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Here be Startups: Exploring a Young Digital Cluster in Inner East London

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Abstract
The digital industries cluster known as 'Silicon Roundabout' has been quietly growing in East London since the 1990s. Now rebranded 'Tech City', it is now the focus of huge public and government attention. National and local policymakers wish to accelerate the local area's development: such cluster policies are back in vogue as part of a re-awakened interest in industrial policy in many developed countries. Surprisingly little is known about Tech City's firms or the wider ecosystem, however, and existing cluster policies have a high failure rate. This paper performs a detailed mixed-methods analysis, combining rich enterprise-level data with semi-structured interviews. We track firm and employment growth from 1997-2010 and identify a number of distinctive features: branching from creative to digital content industries, street-level sorting of firms, the importance of local amenities and a lack of conventional cluster actors such as universities or anchor businesses. We also argue that the existing policy mix embodies a number of tensions, and suggest areas for improvement.

Keywords: Digital economy, cities, clusters, innovation, London, Silicon Roundabout, Tech City
JEL: L2, L52, M13, O18, O31, R11

1. Introduction

Since the late 1990s, a vibrant high-tech scene has been developing in Inner East London. Neighbourhoods around Clerkenwell Shoreditch, Hoxton and Haggerston form the core, with the Old Street roundabout – 'Silicon Roundabout' – at its heart. Since 2010, enormous attention has been focused on the area and the firms in it. The UK Government has unveiled a high-profile development drive – the 'Tech City' initiative. The Prime Minister aims to build the area into 'one of the world's great technology centres' (Cameron, 2010). More than one Minister has expressed the predictable desire to 'build the UK's Silicon Valley' in East London (Nathan, 2011); simultaneously, strategy has sought to attract large-scale foreign investment. Ministers have also hoped to harness the Shoreditch scene to the economic legacy of the 2012 Olympic Games: the iCity initiative aims to develop a further technology cluster inside the Olympic Park (Osborne and Schmidt, 2012). The London Mayor and East London boroughs are also keen to make their mark, and so there has developed a raft of national *and* London-level policies covering finance, workspace, connectivity, business development, immigration, public-private competitions and research collaborations, as well as a new agency, the Tech City Investment Organisation (TCIO) to lead the 'cluster's' development. [1]

Inner East London also matters to researchers. First, the local 'system' has developed in an organic fashion, with minimal direct policy intervention (Pratt, 2009). It is thus the opposite of the top-down 'official' clusters in countries such as France, Russia and Malaysia. Second, unlike well-known high-tech zones such as Silicon Valley and Silicon Wadi (Saxenian, 1994, Bresnahan and Gambardella, 2004a), the area's industrial roots are in the digital/creative activities, rather than hardware and military-funded research. Third, we have very few hard facts, even down to the count of local firms: 'official' estimates vary from 410 to over 1100 (Nathan et al., 2012). These knowledge gaps raises serious questions for the current policy mix (Nathan, 2011). Given that cluster programmes have been largely unsuccessful (Duranton, 2011), policymakers need to get this mix right.

These UK-centric concerns echo larger academic and practical debates about the scope and shape of industrial policy (Rodrik, 2004). Shifting patterns of globalisation, the current crisis in many Northern states, and environmental challenges have all led to a resurgence of interest

[1] http://techcity.io/, accessed 24 June 2013.

in active industrial management (Foray et al., 2012, Aghion et al., 2013). Notably, US and EU policymakers (with Regional Innovation Clusters and Smart Specialisation) have both endorsed cluster approaches within the industrial policy toolkit (McCann and Ortega-Arguilés, 2011, Yu and Jackson, 2011). Tech City fits UK Ministers' renewed interest in 'industrial strategy' (Department for Business Innovation and Skills, 2012, Cable, 2012) and is seen as 'key to the Government's industrial policy' (Osborne, 2012).

This paper performs a detailed mixed-methods analysis of the Inner East London digital ecosystem, and assesses its future prospects. We ask: 1) how large is the 'hotspot' and how does it function? 2) What are the opportunities and challenges facing local firms? 3) What are the likely impacts of the Tech City initiative?

The paper is one of very few detailed explorations of these issues. There are multiple Tech City policy papers (BOP et al., 2011, McKinsey, 2011) but we know of only two pieces of primary research: Vandore (2011) surveys companies on Wired's seminal 'Silicon Roundabout' list; Foord (2013) combines small area mapping with a firm-level survey. In contrast, we use rich enterprise-level data to track the cluster from 1997-2010, and conduct over 30 detailed semi-structured interviews. We also explore early impacts of the Tech City initiative on local firms, and speculate about likely longer-term effects. We deliberately focus on the local business community, and do not explore wider social impacts of the initiative.

The paper is organised as follows. Section 2 sets out key definitions and concepts, and reviews relevant empirics. Section 3 outlines our methodology and data sources. Sections 4 and 5 present results from the quantitative and qualitative empirical strands, respectively. Section 6 concludes.

2. Framework

We unpick four sets of issues fundamental to understanding the Inner East London system: defining the 'digital economy'; the affordances of cities for digital firms; the 'global' and 'local' elements of digital firms' activity; and the impacts (intended and unintended) of area policies for the digital economy.

2.1 Defining the 'digital economy'

The Inner East London system is a 'digital economy' cluster. The 'digital economy' is a fuzzy concept encompassing a set of industries, a set of outputs (products and services), *and* a set of inputs, production and distribution platforms used at varying intensities across the economy as a whole (Department for Business Innovation and Skills et al., 2010). We take an industry-centred view, looking at firms within the UK Government-defined 'Information and Communications Technology' industries (hence ICT) and 'Digital Content' industries (Department for Business Innovation and Skills and Department for Culture Media and Sport, 2009). These groups are classified using SIC codes – the full list and 'nearest neighbours' are set out in Appendix 1.

SIC codes aggregate outputs, input and production platform information, but are inevitably limited especially in relation to digital content (Centre for International Economics, 2005). For instance, our definition excludes 'nearest neighbours' in online retail, financial services and parts of architecture/design/engineering, but in other cases – notably advertising and broadcast media – includes the whole of industries still transitioning to digital platforms or content digital content (Cities Institute, 2011). Equally, new techniques such as 'big data' analytics are spreading across all sectors (Bakhshi et al., 2012). As we discuss below, many of our interviewees struggled to say whether or not they were a 'tech' business.

2.2 Cities and the digital economy

As with other parts of the knowledge economy, many digital businesses exhibit high levels of spatial clustering (Moretti, 2012). Urban economics and the New Economic Geography explain this through the productivity-enhancing functions of cities, particularly for high-value sectors (Marshall, 1918, Fujita et al., 1999, Glaeser, 2011).

