

Not so Smart? The City and the Digital Economy

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Abstract

There has been extensive and detailed discussion of the impact of digital technologies on productive and distribution systems, and especially the role of humans within them. There has, however, been far less attention on the spatial implications of these technological incursions. We consider the role of cities in an automating world and suggest that the impact of technology on production, intermediation and consumption will combine with ownership patterns in technology sectors to significantly reduce the ability of most cities to generate economic value.

JEL

F63 Economic Development

J23 Labor Demand

R12 Size and Spatial Distributions of Regional Economic Activity

R58 Regional Development Planning and Policy

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1 Introduction

The role of robots, algorithmic problem solving, and artificial intelligence in the production and distribution of goods and services is increasingly recognised as being of deep significance, and potentially transformative of societies that are currently based on payment for human labour (Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017). Such structural change is of course not new; workers have worried about the implications of machines for the demand for their own labour since the first industrial revolution (Zonderman, 1992; Floud *et al* 2014). However, whilst there has been considerable debate on the nature of tasks, occupations and industries that are in danger of disruption from upcoming technological developments, commentators have also pointed out that previous waves of technology usually created more jobs than they destroyed, albeit not of the same type or necessarily for the same people (Autor, 2015). As well as the creation of new occupations, previous technological revolutions have increased productivity and hence driven economic growth (although by debateable amounts) and, in the case of the first and second industrial revolutions at least, improvements in public infrastructure general welfare (Gordon, 2017). Previous technological revolutions have also been notable in that they shift the locations of jobs; in the past they have advantaged the urban over the rural, and specifically cemented the primacy of the city (Floud *et al*, 2014; Drakakis Smith, 2012). Even the third (ICT) industrial revolution, heralded by some as enabling the birth of a ‘weightless’ economy and a ‘flat’ world did not markedly slow the pace of urbanisation despite a growing realisation that urban living came with higher costs (Friedman and Wyman, 2005). We now live in a world which is over 50% urbanised and where the cities are considered to create 80% of global GDP (World Bank, 2018).

Discussion on the intersection of new technology and urban space has so far been, unlike that for labour, generally positive, focussing on the potential for technology to make cities ‘smart’, making service delivery easier, cheaper and better, and thus

improving the lot (and potentially civic engagement) of residents (Batty et al, 2012). However, some of the debate around who provides the enabling technology – largely multinational technology companies and partnerships (see McNeill, 2015) – hints at a deeper problem, and one that this paper addresses. Our suggestion is that current technological revolution(s) are causing significant changes in the role of cities, and in their ability to generate economic value that is then of use to their home nation, particularly we suggest in the relatively service-oriented cities in the deregulated Anglophone West. We have three contentions. Firstly, many such cities employ large numbers of workers in service and intermediation activities that are likely to see significant and early disruption from automation, algorithms and artificial intelligence, and will thus face reduction, or at least significant volatility, in employment numbers. Secondly, that the already-evident impacts of technology on leisure and consumption behaviours will reduce the economic demand for other activities that currently command a large amount of urban space and provide significant urban employment. And thirdly, and closely related to the foregoing, that the concentrated, transnational ownership of technology platforms will serve to draw (taxable) value added out of most cities, reducing local prosperity and welfare both directly and indirectly as governments are less able to tax value added to provide public services. The last impact may be very important if technological transformation requires governments to intervene to manage technology transition processes and protect people from any negative impacts (for example by providing whole-life training or universal basic income).

We begin with a brief consideration of the historical role of cities in human society, before and after the first industrial revolution, as a way of framing our discussion of value creation. We then look at how cities create value today by providing high order employment, and hosting the innovation needed for economic growth, as well as being hubs for leisure, for the provision of health and other public services, and through acting as places from where national and regional societies are (largely)

managed. We then move onto the substance of our argument, which is that this value creation will be placed under significant pressure, and for some elements existential threat, by technological revolutions that reduce the return to human labour whilst advantaging intermediaries (largely technology platforms), service providers and innovators that are transnational and difficult to tax. We conclude the paper with a broad discussion of how cities might respond to these interrelated techno-economic and social challenges.

