

Place-biased technological change: A review and (tentative) framework

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“Some cities have been well positioned or able to adapt more easily than others because their locations, infrastructures, businesses or populations are more suited to the new economy.....

Thus the history of US cities is in one sense a story of cities growing and prospering during certain technological epochs and then either adapting to the next phase, or not, making the transition, or declining and stagnating in real or relative terms”

Atkinson, 1998: 161-162

Summary

- Technological changes have pronounced economic impacts. Economists have long considered the impact of technological change on the labour market: skills biased technological change (SBTC)
- Yet economic geographers / spatial economists have not considered **how different technologies will influence places - place biased technological change**. Instead we focus on 'nuance' – place is considered too complicated.
- But skills are also complicated, and simplification / formalisation can help address this important question - for research (does it help explain regional decline?) and policy (likely impact of drones? Self-driving cars)
- This paper presents a **very preliminary sketch** of (a) the evidence on how past (b) a framework for thinking about how future technological change may influence places, (c) an application of this framework to future technological change

Technological change and cities

- Cities were partly the result of new technologies – improvements in agricultural productivity allowed actors to specialise and agglomerate (Atkinson, 1998)
- British cities developed because of new mass-production technology, surplus labour from agricultural productivity, but need for particular natural environment
 - Wet weather meant soft wool
 - High transport costs meant manufacturers located near resources
- Technological change has impacts which are rarely spatially neutral, but analysis on technological change focused on internet rather than other technologies

Example 1: The economic geography of the internet

Flat world

(Friedman, Ohmae, Cairncross etc.)

New technology has created a level playing field (internet, workflow software etc)

It is possible to compete anywhere

Location no longer matters

Regional disparities will decline

Spiky world

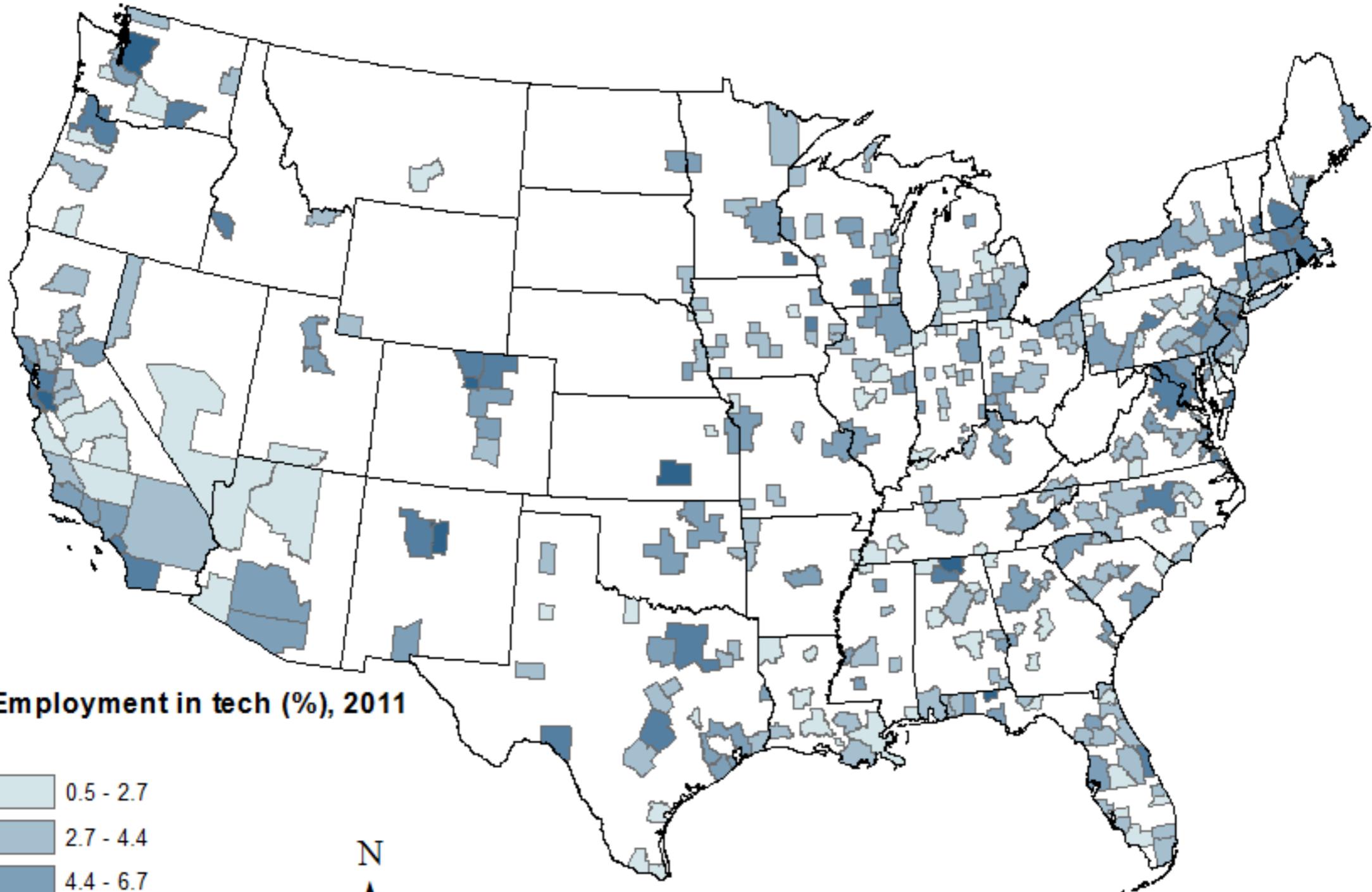
(Florida, Atkinson, Rodríguez-Pose & Crescenzi)

