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CREATIVE ECONOMY EMPLOYMENT IN THE US, CANADA AND THE UK

A COMPARATIVE ANALYSIS

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CONTENTS

SUMMARY

This report is part of Nesta's ongoing research programme to better understand the size, growth and industrial/occupational structure of the creative economy, in the UK and internationally. The creative economy is defined as employment in the creative industries (both in creative jobs and in other roles), plus employment in creative jobs outside the creative industries.

This is an important task. Analysts and policymakers have long complained of the dearth of internationally comparable statistics on the creative industries, which has made it impossible to benchmark the performance of different countries. In January 2014, the Department for Culture, Media and Sport (DCMS) adopted the Dynamic Mapping methodology (Bakhshi, Freeman and Higgs 2013) for classifying some industries as 'creative' and others not, for the purposes of producing its *UK Creative Industries Economic Estimates* (Department for Culture, Media and Sport 2014). This methodology is based on the principle that the creative industries are "those industries that specialise in the employment of creative talent for commercial purposes" (Bakhshi, Hargreaves and Mateos-Garcia 2013) – that is, have unusually high proportions of their workforce employed in creative occupations ('creative intensity'). Through its use of Standard Industrial Classification (SIC) codes and labour force survey data, the Dynamic Mapping methodology was originally designed to enable the production of internationally comparable statistics. Following on from this, in 2015 Nesta published a report (Nathan, Pratt and Rincon-Aznar 2015) that analysed creative economy and industry employment in the member states of the European Union.

The current report makes two contributions. First, we compare the size, growth and geography of employment in the UK and US creative economies between 2011 and 2013, and provide comparable figures for size of employment in the Canadian creative economy in 2011. Second, we explore the differences in structure between the creative industries of the UK, the US and Canada by comparing the distribution of creative intensity across industries in the different countries.

To do this, we crosswalk the UK creative occupation and industry codes to the closest comparable US and Canadian codes using international standards for occupations (ISCO codes)[1] and industries (ISIC codes)[2] as a bridge between the UK, US and Canadian typologies. Specifically, we take advantage of very detailed US and Canadian occupational codes to match the UK creative occupations to the corresponding US and Canadian creative occupations, and make the best possible matches for creative industries too.[3] We then assemble estimates of national and sub-national employment in the creative economy and creative industries, separating out creative jobs and non-creative jobs (Higgs, Cunningham and Bakhshi, 2008, call this the 'Creative Trident'). We use employment microdata from workforce surveys: the American Community Survey (ACS) and the UK Annual Population Survey (APS) for the years 2011 to 2013,[4] plus aggregates from the Canadian National Household Survey data for 2011. We also use business microdata from the US Occupational Employment Statistics series to establish that our results are consistent for employees across different sampling frames (businesses vs. households). We then analyse the distribution of creative intensities across sectors, and run a series of sensitivity checks, to explore the differences between the three countries.

This procedure has involved finding solutions to a number of complex data comparability issues. In particular, industry and occupational classifications do not transpose precisely from one country to another. For example, the classification of 'new' industries, including some creative industries, tends to be dealt with differently by different statistical agencies. Variations in sample sizes and methodologies between datasets further complicate matters. For these reasons, the fine-grained international analysis that researchers and policymakers can routinely do for sectors like manufacturing is more challenging for the creative economy.

Table A presents our headline results for the creative economy. As a percentage of the workforce, in 2011 (the year for which we have Canadian data) Canada's creative economy was the largest, at 12.9 per cent, compared with 9.5 per cent in the US and 8.2 per cent in the UK. Since 2011, however, the creative economy in the UK has grown faster than the US on average, by 4.7 per cent per annum (p.a.) compared with 3.1 per cent p.a. in the US. Note that our UK figures here are slightly different from those published in DCMS 2014 as we have had to remove: a) second jobs and; b) armed forces employment, in order to align with the US and Canadian sampling frames.[5]

TABLE A CREATIVE ECONOMY EMPLOYMENT IN THE US, CANADA AND THE UK

US creative economy, 2011-2013		
Year	Total jobs	Share of all employment
2011	13,396,000	9.48%
2012	13,810,000	9.60%
2013	14,241,000	9.75%

Canadian creative economy, 2011		
Year	Total jobs	Share of all employment
2011	2,242,000	12.90%

UK creative economy, 2011-2013		
Year	Total jobs	Share of all employment
2011	2,326,000	8.18%
2012	2,487,000	8.68%
2013	2,549,000	8.76%

Source: American Community Survey (ACS), UK Annual Population Survey (APS), Canadian National Household Survey.

Notes: APS data has second jobs removed to align sampling frame with ACS. All samples have armed forces jobs removed to align sampling frames.

Table B shows the so-called 'Creative Tridents' for the three countries which set out important differences in the structure of their creative economies. **Notwithstanding the fact that the Canadian estimates are for 2011 and the US/UK figures in this table are 2011-2013 averages, so they are not strictly comparable, Canada – at 7.8 per cent of the workforce – has a larger share of workers employed in creative occupations than both the UK (6 per cent) or the US (4.4 per cent).** However, strikingly, **within the creative industries the UK's share of creative specialists (creative specialists are those in creative occupations working in creative industries) is much higher than in both Canada and the US** (52.3 per cent, vs. 37.4 per cent and 27.4 per cent respectively).

As with the creative economy, **Canada's creative industries account for a larger share of overall employment than its US and UK counterparts (8.2 per cent in 2011, vs. 7.1 per cent in the US and 5.4 per cent in the UK).** Canada and the US have similar employment distributions across creative industry groups, **but both differ markedly from the UK.** For example, the advertising and marketing industries in Canada and the US are almost three times larger as a percentage of the workforce than their UK counterparts (1.28 per cent and 1.32 per cent respectively, vs. 0.49 per cent), and architecture is at least three times larger (1.49 per cent and 0.99 per cent in Canada and the US respectively, vs. 0.31 per cent in the UK). Conversely, the design sector in the UK accounts for a greater share of employment than in Canada and the US (0.37 per cent vs. 0.31 per cent

and 0.22 per cent respectively). This second pattern also holds for the film, TV, video, radio and photography industries (0.74 per cent vs. 0.62 per cent and 0.67 per cent, respectively) and ICT/ software sectors (1.82 per cent vs. 1.6 per cent and 1.45 per cent, respectively).