Agglomeration economies operate differently across sectors (Faggio et al., 2013). Urban areas' role in raising levels of innovation and entrepreneurship is particularly important in digital sectors, which are characterised by high knowledge-intensity, low entry barriers, and thus by large numbers of small, young firms. By facilitating the flow of ideas, big, economically diverse urban cores act as 'nurseries' for start-ups and SMEs (Jacobs, 1969, Duranton and Puga, 2001). Innovation systems analysis emphasises how networks of

interdependent public and private actors shape innovative activity (Freeman, 1987). For instance, activist universities can also help generate innovations and assist cluster growth (Hausman, 2012). Chatterji, et al (2013) highlight the strong links between initial levels of entrepreneurial activity in an area, and that area's subsequent economic growth; both case studies and econometric work show the long-term importance of local cultures of entrepreneurship (Saxenian, 1994, 2006, Glaeser et al., 2012).

This means that clusters often can often develop from earlier 'versions' of themselves. Duranton (2007) argues that the current location of a given urban industry is partly determined by the location of past breakthrough inventions, with firms relocating to 'breakthrough locations': these shifts will amplify the agglomeration channels discussed earlier. Evolutionary economic geographers explore these trajectories in more detail, focusing on different modes of technological 'branching' (Boschma and Frenken, 2011). We need to test how far these various channels operate in the Inner East London system, and how far they shape firms' location decisions.

2.3 Digital organising logics

We will also want to test the interaction between area properties and East London firms' production, distribution and sales processes. Real world clusters exhibit multiple 'cluster shapes' (Kerr and Kominers, 2012); in digital content activities, in particular, there is a strong tendency towards 'micro-clustering' at very local scales, with densely linked networks of firms and supporting actors (Hutton, 2008, Storper and Scott, 2009, Chapain et al., 2010). Core production activities are labour-intensive, dependent on complex information that requires face-to-face communication. The presence of multiple small firms and freelancers means that informal networks and 'soft infrastructure' such as bars and cafes are important in sourcing collaborators and opportunities (Currid, 2007). Knowledge spillovers are very localised, falling off within a few blocks (Arzaghi and Henderson, 2008).

While this organising logic may apply to other actors on the production side – auxiliary services such as lawyers and accountants – customer geographies differ. Low-cost digital sourcing, storage, communication, marketing and sales platforms jncreasingly permit SMEs and micro-businesses to operate as 'micro-multinationals' (Keeble et al., 1998, Varian, 2005). These technological shifts may also uproot some production-side activities from

specific local environments, with firms adopting a mix of 'global' and 'local' organisational modes.

2.4 Area policies for the digital economy

In theory, clustering should occur 'organically', as firms sort into optimal locations (Glaeser, 2008). In practice, this may not occur because of poor decisions, imperfect information, lack of finance or other constraints. The evident externalities from clustering thus create an in-principle case for policy intervention (Harrison and Rodríguez-Clare, 2009, Helsley and Strange, 2012, Chatterji et al., 2013, Nathan and Overman, Forthcoming). Most area-based industrial policies are cluster policies (Porter, 1990, Porter, 2000). These emphasise physical location as a container for interacting firms, upstream / downstream linkages and supporting industries; cluster approaches also seek to replace traditional sectoral interventions with an area-wide strategy. In its 'Triple Helix' flavour, cluster policy focuses on interactions between the private sector, local government and universities' 'third mission' activities (Leydesdorff and Etzkowitz, 1998).

Cluster approaches have been widely criticised on conceptual grounds – as too loosely defined to be useful, ignoring negative effects of agglomeration and entry, and glossing over detailed channels (Martin and Sunley, 2003, Duranton, 2011). Empirical analysis also tends to find little impact of cluster policies on area-level outcomes (van der Linde, 2003). The empirical literature is less clear on what more effective policies might involve, although a recent major study highlights the need to encourage entrepreneurial activity, and develop individual firms' managerial and absorptive capacities (Bresnahan and Gambardella, 2004b). Similarly, Nathan and Overman (Forthcoming) argue for more spatially-sensitive horizontal programmes, combined with policies to promote urban-level agglomeration. Questions also remain about the appropriate roles of FDI, export promotion, public procurement policies, and U-I linkages (Javorcik, 2004, Uyarra and Flanagan, 2009, Lawton Smith and Bagchi-Sen, 2011, Aghion et al., 2012).

One key criticism of cluster models is that they ignore negative feedback channels. Over time, urban affordances are double-edged. Agglomeration economies help firms in cities become more productive; as the cluster grows, though, the costs of co-location also rise as firms compete for limited resources (Combes et al., 2005). Similarly, clusters generate and

attract new entrants, who may enhance knowledge spillovers, increase levels of competition or both (Markusen and Venables, 1999). If competition and creative destruction force incumbents to innovate and push the weakest firms out of the market, this raises *aggregate* productivity but there are individual winners and losers (Melitz, 2003, Aghion et al., 2009). Policymakers will thus need to balance raising overall (national) welfare, with the desire to build (area-level) cluster competitiveness (Aghion et al., 2012, Acemoglu et al., 2013).

How might a policy shock such as the Tech City initiative affect an area? The shock might play out through a combination of channels: 1) area reputation effects; firm entry leading to 2) knowledge spillovers and/or 3) increased competition; and 4) property market effects, in particular accelerating property costs for local firms. These effects may be moderated by subsequent policy responses, which in turn influence location decisions by future generations of firms.

3. Methodology

Our empirical strategy has two strands. First, we conducted microdata analysis from 1997-2010, primarily using the Business Structure Database (BSD), a firm-level dataset that provides close to a universe of UK businesses (Office of National Statistics, 2012). This gives us a detailed fix on the cluster's size and long-term evolution, as well as patterns of co-location within area and industry. We focus on firms with BIS-DCMS digital economy SIC codes, and create ward-level firm and employment counts.. Note that the BSD excludes firms below the UK VAT threshold or those without employees on the PAYE system. As such, it likely undercounts digital economy firms. While employment estimates will be minimally affected, firm tallies will be lower bounds.[2]

Second, we used semi-structured interviews with local firms and stakeholders. This allows us to get a 'street-level' sense of the cluster, firms' location decisions and ways of working, and to get an early sense of Tech City impacts. The firm sample is drawn from the Tech City Map, the largest business directory for the area.[3] We drew a random sample of 100 firms,

[2] Manual checking by the Secure Data Service using firm names and postcodes from the Tech City Map to the BSD confirms that this is the case for technology companies in East London.
[3] www.techcitymap.com, accessed 24 June 2013.

stratifying on these groups.[4] Within the sample we identified five firms from Wired Magazine's list of 'Silicon Roundabout' firms (Wired UK, 2010). These are likely to be older, more established and successful businesses. Phone and email contact yielded 36 face to face interviews in 34 companies, all with founders / senior managers. We also assembled a control group of non-local technology firms using the DueDil/Tech Hub London-wide list of 'real tech start-ups' (DueDil and TechHub, 2011), and conducted three semi-structured interviews by phone. Finally, using snowballing for recruitment, a series of face-to-face stakeholder interviews were conducted across the public and private sectors.[5]

4. Findings: quantitative

4.1 Mapping

Despite its fluid boundaries, Inner East London has three foundational geographies. The first attempt at mapping the system was Matt Biddulph's speculative, jokey 'Silicon Roundabout', covering 15 firms around the Old Street intersection (Bradshaw, 2008). In early 2010 Wired magazine expanded this to 42 companies (Wired UK, 2010). Most recently, and following the area's official branding as 'Tech City', the Tech City Map provides a live mapping of over 1,000 digital economy firms. None of these surveys is designed to be comprehensive, however, and existing estimates of cluster size vary wildly (Nathan et al., 2012).

