Geography, skills and careers patterns at the boundary of creativity and innovation: digital technology and creative arts graduates in the UK

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Abstract

In the last decades, research on knowledge economies has taken central stage. Within this broader research field, research on the role of digital technologies and the creative industries has become increasingly important for researchers, academics and policy makers with particular focus on their development, supply-chains and models of production. Furthermore, many have recognised that, despite the important role played by digital technologies and innovation in the development of the creative industries, these dynamics are hard to capture and quantify. Digital technologies are embedded in the production and market structures of the creative industries and are also partially distinct and discernible from it. They also seem to play a key role in innovation of access and delivery of creative content. This chapter tries to assess the role played by digital technologies focusing on a key element of their implementation and application: human capital. Using student micro-data collected by the Higher Education Statistical Agency (HESA) in the United Kingdom, we explore the characteristics and location patterns of graduates who entered the creative industries, specifically comparing graduates in the creative arts and graduates from digital technology subjects. We highlight patterns of geographical specialisation but also how different context are able to better integrate creativity and innovation in their workforce. The chapter deals specifically with understanding whether these skills are uniformly embedded across the creative sector or are concentrated in specific sub-sectors of the creative industries. Furthermore, it explores the role that these graduates play in different sub-sector of the creative economy, their economic rewards and their geographical determinants.

Keywords: Digital technologies; creative industries; human capital; creative graduates

1. Introduction

In economics and especially in the regional economic literature, there is a general acknowledgement of the key role played by knowledge and skills (often referred to as 'human capital') in fostering local innovation (Desrochers, 2001; Faggian and McCann, 2009). However, the way human capital is measured has been a source of heated debate in recent years. Several contributions by Florida and co-authors (Florida, 2002b; Florida et al., 2008; Stolarick and Florida, 2006) introducing the 'creative class' concept, questioned the idea that education is the best measure of skills and knowledge embodied in workers, pointing out that what workers 'actually do' – i.e. their occupation – should be taken into account instead. Although not without criticism (see Comunian et al., 2010 for a review), this idea of looking at 'creativity' as a source of development found a fertile ground in many countries including the UK where the term 'creative industries' - introduced in 2001 by the Department of Culture, Media and Sport (DCMS) - has often been advertised as a key driver for economic growth.

However, although the creative industries concept rapidly took central stage in both policy making and academic research, many questioned the rationale (and the need) behind the shift from cultural to creative industries (Garnham, 2005) with particular attention to the role that digital, information and media technologies play in this new defined sector (Oakley, 2006; Taylor, 2006). Crucial in the DCMS definition of creative industries is the role of individual talent. Creative industries are indeed defined as "those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property" (p. 4). Such industries include 'advertising, architecture, the art and antiques market, crafts, design, designer fashion, film and video, interactive leisure software, music, the performing arts, publishing, software and computer services, television and radio' and they were presented as the new driver of the UK economy. However, the UK regions do not benefit equally from the presence of these industries. Since early research (DCMS, 1999), many authors have pointed out the uneven geography of creative and cultural production in the UK with London playing a leading role and many regions struggling to even appear on the stage (Chapain and Comunian, 2011; Comunian, et al., 2010; Comunian and Faggian, 2014; Knell and Oakley, 2007; Oakley, 2006)

Critical commentators recognised the changing pressure and the new focus of the DCMS towards commercially-driven cultural products, with specific attention towards the inclusion of sectors like interactive leisure software that had a strong technology and intellectual property connotation (Oakley, 2006). While at the end of the 1990s, the policy shift has been from cultural to creative industries, more recently there has been a further, although more soft, stir from the creative to the digital industries (DCMS and BIS, 2009). This is specifically driven by the strong performance of the technology-driven companies within the creative industries, with Software and Electronic Publishing accounts for the most GVA out of all the Creative Industries (DCMS, 2010).