2 Value Creation in the Historical City (1250)

For the entire 5,000 years of recorded human history, cities have had a primary role in the organisation of complex societies. The near East record, including from Egypt, shows how people invented (or adopted) a variety of innovations that improved human and natural productivity, including the division of labour, purposeful irrigation, and the storage of foodstuffs and seeds for future use (Morris, 2010): Importantly, whilst these innovations were agricultural in their application, their organisation was (or quickly became) urban in locale. Amongst the earliest fragments of written history are ledgers that record the storage and distribution of grain in the granaries of Uruk, an early city in Sumeria, revealing the role of priests – an early urban elite – in the collection, allocation and no doubt taxing of resources (Goulder, 2010). Such activities no doubt benefited from reduced in transaction costs due to the co-location in urban areas of executive and administrative power (kings and bureaucrats) and, increasingly over time, artisans and other specialised occupations. This enabled the development of increasingly sophisticated, rich and geographically-spread societies – not least through the central organisation, training and deployment of the professional and part-time ‘gig-economy’ warriors that made empires a possibility (Hamblin, 2006). Here, then, cities provided management ‘nous’, but the necessities of life – food, bio-energy and materials for building – were largely rural in nature, as was much of the labour that

fuelled the urban revolution; Liverani (2013) suggests that cities enabled this appropriation of the material economic base via an 'unequal exchange', exporting ideologies and cultural influence to the periphery in return for basic commodities – if required, at force of arms.

Urban innovations, social and technical, complemented continuing rural production and other exploitation of natural resources to increase human welfare over subsequent millennia, albeit slowly (Alexander, 1954; Morris, 2010; Jacobs, 2016). As societies increasingly traded, the role of cities as enablers of this trade and, like multiply ill-fated Troy, as protectors of (and rentiers from) key trade routes, becomes more important (Acemoglu *et al* 2005). This broad model of human organisation remains reasonably constant until the industrial revolution. For example, the high-living and stereotypical debauchery of the 17th and 18th century London rich, including the Crown, was enabled by their status as (for the most part absentee) landowners of large rural estates, with lives made even more delightful by the fruits of the growing empire – tea, coffee, sugar and tobacco (Braudel, 1992; Rubenstein 1977). The role of cities as a place where value was spent (or wasted) by the monied class persisted well into the Victorian era, but, as noted by Marx, the industrial revolution changed the role of urban places. As well as centres of government, religion and trade, cities begin to *produce*, with the economies of scale and application of fossil energy possible in large factories shifting the locus of value adding firmly away from the countryside – in terms of the new and interesting products, if not in terms of basic energy and foodstuffs (Floud, 2014; Steel, 2013). Importantly, the Renaissance then industrial revolution see the cementing of the role of urban areas as the centres of technological innovation, (as lauded by Adam Smith) both in factories and in universities – albeit of course with transport innovations often developed and applied where needed in the landscape to enable the movement of materials, goods and people (Jacobs, 2016). The industrial

revolution then concentrates value creation in cities – certainly if urban wage premia are any indication (Allen, 2001).

A picture now emerges over the 18th – 20th centuries of the city as releasing the ‘agglomerative’ benefits of co-location, and population and firm density for both Fordist economic production (in terms of logistics, trade-enablement and labour supply for example), and for the promulgation of knowledge transfer, via clustering, of various types (see Krugman, 1991; Romer, 1994; Vanolo, 2015; Jacobs, 2016). The orientation of the Western, ‘developed’ city however as the locale for product creation was to come under considerable stress following the neo-liberal turn in the early 1980s, and the loosening of capital controls and full integration of Asian nations in global production chains that followed; with of course problematic consequences (Galbraith 2009; Jones, 2015; Marcuse, 1997; Massey and Meegan, 2014; Mazzacuto, 2018).

3 Value Creation in the City Today

The shift in production beginning in the 1960s and hastened by the deregulation of capital mobility in the 1970s and 1980s, the European Single Market, and the ‘open door’ policy of China in 1991, markedly changed the economic role of Western cities, and especially in the UK and US (Amin and Thrift, 1996). Over recent decades, manufacturing employment, both in total and as a share of employees fell significantly in both countries, and in their urban areas (Harris *et al* 2018; see Figure 1). This is not to say of course manufacturing *disappeared* from cities: rather it refocused on higher value, innovative activities where the strong research and capital-ownership base in the West still conferred advantages, and in some cases where capital was a dominant cost in production and difficult to shift (for example car manufacture; Harris *et al* 2018). Large scale manufacturing employment was replaced in quantity, if not always quality, by that in services, both private and public, with of course interesting differences

between cities based, for example, on their (human) comparative advantage or where they stood in national urban hierarchies (Martin et al 2014; Jones, 2015). White-collar jobs growth was very varied in nature, including high-value private professional services (financial and legal for example); technical services (not least in ICT); and public services such as healthcare (Glaeser *et al*, 2001). What did not change for the bulk of employees was the routine nature of work; what *did* change was that employment became polarised between reasonably well-paid white-collar service employment, and low value/low wage personal service employment (of various types), catering largely to outside and local markets respectively (see Andress and Lohmann, 2008; Sassen, 2016). The 'export base' for the UK and US, and the cities within them that comprise the majority of their GDP, then narrowed to focus more on financial services, professional services and tourism, bolstered by other income relating to the ownership of foreign-employed assets – including of course returns to innovation and, related to this, global brands. These inflows have however not been enough for either country as a whole to maintain trade balance with the rest of the world (Reinbold and Wen, 2018).

