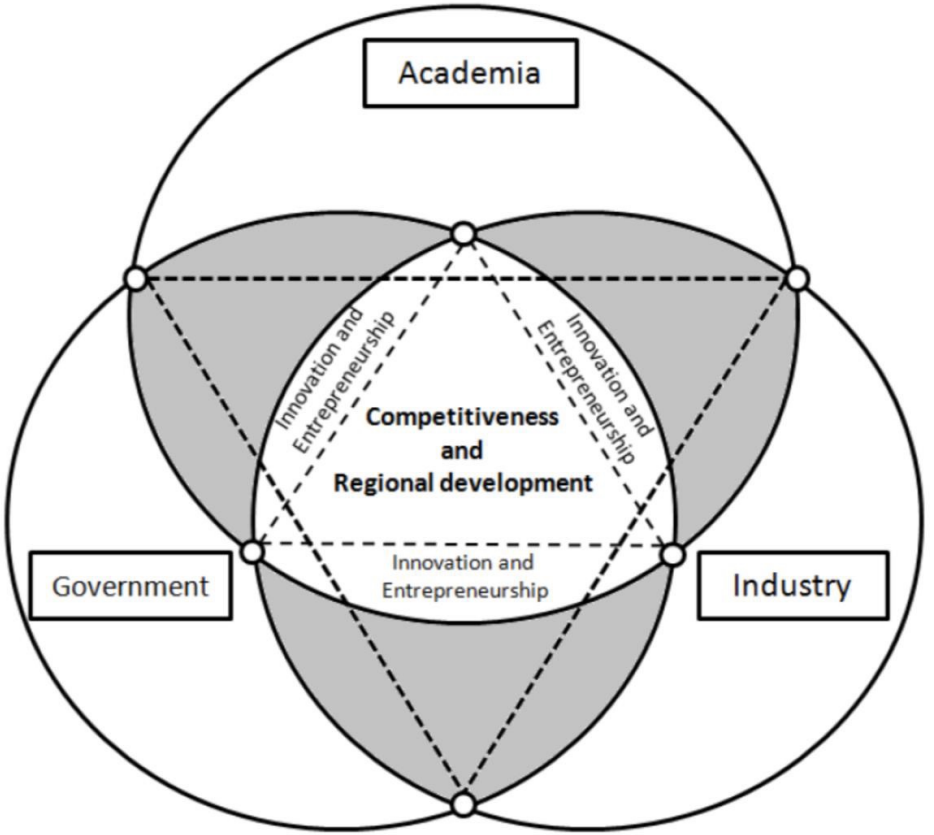
- Links back to urban systems perspectives





Innovation, growth and cities II

- Remember: innovation isn't just what firms do!
- **Innovation systems takes a broader view, emphasising the role of public sector actors**
  - Universities, research labs
  - Urban and national government
  - Public and private sector links



Source: Farinha & Ferreira (2012)

Part 2: theory + evidence

Theory: urban economics

- **Key idea = cities help firms and workers become more productive**. 'Agglomeration economies' make this happen
- Duranton and Puga (2004) divide these into three types
  - **Sharing** – benefits of shared infrastructure, e.g. public transport
  - **Matching** – deep labour markets help workers and firms find the best job / people at any point
  - **Learning** – generating new ideas, learning from others
- **Production side**: cities connect people; help them observe, learn from each other
- **Consumption side**: urban scale supports a rich set of products, services, experiences

Evidence: cities and innovation

- Innovation is higher in cities (Carlino and Kerr 2015, Storper and Venables 2004)
- Doubling the jobs density in a city raises patenting/head by 22% (Carlino et al 2007)
- Denser areas more important for unconventional ideas (Berkes and Gaetani 2020)