In this evolving policy and business framework it is important to ask what role digital skills and human capital play in the creative industries. The chapter argues that a better understanding of human capital and skills in the 'digital technology' sector is key to understand and truly capture the impact of the technological evolution on companies and on the economy overall. Previous contributions, such as (Comunian et al., 2010), demonstrated the contradiction between the assumed key economic importance of the creative class (Florida, 2002a) and the low financial rewards and career uncertainty of the core cultural workforce (Menger, 1999). Nonetheless, there is almost no research on the career prospective and job opportunities for graduates in the digital technology and on their contributions to the creative industries. One exception is a report from NESTA (NESTA, 2011) which

specifically considers the link between skills and two digital industries: the video games and visual effect industries. It highlights the importance of higher education and emphases the important overlap between artistic skills and STEM skills[i]. It is particularly important therefore to understand the connections between digital skills and the creative industries.

The chapter argues that in order to further our understanding of the role and importance of digital technologies in the creative economy, we need to deepen first our understanding of the role played by digital skills in relation and comparison with creative skills in this sector. We particularly want to identify the geographical dynamics and concentration of the 'digital human capital' and its integration with local creative economies.

2. Research landscape: creative industries between creative and digital technology skills

The literature highlights the need of a better understanding of the connection between creative industries, creative work and digital technology skills and their relation to innovation (Bakhshi et al., 2008). However, not much attention is placed on the role of careers and skills. We tackle this gap by first looking at the working condition of creative and media workers and second, by addressing the role played by digital technology in the creative industries, especially in relation to the more recent policy framework.

The literature widely recognises that careers in the creative sector tend to be unconventional, often relying on a mix of part-time and transient jobs often resulting in low wages. However, our understanding of how these patterns might be different across the different subsectors of the creative industries and the range of occupations involved is still very limited. There are many studies looking at the labour market adversities faced by artists and cultural workers, from unstructured working patterns, to over-supply and lower salaries (Comunian, 2009; McRobbie, 2002; Menger, 1999). While this research gives us an important insight on key issues faced by creative workers, it has the limit of grouping artistic and new digital professionals into one single, and very heterogeneous, category. Some authors have tried to look more closely at the workers in the digital and media industries (Christopherson, 2002, 2004; Gill, 2002; Neff et al., 2005; Pratt, 2000), but their contributions generally rely on qualitative data and case studies, which do not allow for comparative work across different creative disciplines. Building on initial work by Comunian et al. (2010) the current chapter addresses this shortcoming by exploring the differences in labour market performance and career patterns of digital technology graduates.

The second important dimension is the complex interconnection between digital technologies and the creative industries with its related policy implications. Potts and Cunningham (2011) questioned the narrow perspective of considering 'creative industries' as a sector of the economy, arguing instead that the creative industries should be considered as part of the national innovation system, contributing to the generation of ideas and technology. However, it has proved extremely hard for researchers to assess and measure the interconnections between the creative industries and the broader economy. The knowledge about the skill composition of creative industries is still very limited and although the literature recognises the complex interplay between artistic and technological skills needed in this sector (Healy, 2002) this remains an under researched area. The use of digital technology is a driving factor of creative industries. Skillset (2010) highlights that in the creative media industries the most common areas of training identified by employers are related to new and digital technology (one in four people). A recent report from NESTA looking at the video games and visual effects sector suggests "There are already many university courses purporting to provide specialist training for video games and visual effects. But most of these courses are flawed, leaving those graduating from them with poor job prospects" (NESTA,

2011, p.5). This highlights the importance of higher education and skill development to gather a better understanding of the sector and the importance of digital skills.

The two areas of the literature summarised above highlight the need for a better understanding of our knowledge of the role of digital skills in creative industries. Furthermore, geography plays an important role in the creative economy and research highlights the uneven distribution of higher education provision (Comunian and Faggian, 2014; Comunian et al., 2013) and, even more so, of job opportunities in the creative sector (Lee and Drever, 2013; NESTA, 2009) with London playing a very predominant role (Faggian et al. , 2013; Knell and Oakley, 2007).

Following these considerations, the chapter aims to address three core research questions in relation to the role played by digital and technological skills - represented by digital technology graduates - in the creative industries and its workforce.

1. What is the role played by digital technology graduates in the creative labour market and what is the geography of provision of these subjects?
2. What are the sectors entered and jobs undertaken by digital technology graduates and where do they concentrate?
3. What factors influence the probability of a digital technology graduates to take a creative job or working in the creative industries and what influence the salary they earn?