Our analysis re-maps the cluster using richer, time-consistent data. Rough mapping using BSD employment density aggregates indicates a series of digital economy hotspots across inner London (Figure 1). Inner East London is at the eastern end of this corridor, spanning the boroughs of Islington, Hackney, the City and Tower Hamlets. Within the area we identify three 'core wards' – Clerkenwell, Hoxton and Haggerston – and nine 'wider wards' – the three core wards, plus Bunhill, Cripplegate, Portsoken, Spitalfields, St Peter's and Whitechapel.

[4] Random sampling without replacement, n = 1050 firms.
[5] Interviews were anonymised and transcribed. Manual text coding was done using Dedoose.

The mapping shows both the spatial continuity with other well-known creative economy hotspots in London, and temporal continuity with previous 'versions' of the area, notably its past official incarnation as the 'City Fringe' (Hutton, 2008). Echoing Foord (2013) we also find suggestive evidence of 'micro-clustering': ICT and digital content have subtly different employment geographies. This suggests both close interactions between firms, and the localised knowledge spillovers typical of a Marshallian industrial milieu (Marshall, 1918) or Porterian cluster (Porter, 2000). Our qualitative analysis confirms this (see section five).

4.2 Counting

Next, we use BSD data to track firms and employment from 1997-2010 (the latest available data at the time). For 2010, we find 1,390 enterprises in core wards and 2,790 in the wider area. Note that these are substantially higher than official counts, even with under-counting built into the data structure.

Overall, firm counts have almost doubled from 1997-2010 (Figure 2). We can see four phases in the area's development: slow growth in the late 1990s, peaking in the first dot-com boom; gradually accelerating growth in the mid-late 2000s; and a tailing-off in the last few years (some of this may stem from the newest firms not appearing in the VAT rolls). Digital content firms drive growth to a striking extent: these businesses have closest functional and product linkages to the wider creative economy, and this is suggestive of a 'branching' from the creative economy towards the digital. Note also how much action occurs *before* the area's unofficial 'naming' as Silicon Roundabout in 2008, and its official 'branding' as Tech City in late 2010. Company registrations have risen substantially since 2010, but only a fraction of these businesses will scale enough to make it into the BSD.[6]

Turning to employment by sector, the digital economy supported over 46,700 jobs in 2010, with the biggest share in digital content (Table 1). 'Digital economy employment' also rose

[6] http://www.ft.com/cms/s/0/affb7498-ed52-11e2-ad6e-00144feabdc0.html (accessed 30 September 2013).

rather faster in Inner East London than in the city as a whole, more than doubling between 1997 and 2010 (versus a 44 percentage point jump in Greater London).[7]

Notably, while Greater London's digital economy employment *fell* by 16,000 in 2009-2010, it rose inside the cluster. This was driven by employment in digital content sectors, with falling employment in ICT businesses.

As a share of the Inner East London employment base, the digital economy has become increasingly dominant, rising from around 5% to over 15% of all jobs in the period (Figure 3). The area is notably denser in digital jobs than Greater London (which it overtook) around 2000 and the rest of the UK. However, employment shares start to flatten off in the mid-2000s. Given that job counts for Inner East London have *risen* overall during that period, this suggests some diversification in the wider local economy.

In employment terms, digital content is the dominant component of the digital economy both in East London and across the UK (Figure 4). However, note that Greater London has a substantially higher digital content employment share than Silicon Roundabout; this is driven by the higher quantum of firms outside the area, and the relative absence of large content employers (such as advertising, publishing, print or broadcast media).

We also conducted further within-sector analysis on the area's industrial composition. These results are limited by SIC coding; the ICT sub-sector is dominated by telecoms and computer hardware consultancy, while digital content is more diverse, with software consultancy, advertising, radio and TV, news and publishing taking the largest shares.[8] Again, this highlights branching towards 'creative digital' activities. Exploratory analysis by the Tech

[7] 'Digital economy employment', 'ICT employment' and 'digital content employment' refers to *all* jobs in these sectors, rather than the subset of jobs in those sectors with relevant occupational content. For a related analysis on both sectoral and occupational dimensions, see Bakshi et al (2012).
[8] Full results are available on request.

City Map indicates the huge diversity of content activities within these broad categories: a rceent survey of 774 Tech City Map firms found that 16% work in digital marketing, and more than half are 'creative tech' firms such as 3D and animation designers (Star, 2011).

5. Findings: qualitative

We begin with some pen-portraits of firms and their founders; then discuss ways of working, affordances of the area, perceived challenges and views of policy. Findings from the core group and the control group are very similar, except where stated.

5.1 Founders and firms

Our interviewees were predominantly male, white and UK-born. The group is notably less gender and ethnic-diverse than the local community or the average London start-up.[9] Over 40% of the group were in their 30s, with 2/3 over 30. This is some way from the popular image of scruffy tech geniuses, but reflects other research on the demographics of successful tech entrepreneurs (Wadhwa et al., 2008). In particular, those from the 'Wired list' – broadly, the most established businesses – were exclusively in the late 30s age bracket. Some of these latter were classic serial entrepreneurs, active since the dot-com boom. The sample is also highly educated: almost all had a degree, around a third have postgraduate qualifications (not all in computer science) and around a third had been to Oxbridge.

By contrast, the profile of firms is very different: 21 out of 34 are less than five years old, a lot younger than the Greater London SME average (7.9 years) and the UK digital economy average (7.6 years).[10] Half the sample are start-ups – companies less than three years old, including spin-outs from large firms (Blank, 2011). This is slightly less than the 60% identified earlier by Vandore (2011).

All the firms are SMEs. Over half are micro-businesses (10 employees or less); a third were small businesses (11-50 employees) and five were medium-size. Six of the firms were

[9] Sample descriptives compared with Greater London means from the 2010 Small Business Survey.
[10] Sample descriptives compared with 2010 SBS data. Unless otherwise stated, 'firms' refers to enterprises. In a few cases, sites visited are local units of a larger business.

branches of larger businesses, often deliberately placed in East London; one had recently been acquired by a large multinational.