TABLE B CREATIVE TRIDENTS FOR THE US, CANADA AND THE UK

US, 2011-2013			
	Creative industries	Non-creative industries	All industries
Creative occupations	2,817,000	3,537,000	6,354,000
Non-creative occupations	7,462,000	129,089,000	136,551,000
All occupations	10,279,000	132,626,000	142,905,000

Canada, 2011			
	Creative industries	Non-creative industries	All industries
Creative occupations	534,000	815,000	1,348,000
Non-creative occupations	893,000	15,126,000	16,020,000
All occupations	1,427,000	15,940,000	17,368,000

UK, 2011-2013			
	Creative industries	Non-creative industries	All industries
Creative occupations	809,000	908,000	1,717,000
Non-creative occupations	737,000	26,274,000	27,011,000
All occupations	1,546,000	27,182,000	28,728,000

Source: American Community Survey, UK Annual Population Survey, Canadian National Household Survey. Note: APS data has second jobs removed to align sampling frame with ACS. All samples have armed forces jobs removed to align sampling frames. Totals may not sum due to rounding.

Creative intensities are – with a small number of exceptions (such as design and ICT) – substantially higher in the UK's creative industries than in their Canadian and US counterparts. However, **creative intensity is shown to be bimodally distributed in all three countries, suggesting that creative intensity is a good discriminator for creative and non-creative industries in Canada and in the US, just as it is in the UK (and as Nathan, Pratt and Rincon-Aznar, 2015, show, in a range of EU countries too).** However, there are some important differences in sub-sectoral composition. There are other additional high creative intensity sectors in Canada and the US which are not included in the DCMS list of creative industries in the UK.

Sub-national analysis for the UK and US also highlights some key differences between the creative economies of the two countries.[6] Reflecting the nature of the survey data we analyse, we look at residence-based employment data patterns in NUTS2[7] spatial units for the UK and metropolitan statistical areas (MSAs, or 'metro areas') for the US. Both of these are administrative units. Metro areas are arguably a better measure of local spatial economies than NUTS2 units as they include information on commuting patterns, whereas NUTS2 areas are purely based on combining administrative geographies. In both cases, the units can be smaller than commuting areas of the largest urban cores (e.g. London in the UK, or LA in the US), and this should be kept in mind in what follows.

Notwithstanding the obviously larger workforce in the US than the UK, the magnitude of the differences in urban creative workforces is worth highlighting. For example, the largest US metro area, New York-Newark-New Jersey had a creative economy employment of over 1.1 million in 2012, rising to above 1.2 million in 2013. This is bigger than the top four UK NUTS2 areas combined, and more than twice the size of London's creative economy workforce. However, when we examine creative employment for the Greater South East of England as a whole (i.e. London and the South East and Eastern NUTS1 regions, the area that includes almost all inward commuting to London), we obtain levels and proportions of creative employment that are similar to those of the New York-Newark-New Jersey metro area.[8, 9] In US metros, creative industries workforces are also typically much larger than counts of creative workers embedded in other sectors – a position generally reversed in the UK, albeit that this analysis is on a smaller spatial scale.

Turning to employment shares, in 2013 the top five metros had creative economy shares of 20.3 per cent (San Jose), 18.3 per cent (DC), 17.4 per cent (San Francisco) and 15.1 per cent (Austin and Seattle). For the creative industries, metro areas such as San Jose-Santa Clara-Sunnyvale (15.8 per cent), Washington DC and surrounds (14.9 per cent), San Francisco-Oakland (13.8 per cent), Seattle (12.2 per cent) and Austin (11.8 per cent) exhibited the highest creative industries shares, with 15 of the top 20 metro shares showing employment shares over 10 per cent. In the UK, the share of employment accounted for by the creative economy was 21.5 per cent for Inner London, 14.7 per cent for Berkshire, Buckinghamshire and Oxfordshire, 12.1 per cent for Surrey, East and West Sussex, and 12.0 per cent for Outer London. The creative economy employment share for the UK's Greater South East (which subsumes all these areas) was around 12 per cent. Creative industries employment shares only exceed 10 per cent in the case of Inner London (14.9 per cent in 2013).

Taken together, our results suggest that there are significant differences in the structures of the creative economies in the three countries which warrant further investigation. The UK's creative economy is the smallest of the three as a share of the workforce, but its creative industries have the highest creative intensities. This is consistent with the idea that the UK's creative industries are more specialised in creative work than either their US or Canadian counterparts. The US has the largest creative economy in counts, but this comprises a smaller share of all employment than in Canada. US creative industries have the lowest average creative intensities. Canada's creative employment is broadly similar in size to that of the UK. Canada, however, has the largest share of creative economy employment, the largest share of workers in creative occupations, and the largest share of creative workers embedded in non-creative industries (that is, industries whose UK equivalents are not in the DCMS creative industries set).

There are various possible interpretations for these findings. One is that creative labour inputs inside the UK's creative industries are, in comparison to the US and Canada, more important to producing goods and services in those industries than roles in, for example, finance, logistics, and management. What is also striking is that Canadian non-creative industries have the biggest share of creative workers, followed by the UK, and the US some way behind this. What also stands out is that US creative economy agglomerations are substantially larger than those in the UK, and this may conceivably help US localities enjoy stronger agglomeration economies. In terms of concentrations of creative economy employment as a share of the workforce, only London and parts of the Greater South East come close to the biggest US conurbations, such as the New York, LA, San Francisco Bay Area, Washington DC and Austin metros.

This analysis adds to a small number of previous cross-country studies on the creative economy (e.g. Clifton and Cooke, 2009; Evans, 2009; King, Mellander and Stolarick 2009; and O'Connor and Kong, 2009).[10] Any attempt to produce internationally comparable statistics in the creative economy area, however, requires addressing data-related and definitional challenges, and we highlight three main sources of uncertainty below.