3. Data, Definitions and Methodology

3.1. HESA Data

Our analysis is based on micro data from the ‘‘Destinations of Leavers from Higher Education’ (DLHE) survey matched to student record data (collected as part of the ‘Students in Higher Education’ survey), both collected by the UK Higher Education Statistical Agency (HESA). The DLHE survey, targeted towards British domiciled students, is undertaken every year by all UK institutions to collect information about their graduates’ employment activities six months after graduation. For this chapter, we focus on British domiciled undergraduate students who graduated in 2005 (with employment data for 2006). Since we focus on employment patterns, these two years are particularly good as they refer to the pre-recession period. The recession which took place following the 2007 credit crunch in UK had a negative effect on graduates’ employment in general (Shattock, 2010), but it might have impacted graduates from different disciplines differently hence biasing our results.

The DLHE survey includes information on the graduate’s employment: annual salary level, employer sector code (4-digit SIC code), job occupational code (4-digit SOC code) and location of employment (postcode and government office region of employment). From the student record data, we obtained information on graduates’ personal characteristics (such as gender, age, ethnicity, whether have a disability), subject of study (at the 4 digit Joint Academic Coding System (JACS) code); degree results and type of institution attended. Our final DLHE sample includes 207,271 records (with a response rate of 77% from the sample of all British graduates eligible for a DLHE return). Our sample size reduces slightly to 199,650 when we exclude those graduates who provided an explicit refusal to answer the DLHE survey or undertook combined subjects (since it was not possible to classify these subjects). While the figures we present for graduates within the creative industries are only a sub-sector of the overall creative workforce there are key supporting factors highlighting the relevance of these data collected for creative industries in UK (Skillset, 2010): the workforce is young – (42% in creative media is under 35 years old and 52% in the overall creative and

cultural sector is under 40 years) and highly skilled (57% in creative media and 54% in the creative and cultural sector have a degree or equivalent qualification)

3.1 Definitions: Subjects and creative industries and occupations

In order to fully explore the role played by different skills in the creative industries, we group the graduates into 3 categories, according to their main subject of study (identified by HESA's JACS codes), with our particular focus on digital technology compared to the other subject groups: Our subject definition is as follows:

1. Digital technology (selected JACS codes from G,H,J)[1]
2. Creative Arts and Design (all JACS codes beginning with W)
3. Other (all other JACS codes)

In line with previous work (Abreu et al., 2012; Comunian et al., 2010) our creative industry definition stems from the DCMS definition (1999; 2001). We use a creative jobs approach à la Cunningham et al. (2004) and consider both creative jobs within the creative industries but also creative jobs in other sectors. We use the initial DCMS definition based on 4-digit SIC codes (DCMS, 2001) but supplement this definition with other creative workers in occupations based in sectors outside the creative industries as identified by a more recent DCMS document (DCMS, 2010). Moreover, we also took on board some of the criticisms to this DCMS definition by NESTA (2008b). Following NESTA (2008b), we further classify a creative job as being:

- Specialised – in a creative occupation within the creative industries;
- Supported – in a non-creative occupation within the creative industries;
- Embedded - in a creative occupation outside the creative industries.

We also break down creative jobs into sub-sector categories, using the following groups: Advertising, Architecture and design engineers, Design, Designer fashion and crafts, Film, TV, Radio and Photography, Music and Visual Performing Arts, Publishing, Software, computer games and Electronic Publishing, Libraries, museums and cultural activities. Examining sub-groups is important given creative jobs are very heterogeneous and past research has shown substantial differences between sub-groups (McGranahan, Wojan, and Lambert, 2011).

3.2 Methodology

The chapter employs a three-step methodology. First, we use descriptive statistics to identify basic patterns and trends in our sample, e.g., how many graduates enter the labour market and how many specifically enter creative jobs or jobs in creative industries, how many graduates from digital technology and how many from other subjects enter the digital technology sector and so on. We consider also the role of geography in the study and employment patterns.

Second, we present some descriptive statistics focused specifically on the differences across creative sub-sectors. We are particularly interested in uncovering what sub-sectors of the creative economy employs more digital technology graduates and which sector offers them the best job opportunities, e.g. a graduate level job.