Figure 1 around here

Where cities – and especially capital cities – have performed better than national economies in terms of overall economic growth, there is some debate as how far this relates to inflation in assets, especially property (Toporowski, 2009), pointing to the other functions of cities that have become increasingly important in their economic mix – as leisure, consumption and residential spaces – and with much of this dependent on urban returns from financial systems that are arguably too big to be efficient drivers of national economic growth (Law and Singh, 2014)¹. Investment in the

¹ And see <https://www.theguardian.com/news/2018/oct/05/the-finance-curse-how-the-outsized-power-of-the-city-of-london-makes-britain-poorer> for the wider argument.

UK for example (as mediated by various City and city-based financial institutions) is focussed on urban and peri-urban property development of various types to a far greater extent than much of continental Europe, and with questions as to how far this might explain the UK 'productivity puzzle', and indeed as to how far the scale of provision matches actual social need. Even in activities wherein cities retain an unmistakable value-creating advantage – the symbiotic twins of higher education and publicly funded research – we see the precarious nature of the city's economic role. Research is enabled not just through the attraction of research grants and contracts, but also through its subsidisation by surpluses (financial and staff time) from inexpensive and low-time demand business, law and arts teaching, both within and between university departments. Whilst higher education students have in the past seen significant wage-premia returns on their education, especially in business and professional subjects, the picture is far more nuanced for current, let alone future, students, with significant expansion in the supply of graduates combined with a potentially technology-related reduced demand for human labour (at most levels) in the large partnerships and other 'blue chip' firms that are their expected destination (Frey and Osborne, 2017). It is notable that even as China, a key driver of demand for such education, rapidly expands its domestic provision, cities allow or enable the construction of ever-more low-cost, extremely dense and single-purpose student housing (Kinton *et al*, 2018).

In summary then the modern large city is largely post-industrial, at least in the sense of mass industry, Typically, foreign revenue earnings depend on a small number of specialised services, varying between cities but typically including higher education, research and innovation, professional (especially financial) services and the earnings of headquartered firms from assets employed abroad. Meanwhile valuable material resources from within and beyond the nation, both natural and financial, continue to support city development. Cities themselves provide important consumption and retail

and logistical intermediation spaces. The ability of cities to create economic value from this mix of activities is, however, likely to come under significant pressure as the changed nature of globalised production mixes with technological incursion into production, distribution, intermediation and consumption. And this is especially so because of the ownership of relevant IP, technologies and platforms.

4 Challenges to the City

In this Section we consider how technology, specifically, might affect the extent to which cities in the West can remain drivers of national economic growth – or more broadly, providers of important services. Following our earlier discussion, we divide our discussion (broadly and probably contentiously) into issues of production, distribution and intermediation, consumption, and then social organisation and service delivery.

4.1 *The Value of Production*

European cities, once the purveyors of manufactures for their national populations and for export, have relinquished that role, with notable exceptions, largely to Asian places. The nature of that transfer has, however been complex, with the 1960s and 1970s seeing the incursion of Japanese, and then Taiwanese and Korean state-backed industrial giants into Western markets and the resultant flight East of the value associated with the production of relevant goods (with the caveat that some would be clawed back via tariffs). Latterly, some of those conglomerates have chosen to manufacture in the West – for example, Nissan in Sunderland, UK. The incursion of China into productive systems post-1991 was somewhat different, with Chinese factories in the early years manufacturing for Western (and other Asian) corporations, and thus with a portion of value added associated with those products remaining in the places where corporations are headquartered, or where they undertake R&D

(Contractor *et al* 2010). Over time, however a number of sectors have seen key 'OEM' ownership transfer to Asian companies – car maker Volvo and PC manufacturer Lenovo (nee IBM) being two iconic examples. At the same time, a number of firms that had never produced in Asia – Jaguar Land Rover, and Corus Steel for example – have been purchased by Asian firms, reducing the portion of production value that remains in the developed world, with profits and, potentially at least, higher value activities heading East – and with production locale based ever more on cost, rather than 'national' considerations², and with this particularly evident during times of capital renewal (or structural economic change; Omoto *et al* 2018). In a number of sectors, Asian OEMs now compete on a like-for-like basis with the Western brands that produce in (often the same) Asian factories, rather than relying upon lower cost and the targeting of value conscious consumers. The most obvious, exception here is Apple, where a strong brand and high margins on globally manufactured products are captured by the OEM. Here, however, the economic value does not necessarily return to the US, either in terms of profits themselves (with Apple rarely paying dividends to owners), or via taxes that are due (with the corporation refusing to return profits to the high-tax USA (Jones, 2018).