First, any crosswalking procedure of the kind that is essential for our analysis is inherently noisy. The best available American labour force dataset (the ACS) does not contain as much detail on respondents' industries as we would like, and there are similar – though less severe – challenges with the Canadian data. In most cases, we can make 1:1 matches between UK and US industries, using four-digit SICs and four- or five-digit North American Industrial Classification System (NAICS) codes. In other cases, individual UK industries can only be matched to groups of US industries, so there is some loss of industry resolution. However, our analysis is able to exploit fine-grained US occupation codes, and we demonstrate that our results are robust to a battery of sensitivity tests where we exclude 'problematic' industry cells, reweight data for marginal industries, and so on. An obvious conclusion from our analysis is that there is a need for more detailed industry information in public labour force datasets in the US, Canada and the UK.

Second, the production of strictly comparable estimates imposes considerable demands on data. For the UK and US, we are able to work with rich microdata. However, the Canadian analysis is restricted because the only survey large enough to handle the detailed industry and occupational analysis we require is the five-yearly Canadian National Household Survey. For the purposes of the Dynamic Mapping analysis, the annual data available from the Canadian Labour Force Survey is of limited use because of data constraints (high levels of redaction for industry-by-occupation cells, especially at sub-national level) and constraints on data access (data agreements can take several months to negotiate with Statistics Canada).

Third, we follow the example of the DCMS's statistics and Bakhshi et al. (2015) in conducting our sub-national analysis using residence-based data. This gives a good sense of where creative economy workers live, but a less clear picture of where the activity actually takes place. Further analysis using workplace-based data, as well as projects that use very small-scale ('hyperlocal') patterns of company and worker co-location within cities, are the logical next steps that would take the analysis forward here.

1. INTRODUCTION

This report compares employment in the creative economies of the US and UK between 2011 and 2013, and for Canada in 2011. It does this using microdata from the UK's Office for National Statistics' (ONS) Annual Population Survey (APS), the US Census Bureau's American Community Survey (ACS), the US Bureau of Labour Statistics' Occupational Employment Statistics (OES), and the Canadian National Household Survey (CNHS), and by constructing a series of crosswalks from UK-designated creative occupations and industries to their North American equivalents. This analysis is part of a larger project that has also produced comparative statistics for selected EU countries (Nathan, Pratt and Rincon-Aznar, 2015).

The starting point for the analysis in this paper is the Dynamic Mapping methodology for the creative economy developed by Bakhshi, Freeman and Higgs (2013) (hence BFH), which has been adapted by the UK government to generate its own creative economy estimates (Department for Culture Media and Sport 2014). This methodology is based on the principle that the creative industries are "those industries that specialise in the employment of creative talent for commercial purposes" (Bakhshi, Hargreaves and Mateos-Garcia, 2013) – that is, have unusually high proportions of their workforce employed in creative occupations. This is the notion that the intensive use of creative labour is a key distinguishing characteristic of the creative industries (Freeman, 2008). Use of both industries *and* occupations to define the creative economy also has roots in the work of the European Leadership Group on Culture, under the auspices of the European Commission (Deroin, 2011). BFH's analysis proceeds in five stages:

I. Determine the set of 'creative occupations', defined using four-digit SOC codes $o = 1, \ldots o$ for the set of all four-digit occupation codes O. To do this, BFH subjectively score four-digit SOC codes in a 'Creative Grid', which is drawn from a review of the creative work literature and identifies five task-level features of creative work. BFH then score a longlist of occupations, keeping those four-digit SOCs that score four or more out of five in terms of task content.

II. Calculate total employment in each four-digit Standard Industrial Classification code (SIC4) industry cell i across the set of all four-digit industries $I = 1, \ldots i$. Work out the 'creative intensity' of each industry. This is specified as the share of creative occupations' employment in industry i, or E_{coi} / E_i (where E_{coi} is employment in creative occupations in industry i and E_i is all employment in industry i).

III. Set a creative intensity 'threshold', where industries with creative intensities above this threshold are classified as 'creative industries' and the rest 'non-creative'. Denote those creative industries by 'CI'. BFH use a probabilistic procedure to identify this threshold as 30 per cent for the UK over the period studied.[11] They also exclude some 'volatile' industries where creative intensity is not consistently above the threshold, or where cells are based on small samples following official guidance.

IV. Calculate creative industries and creative economy employment following the Higgs et al. (2008) 'creative trident' approach. Specifically, creative economy employment is given by the sum of creative industries employment (E_{ci}) – that is, creative and non-creative jobs – and all creative jobs in other industries ('embedded' jobs, or E_{coi} across all non-creative industries i).

V. BFH also employ a series of sensitivity checks, which includes varying the set of 'seed' occupations (e.g. choosing an occupational threshold score of three instead of four), varying the set of creative industries, varying the creative intensity threshold and replicating the results using the ONS's Annual Survey of Hours and Earnings (ASHE) business survey instead of labour force survey data.

Bakhshi, Davies, Freeman and Higgs (2015) – BDFH – present estimates for the period 2011-2013, using the set of four-digit SOC 2010 codes and SICs adopted by the DCMS in its Creative Industries Economic Estimates. They report 2.6 million creative economy jobs in 2013. It is important to note that following an industry consultation, the DCMS includes in their estimates a small number of SOC2010 codes that, according to BFH, would not score four or higher on the creative grid, and a small number of SIC codes whose creative intensity is lower than 30 per cent. So, the results in BDFH are not strictly consistent with an application of the Creative Grid in BFH. Appendix 1 sets out these DCMS-designated four-digit creative occupations and creative industries.