Finally, as in previous contributions, (Comunian et al., 2011; Faggian et al., 2013), we examine the factors affecting the choice of entering the creative sector. We use a logit model

[1] Codes include all computing sciences codes under G, all codes beginning with H6 (except H673 and codes beginning with H68 and H69) and all codes beginning with J52 and j93.

to identify the factors influencing the probability of digital technology graduates and other graduates entering a creative job, as in equation 1:

$$\ln(\frac{P_1}{P_0}) = \beta_1 X + \varepsilon \quad (1)$$

X is a vector of explanatory variables and ε is a random error term. Our explanatory variables include gender, age, ethnicity, subject group, degree classification, institution type and region of employment. We also run equation 1 separately for each of the 3 subject groups, thereby excluding subject group from the explanatory variables.

Finally, we estimate Mincerian-type earning equations (Eq. 2 and 3) to identify the key determinants of salary differences across graduates.

$$\ln W = \beta_1 X + \varepsilon \quad [2]$$

$$\ln W = \beta_1 X + \beta_2 SEC + \varepsilon \quad [3]$$

Where the dependent variable is the natural logarithm of earnings (W), X is a vector of explanatory variables and ε is a random error term. We make use of the salary variable in the DLHE survey (with the 'full time equivalent' asked for those working part-time). We exclude those who claim to earn less than the national minimum wage[ii] and, following Chevalier (2011), those who earn £60,000 or more. X contains the same set of controls as in equation 1 plus mode of employment (full time, free-lance/self-employed) part time/unpaid work. Equation 3 adds creative sub-sector dummy variables as listed in section 3.1

4. Results

4.1 Descriptive Statistics

Our sample includes about 18% of students in either Digital Technology (7.62%) or Creative Arts students (10.55%). While this percentage might seem small, it is not negligible and it also needs to be acknowledged that, due to the growing interest in these subjects, many universities have seen an increase in the number of students in recent years (Heartfield, 2005). As Table 1 shows, the provision of creative courses is not uniform across the country. Greater London and the South East attract the most students in the digital and creative disciplines. However, other regions also play a role. The percentage of 'creative arts' students is above 10% in both the North West and East Midlands, while 'digital technology' students, outside Greater London (19.19%) are based in Yorkshire and the Humber (10.69%), the North West (10.23%) and the South East (10.03%).

INSERT TABLE 1 ABOUT HERE

Past research has shown that creative graduates, in general, tend to have poor labour outcomes (Abreu, et al., 2012; Comunian et al., 2010; McGranahan, et al., 2011). Table 2 shows that digital technology graduates are similar to creative arts graduates (see Table 2), but with some exceptions.

First, digital technology students have the highest unemployment rate among all graduates (10.3% compared to 5.56% for graduates from other subjects), even compared with creative arts students (9.54%). Second, digital technology students are less likely to have part time (7.44) or voluntary/unpaid jobs (0.59%) compared to other graduates (7.61% and 0.87%) and especially compared to other creative arts graduates (12.64% and 1.25%). The higher unemployment rate for digital technology graduates can be explained in different

ways. It could be linked to an oversupply of students in these subjects, but also to students being overspecialised for the role offered in the creative sector or being willing to wait for a longer time in search of a better job. While our previous knowledge of creative graduates' career patterns remains relevant, it is clear that digital technology students' experiences differ from Creative Arts graduates and it is important to explore these differences further.

INSERT TABLE 2 ABOUT HERE

4.2 Creative Labour market and digital technology graduates

After understanding the general trends of the different graduate subject groups and their work patterns, it is important to consider specifically their interconnection with the creative sector. Table 3 shows a breakdown of sectors employing creative graduates. Creative graduates are broken down in three sub-categories: digital technology, creative arts and other.
Only about a third of digital technology graduates (39.35%) and creative arts graduates (38.34%) find a job in creative sector. The other two thirds find an occupation outside the creative sector, but there are some differences between digital technology and creative arts graduates. Almost 20% of digital technology graduates find employment in the science, engineering and technology industry, while creative arts graduates entering a non-creative sector tend to prefer the education sector.

Some interesting patterns also emerge by looking at the employment sub-sectors within the creative sector. Of the 39.35% of digital technology graduates who enter the creative sector over three quarters (77.33%) enter one specific sub-sector, i.e. the software, electronic games and publishing sector. This is clearly linked to their high level of specialisation, but also to the fact that - due to the nature and size of creative industries - digital work tends to be outsourced rather than incorporated in the functions of other sectors.