Whilst, then, the drift of productive value-capture has been Eastward and away from cities, it is not all one way. In the UK, the 'march of the makers' has focussed on how technology and 'Industry 4.0' can enable Western, mostly urban places, to compete based on individuality and quality as opposed to identikit mass production and cost (De Propris *et al* 2017). Whilst the prospects for re-localisation of manufactures is encouraging for those who cherish diverse and dynamic developed cities, the, focus on artisan, technology-enabled goods means the likelihood of large scale employment

² See for example <https://www.telegraph.co.uk/finance/newsbysector/industry/9906785/Jaguar-Land-Rover-mulls-full-production-in-India.html>

creation is low. It is notable in addition that most cities, in the UK at least, continued to lose manufacturing employment³ from 2001 through 2016⁴ with the best performance since 2010 – of Sunderland – largely due to the expansion, not of local firms and high value clusters, but the growth of a traditionally structured (if product-innovative) Asian factory and its suppliers (Stewart and Garrahan, 2017)

4.2 The Value of Distribution and Intermediation

Cities have traditionally been key spaces of intermediation, facilitating the exchange of money for goods (often produced elsewhere), via retail, transport and logistics; and of ideas for capital (for example in stock exchanges). Latterly they have also become places where local and dispersed populations access services that are developed and owned outside the city, or even nation. The substantial growth in white-collar professional, financial and insurance ‘back office’ employment across many UK cities has been a clear case in point, and, along with public sector and consumption activities, have been key elements in employment growth in over recent decades (Office for National Statistics, various; Centre for Cities, 2018). Key elements of this intermediation function are already under threat from technological development. The growth of online retailing has been one of several factors – including the development of out-of-city (or at least of out-of-CBD) ‘big box’ retailing – that has driven down the demand for retail space across cities in number of countries, at least outside of concentrated hot-spots in hot cities⁵ (Hubbard, 2017; Centre for Retail Research and Daily, Mirror, 2018). This has concomitantly increased the (perceived) importance of hosting the spatially concentrated high-value activities of the new ‘winners’; see for

³ Value added is harder to measure by sector at this spatial scale

⁴see Figure 1, and Centre for Cities’ interactive data tool at <http://www.centreforcities.org/data-tool/#graph=timeandindicator=manufacturing\actual\2010--2016>

⁵ See also <http://www.retailresearch.org/retailatbay2018.php>

example the bidding for Amazon's second HQ between US cities (Parilla, 2017). Upcoming waves of technological incursion into intermediation are unlikely to be kinder. A number of analyses of the automation of work suggest that occupations that are narrow in their range of tasks, non-manual and repetitive and/or process driven are likely to suffer early and significant disruption (Arntz *et al* 2016) – witness another Amazon example, whereby 3,000 new 'Go' stores will be largely workerless in terms of customer interaction (Grewal *et al* 2017). Whilst cities have (arguably) already lost much 'routine' retail employment, that is of this type – meaning that which remains perhaps includes strong elements of higher value personal service – much white-collar urban work, in call and customer centres, but also in perceived higher-value professional service industries like legal and accountancy where intermediation bleeds into value creation – looks distinctly vulnerable. The loss of such employment – paralegals, call centre operatives and audit accountants for example – would leave a large hole for cities to fill in terms of floorspace and consumption-related economic demand. The prospects for this change happening rapidly are potentially high in industries which are oligopolistic in structure. Once automation becomes cheaper or more effective for a particular task or occupation and is adopted by one company or partnership, competitive pressures would see others follow quickly or lose market share (see Mirvete *et al*, 2015 for an automotive parallel). Future change in these urban-located intermediation activities and professional services could be swifter than that seen so far in retail. For other intermediation and enabling sectors, the picture for human engagement is similar, although mediated by the complexity of bundled tasks – for example it may take rather more time before intra-urban transport is fully automated (Tegmark, 2017).

The economic value that 'leaks' from cities as part of these changes may end up elsewhere in the same region or nation, perhaps in the form of increased profits for national firms, or it may largely disappear abroad. In either case, as labour input reduces in intermediation and service processes, they will become harder to tax. Interestingly, even where human input remains key in distribution processes – the delivery of food and goods for example – the incursion of global platforms, and their (and other firms') use of reliable and high-speed e-connectivity has combined with new organisational approaches to make human employment (increasingly self-employment) less rewarding and value-capturing, and conversely more stressful (De Stefano, 2015).