New technology has heightened importance of agglomeration

Cities function as nodes in production

Localised assets, knowledge-spillovers and 'buzz' still matter hugely

Regional disparities will continue

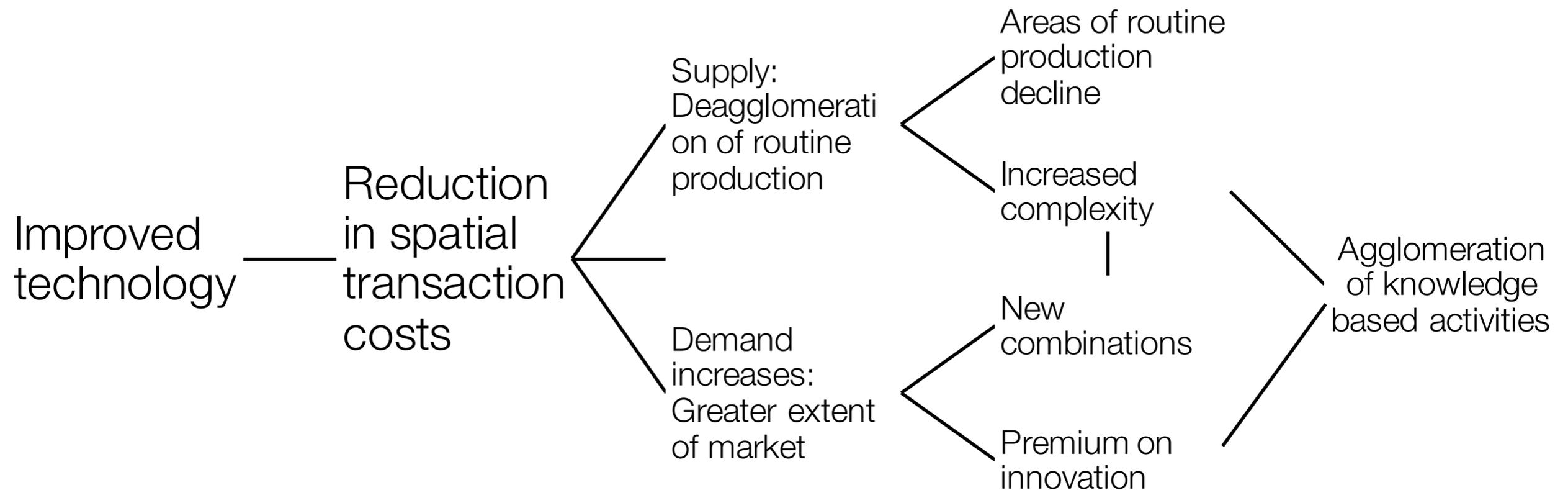


Employment in tech (%), 2011

- 0.5 - 2.7
- 2.7 - 4.4
- 4.4 - 6.7
- 6.7 - 10.4
- 10.3 - 24.1



The internet and economic geography



Information versus communications technology

- Information technology – may help disperse economic activity, as it provides
 - e.g. Empowered nurses (Bloom et al., 2015)
- Communications technology – may centralise control functions
 - e.g. Ceremonial ambassadors
- Tensions within technologies meaning they do not simply have agglomerating / disagglomerating activities but both