INSERT TABLE 3 ABOUT HERE

In terms of the type of creative job performed, i.e. specialised, supportive or embedded (last three rows of Table 3) different subject groups not only enter different creative sub-sectors but also play a different role within the creative sector. For example, 52.69% of digital technology graduates are embedded within non-creative industries (compared to 34.22% of creative arts and 37.89% of other graduates), with 33.14% in specialised roles (creative arts are the most likely to be in specialist roles at 45%) and only 14.16% in supportive roles.

This seems to suggest that other non-creative sectors are able to embed digital technology graduates, providing them with creative occupations even outside creative industries. Furthermore, it also implies an acknowledgement across the wider economy of the value of the creative skills of digital graduates (for example a web designer in a manufactory industry). Finally, it is worth noticing that digital technology graduates are less likely to be in Specialised positions, which might suggest that it is a challenge for them to enter core creative occupations within creative industries, which is comparable to the position occupied by the general 'Others' group. Compared also to the Creative Arts group, it seems that digital technology graduates do not occupy as many specialised positions and this might be linked also to a less recognisable role of these graduates in creative occupations (especially outside the core software sector).

Table 4 shows that the geography of creative jobs is also very uneven. Only five regions have a higher percentage of digital graduates in creative than non-creative jobs: London (24.13% vs. 22.28%), South-East (15.86% vs 10.87%), South West (6.93% vs. 5.85%), East of England (6.47% vs. 5.61%) and Northern Ireland (3.75% vs. 2.86%). The

market for creative jobs for creative arts graduates is even more concentrated with only London and Scotland offering more opportunities in creative jobs than non-creative jobs.

INSERT TABLE 4 ABOUT HERE

4.3 Digital technology graduates in the creative economy: jobs and salary profile

After analysing the overall dynamics and job patterns of digital technology graduates, we model the likelihood of getting a creative job - for all students and digital technology graduates separately - using a logit model (equation 1). Results – expressed in odds ratios (the exponential of the logit coefficient and refer to the likelihood of being in a creative job) - are presented in Table 5.

The logit model shows that digital technologies graduates are over five times more likely to enter a creative job than other graduates. The same result applies to creative arts graduates even that the odds ratio is slightly lower (around four). Studying in a Russell Group (research intensive) or old University also makes digital technology graduates significantly more likely to get employment in a creative sector (about 26.6% more likely), while the same does not apply to creative arts graduates. However, this last result might be a result of the fact that creative arts courses tend to be heavily concentrated in post-1992 or 'new', Universities.

INSERT TABLE 5 ABOUT HERE

Again by looking at the geography of creative jobs, London emerges as the hot-spot for creative employment but more for creative graduates than for digital technology graduates, which instead seem to find jobs across a larger area which includes not only London, but also the South-East and East of England. This could be partly a function of the fact that digital technology graduates can often work remotely from home. However, even though their jobs could be considered more 'footloose', they still benefit from having large cities (such as London) nearby for occasional face-to-face meetings. The same does not generally apply to creative arts graduates who might require physical infrastructures such as theatres, exhibition centres and museum and so on.

Alongside the opportunity to enter a creative career it is important to also consider how a creative job is rewarded economically. Table 6 shows the results of the basic Mincerian earning equations. Model 1 (Eq.2) looks at the salaries of the whole sample of graduates and includes individual, course and university explanatory variables. Model 2 (Eq. 3) also adds controls for the type of creative sub-sector entered after graduation. Models 3 and 4 are the same as Models 1 and 2 but restricted to the sample of graduates who entered a creative job.

As expected, digital technology graduates earn more than creative arts graduates and significantly more if they enter a creative job (an increase of about 7% by looking at the difference between Models 1 and 3). Graduating from a research intensive university such as the ones belonging to the Russell Group carries an average 'premium' of 7.6-7.7% across all occupations and a premium between 3.3 and 4% for creative job (depending on whether the sub-sectors are controlled for, Model 4, or not, Model 3). A closer look at the creative sub-sectors shows substantial differences among them. While an occupation in the 'software' sector is associated with a salary premium that ranges between 9.6% and 11.8% according to the model specification, being in the music, film, publishing, design or libraries sectors is associated with a salary penalty ranging from a minimum of 5.8% (design in creative jobs) to as much as 18.2% (librarians in creative jobs). This is good news for digital graduates whose preferred creative sub-sector is indeed software (as shown in Table 3).