This detailed, multi-year, structured comparative exercise is the first of its kind that we are aware of, although there are other, simpler studies on creative occupations (King et al., 2009), the creative industries (Falk et al. 2011) and creative industry clusters (Boix, Capone, De Propris, Lazzeretti, and Sanchez, 2014; Boix, Hervás-Oliver, and De Miguel-Molina, 2012).[12] There is also a broader comparative literature for the creative industries and creative economy (Clifton and Cooke, 2009; Evans, 2009; O'Connor and Kong, 2009; Pratt, 2000), as well as previous analysis using industries and occupations as proxies for creative or cultural economy activity, notably Deroin (2011), Markusen, Wassall et al. (2008), Gordon and Beilby-Orrin (2006) and KEA European Affairs (2006).

The rest of this report is structured as follows: Section 2 sets out how we extend the Dynamic Mapping approach internationally, and introduces our key datasets; Section 3 takes the reader through the crosswalking exercise for occupations and industries; Section 4 provides headline results for US and UK creative economy employment, 2011-2013 trends, the 'creative trident' in both countries and the creative industries, and also contains analysis for Canada in 2011; Section 5 subjects the US and Canadian results to a series of robustness checks; Section 6 explores US-Canada-UK differences in more detail, using creative intensity distributions; Section 7 provides sub-national analysis for US metros and UK NUTS2 areas; and Section 8 concludes. Appendices 1-4 provide supporting material.

2. EXTENDING THE DYNAMIC MAPPING APPROACH

There are inherent tensions in applying the Dynamic Mapping methodology in other countries and producing creative economy estimates that are strictly comparable with the UK's, as industries with high creative intensity in one country may not necessarily have high creative intensities in another. That is, under the methodology, what the methodology shows as a 'creative industry' in one country need not be a creative industry in the other. We manage this tension by using the following workflow:

- **First**, we crosswalk the set of DCMS creative occupations to US and Canadian occupational codes, using internationally consistent International Standard Classification of Occupations (ISCO) codes as bridges between the UK Standard Occupational Classifications (SOCs), US Occupational SOCs (OCCSOCs)[13] and Canadian National Occupational Classification for Statistics (NOC-S) typologies. We use concordance tables to do the translation.[14, 15]
- **Second**, we perform a similar crosswalking exercise on the set of DCMS creative industries, again using concordance tables, and using ISIC international industry codes as a bridge between UK SICs and US/Canadian NAICs classifications.[16]
- **Third**, we compare employment levels and trends across the three countries, both at national and sub-national levels. We do this for the creative economy as a whole, the creative trident, and for specific creative industries and industry groups. We also run our main results through a series of sensitivity tests.
- **Fourth**, we use the distribution of creative intensities across the US, Canadian and UK economies, as well as the intensities of specific creative industries and industry groups, to explore the features of the creative economy in the three countries.

Any attempt to produce internationally comparable creative economy statistics is not straightforward. Previous statistical comparisons have typically glossed over differences in the national sources and methods used to produce different country statistics, Pratt (2000) is one exception. Other studies use high-level occupational/industrial classifications: for example, King et al. (2009) conduct a cross-country analysis for the US, Canada and Sweden, but adopt a much simpler treatment that aggregates occupations into four groups based on Creative Class concepts, and groups industries into four blocs.

Our analysis requires us to deal with various data-related challenges.

First, we need to find data sources for the US and for Canada that contain sufficient detail on individuals' occupations and industries to compare with UK estimates, allow for trends analysis (which rules out Decennial Census data, since this only allows for analysis every ten years) and allow us to work at urban/metro scale, as well as at a national level.

Second, we need to select comparable spatial units for the sub-national analysis. We discuss these issues in sections 2.1 and 2.2 below.

Third, and fundamentally, any crosswalking process of the kind that underpins our results is inherently noisy. It is important to understand why. To do the crosswalking we use official concordance tables developed by the UK Office for National Statistics, US Census Bureau and Bureau of Labor Statistics, Statistics Canada and UN agencies. In many cases, the concordance tables provide 1:1 matches from a given UK occupational or industry cell, through

the international ISCO 2008/ISIC4 standards, to US OCCSOC 2010, Canadian NOC-S and North American NAICS 2007 categories. In other cases, we have multiple assignments from a UK cell to its foreign counterpart, so we work with best-fit alternatives. Section 3 explains our choices in more detail. We then test our assumptions in a series of sensitivity checks, as set out in Section 5.

Finally, the highest resolution US and Canadian industry data – even in the best available data – creates further noise, as we discuss below and in Section 3. The US and Canada have more detailed occupational classifications than the UK (for example, the US has 840 six-digit occupational categories, versus 369 four-digit SOC 2010 codes), and we are able to exploit this greater detail in the occupational analysis. The industry coding systems used by Canada and the US also have considerably more detail than their UK counterpart, with 1,175 six-digit NAICS 2007 categories (versus 806 five-digit SIC classes and sub-classes in the UK). However, there is no suitable US labour force data that provides the most detailed NAICS industry codes. This means that, counterintuitively, we occasionally have less industry detail for US/Canadian workers than for their UK counterparts, as the most detailed information is at unavailable levels of the typology. Again, we develop best-fit alternatives in these cases and test these solutions in sensitivity checks.

2.1 **Datasets**

Following the original Dynamic Mapping research by BFH and subsequent work by BDFH, and the DCMS's economic estimates, we use Annual Population Survey microdata for the UK analysis. The Annual Population Survey is the largest household survey in the UK and combines waves one and five of the UK's quarterly *Labour Force Survey* with annual local data for England, Scotland and Wales (Office for National Statistics 2015). Each year of the APS contains around 320,000 observations on respondents aged 16 or over, and provides very rich information on social and socio-economic indicators for individuals and their households, as well as spatial identifiers at a variety of levels from local authorities upwards. The APS includes information on self-employed people and second jobs, both common features in creative industries and occupations (and a principal reason why they are the basis of Nesta's Dynamic Mapping and the DCMS's Creative Industries Economic Estimates). We use APS person weights to gross up to national and sub-national totals. As with previous UK studies, we use 2011-2013 data.

For the US analysis we use 2011-2013 data from the American Community Survey (ACS) (Ruggles, Alexander et al. 2010). In addition, we use Occupational Employment Statistics (OES) data for robustness checks. These datasets were selected through a review of available resources. Table 1 below highlights the key features of the three main US datasets for labour force information: the ACS, the OES and the Current Population Survey.