Activities ranged from software development to viral media to digital PR. Echoing the quantitative analysis, the vast bulk were in digital content industries, although a few might be placed in ICT sectors such as 'computer hardware consultancy'. Perhaps not surprisingly, less than half the sample (15/34) considered themselves 'tech' companies, and many found the question hard to answer:

> *To be honest it's virtually impossible to explain what we do. ...we are a tech company definitely but we are also equally a creative company. (E12, C11)*

> *Most people [here] are from an engineering or a computer science background. But ... we probably see ourselves as a games company now. (E23, C21)*

5.2 Ways of working

Firms exhibited global *and* local working patterns, particularly for production-side networks. Core workforces were typically located locally, along with key networking, selling and business development functions. But we also uncovered extensive international operations: around 40% of firms (14/34) had bases in more than one country, the majority in two to four locations, with a couple of present in six or more. The majority are Varian's 'micro-multinationals':

> *It's one or two people in all of those countries ... getting business and using freelancers to deliver. And coming back to us for advice on intellectual property and things like that.. (E2, C1)*

> *You can find very highly skilled IT people based in Russia and the Ukraine, for about a third of the price of the UK or even less, and they work harder, you haven't got to manage them so much because they can work from home over there. (E11, C10)*

We found a combination of the accidental and the strategic. One team had opened a 'New York office' because they'd found a strong programmer living there. We also found low-cost attempts to internationalise – for example, buying a US landline number that re-routed calls to the founders' UK mobiles.

Customer networks had multiple geographies, with firms selling to the rest of London, UK-wide or internationally. Local customers were notably sparse – but many firms appreciated the area's proximity to large markets in Central London (see below).

5.3 The area

We found substantial differences between location decisions of older firms (and founders) and younger businesses. For the former, the decision was often by chance: founders lived nearby, or had been offered free/cheap space:

> *So I've always lived in Hackney when I've lived in London, … and]a friend] found … some bit of Hackney council who will put you in touch with landlords … So we actually, through that … literally a room above a pub … So we … spent £50 on the cheapest possible IKEA furniture, and moved in there. … And we … just more or less stumbled on the fact that this was a really good part of town to be in. … word of mouth, other friends ended up renting other rooms in that type of pub, and you started to have that tiny network effect. (E18, C16)*

Those in the control group showed similar decision-making sequences. By contrast, younger businesses (especially start-ups) had made deliberate choices, often informed by awareness of 'Tech City':

> *First of all, this [co-working] place was half as expensive as any serviced office. And secondly, there was an article in the Economist… and we saw that … and said, 'well, there's a lot going on.' (E6, C5)*

For those in East London, the area supports firms' global-local production techniques, and provides strong market access to customers, both locally and further afield. Cited advantages include cheap space (versus more central parts of London); excellent amenities (especially food, coffee and nightlife); easy access to the rest of London; presence of similar firms, and general 'buzz'. Notably, 'buzz' delineated both a kind of social wallpaper that helps attract and maintain staff; a source of ideas; and a source of collaborators, with formal and informal networks, serendipitous meetings and the area's 'soft infrastructure' playing important roles.

> *You have no problem, ever, persuading someone to work here. Whereas, if we were on a Science Park in Newbury, I'm certain we wouldn't find good calibre developers*

when we needed them, or that if we could they wouldn't want to move to where we were. So that's the first thing. Apart from that, it's kind of handy being close to other like-minded companies…. I actually don't think you get many pearls of wisdom in those conversations, but it just makes you feel less isolated. (E32, C30)

If someone's sort of interested in streetscape and visual culture then this is a good place to be. There's lots of new ideas, inspiration … we work a lot with creative agencies … It helps that we have a sense of what's fresh and what's new. (E28, C26)

I like the fact that you bump into interesting people or that you might sort of read something that someone's written online and then meet them down at the pub. … when I worked in South Kensington that never happened.(E8, C7)

The lack of a traditional, physical supply chain means that these firms are much more sensitive to softer factors affecting production. Such affordances also help shape firms' location choices *within* the area. Echoing our mapping, we found evidence of careful sorting on sometimes very tight geographies: for example, one social media firm had moved, as it grew, four times since its inception – staying within the same 200-metre radius of Brick Lane.

I don't want to move anywhere else. I wouldn't ever dream of going to Soho. I would probably go kicking and screaming to Clerkenwell. (E16, C14)

For most, these upsides vastly outweigh the negatives: in many interviews firms had to be actively prompted on the latter. The most common complaint is rising rent, the inevitable consequence of the attention the area is receiving (see 5.5). Other complaints cited by a few included the ugly streetscape, lack of amenities for mothers, and the lack of obvious 'Tech City' signifiers. Notably, given the area's impoverished 'East End' reputation, crime was only mentioned by a couple of firms.

5.4 Future challenges

Both in our main group and the control group, firms highlighted various growth barriers, in particular access to finance, finding and retaining skilled workers, and management capacity (Table 2).

Many of these are generic SME challenges, but with digital economy 'twists' that make them substantially harder to overcome. Some of these are rooted in the global structure of the digital sector; others in the inherent novelty of digital economy activity; others features of the young East London system.

The inability to find skilled staff was often the most important issue. Firms argued that there was an undersupply of skilled developers in the UK – often blaming school and university syllabuses – forcing them to rely more on immigrant workers. This often meant hiring from outside the EEA (and notably from North America, South or South-East Asia).

> *No [UK] education coupled with visa restrictions is not a particularly good combination. (E6, C5)*

In turn, current UK migration rules caused problems, especially the (real and perceived) time, costs and bureaucracy involved in processing applications. Firms were typically too small, or lacked capacity, to take advantage of more relaxed rules on inter-company transfers. (The oft-cited 'Entrepreneur Visa' may raise the supply of new business founders, but has no effect on *existing firms* seeking skilled staff.)

While barriers to entry in technology sectors are often very low, risk levels are high. Potential investors need to be both risk-loving and very well-informed about these sectors, something not generally true of the current UK early investor community. We found three groups of firms: a small group who'd been able to rely on personal contacts; a bootstrapping group (who as a result, often felt unwilling to look for external later stage finance); and a third group who'd had to look for angel or VC money, with mixed results. Many complained about UK investors' risk-aversion, small size and focus on established prospects:

> *In Silicon Valley you can get investment based on an idea. And that's because they're used to investing in tech. (E2, C1)*

> *Investors need to understand what tech investment is all about ... [It's] VC investment with high risk, very improbable returns. Understanding that needs to be*

put forward. I've been in VC for four years now and it's quite hard to educate someone around this. (S1)

We need a second round of funding to actually develop [our product]. If we were in the US we would probably have gotten it all at once. But we're not in the US. So we've had to split it up into a number of small steps. (E24, C22)

This last point echoes other research on co-ordination problems in UK VC (Reed, 2010, Lerner et al., 2011, Marston et al., 2013). Of the ten UK Enterprise Capital Funds, only one specialises in digital economy investments. And only a handful of banks, VCs and angel investors specialising in the digital economy are physically located in the area.[11]

The East London cluster is still embryonic compared to the South Bay Area: inexperienced investors are reacting to business plans from (often) new and inexperienced companies. So the supply of high quality entrepreneurs also has to improve (Rigos, 2011). Similarly, one interviewee remarked on the lack of 'elder wisdom' in East London compared to the US West Coast, 'where I've had my most useful conversations':

It's either being able to call someone when you've got a problem … a web server scalability problem, or whether you're about to raise a round of funding and you're wondering what to do about, you know, salary rises for your early employee or issuing equity … (E18, C16)

Older entrepreneurs and venture capital providers in London we spoke to are often happy to help with advice – but young entrepreneurs lack networking skills or gravitate to the 'beer and pizza' events where they network with each other, rather than older, more experienced entrepreneurs. Networks, although mushrooming, are still nascent (S1, S4).