More examples: Electricity, cars + containerization

(Selective) history on technological change

- **Electricity transmission** – freed power-intensive manufacturing activity from location near rivers / coal (Swinney & Thomas, 2015)
 - e.g. Manufacturing in South Wales
- **Cars and highways** – more efficient transport technology allowed spreading of economic activity
 - e.g. Milton Keynes or US deconcentration of US manufacturing (Atkinson, 1998)
- **Containerization** – put a premium on large ports, reduced labour use and changed (Levinson, 2006)
 - e.g. Shift from shallow San Francisco to deep Oakland

Long-term urban change in the UK

Swinney & Thomas (2015) regress share of knowledge jobs in 2011 against industrial structure in 1911 (53 cities)

Some persistent advantages

- Cities with share of knowledge services then still tend to have share of knowledge jobs

Decline of natural advantages

- Importance of docks (dock working, seaside)
- Extractive industries

| | Beta (se) |
|--------------------|---------------------|
| Heavy industry | -.0124* (0.064) |
| Light industry | -0.123 (0.057) |
| Extraction | -0.203** (0.063) |
| Dock working | -0.857** (0.231) |
| Rail | 0.066 (0.196) |
| Knowledge services | 0.565* (0.318) |
| General labourers | -1.653** (0.812) |
| Seaside | -0.061** (0.026) |
| Cons. | 0.173** (0.055) |