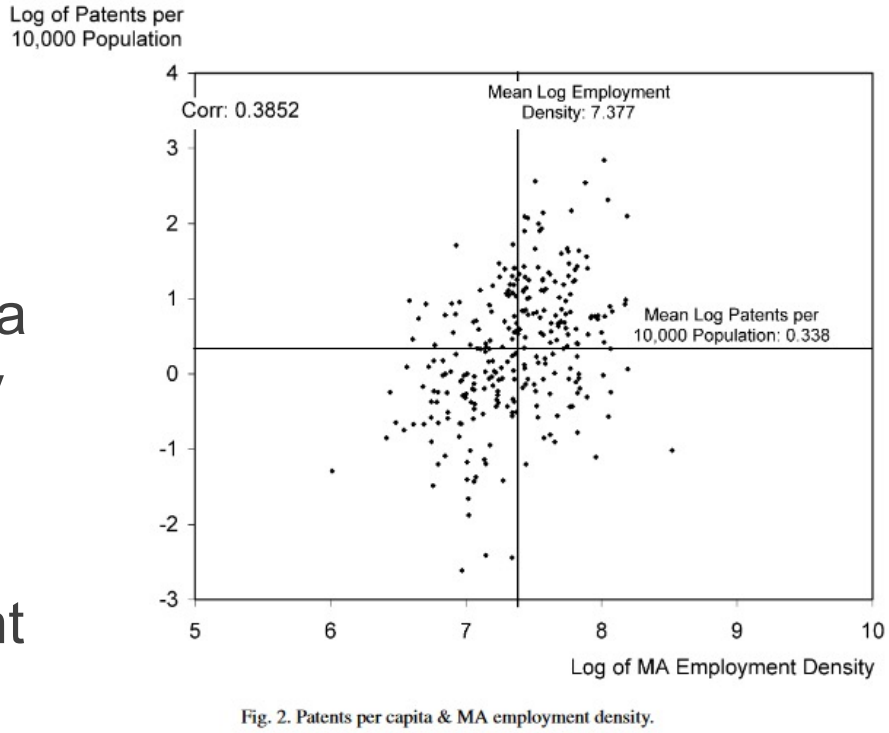


Fig. 2. Patents per capita & MA employment density.

Carlino et al 2007

Evidence: which bits of cities?

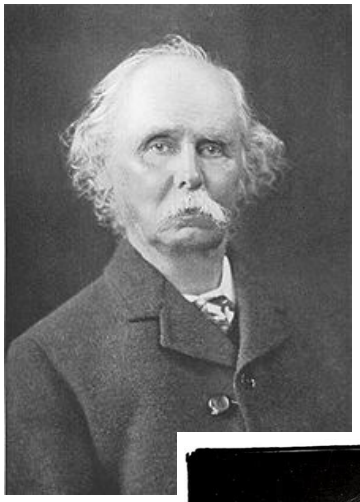
- **City ~ innovation links can be highly localised.** Why?
- Chance meetings between workers at nearby firms raises knowledge spillovers between the firms (Atkin et al 2021)
- So, how might we help people meet, exchange ideas, observe each other, collaborate … ?
  - **Physical infrastructure:** Roche (2020) finds (very) small positive links from walkable streetscapes to patenting
  - **Social infrastructure:** both Roche and Andrews (2019) find that spaces for interaction, e.g. bars and cafes <~> higher patenting
- More formally, academics talk about **clusters** as local systems for these processes

Clusters

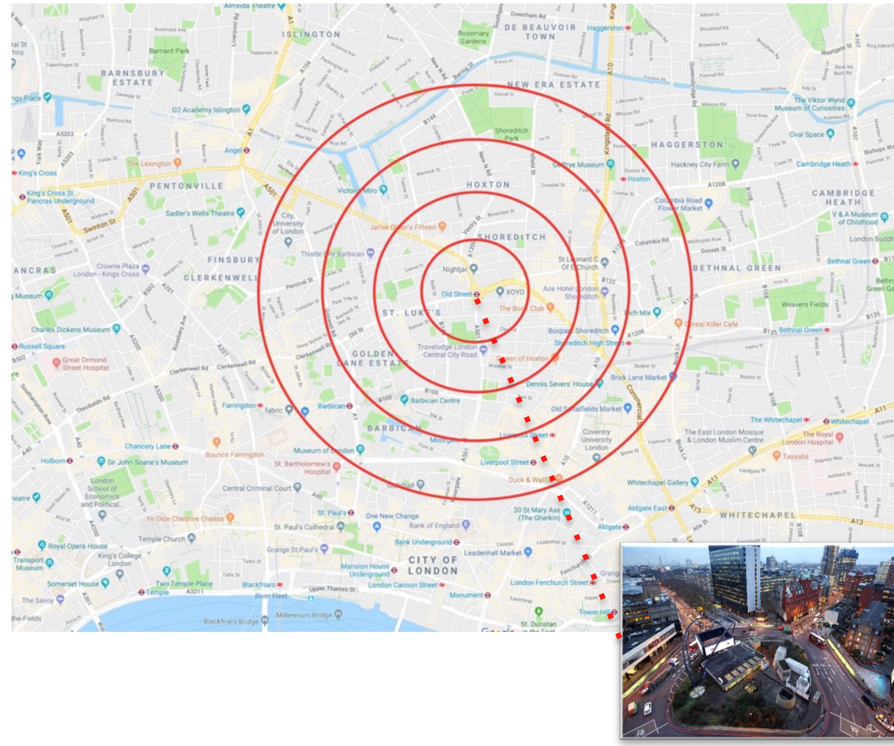
- Key idea: **colocation, interaction and collaboration by firms in cities** fosters innovation, growth (Marshall 1918)