5.5 The Tech City initiative

Contrasting messages about Tech City emerged from our East London interviews. Awareness was lower than expected: around a third of interviewees had little or no knowledge about the initiative (likely to be vanishingly small now). Those with views split down the middle, with

[11] This has been changing since the primary research period, with Silicon Valley Bank and other investors opening offices in the area.

equal counts of positive and negative opinions. Optimists welcomed the attention Tech City could bring:

> *Tech City's great. I think all of this helps to push the ecosystem generally, because it gets into people's minds … (E24, C22)*

> *It's creating a lot of similar-minded people in the area as well, and all of those people can feed off each other and the different ideas, the sense of community, can really make each of their businesses better. (E11, C10)*

Pessimists – often older firms or more experienced founders – were more sceptical:

> *Tech City is what government people call it. I don't think I've heard anyone call it Tech City without sort of air quotes. (E18, C16)*

> *My personal perception of Tech City is very much a government jumping on the bandwagon, and sticking a label on it. (E23, C21)*

There was some confusion about governance – some knew about TCIO, but the organisation had a low profile. Ministers' public interest had also led some to think the initiative was 'Cameron's baby' or similar. Notably, there was little interest in relocating to the Olympic Park, which was seen as disconnected from, and lacking the critical mass of Shoreditch:

> *It feels like the kind of thing where there'd be a first user disadvantage to that space. There'd be a worry that you would be moving out onto a tumbleweed strewn cul de sac, and would be cut off from the vibrancy … associated with this particular area.. (E33, C31)*

> *For us it is not an option to be based in Stratford. Because we have to be in close proximity to our clients. (E5, C4)*

Some concerns arguably reflect perception over reality – local connections to Stratford are excellent, even if the Olympic Park is harder to reach. Nevertheless, the iCity initiative will clearly need to persuade smaller firms to locate in the campus, especially as there are already multiple technology property markets (for example in Dalston, London Bridge, Canary Wharf and west of Soho) (Savills, 2012).

At the time of the research, only suggestive evidence of policy impacts was available. No one doubted that 'Tech City' had raised the area's profile: its bright light had already affected industry location decisions, especially for younger firms. It was impossible to tell whether new entry has been felt most keenly through the spillovers or competition channels, although some expressed worries about poaching of ideas and staff. What *was* already evident were significant property market effects. Around 40% of interviewees were worried about the cost of office space, with many contemplating relocation:

> *One of the disadvantages of being in an area that's getting trendier and trendier and trendier is that the rents are going through the roof. It's on the edge of being sustainable. (E29, C27)*

As a senior GLA politician put it at a project seminar:

> *Even if a third of firms in Tech City haven't heard of it, you can bet every estate agent has. (S9)*

6. New directions?

Inner East London's digital economy is a striking example of a cluster, with a number of distinctive features. It has evolved organically, emerging out of technological shifts in the creative industries, and maintaining important structural links to the wider London creative economy. At area level, this manifests itself in evidence of progressive 'branching' from creative to 'creative digital' firms and employment. In terms of geography and business population, Silicon Roundabout is also tiny compared to Silicon Valley, and is centred on a few highly specific neighbourhoods, with some micro-clustering within the zone; conversely, property market pressures now seem to be shifting boundaries outwards. The system is also striking for the historical lack of HE actors or 'Triple Helix' activity: so far universities have acted as providers of skilled people, nothing more.

The launch of the Tech City initiative has hugely raised the area's profile, and may have created an inflection point in its development. However, many policy challenges remain.

Early Tech City strategy had three broad goals: to develop the area, to raise levels of FDI, and to generate a halo effect for the Olympic Park. This research has highlighted the tensions between these objectives. The impacts of FDI on incumbents are not straightforward, and may generate benefits (via knowledge spillovers) or costs (via competition in the marketplace, for inputs or both): the quality and absorptive capacity of incumbents matters (Meyer and Sinani, 2009). Given the still-developing state of the cluster, it is not clear that simply maximising the *level* of foreign investment is helpful if the aim is also to develop London and the UK's competitive position. Rather, policymakers should identify complementary investments (such as finance providers, auxiliary services and workspace managers) and seek to attract the right *mix*, as well as helping the strongest locally-based firms with support in international expansion and exports. Encouragingly, there are signs that the TCIO is moving to such a model (Tech City Investment Organisation, 2012), as is the GLA.[12] Equally, policymakers need to be realistic about the agglomeration diseconomies and processes creative destruction inherent in a growing cluster: failure rates are high and preserving incumbent positions may come at the expense of achieving wider welfare goals. There are fewer signs that this deeper tension is being addressed.

Equally, policymakers should downplay the Olympic Park as a natural extension of the Shoreditch cluster; as our interviewees make clear, this is not credible. The Broadcast / Media Centre site is a natural campus space for large organisations: not surprisingly, the first tenants include a university (Loughborough) and a multinational (BT).[13] In theory the site could also develop a Shoreditch-style industrial district. A community of like-minded small firms in iCity would make locating there more attractive, and this offers one possible route for policymakers to take, as well as exploring links to the creative community in nearby Hackney Wick. More seriously, there is no obvious locational logic to the iCity site: as our mapping makes clear, there are already a number of digital economy hotspots in London (and related property markets). Analogies to Canary Wharf are misleading – technology firms have far more spatial choice than financial services firms did in the 1990s.

At the time of writing, several new features are emerging. First, there are signs of further industry branching, notably financial services technology ('fintech'), environmental software

[12] http://www.london.gov.uk/priorities/business-economy/for-business/recruitment/foreign-workers (accessed 30 September 2013).
[13] http://icitylondon.com (accessed 24 June 2013).

/ services ('cleanweb') and digital manufacturing. These new production spaces exploit existing knowledge bases, notably software and web dev, and large downstream markets – information-hungry financial services firms, and London's ageing, inefficient physical infrastructures.

Second, and linked to this, cluster boundaries are undergoing further spatial shifts. Anecdotal evidence suggests technology firms are selecting into contiguous neighbourhoods in the North (such as Dalston and central Hackney[14]), South (the City of London) and West (Camden and King's Cross), as well as the large Level39 accelerator space in Canary Wharf (ironically, founded by the former head of TCIO).[15] How far these shifts are driven by property costs is unclear. Average local rent rises are in line with the rest of London.[16] For younger firms, the shared workspace market is thriving, with new providers entering the market (notably Google Campus) and existing providers expanding (Tech Hub, the Trampery, Hoxton Mix, Central Working). However, the core streets around Shoreditch lack large floorplate offices, with little opportunity for new construction given the urban grain. Competing uses – whether other sectors, residential or student halls – may also ramp up costs for SMEs.