Overall, we judge that the American Community Survey is the best statistical 'base' for our purposes.[17] The ACS is a 1 per cent workforce survey taken annually, which covers around three million households and individuals aged 16 or over and, like the APS, is collected on a residence basis. It provides highly detailed occupational information covering the full six-digit OCCSOC classification. It provides less detailed information for industries: in the study period, industry information is generated by crosswalking US Census industry codes to NAICS (so-called 'INDNAICS'), which are typically given at four-digit level, but sometimes at more or less detail than this. For the creative industries codes we are interested in, coverage is pretty good: in the resulting crosswalk, three codes are crosswalked as three-digit NAICS, and the remaining 20 at NAICS4 or above.[18] The ACS also provides information on self-employment, a crucial consideration for covering creative economy activity. The large sample size also means we can be confident about working at sub-national level. In our analysis we work with US Metropolitan Statistical Areas (MSAs or 'metros') but the data would allow us to work at smaller levels of detail if we so chose.[19]

TABLE 1 COMPARING US DATA SOURCES

US			
Source	**American Community Survey**	**Occupational Employment Statistics Survey**	**Current Population Survey**
Size per survey	3,000,000	200,000 (400,000 per year)	60,000 (720,000 per year)
Frequency	Annual	Bi-annual	Monthly
Sampling frame	Households. Adult population, includes self-employed	Establishments. Excludes self-employed, 'household workers' etc.	Households. Population aged 16+, includes self-employed
Coverage from	2001	1999	1968
Occupation codes	Six-digit OCCSOCs	Six-digit OCCSOCs	Six-digit OCCSOCs
Industry codes	US Census Bureau industry codes; crosswalked to NAICs at three-five digits	Four-five digit NAICs	US Census Bureau industry codes; crosswalked to NAICs at three-five digits
Smallest spatial units provided	Public Use Microdata Areas (PUMA), units of 100,000 people	States	MSAs

There are some minor sampling frame differences from the APS in the UK: the ACS has no information on second jobs, but has full coverage of the Armed Forces, unlike the APS where a number of forces personnel are excluded.[20] We therefore standardise the datasets by removing armed forces respondents from the US data, and remove second job information from the UK data.

As Table 1 shows, there are at least two alternatives to using ACS data. The Occupational Employment Statistics dataset is a bi-annual survey of 200,000 businesses in the US. Like the ACS, the OES provides highly detailed occupational data, and also provides industry codes at NAICS4 level (and in selected cases NAICS5 and NAICS6). However, the OES has a number of limitations for our purpose. First, because the sampling frame is businesses not households, there is no coverage of self-employed workers and data is collected on a workplace basis. Second, because the sample is so much smaller than in the case of the ACS, the OES only allows for sub-national analysis at state level, and with limited industry detail. This makes comparisons with UK cities and local economies next to impossible. However, we are able to use the OES at a national level for sensitivity checks, to test the precision of our industry crosswalking (see Section 6).

The third candidate US dataset is the Current Population Survey (CPS). For many researchers, the CPS is attractive because individual respondents can be followed through time. However, this longitudinal dimension is not something we need for the present analysis. Like the ACS, industry codes are provided at crosswalked four-digit detail, with some exceptions at NAICS3 and NAICS5 level. However, the CPS has a substantially smaller sample size than either the ACS or the OES. This makes it less reliable for national analysis than the ACS, and – we suggest – rather less suitable for area-level work.

TABLE 2 COMPARING CANADIAN DATA SOURCES

CANADA		
Source	**Canadian Labour Force Survey, Public Use Microdata Files (PUMF) version**	**Canadian National Household Survey**
Size per survey	54,000 households, 100,000 individuals (1.2 million individuals per year)	4.5 million households
Frequency	Monthly	Every five years
Sampling frame	Civilian population over 15, excluding military. Includes self-employed includes self-employed	Households
Coverage from	1987	2011
Occupation codes	Two-digit NOC-S	Four-digit NOC-S
Industry codes	Two-digit NAICS	Four-digit NAICS
Smallest spatial units provided	Highly redacted	Provinces, Census Metro Areas, Agglomerations for aggregate results, highly redacted for cross-tabs

Table 2 sets out the two main Canadian data sources. These are the Canadian Labour Force Survey (CLFS) and the Canadian National Household Survey (CNHS). As with the US datasets, these were selected through a review of available resources.

Neither dataset is ideal for our purpose. The CLFS provides annual information over a long time period, and has a large sample of 1.2 million individuals per year; however, the public use (PUMF) version of the dataset contains less detailed industry and occupational data than we need. There is a restricted (RDC) version of the CLFS dataset that provides the requisite four-digit industry and occupation data, but this comes with two major drawbacks. The first is practical: full access is only available in 22-day increments and can take several months to secure. The second is structural: we require detailed industry-by-occupation information, which runs up against confidentiality constraints in the CLFS data. It turns out that, even working at national level, over 80 per cent of the industry-by-occupation cells required would be redacted. Sub-national analysis is not feasible for the same reasons.[21] For these reasons, we use aggregates from the 2011 Canadian National Household Survey to conduct a restricted comparative analysis for Canada. The CNHS surveys 4.5 million households, and provides detailed information on employed individuals' industry and occupation. It is a voluntary survey designed to supplement the 2011 Canadian Census, which in that year only included a short-form rather than the long-form enquiry of previous years. The location information provided by the survey is on a residential basis. The CNHS was sent to around 30 per cent of Canadian households, and generated a response rate of 68.6 per cent, so effectively covers around 21 per cent of all households. Like the ACS, it does not include information on second jobs. Members of the armed forces stationed abroad are excluded; to line up the sample with US and UK data we exclude *all* armed forces respondents.

As Table 2 makes clear, there are two constraints on CNHS data. One is that the survey is carried out every five years, so that annual trends analysis is not possible. The second is that sub-national analysis is possible, but not for the detailed industry-by-occupation cells we need here.