- In the jargon, ‘industrial production districts’ or ‘milieux’ in cities

  - **Clusters may involve firms in the same industry** (Marshall)
  - **… or involve knowledge spillovers across industry** (Jacobs, 1969)



Clustering at different scales



L: Overlapping commuting zones in Silicon Valley, Kerr and Kominers 2015. US Census 2000 data.

R: Microclustering in Tech City, Nathan 2020. 250m distance rings derived from interviews

Evidence: what kinds of interaction?

We looked at lots of places, and there were a couple of companies in this area already, and we moved here because the other companies were here. And you know … the first weekend we were here we went out and got some sandwiches and sat in the park … and I ran into some friends who worked at [redacted]. And that was, you know we talked about some possible ways we could work together … . (F3)

Nathan, Vandore, Voss 2019

- Many types of interaction going on here!
  - Random interaction [bumping into people vs planned]
  - Rich interaction [exchanging detailed / tacit information]
  - Interaction in the same industry space [vs different industries]
  - Interaction with people you already know [vs people you don't]
- Lots of questions about which of these matter more

Diversity or specialisation?

- **Both! But evidence tells us industrial diversity is especially important for urban innovation** (Glaeser 2011)

- **Why? Learning across (more or less related) industries**
  - Social media <= technology + communication + media industries
  - Fintech <= finance + technology + cryptography industries
  - Cleantech <= energy + environment + tech industries

- **Why? It helps insulate cities against shocks**
  - Example = a major employer closes down, or ‘jumps’ production to another country => lots of other types of activity and work available

Theory: innovation systems

- **So far, we've focused on what firms and workers do**

- Innovation system = 'the set of institutions directly concerned with scientific and technical activities' (Freeman 1991)
- In practice, these systems may be sub-national

- **Regional innovation system** (Cooke et al 1997)
  - Productive system = what firms do
  - Financial system = private and public support for R&D
  - State system = budgets, policy levers, ability to use them
  - Social system = how actors interact, learn from each other
  - Institutional structure – tacit conventions, formal rules of the game

Example: Silicon Valley

- **Most important tech cluster in the world?** Tech and practices highly influential in Smart Cities discourse
- **Four core phases of development, with 'branching' from sets of related technologies**
  - Transistors: 1950s: Hewlett Packard, Fairchild
  - Integrated circuits, 1960s-70s: Intel, AMD
  - Personal computing: 1970s-90s: Xerox PARC, Apple, Adobe
  - Web and social media: 1990s - : Google, Facebook, Twitter
- **Broader diversification** from IT into software, web/social media, plus life sciences, biotech and 'cleantech'

Example: Silicon Valley

- **Most important tech cluster in the world?** Tech and practices highly influential in Smart Cities discourse

- **Key socio-economic features** (O'Mara, 2020; Storper et al, 2015; Atkin et al, 2021)

  - Startup culture: rapid company formation, serial entrepreneurs

  - Very large VC system: allows vast scaling without profit

  - Networking: informal, intensive. Importance of informal / chance interactions in shaping knowledge flows

  - Culture: utopian / anarchist / libertarian

Example: Silicon Valley

- **Does all this show self-organising innovation?** No!
- Role of the **'hidden developmental state'** (Block, 2008)
- **University networks and research**
  - Fred Terman founded Stanford Research Park in 1951
  - First Arpanet demo by Doug Engelbart at SRI, Stanford in 1969
  - Stanford grads founded Hewlett-Packard (1939) and Google (1998), latter using US government grant for the PageRank algorithm

Example: Silicon Valley

- **Does all this show self-organising innovation?** No!
- Role of the **'hidden developmental state'** (Block, 2008)
- The **defence industry** in Silicon Valley
  - Deep roots: Bay Area harbour as naval base and shipyards
  - Many military uses for radars, transistors, circuits
  - Public sector (incl DARPA) as lead client: Fairchild, Lockheed, SRI
- All of this raises important questions for urban innovation policy … we'll come back to it in the next lecture!