Figure 2 about here

4.3 *The Local Value of Consumption*

As well as challenges to cities' role as nexuses of production and intermediation, globalisation and technology bring challenges to the city as a locale for consumption. Here we see rapid change in household behaviours, often mediated by income, location and other factors, which have implications for city function. Whilst such behaviour change has of course contributed to (and responded to) the redistribution of retail, consumption behaviours have also changed in other ways. A change in eating and drinking habits has already led to a notable change in the fabric of cities, with traditional pubs and restaurants giving way to coffee bars that provide much of the same function albeit in typically more homogeneous (and multinational-owned or franchised) environments (Andrews and Turner, 2012). The formal accommodation sector is under pressure from the rise of the 'sharing' economy (Airbnb for example) which switches value from local labour to the owners of capital, sometimes not locally resident (Zervas *et al* 2017). As importantly, the 'shape' of

household spending has changed, with spending on food away from home (and especially serviced food) pressured by higher housing costs (Schanzenbach *et al* 2016). This trend has been concurrent with the growth of with home-based *cultural* consumption that depends on technologies that deliver very high (technical) quality media along high-bandwidth pipes. PwC forecast that in the UK spending on streamed video will overtake cinema receipts in 2019, and that on music streaming will overtake live concerts in 2021 (PwC, 2018) This cultural consumption, is enabled – delivered, mediated, sometimes created – by a small number of (usually) US based corporations (Netflix, Spotify, Google Amazon etc.), and the change in spending associated with such activity – subscription fees for centrally-commissioned, globally-sold, film and TV broadcasts, remote viewed elite-sport, and low-production-cost YouTube and social media content – is almost certain to result in higher levels of economic value accruing to transnational corporates that own the content, and sometimes the hardware (Wayne, 2018).

There is then a meta trend emerging across several types of consumption, and it is technologically dependent. The same internet that enables ‘endless-variety’ home media consumption and hence an (apparently) more interesting home also enables efficient, predictable access to home-delivered services, either for the ‘big grocery shop’, or the impulsive Deliveroo or UberEats purchase. Mainstream economics would suggest of course that such developments add to household welfare (and hence societal value) compared to the counterfactual – otherwise, why would people use them? – but the existence of aggregate efficiency savings or market-revealed welfare enhancements does not of course preclude problematic impacts on other socially important elements such as equality, worker rights, health or, at issue here, the geo-economic ‘footprint’ of service provision and of any value created (Mazzacuto, 2018). And the dominance of within-home consumption has of course implications for city function beyond the accrual of value added.

4.4 The Value of 'Social Service'

Finally, we might consider how cities create, retain and then distribute value via their role as centres of government, wider public organisation and public service delivery – and how this might be (further) affected by globalised technology. Here it is far from clear that technological development will have an immediate and widespread effect, for several reasons

Firstly, cities' roles as centres of governments could potentially insure them from employment losses that might 'naturally' follow from technological incursion. Governments are (in some cases at least) slow in adopting new technologies, especially on a nationwide or wholesale basis⁶, and then poor at implementing organisational change following the decision to adopt new technologies (see for example, Lui and Yuan 2015). This may reduce or delay job-destroying technological change – as indeed may the fact that governments (at various scales) can create, change or interpret regulation that allows or restricts technological incursion. Notably, prior crises have seen government institutions (or at least the more powerful and central ones) reduce service provision whilst protecting, as far as practicable, their own employment levels (Mitchell, 2012; Gordon, 2016). Secondly, there is an argument, although it is only that, which might characterise UK and US governments as having passed through multiple rounds of streamlining and outsourcing following the right-ideological turn of the 1980s, meaning that services likely to be affected by new technologies – service centres, back office administration etc – have already been outsourced to subcontracting companies that will now bear the brunt of related employment reduction (although this may be only partly true; there are plenty of public

⁶ The UK's National Health Service is the world's largest purchaser of fax machines. <https://www.telegraph.co.uk/news/2018/07/11/nhs-worlds-biggest-fax-machine-buyer-due-stubborn-resistance/>

sector administrative and process jobs left). Thirdly, much public sector service delivery relies upon occupations that are creative, complex, encompass a range of tasks and require a high level of personal interaction: nursing, policing and teaching are areas where it is likely to be both socially and technically awkward to roll out widespread automation (Arntz et al 2016). Indeed here, automation and algorithms might have more scope to reduce costs in service delivery, or augment humans in higher-quality service delivery. Finally, public services are (at least by economic definition) not in a competitive market, and hence do not face the same pressures to implement new approaches and technologies on a purely 'best financial value' basis⁷ – although one imagines some social pressure to do so might arise if public service delivery remained human-dominated as private services became automated.