INSERT TABLE 6 ABOUT HERE

Although Table 6 reports the results only on the variables of interest for our analysis, other results on individual characteristics are significant. For instance, being a female is associated with a salary penalty. This is a very well-known result in labour economics studies employing a Mincerian-type methodology and it has also been found to be true in other studies focusing on creative graduates (Comunian et al., 2010).

5. **Discussion and Conclusions**

The main aim of this chapter was to better understand the role played by digital technology human capital and skills in the creative sector, with a particular focus on the differences between digital technology graduates and creative arts graduates. Our data highlight that, although the creative sector employ graduates from very different disciplines, creative arts and digital technology graduates still make up the majority of employees in this sector. Digital technology graduates are, as expected, predominantly employed in the software sector. They are present in other creative sub-sectors only in very limited numbers, with many instead working even outside the creative industries. This last finding highlights the high degree of specialisation of these graduates but also the potential lack of a need for digital technology skills in the creative industries (if we exclude the software sector). Digital technology graduates are more likely to be embedded in non-creative industries while creative arts and humanities graduates are most likely to be in specialised roles (creative occupations in creative industries). This sectorialisation of occupations and concentration of digital skills only few creative sectors (and mainly in software) might have implications in reference to the ability of the sector to innovate and incorporate technological advances in its development (NESTA, 2008a, 2008b)

While previous research in this area has highlighted the limited financial rewards and unstructured working patterns of creative graduates, graduates in digital technology experience different patterns. Digital technology graduates are paid more than creative arts graduates, but similarly to other creative arts graduates, they benefit more strongly from being in a creative job (than in a non-creative one).

Results suggest a general high degree of concentration in the spatial distribution of both digital technology and creative arts graduates. Especially for the latter, the role of London is dominant confirming recent research on creative industries clusters (NESTA, 2009; A. Pratt, 2004). Greater London and the South East of England have a leading role in the UK creative economy also thanks to a self-reinforcing mechanism stemming from the interaction between creative universities and the creative sector. Clearly these areas benefit from historical and infrastructural advantages in the creative higher education provision and these advantages are well exploited by the local creative production system creating a long-lasting and embedded symbiosis.

Reflecting back on our research questions we have discovered that provision of courses in these disciplines is not evenly distributed. Greater London and the South East attract most of the students in digital and creative disciplines. However, Yorkshire and The Humber also attract a considerable number of digital technology students. As far as first employment after graduation is concerned, Greater London and the South East also have a dominant role providing the highest percentage of creative jobs to digital technology graduates (respectively 24.13% and 15.86%) and creative arts graduates (respectively 36.24% and 11.36%)

In response to the second research question, we have highlighted that digital technology graduates follow specific working paths within the creative economy. About one third of digital technology graduates (30.4%) enter the software sector. However, digital technology students clearly see the creative economy as a key sector for their employment and are more likely (when employed in a creative job) than creative art students (but not other

subjects) to state the "job fitted into their career plan". We have also highlighted that geography plays a role as the only regions that offer more employment to digital graduates in creative jobs than non-creative jobs are London, the South-East, South West, East of England and Northern Ireland.

In response to the third research question, we looked into the probability of getting a creative job for digital technology graduates. Our logit model suggests that digital students and creative students most likely to be in creative job. First class achievers improve their chances of a creative job and higher salaries (but this is weaker in creative jobs in general). Finally, we have shown that digital technology students earn more than creative arts students and gain more by being in a creative job than other students, who on average earn more in a non-creative sector. The software sector offers them on average the greatest earnings. We have again highlighted the geography of employment here as London and the South East offer a wider geography of opportunities to digital technology graduates while creative arts students are much more concentrate in the single London region. Finally, looking at the salaries of creative graduates, we have confirmed some of the previous observations coming from the descriptive statistics. Digital technology graduates are better paid than the rest of the creative graduates and have, generally, better working conditions. This is true whether they work within or outside the creative sector, although a creative job gives them a higher salary premium. Within creative jobs there is a clear split among sub-sectors with more technology oriented sub-sectors and architecture doing much better than the more artistic oriented sub-sectors.