Part 3: possible futures

The future(s)

“The central paradox of the modern metropolis: proximity has become ever more valuable as the cost of connecting across long distances has fallen”

(Glaeser, 2011)

An urban paradox

- We've seen that **innovation is urbanised**. Why?
  - Knowledge spillovers, learning from observation
  - Ease of interaction, chance meetings
  - Supporting roles of urban infrastructure
- **But for innovation in individuals and teams**, proximity seems to matter more for first interactions and less for continued interactions (Clancy 2022, Crescenzi et al 2016)
  - Social, professional, institutional links > geography
  - Cheaper, better communications technology and transport
- **So why do cities still matter for innovation?**

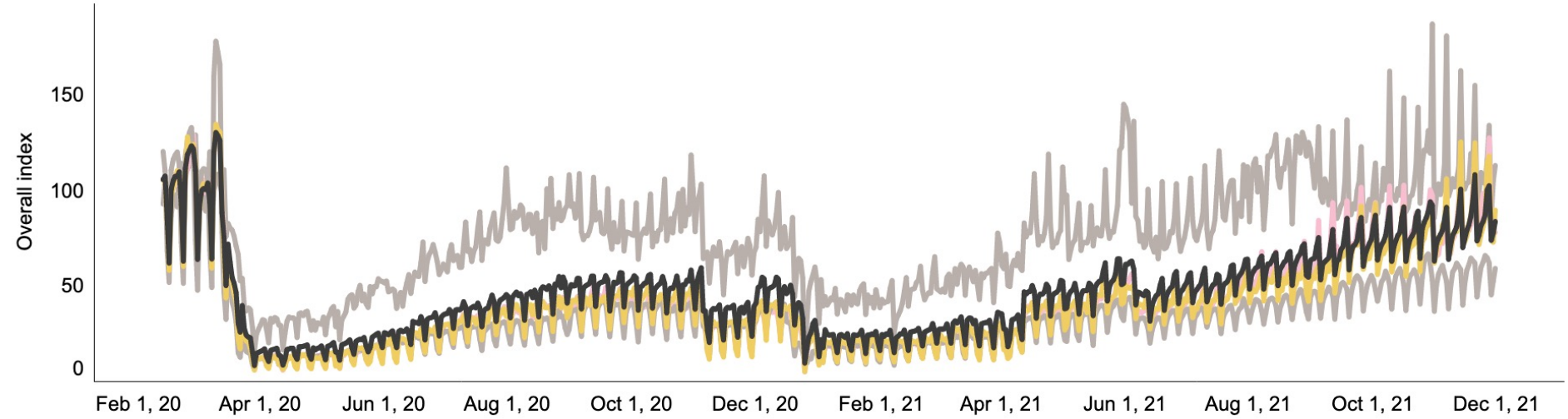
Paradox solved?

- Today's urbanised innovation systems reflect three C20 trends: 1) **structural shifts in the world economy** 2) **tech/infrastructure complementarity** and 3) **effective public policy for cities** (Glaeser 2011)
  - 'Western' cities largely produce services and experiences
  - Firms put high-value / complex activities in urban cores, and these benefit from rich face-to-face interaction
  - Cheaper / better tech and transport *enables* all of this: it reinforces big cities' economic positions
  - Urban policymakers have improved amenities and public services, so that cities are more attractive places to be

Future shocks

- **These macro forces are powerful**. History also tells us cities are resilient to big shocks (Nathan and Overman 2020)
- What kinds of change might threaten cities' position?
  - Climate: most major cities are low-lying / coastal
  - Technological: automation
  - Social/political: urbanised inequality, Big Tech
  - Economic: distributed manufacturing (e.g. 3D printing) that shifts patterns of production
  - Economic/technological: shift to remote working and consumption

Forced experiments



Legend:

Average
London
Southend
Birmingham
Manchester

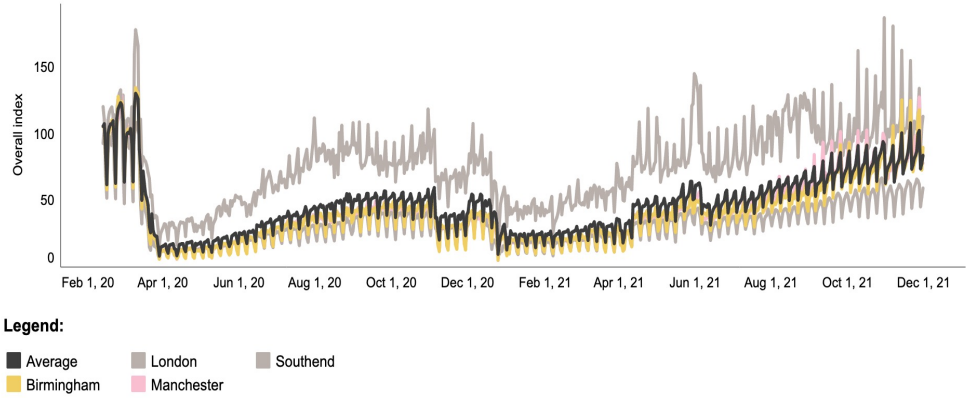
Source: Centre for Cities High Street Recovery Tracker. https://www.centreforcities.org/data/high-streets-recovery-tracker/
This index looks at everyone who was in the city centre at any time of the day, compared to a pre-lockdown baseline of 100.

The pandemic has led to huge drops in urban mobility, especially in bigger cities and especially in London

Forced experiments

- Pandemic ~ huge drops in urban mobility
- Tech enablers: broadband + cloud + Zoom, Teams

- Huge jump in working from home in 2020: 6% to 43% (Felstead & Reuschke 2020)
- Clancy (2020): remote/hybrid working tech doesn't have to be *better*; it just has to be *good enough* – and cheap



Hybrid work

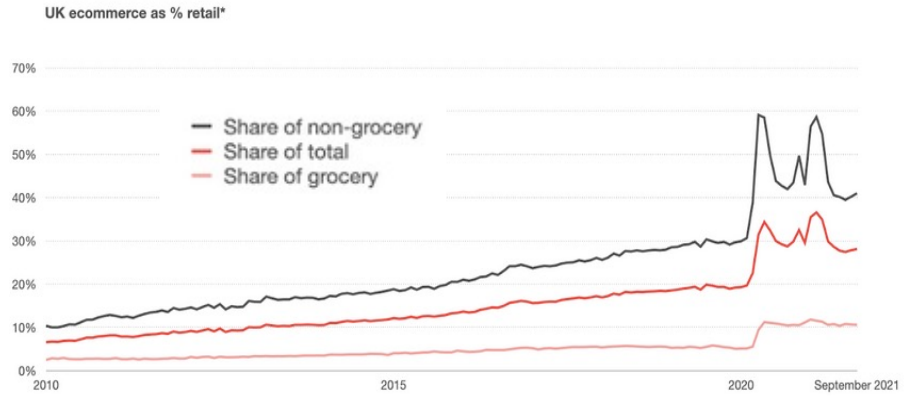
- Remote and hybrid working ‘works’ for existing teams
- Less clear it’s good for new/complex work: ideas generation; learning; chance interaction. There’s lots of evidence big cities and face to face *are* good for this (Nathan and Overman 2020)

- Expect lots of messy experimentation …

    - Emerging consensus around hybrid work: 2-3 days at home (Bloom & Strauss 2021). How can firms make this work *well*?
    - Lower demand for office space in central business districts, or higher demand for more flexible space?
    - Cities offer production *and* consumption benefits, and these are hard to unbundle (Smith 2021). Will people move from city centres to suburbs, or out of cities altogether?

Hybrid consumption

- **Detaching consumers from consumption spaces**
  - Online retail
  - On-demand grocery
  - Dark kitchens, dark stores



Source: ONS

- **Disruptive urban innovation!**
  - Decline / reconfiguration of shops and high streets
  - Growth of warehouses, fulfilment + ‘dark spaces’
  - Denser logistics networks
  - New types of urban work

Summary

- Innovation = invention + commercialisation + diffusion
- Not just something firms do
- Consensus on importance of innovation to long term economic growth – Schumpeterian view, Endogenous Growth Theory view
- General Purpose Technologies are building blocks in this innovation~growth process, as well as foundational to Smart City tools

- Innovation helps produce the tools and infrastructures for Smart Cities
- Consensus on the importance of urban areas in supporting innovation
- Differences of opinion about how this happens – urban economics vs innovation systems
- Case studies suggest both perspectives add value – but it's not just about the market!

Summary

- Why is urbanised innovation still important today?
- A big part of the answer: contrary to predictions, to date cheaper/better tech and transport have helped reinforce big city economies – rather than spread activity out
- Cities and clusters have globalised, with clusters often nodes in bigger production systems

- All this could still be disrupted by technological, economic or environmental shocks
- For example, remote/hybrid working may yet radically change urban innovation systems – big open questions here

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