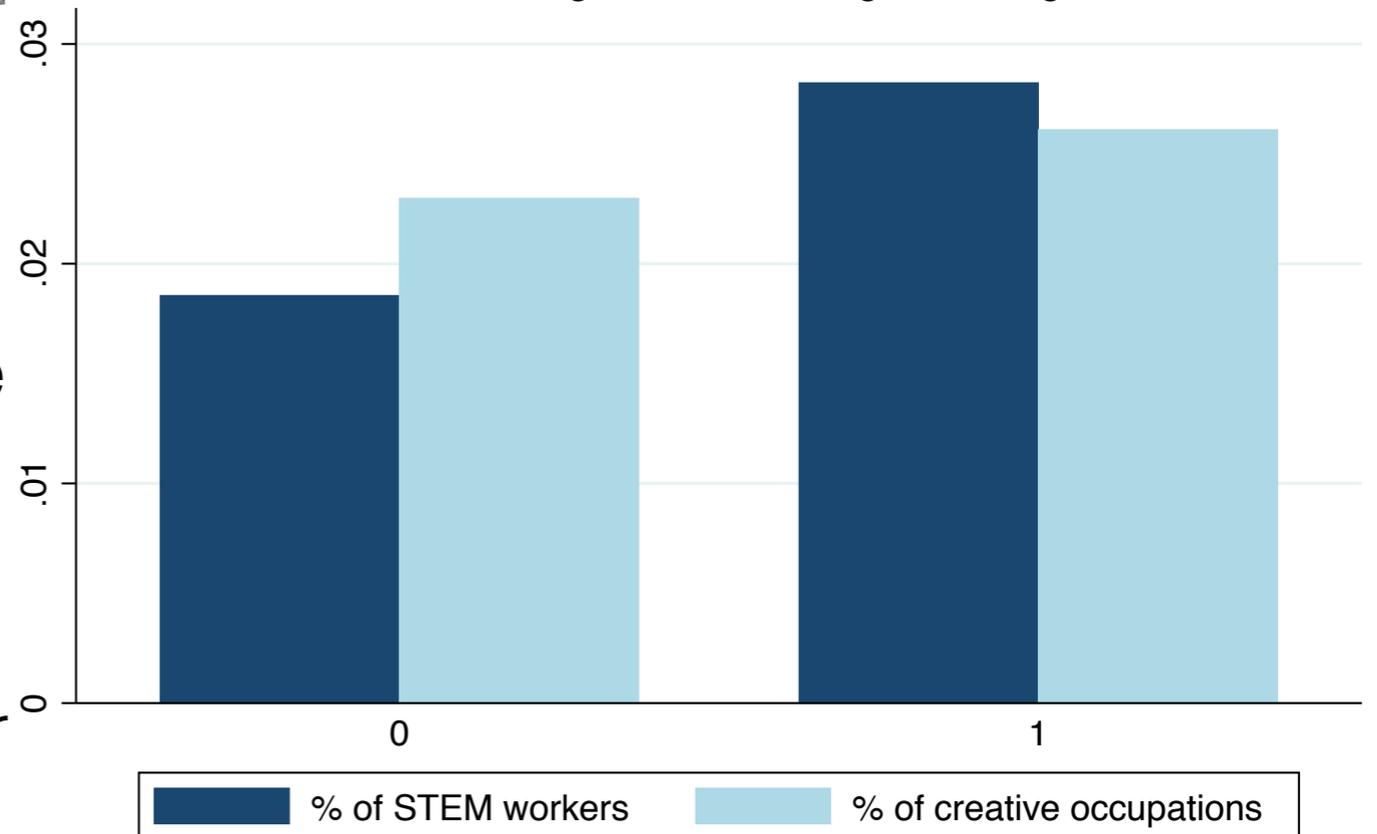
Persistent advantage in the US / Canada

Long-term persistence of higher order activities in US cities (Storper 2013)

- Land grant colleges still explain almost 10% of variation in share of STEM occupations (see figure)

30 year persistence in higher-order services in Canada (Polese & Shearmur, 2004)

STEM / Creative occupations, US MSAs 2011
0 = No land grant / 1 = Land grant college



Three ways of thinking about the impact

- **Agglomeration versus disposal** – will the new technology help spread economic activity or bring it together?
 - e.g. will the internet create a flat world?
- **First nature economic geography** – rainfall, temperature, access to sea, natural resources (Krugman, 1991)
 - e.g. recycling plants + 50% regulation led to a decline in Canadian logging towns (Polese & Shearmur, 2006)
- **Second nature geography** – scale economies, home markets. Interpreted more broadly: types of sector or function of the economy
 - e.g. will new production technology wipe out a sector?

| Technology | Agglomeration / dispersal | First nature geography | Second nature geography |
|------------------|--|---|---|
| Internet | <p>Dispersal of information intensive-activity leads to complexity and agglomeration of knowledge-based, f2f functions</p> | <p>No clear prior Potential bias towards quality of life</p> | <p>Focus on existing knowledge-intensive agglomerations Decline in routine production in industrial cities</p> |
| Electricity | <p>Allowed dispersal of activity from power sources</p> | <p>Decline of coal agglomerations - Manufacturers no longer needed to be near a source of power</p> | |
| Containerisation | <p>Reduced shipping cost and facilitated dispersal of production Agglomeration of shipping activity in mega-ports</p> | | <p>Reduced employment in port cities</p> |

Some futurology:

Autonomous vehicles, 3D printing

| Technology | Agglomeration / dispersal | First nature geography | Second nature geography |
|------------------------------------|--|--|--|
| Autonomous vehicles | <p>Dispersal of residential, but reduces agglomeration diseconomies – increasing potential for agglomeration</p> | ? | <p>More efficient knowledge-intensive agglomerations</p> <p>Rebirth of country pub</p> <p>Decline of the truck-stop</p> |
| 3D Printing | <p>Dispersal of some manufacturing (impact limited)</p> <p>But allow it to happen in niche locations (agglomeration)</p> | ? | <p>Proximity of designers to manufacturing</p> <p>But may reduce manufacturing employment in cities</p> |
| E-commerce (not really futurology) | <p>Dispersed shops decline</p> <p>Agglomeration in warehouse near transport links</p> | Proximity to 'central core' likely to matter | <p>City centres may thin-out / change their functions</p> <p>Road network may become more important / proximity to people less important</p> |

E-commerce

“... a significant share of activities such as banking, travel reservations, and shopping that occur in neighbourhood shops could be replaced by electronic interactions. This would lead to the development benefits shifting from dispersed face-to-face businesses in neighbourhoods and malls to concentrate in a few back office and warehouse locations where such services are administered. These are likely to locate in lower cost regions and lower cost areas of the metro, usually outer suburbs or exurbs”

Atkinson, 1998: 144.

Conclusions

- Cities shape and are shaped by technological change
- Long tradition of speculative work on changing technology and economic geography, but little work attempting to systematically consider how changing technologies influence 'place'
- Autonomous vehicles – some agglomeration forces, but also help disperse around core. These impacts will be nuanced: the country pub versus the truck stop.
- Policy: Emphasis on adaptation, rather than trying to swim against tide

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