There is very little literature and data in this area of research and the chapter has only highlighted some key issues and dimensions of this debate but further research needs to be undertaken. In particular, we need a better understanding of how creative industries invest in human capital and what are the key required skills and knowledge required in the sector. We also need greater knowledge of the role of digital technology knowledge when adopted in embedded ways across a range of sectors. Skillset (2010) states that "a major gap in skills (and knowledge) evident across the Creative Industries is working with and exploiting digital technological advances (including specific software applications)" (p.27), this chapter has highlighted that a broader awareness of how these skills enter the creative economy is also essential in order to maximise its potential.

Moreover, the chapter should serve as a warning about considering creative industries as a 'homogeneous entity'. There seem to be a clear separation between more technological sectors (and graduates) and more artistic ones with the former doing relatively well in the labor market - and sometimes even surpassing non-creative sectors (and graduates) - and the latter doing much worse. This should be taken into account when devising policies for the creative sector as a whole, making sure that the success of the digital economy does not overshadow the difficulties (especially in terms of financial rewards) faced by the rest of the creative economy. Further research is also needed to look comparatively at longitudinal data and career histories of graduates both in the arts and digital technologies to understand how their skills and knowledge is shaped by different career experiences and by engaging with different sectors of the creative economy.

Bibliography

Abreu, M., A, Faggian, R. Comunian, and P. McCann (2012), '"Life is short, art is long": the persistent wage gap between Bohemian and non-Bohemian graduates', *The Annals of Regional Science*, 49, 305-321.

Bakhshi, H., McVittie, E., and Simmie, J. (2008), 'Creating innovation: do the creative industries support innovation in the wider economy?', London: NESTA.

Chapain, C. and R. Comunian (2011), 'Dynamics and differences across creative industries in the UK: exploring the case of Birmingham', *REDIGE, 2*(2).
Christopherson, S. (2002), 'Project work in context: regulatory change and the new geography of media', *Environment and Planning A, 34*, 2003-2015.
Christopherson, S. (2004), 'The Divergent Worlds of New Media: How Policy Shapes Work in the Creative Economy', *Review of Policy Research, 21*(4), 543 - 558.
Comunian, R (2009), 'Questioning creative work as driver of economic development: the case of Newcastle-Gateshead' *Creative Industries Journal, 2*, 57–71.
Comunian, R., C. Chapain and N. Clifton (2010), 'Location, location, location: exploring the complex relationship between creative industries and place', *Creative Industries Journal, 3*(1), 5-10.
Comunian, R. and A. Faggian (2014), 'Creative Graduates and Creative Cities: Exploring the Geography of Creative Education in the UK', *International Journal of Cultural and Creative Industries, 1*(2), 19-34.
Comunian, R., A. Faggian and Jewell, S. (2011), 'Winning and losing in the creative industries: an analysis of creative graduates' career opportunities across creative disciplines', *Cultural Trends, 20*(3-4), 291-308.
Comunian, R., A. Faggian and Q. C. Li (2010), 'Unrewarded careers in the creative class: The strange case of Bohemian graduates', *Papers in Regional Science, 89* (2), 389 - 410.
Comunian, R., C. Taylor and D. N. Smith (2013), 'The Role of Universities in the Regional Creative Economies of the UK: Hidden Protagonists and the Challenge of Knowledge Transfer', *European Planning Studies*, 1-21.
Cunningham, S., T. Cutler, G. Hearn, M. Ryan and M. Keane (2004), 'An innovation agenda for the Creative Industries: Where is the RandD?', *Media International Australia: incorporating Culture and Policy, 112*, 174-185.
DCMS (1999), 'Creative Industries - The regional dimension', London: Department for Culture, Media and Sport.
DCMS (2001), 'Creative Industries Mapping Document'. London: Department for Culture, Media and Sport.
DCMS (2010), 'Creative Industries Economic Estimates', London: DCMS.
DCMS and BIS. (2009), 'Digital Britain: Final Report', London: Department for Culture, Media, Sport and Department for Business, Innovation and Skills.
Desrochers, P. (2001), 'Local Diversity, Human Creativity, and Technological Innovation', *Growth and Change, 32*, 369 - 394.
Faggian, A., R. Comunian, S. Jewell and U. Kelly (2013), 'Bohemian Graduates in the UK: Disciplines and Location Determinants of Creative Careers', *Regional Studies, 47*(2), 183-200.
Faggian, A. and P. McCann, P (2009), 'Human capital, graduate migration and innovation in British Regions', *Cambridge Journal of Economics, 33*, 317-333.
Florida, R. (2002a), 'The Economic Geography of Talent', *Annals of the Association of American Geographers, 92*(4), 743 - 755.
Florida, R. (2002b), *The Rise of the Creative Class*. New York: Basic Books.
Florida, R., C. Mellander, and K. Stolarick (2008), 'Inside the black box of regional development--human capital, the creative class and tolerance', *Journal of Economic Geography, 8*(5), 615-649.
Garnham, N. (2005), 'From cultural to creative industries. An analysis of the implications of the "creative industries" approach to arts and media policy making in the United Kingdom', *International Journal of Cultural Policy, 11*, 15-29.
Gill, R. (2002), 'Cool, Creative and Egalitarian? Exploring Gender in Project-Based New Media Work in Europe', *Information, communication and society, 5*(1), 70-89.
Healy, K. (2002), 'Survey article: Digital Technology and Cultural Goods', *The Journal of Political Philosophy, 10*(4), 478 - 500.
Heartfield, J. (2005), 'The Creativity Gap', London: Blueprint, ETP Ltd.