In summary then, one might imagine future cities then as places where public and civic actors once again hold sway; centres of government, health and social services, learning, and perhaps some cultural consumption. This relatively benign picture is however undermined by one key factor: government services depend on a solid, indeed, growing national tax base in order to fund services⁸. The trends in production, intermediation and consumption described in earlier sections however work to reduce the ability of cities and other places to create taxable value under current structures – and this at a time when the need to command resources centrally may be increasing, not least because one emerging theme of the debate on the automation of work is the need for governments to both ensure citizens are (continually) re-trained to respond to the ever-changing workplace, and to work to redistribute resources away from those who will increasingly capture them in the market (the owners of capital and

⁷ Of course some elements of public service act within internal (NHS in England) or external (Higher Education) markets. So far these have largely not been characterised by cost competition, but that may well change.

⁸ It is outside the scope of this paper to debate whether taxes *actually* fund public spending rather than enabling public money creation.

IP) and towards those who need them (e.g. the newly unemployed). Properly managing such social, spatial and financial transformation will be far from easy, even with a strong existing tax base. Without it, it seems impossible.

5 A Smarter Future City?

This paper has so far argued that the rapid development of internet-enabled technologies enables and encourages structural economic change that calls into question the current role – and the spatial character – of many cities, especially those that have developed a functional concentration in professional services, finance, retail and consumption. Cities of course have, as we make clear, endured or welcomed prior rounds of economic transformation. But the prospect of high proportions of workers disrupted (if not excluded) by the role of technology combining with non-local, indeed effectively almost a-spatial ownership and value capture, and new forms of industrial organisation makes future change qualitatively different. Countries have relied upon cities to provide economic and social value in numerous ways, and feted, resourced, protected and favoured them in return; cities that are unable to any longer provide value creation and employment functions risk shrinkage, irrelevance and even abandonment, as previous rounds of industrial change have shown. The ‘AI revolution’ thus requires a response that is thoughtful, multi-faceted and long-termist in nature. Whilst a full discussion is outside the scope of this paper, we sketch some potential areas for debate below.

Sensible, Context-Aware City Planning – Many commentators have noted the retreat of city planning processes over recent decades, especially in the UK and US (Hammond, 2018). Prior rounds of municipal land use planning caused problems due to their inability to forecast and respond to changing economic conditions, but this is no

reason not to bring the civic and public back into city development. Indeed, the performance of the private sector (alone) in creating liveable cities or predicting future trends is far from flawless. It is notable that even in politically neoliberal countries, successful cities such as Melbourne have an approach to place-development that is proactive, encourages diversity of residential and commercial space, and recognises wellbeing, not GDP as the central objective⁹. Whilst current liveability might not predict future success, an approach which is collaborative across public private and third sectors, and rewards economic diversity and social inclusion, is more likely a better place to start tackling big, transformative questions than one where a cowed and reactive public sector seeks to lever relatively insignificant public space or infrastructure improvements from property development ‘uplift’ (Wrigley and Labrini, 2015)

A Multi-level approach – Our argument has sought to emphasise the importance of transnational organisations in changing economic structures and household behaviours. It is then impossible to adequately respond to these changes at (purely) city level. The danger here is of a ‘beggar thy neighbour’, zero-sum bidding processes whereby places compete for a smaller and smaller number of mobile projects and production sites that promise high value employment, but with economic impact uncertain and the cost of bidding high¹⁰ - and with many places unable to participate. The lessons of the 1980s and 1990s here are instructive; the additionality of place incentives that encouraged the attraction of globally (or at least EU) mobile capital was questionable (Wren, 2005). Avoiding such behaviours requires cities and city-regions to work together in ways which may not come naturally. State/regional and

⁹ <https://www.planning.vic.gov.au/policy-and-strategy/planning-for-melbourne>

¹⁰ Interestingly Tesla is already in dispute with its chosen Gigafactory home state, Nevada, in respect of unpaid taxes;

national governments, and supra-national organisations therefore have a role in ensuring the balance between capital and place is appropriate, and to be watchful, as during the second industrial revolution of the 19th Century, for market capture and resultant monopoly behaviours. The success of the EU particularly in obtaining redress for such behaviour from a number of the big tech players – although not yet in disrupting market structure – is notable.