2.2 **Spatial units**

Sub-national analysis is feasible for the US and UK, but requires further choices to be made. First, we need to remove sampling errors that might creep in when using small area geographies. We do this by suppressing cells where any area-level aggregated count is under 800 observations, and restricting trident analysis to the national level. Second, we need to choose spatial units in each country that are both broadly comparable and provide at least a basic representation of local economies, given that in both cases data is collected on a residence basis.

The optimal UK spatial units would be Travel-to-Work-Areas (TTWAs), which are widely considered to be the best approximation to a local economy. However, the data made available to us was only coded at local authority and NUTS1-3 coding. None of these geographies are contiguous with, or nested in, TTWAs.[22, 23] We therefore choose NUTS2 areas in the UK and Metropolitan Statistical Areas (MSAs or 'metro areas') in the US as our main units of analysis. In the US, the Office of Management and Budget (OMB) identifies metropolitan, micropolitan and other statistical areas for Federal statistical purposes. Metro areas have at least one urbanized area that contains 50,000 or more residents, and adjacent territory that is highly integrated as determined by commuting ties. Metros represent self-contained labour markets and are widely used by urban economists and economic geographers, as well as for creative economy analysis (see King et al., 2009, for one example).

For the UK, NUTS3 units would provide much more spatial variation, but individual NUTS3s can be smaller in size than major cities, so are arguably less good as an approximation of the spatial economy (London is divided into 21 zones, Greater Manchester into five zones, and conurbations like Greater Bristol and Greater Glasgow are cut into urban cores and surrounding suburbs). Given that UK data is residence-based, using NUTS3 geographies would then generate implausibly high creative economy estimates for suburban areas surrounding urban cores. Using NUTS2 areas arguably partly addresses this problem by working with collections of related NUTS3 areas, providing a more natural representation of cities and spatial economies more broadly.

3. CROSSWALKING CREATIVE OCCUPATIONS AND INDUSTRIES

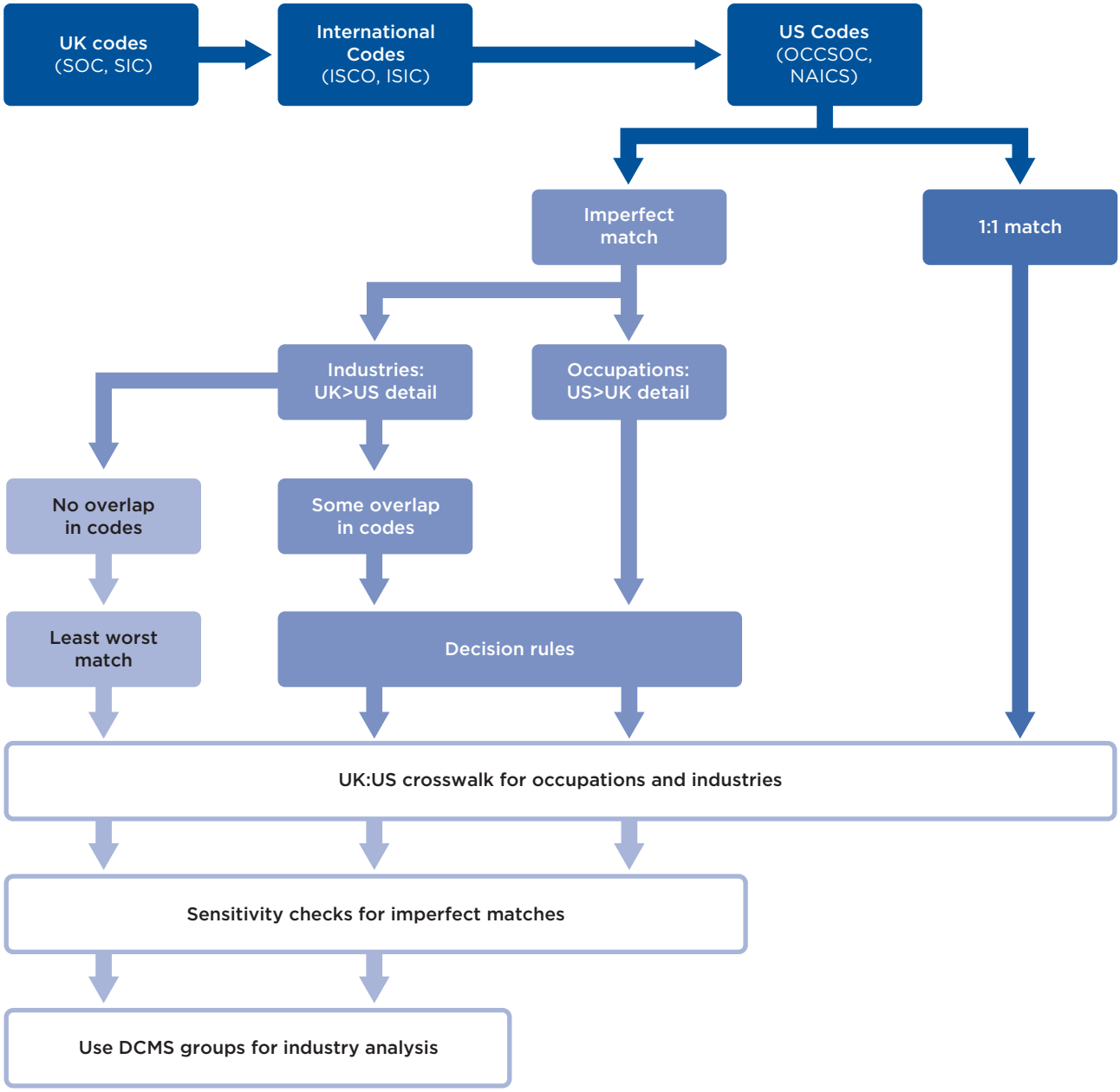
This section of the report explains how we create lists of US and Canadian creative occupations and industries by crosswalking from the UK codes specified by DCMS. In general, different industry and occupation systems have evolved in parallel over time.[24] In recent years, there has been a series of efforts to back-fit these into international standardised typologies such as ISIC (for industries) and ISCO (for occupations).[25] We exploit these international systems to create a bridge from the UK creative occupations and industries as designated by the DCMS, to their equivalents in the US and Canada. To do this, we use a series of concordance tables to create a mapping (or 'crosswalk') from UK occupation and industry typologies, to US and Canadian occupation and industry typologies.