Knell, J. and K. Oakley (2007), 'London's Creative Economy: An Accidental Success? ', London: The Work Foundation.
Lee, N. and E. Drever (2013), 'The creative industries, creative occupations and innovation in London', *European Planning Studies, 21*(12), 1977-1997.
McGranahan, D. A., T. R. Wojan and D. M. Lambert(2011), 'The rural growth trifecta: outdoor amenities, creative class and entrepreneurial context', *Journal of Economic Geography, 11*(3), 529-557.
McRobbie, A. (2002), 'Clubs to Companies: Notes on the Decline of Political Culture in speeded up Creative worlds', *Cultural Studies, 16*(4), 516-531.
Menger, P. M. (1999), 'Artistic Labor Markets and Careers', *Annual Review of Sociology, 25*, 541-574.
Neff, G., E. Wissinger and S. Zukin (2005), 'Entrepreneurial Labor among Cultural Producers. "Cool" Jobs in "Hot" Industries', *Social Semiotics, 15*(3), 307-334.
NESTA (2008a), 'The art of innovation: how fine arts graduates contribute to innovation', London: NESTA.
NESTA (2008b), 'Beyond the creative industries: mapping the creative economy in the United Kingdom', London: NESTA
NESTA (2009), *The geography of creativity*. London: NESTA.
NESTA (2011), 'Next Gen. Transforming the UK into the world's leading talent hub for the video games and visual effects industries. A Review by Ian Livingstone and Alex Hope', London: NESTA.
Oakley, K. (2006), 'Include Us Out—Economic Development and Social Policy in the Creative Industries', *Cultural Trends, 15*(4), 255 - 273.
Pratt, A. (2004), 'Mapping the cultural industries: Regionalization; the example of South East England', in D. Power and A. J. Scott (Eds.), *Cultural industries and the production of culture* (pp. 19-36). London: Routledge.
Pratt, A. (2000), 'New media, the new economy and new spaces', *Geoforum, 31*(4), 425-436.
Shattock, M. (2010), 'Managing mass higher education in a period of austerity', *Arts and Humanities in Higher Education, 9*(1), 22-30.
Skillset (2010), '2010 Employer Survey', London: Skillset UK, available online http://creativeskillset.org/assets/0000/6002/Skillset_Employer_Survey_2010.pdf (last accessed 18/09/2015).
Stolarick, K. and R. Florida (2006), 'Creativity, connections and innovation: a study of linkages in the Montréal Region', *Environment and Planning A 38*(10), 1799 - 1817
Taylor, C. (2006), 'Beyond Advocacy: Developing an Evidence Base for Regional Creative Industry Strategies', *Cultural Trends, 15*(1), 3 -18.

[i] STEM subjects are identified with the sciences, technology, engineering and maths.
[ii] If we assume that full time individual's work a minimum of 30 hours for 52 weeks and using the minimum wage as of January 2006 which was £4.25 this equates to £6630 which we rounded down to £6500.