Governance arrangements are also evolving. Many challenges facing East London firms are not amenable to area-based cluster initiatives: in particular, finance markets, skills and migration policies involve largely or wholly national policy levers. This multi-level issue set calls for careful governance, bringing together local private actors (entrepreneurs, firms, investors, landlords, local amenities), public actors (the London Mayor and GLA, Boroughs, universities and colleges) and national actors (the Department of Business (BIS) and 10 Downing Street). So far, the unstable politics of Tech City has been unhelpful in this respect. Early Tech City thinking was dominated by Downing Street, driven by two key officials, Steve Hilton and Rohan Silva, who have now left Government. There are some signs that Tech City may dissolve into a bigger, national strategy: both BIS and TCIO have signalled interest in developing a 'cluster of clusters' across the UK. Thus the London Mayor – who has so far shown sporadic interest in the area – will need to play a more active role.

[14] The Trampery recently opened a major new space in London Fields, for example (http://www.thetrampery.com/#london_fields__hackney_ (accessed 30 September 2013).
[15] Level 39 is 'Europe's largest accelerator space for finance, retail and future cities technology companies.' (http://www.level39.co, accessed 24 June 2013.)
[16] http://techcitynews.com/2013/05/20/office-rents-not-inflated-by-tech-city-hype/ (accessed 30 September 2013).

Several research gaps remain. Future analysis could use Companies House data to track business formation and survival in more detail; larger scale surveys would provide structured, fine-grained information on company behaviour, and shifts into new geographic and product spaces should also be explored. There is a also a clear need for research on the social impacts of 'Tech City', not least on local residents and neighbourhoods where the initiative is likely to be accelerating gentrification.

List of tables and figures

Table 1. Employment growth in the digital economy, 1997-2010.

Year	core wards			IEL		
	DE	ICT	DC	DE	ICT	DC
1997	826	126	700	1591	348	1243
1998	885	184	701	1803	508	1295
1999	959	220	739	1982	674	1308
2000	1027	257	770	2102	734	1368
2001	1072	276	796	2216	793	1423
2002	1053	264	789	2228	765	1463
2003	1181	268	913	2643	712	1931
2004	1201	254	947	2611	681	1930
2005	1189	243	946	2614	630	1984
2006	1213	239	974	2828	635	2193
2007	1259	236	1023	2779	597	2182
2008	1357	254	1103	2830	605	2225
2009	1437	256	1181	2896	596	2300
2010	1406	228	1178	2870	570	2300

Source: BSD / SDS.

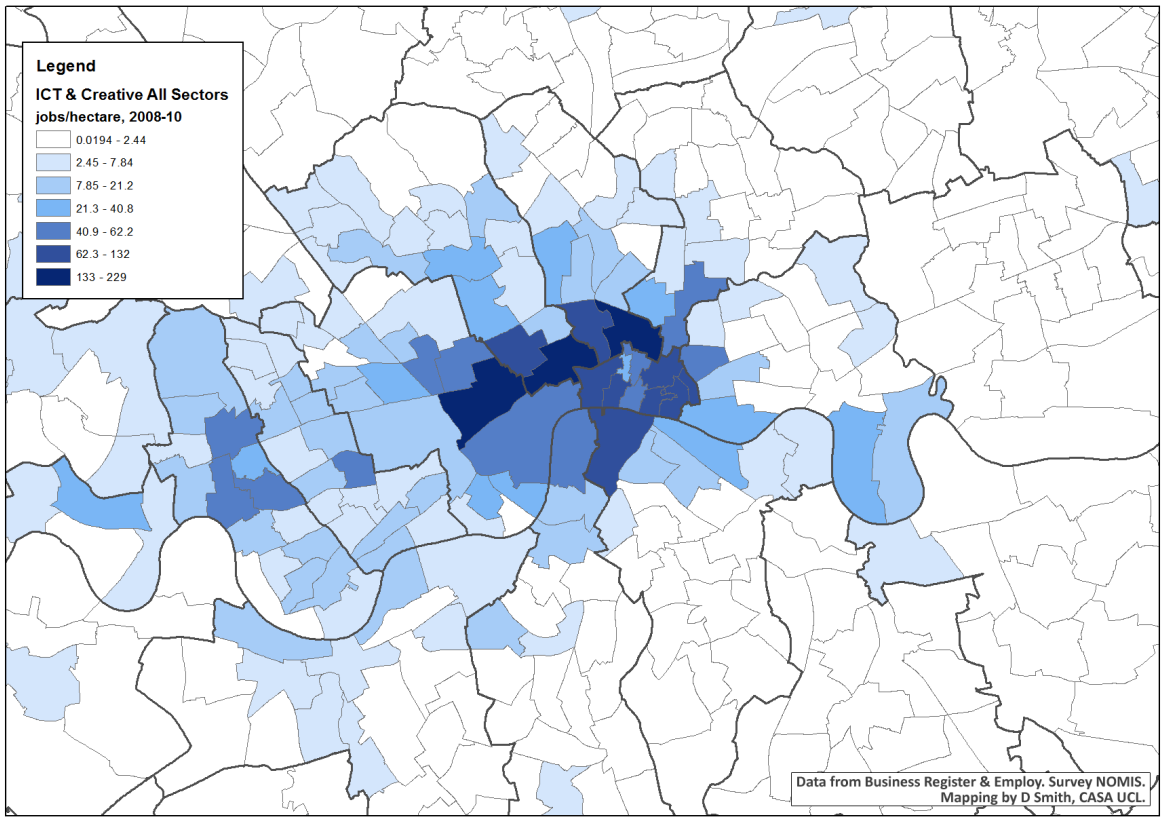
Note: IEL = Inner East London, GL = Greater London.

Table 2. Key challenges for inner East London firms.

Issue set	Number of firms citing as challenge
Business development	19
Access to finance	17
Skills gaps	14
Mentoring and management advice	13
Workspace access and cost	13
Connectivity	13