Understand the Peaks and the ‘Rising Tide’ – Max Tegmark, in his book *Life 3.0* (Tegmark, 2017) presents the range of human abilities as a topographically diverse landscape, and the abilities of artificial intelligences and algorithms as a rising tide. The tide covers some tasks as AI capability advances – adding up, providing driving directions, soldering motherboards, playing chess (and now Go) and so on – but with the peaks, so far untouched. Developing workers – or rather people – whose skills and aptitudes place them at or near the peaks is key. Emerging evidence is that the ‘peaks’ include a number of interpersonal skills, especially those requiring empathy; negotiation, critical thinking, co-ordination and problem solving in complex (social) environments for example (Tegmark, 2017; Autor 2015). Added to these we might imagine skillsets and capabilities that are, at core, physical but require a number of ancillary tasks – social care and nursing are usual examples, but even ditch digging is some way from full automation, especially in crowded urban environments. The issue here is that ‘people skills’ are poorly taught, especially in poorer places with lower quality schools¹¹, and that caring and labouring occupations have low pay and low social kudos. None of this is however insurmountable. Even if the encouragement of such skillsets did not ensure employment in the face of the rising tide, an education

¹¹ <http://www.centreforcities.org/publication/can-cities-outsmart-robots-future-skills-uk/>

system, that encouraged engagement, creativity and developed capabilities would still be socially useful, especially if extended into adulthood.

Gaming ‘the end of work’ – An automation revolution that results in the end of human labour, or its massive downscaling is at the gloomier (or from Keynes’ perspective, optimistic) end of the wide range of forecast outcomes. Few are suggesting cities will become workless (or consumption-free) places. However, considering the shape of a city that did *not* have to respond primarily to the daily movement of people, largely in private vehicles, to and from spatially concentrated places of work would be illustrative and educational. Tentative moves and policy toward the repurposing of buildings and connective space, the decentralisation of daily life across cities (and city-regions), and a fuller focus on the protection of citizen wellbeing via the sustainable delivery of services (including ecological services) could be imagined and tested in far more radical ways. It is unlikely that any learning would be wasted, whatever the final shape of upcoming technological revolutions.

6 Conclusion

In this paper we have outlined the roles that cities have played in human societies over millennia, and the roles they take today, as nexuses for service delivery, distribution and consumption and the production of knowledge – if less these days the production of goods. We have argued that a number of these current functions are under threat by technological incursions that are owned, managed and often deployed by a handful of transnational corporations. Further, we would suggest that in the UK and US particularly a focus on financial and professional services, large scale investment into arguably-productive property and a relatively laissez faire approach to employment regulation and spatial planning makes their cities more vulnerable. Whilst

the incursion of technology into the workplace will (again) bring disruption and a need for workers, firms and governments to respond, there are two factors that make this round of structural change especially challenging. The first is that widespread use of AI and algorithmic approaches may rapidly make uncompetitive large numbers of white-collar workers on whose wages cities rely, and the second is that the ownership structure of enabling technology platforms will remove value from *most* places – advantaging the handful of places where capital and innovations are owned.

There are now entities whose ability to capture value makes them (albeit briefly) trillion-dollar ventures, yet they employ, relatively, handfuls of people, either directly or in formal supply chains. The employment supported by technology platforms in the growing ‘gig economy’ is typically non-unionised, precarious and low paid. The corporations themselves are clustered in their origin and headquarters on the West coast of the USA, although not in terms of revenue generation (or indeed the declaration of their profits). As more business moves to the cloud, be that Azure or AWS, the ability of these corporates – or future types of firms like them – to capture value will increase. At a time when the prognosis for labour force is for increased income inequality, the prospect of lower aggregate value accruing to labour, and hence the places they live, is not a happy one¹². Places are starting to think about future skills needs, adding demographic and social change to the contextual mix, but few have yet considered the implications of an overall far smaller (and/or much worse paid) workforce for local economic demand and hence the viable ‘shape’ of their cities or city regions. Now might be a good time to start. Another focus might be to consider how far current taxation systems (insofar as they are devised at city-scale) are fit for the future in terms of extracting value from economic processes – e.g. via taxing labour, visitors or land and buildings – at a time when the use and productivity of these inputs might

¹² See <https://www.bain.com/insights/labor-2030-the-collision-of-demographics-automation-and-inequality/> for a discussion

undergo significant change. And finally, on the household side, cities might consider whether the economic – as well as health, wellbeing and experiential – impacts of an indoors, e-connected, stuff-delivered existence are sufficiently troublesome to encourage a shift back, on the part of individuals and households, to a more ‘spatially engaged’ mode of living. And perhaps how to encourage it.