The workflow generates three basic scenarios, each of which require different analytical steps. These are set out in Figure 1: for presentational purposes we use just the US as an example, but the workflow is identical in the Canadian case. In the first (ideal) scenario, we have 1:1 matches from UK to international codes, and from international to US or Canadian codes. In these cases, we can read our result directly off the concordance tables. This is the case for almost all occupational codes, and some of our industry codes too.

In the second scenario, there is a less than perfect match. In some cases, a UK or international code will match onto multiple US/Canadian codes (as in occupations); in other cases (some industries) we will lose some detail in the crosswalking process. In such cases we use transparent decision rules to create best-fit matches.[26] Where the match results in less detail on the North American side, as with some industries, we use DCMS creative industry groups (DCMS 2014) to enable like-for-like comparisons. We also use sensitivity checks for individual industry matches to test any contestable assumptions.

In a third scenario, there is only a marginal match between codes. This occurs for a few US industries. As we explain below, the way US industry codes are made available in our data leads to a couple of cases where there is no match between a four-digit UK industry and any four-digit US equivalent (rather, the match is from SIC4 to NAICS6, a level of resolution we do not have in any suitable US dataset). In these cases, we construct 'least-worst' matches and, as before, use sensitivity checks to test these.

FIGURE 1 **CROSSWALK WORKFLOW**



Box 1, below, summarises our decision rules for individual industries and occupations. There is – inevitably – some subjective judgment involved in their application, but these steps at least render the process transparent. Appendices 2 and 3 explain each decision made.

BOX 1 CROSSWALKING DECISION RULES FOR INDIVIDUAL CODES

RULE 1. We make a mechanical (1:1) mapping at the most detailed level possible.

When this is not possible:

RULE 2. We use descriptor fields on both sides to select a match on the basis of the free-text description of the cell.

RULE 3. When a UK cell maps onto multiple US/Canadian cells, look for matched US cells based on descriptor (=> RULE 2), then drop others unless included in possible matches for other cells.

RULE 4. Highlight any remaining 'marginal matches', e.g. where descriptors have limited overlap, and run sensitivity tests that include/exclude these cells.

RULE 5. Highlight any cases for which these rules do not result in a UK-US or UK-Canada match. If possible, create a least-worst match using rules above, then run sensitivity tests that include/exclude these cells.

RULE 6. Highlight any errors in the concordance table, suggest an alternative, then repeat.

3.1 Occupations

For occupations, our bridge from UK occupation codes to North American codes is the most recent ISCO08 occupation coding.[27] Appendix 2, Table A4 sets out the resulting crosswalk for the US, where we generate a series of OCCSOC codes that correspond to the DCMS list of creative occupations. The ACS provides very detailed occupational information, so in most cases either a 1:1 mechanical match is possible, or ISCO cells map to a number of US occupational cells (an even better outcome for precision). In all of these cases, we are able to use UK and US descriptors to assign matches. We find one case where the SOC-ISCO concordance table appears to contain an error.[28] At the end of the crosswalking, the 30 four-digit SOC codes designated by DCMS as creative map to 31 ISCO codes and 48 OCCSOC codes, the latter available at five- or six-digit precision.

Appendix 2, Table A5 sets out the occupational crosswalk for Canada, where we generate a set of NOC-S occupational codes for creative occupations.[29] As with the ACS, the CNHS provides very detailed occupational information, so in almost all cases we either have a 1:1 match or find that ISCO codes map to several different NOC-S codes. We find two cases where the same ISCO cell maps onto different NOC-S codes, and use decision rules to resolve these. At the end of the crosswalking process, the 30 four-digit SOC codes map to 48 NOC-S codes.

3.2 Industries

For industries, we use the most recent ISIC4 coding developed by the UN as our bridge between the UK and North American classifications. For the US, we then crosswalk ISIC cells to US industry codes, using the same decision rules as for occupations when non 1:1 matches arise (see Box 1).[30, 31] As mentioned in Section 2, our US industry typology is the INDNAICS system, which crosswalks US Census industry codes to the regular NAICS coding system.

Appendix 3, Table A7 sets out the US crosswalk. For industries, crosswalking is noisier than with occupations, with the 31 DCMS industry codes resulting in 22 US industry codes. This is largely because INDNAICS codes are provided at varying levels of detail, from three-digit to five-digit. It is important to note that all but three of the resulting 22 US industries are crosswalked at NAICS4 or NAICS5 level, but still there is some loss of precision.[32] For example, the DCMS industry group 'Film, TV, video, radio and photography' is covered by seven SIC3 and SIC4 codes, but just three NAICS3 and NAICS4 codes, because the most detailed disaggregation is handled at NAICS5 and NAICS6 levels of the US industry typology: coding that is not available in any US industry dataset suitable for creative industries analysis.

In these cases, we use the nine higher-level DCMS industry groups as our preferred means to look within the creative industries. The groups are: advertising and marketing; architecture; crafts; design activities; film, TV, video, radio and photography; IT, software and computer services; music, performing and visual arts; museums, galleries and libraries, and publishing. In a couple of individual industry cases – photographic activities (SIC 74.2) and translation/interpretation activities (SIC 74.3) – there is no direct match at all from UK SICs at NAICS4 level; rather, the match is six-digit NAICS level, beyond the reach of our US data. In these two cases we construct 'least worst' matches, and run sensitivity checks on our main results including and excluding these cells.

Appendix 3, Table A8 sets out the resulting crosswalk for Canada, where we use standard NAICS codes to generate a set of creative industries.[33] As explained above, the 31 DCMS-designated creative industry SICs map onto the same number of ISIC codes, but the latter are, in some cases, less precise than their UK counterparts. In the second part of the mapping, from ISICs to NAICS, we also lose some detail – because of the way NAICS industry typologies are made available in the Canadian data. In this case the challenges are less severe than for the US, because we have four-digit NAICS codes on the Canadian side rather than the more complex INDNAICS system used in the US data. As with the US analysis, in these cases, comparing specific sectors is not always sensible, so we use the nine higher-level DCMS industry groups as the primary tool to look within the creative industries.