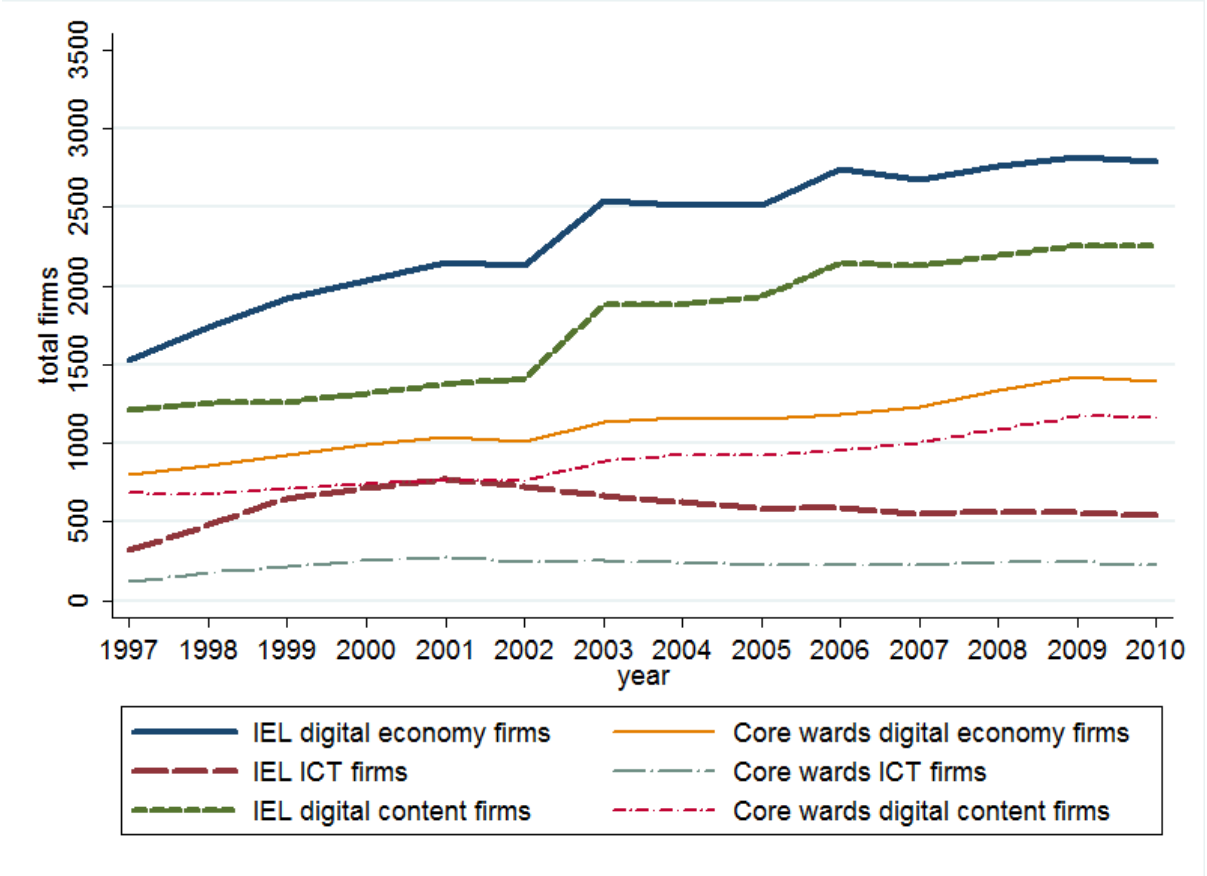
Source: authors' analysis.

Figure 1. Inner London's digital economy: job density 2008-10.



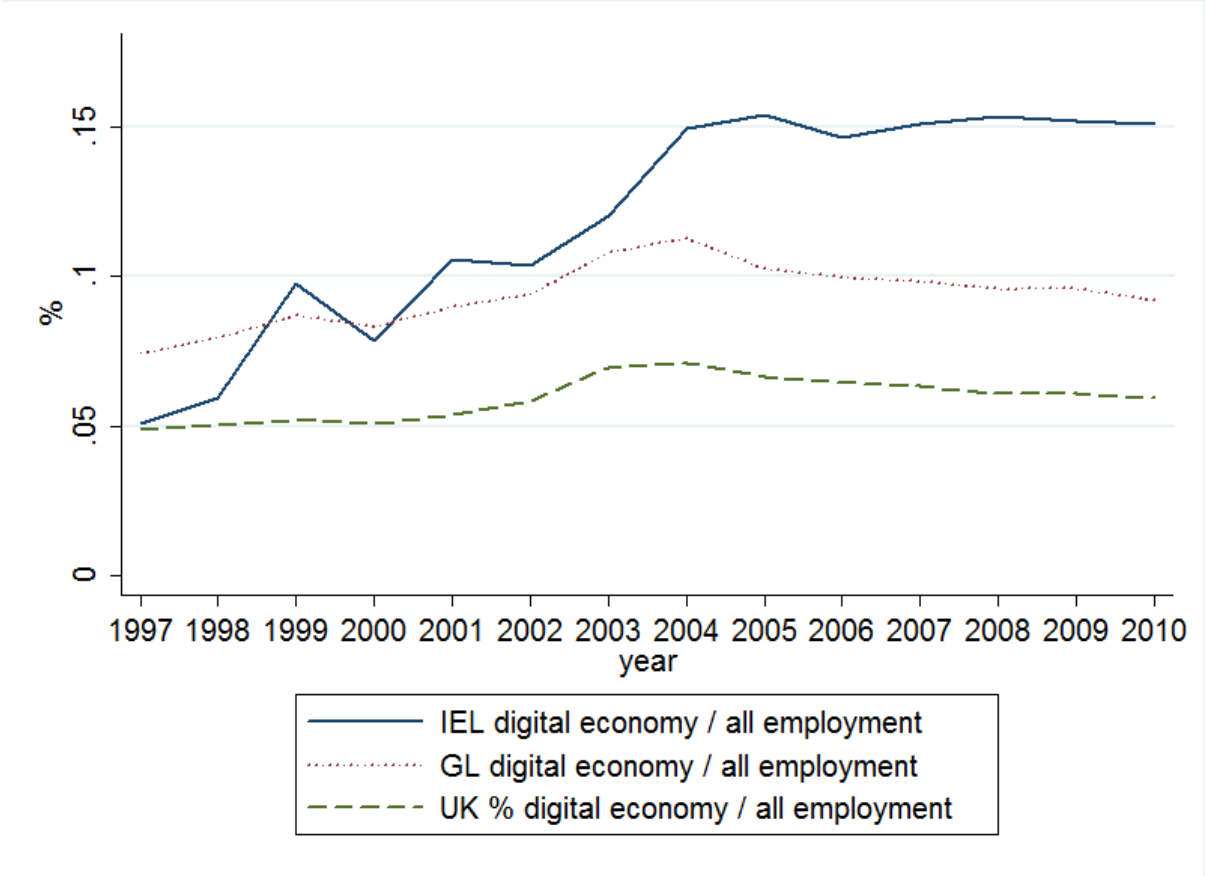
Source: BRES / NOMIS. Map by Duncan Smith.

Figure 2. Digital economy firm counts in Inner East London, 1997-2010.