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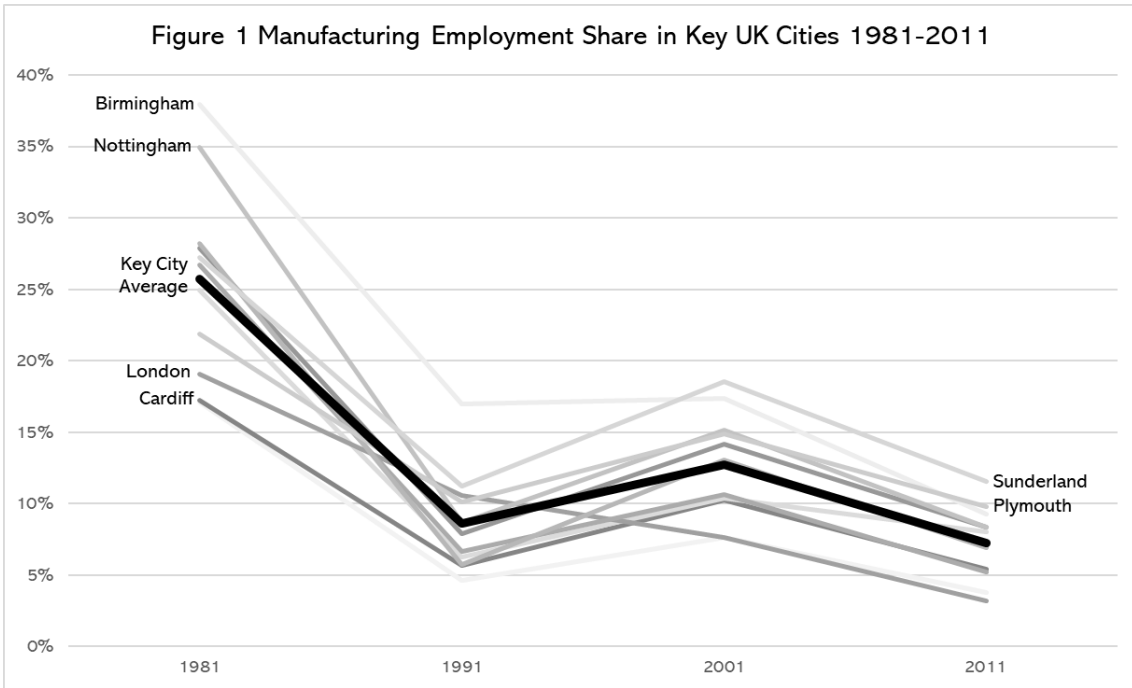
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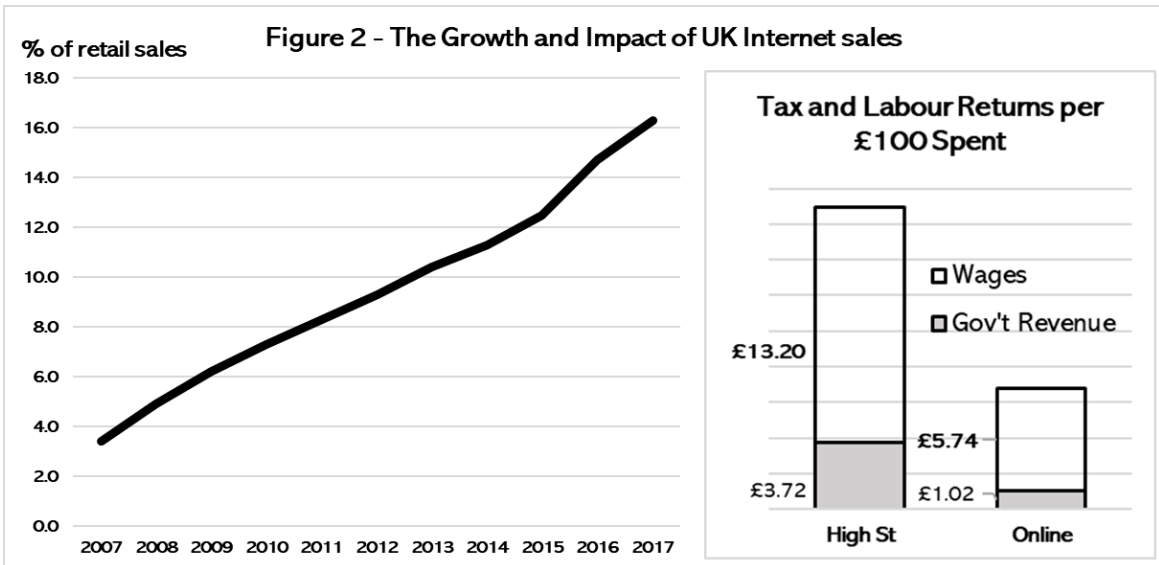
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Source: ONS Censuses of Population. Note city average is unweighted



Sources: ONS (2018); Centre for Retail Research and Daily Mirror (2018)