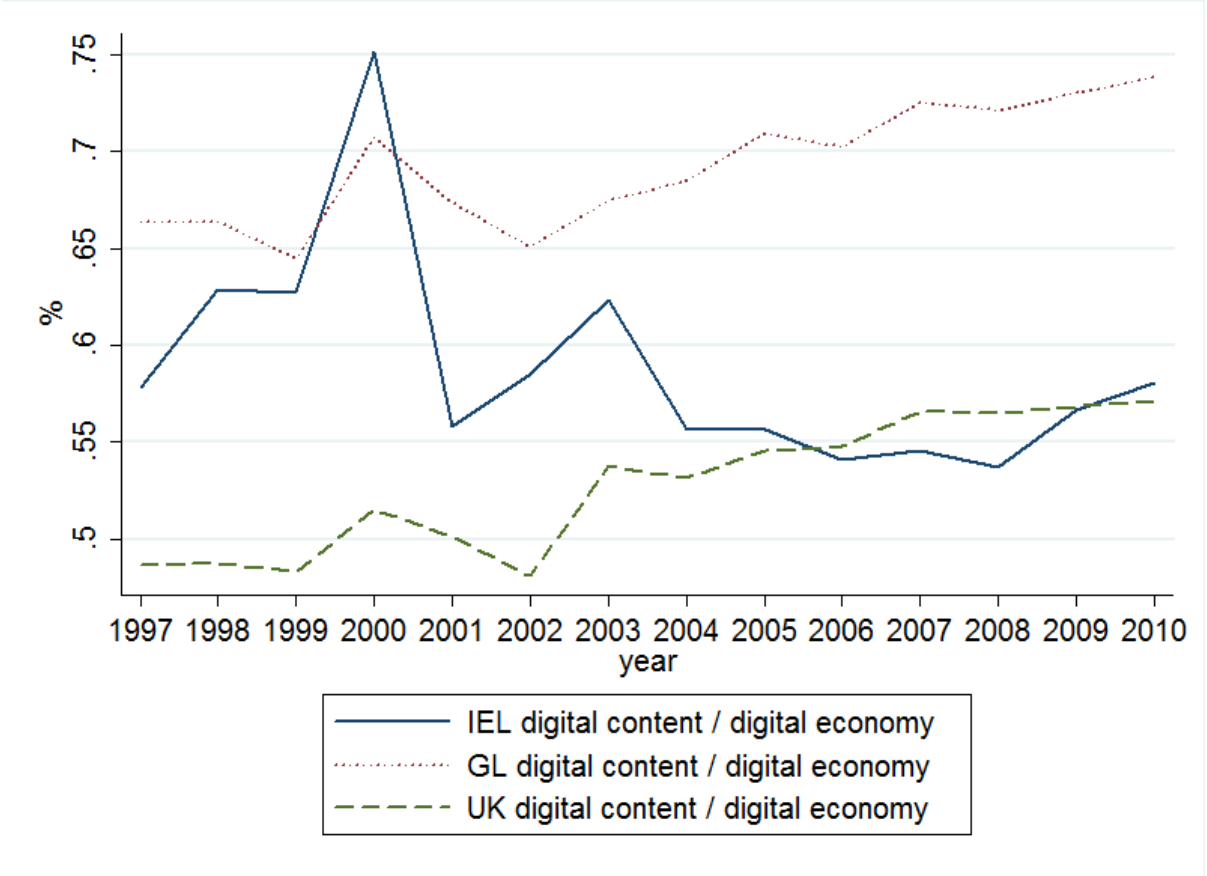
Source: BSD / ONS.

Figure 3. Digital economy employment shares, 1997-2010.



Source: BSD / ONS.

Figure 4. Digital content shares, 1997-2010.



Source: BSD / ONS.

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APPENDIX 1

Table A1: Digital economy SIC codes: ICT.

Code	Description
3001	**Manufacture of office machinery and computers**
3002	**Manufacture of computers and other information processing equipment**
3110	Manufacture of electric motors, generators and transformers
3120	Manufacture of electricity distribution and control apparatus
3130	**Insulated wire and cable**
3140	Manufacture of accumulators, primary cells and primary batteries
3150	Manufacture of lighting equipment and electric lamps
3161	Manufacture of electrical equipment for engines and vehicles not elsewhere classified
3162	Manufacture of other electrical equipment not elsewhere classified
3210	**Electronic valves and tubes and other electronic components**
3220	**Television, radio transmitters and apparatus for telephony and telegraphy**
3230	**Television/radio receivers, sound or video recording or producing apparatus / rel goods**
3310	Manufacture of medical and surgical equipment and orthopaedic appliances
3320	**Instruments and appliances for measuring, checking, testing, navigating, other purposes**
3330	Manufacture of industrial process control equipment
3340	Manufacture of optical instruments and photographic equipment
3350	Manufacture of watches and clocks
5141	Wholesale of textiles
5142	Wholesale of clothing and footwear
5143	**Wholesale of electrical household appliances and radio and television goods**
5144	Wholesale of china and glassware, wallpaper and cleaning materials
5145	Wholesale of perfume and cosmetics
5146	Wholesale of pharmaceutical goods
5147	Wholesale of other household goods
5181	Wholesale of machine tools
5182	Wholesale of mining, construction and civil engineering machinery
5183	Wholesale of machinery for the textile industry, and of sewing and knitting machines
5184	**Wholesale of computers, computer peripheral equipment and software**
5185	**Wholesale of other office machinery and equipment**
5186	**Wholesale of other electronic parts and equipment**
5187	**Wholesale of other machinery for use in industry, trade and navigation**
6411	Post and courier activities
6420	**Telecommunications**
7131	Renting of agricultural machinery and equipment
7132	Renting of construction and civil engineering machinery and equipment
7133	**Renting of office machinery and equipment including computers**
7134	Renting of other machinery and equipment not elsewhere classified

Table continues overleaf …

Code	Description
7210	**Computer Hardware consultancy**
7221	Publishing of software
7222	Other software consultancy and supply
7230	Data processing
7240	Database activities
7250	**Maintenance and repair of office, accounting and computing machinery**
7260	**Other computer related activities**

Source: BIS/ DCMS 2009.
Notes: Codes in bold are included. Where included code is specified at SIC3 (SIC4) detail, I include all neighbours in the SIC2 (SIC3) cell. Codes in yellow are included in digital content (see table A2).

Table A2: Digital economy SIC codes: digital content

SIC2003	Description
2211	**Publishing of books**
2212	**Publishing of newspapers**
2213	**Publishing of journals and periodicals**
2214	**Publishing of sound recordings**
2215	**Other publishing**
2221	**Printing of newspapers**
2222	**Printing not elsewhere classified**
2223	Bookbinding
2224	**Pre-press activities**
2225	**Ancillary activities relating to printing**
2231	**Reproduction of sound recording**
2232	**Reproduction of video recording**
2233	**Reproduction of computer media**
7210	Computer Hardware consultancy
7221	**Publishing of software**
7222	**Other software consultancy and supply**
7230	**Data processing**
7240	**Database activities**
7250	Maintenance and repair of office, accounting and computing machinery
7260	Other computer related activities
7410	Legal and auditing; tax consultancy; market research; business and management consulting
7420	Architectural and engineering activities and related technical consultancy
7430	Technical testing and analysis
7440	**Advertising**
7450	Labour recruitment and provision of personnel
7460	Investigation and security activities
7470	Industrial cleaning
7481	**Photographic activities**
7482	Packaging activities
7485	Secretarial and translation activities
7486	Call centre activities
7487	Other business activities not elsewhere classified
9211	**Motion picture and video production**
9212	**Motion picture and video distribution**
9213	**Motion picture projection**
9220	**Radio & TV**
9230	Other entertainment activities
9240	**News agency activities**
9250	Library, archives, museums and other cultural activities
9260	Sporting activities
9270	Other recreational activities

Source: BIS/ DCMS 2009.
Notes: 3-digit / 4-digit SIC. Codes in bold are included. Where included code is specified at SIC3 (SIC4) detail, I include all neighbours in the SIC2 (SIC3) cell. Codes in yellow are included in ICT (see table A1).