4. THE CREATIVE ECONOMY IN THE US, CANADA AND THE UK

This section of the report provides headline information on the composition of the creative economies in the US and UK, national employment trends and the creative tridents in both countries, using 2011-2013 data. Data on the composition of the Canadian creative economy is provided for 2011. In all results we follow BFH and remove small-sample and 'volatile' cells.[34] As mentioned in Section 2, the UK numbers will differ slightly from DCMS published estimates because, to align the US and UK sampling frames, we: a) exclude second jobs; b) remove all armed forces employment. In the next section, we run a series of robustness checks on our main results.

4.1 Creative economy: levels, shares and trends

Table 3 shows employment in the national creative economies and their components between 2011 and 2013 (for the US and UK) and 2011 (for Canada). The top panel gives results for the US, the middle panel for Canada, and the bottom panel for the UK.

TABLE 3 EMPLOYMENT IN THE US, CANADA AND UK CREATIVE ECONOMIES

US, 2011-2013						
Year	Creative industries		Embedded		Creative economy	
	total	% all employment	total	% all employment	total	% all employment
2011	9,939,000	7.02%	3,457,000	2.46%	13,396,000	9.48%
2012	10,300,000	7.14%	3,510,000	2.46%	13,810,000	9.60%
2013	10,598,000	7.24%	3,643,000	2.51%	14,241,000	9.75%
Year	% growth		% growth		% growth	
2011-12	3.60%		1.53%		3.07%	
2012-13	2.89%		3.77%		3.11%	

Canada, 2011						
Year	Creative industries		Embedded		Creative economy	
	total	% all employment	total	% all employment	total	% all employment
2011	1,427,500	8.2%	815,000	4.7%	2,242,000	12.9%

UK, 2011-2013						
Year	Creative industries		Embedded		Creative economy	
	total	% all employment	total	% all employment	total	% all employment
2011	1,457,000	5.12%	869,000	3.06%	2,326,000	8.18%
2012	1,585,000	5.53%	902,000	3.15%	2,487,000	8.68%
2013	1,597,000	5.49%	952,000	3.27%	2,549,000	8.76%
Year	% growth		% growth		% growth	
2011-12	8.81%		3.83%		6.95%	
2012-13	0.73%		5.56%		2.48%	

Source: American Community Survey, UK Annual Population Survey, Canadian National Household Survey.

Notes: APS data has second jobs removed to align sampling frame with ACS. All samples have armed forces jobs removed to align sampling frames. Figures exclude small cells and volatile cells. All counts rounded to the nearest thousand.

The US creative economy is – unsurprisingly, given the larger size of its economy – substantially greater than the other two: in 2013, the US creative economy comprised over 14 million employees, with 10.6 million in the creative industries and 3.6 million in embedded jobs. By contrast, the UK had 2.5 million employed in the creative economy in 2013, with 1.6 million in the creative industries. In counts, Canada and the UK are quite close together: in 2011, Canada had 2.24 million creative economy jobs and the UK 2.33 million, compared with 13.4 million in the US.

In workforce share terms, the three countries' creative economies are rather closer together: in 2011, the UK creative economy comprised 8.18 per cent of all jobs, the US 9.48 per cent and Canada 12.9 per cent. (As Table 3 shows, Canada also had higher employment shares for the creative industries and embedded creative jobs in that year.)

Table 3 also gives a sense of short-term change over time for the US and UK. Both the US and UK creative economies have grown over the 2011-2013 period, on average by 3.1 per cent per annum (p.a.) in the US and 4.7 per cent p.a. in the UK. Most of the UK's creative economy employment growth between 2011 and 2012 was accounted for by employment growth in the creative industries, but in 2012-13, growth in embedded jobs was higher. The US shows a similar pattern, with creative industries growth particularly high in 2011-2012, and embedded employment growth stronger in 2013.

We only have one year of data for Canada. Could this account for Canada's higher creative economy workforce share? Two factors should reassure us. First, the Canadian results draw on a very large survey, with a substantially bigger sample than either the US or UK data (see Tables 1 and 2, Section 2). This should make us more confident that the 2011 results are not an outlier. Second, we can see from the US and UK data that short-term changes in each country's workforce share over time are relatively small. For instance, in 2013, the most recent year for which we have data, the US-UK difference is close to that in 2011: the US-UK 'gap' in the creative economy is 0.99 per cent points, vs. 1.3 per cent points in 2011. For creative industries, the difference is 1.75 per cent points in 2013, vs. 1.9 per cent points in 2011.

4.2 Creative tridents

Table 4 shows the 'creative tridents' for the US and UK between 2011-2013, and for Canada in 2011. The trident breaks down creative industries and occupations further, allowing us to see the distribution of 'creative' and 'non-creative' occupations – in employment terms – within the set of creative industries and their non-creative counterparts. As before, the top, middle and bottom panels give results for the US, Canada and the UK respectively.

TABLE 4 CREATIVE TRIDENTS FOR THE US, CANADA AND THE UK

US, 2011-2013 average			
	Creative industries	**Non-creative industries**	**All industries**
Creative occupations	Specialists: 2,817,000	Embedded: 3,537,000	Creatively occupied jobs: 6,354,000
Non-creative occupations	Non-specialists: 7,462,000	Non-creative: 129,089,000	Non-creatively occupied jobs: 136,551,000
All occupations	Working in creative industries: 10,279,000	Working outside the creative industries: 132,626,000	Workforce: 142,905,000

Canada, 2011			
	Creative industries	**Non-creative industries**	**All industries**
Creative occupations	Specialists: 534,000	Embedded: 815,000	Creatively occupied jobs: 1,348,000
Non-creative occupations	Non-specialists: 893,000	Non-creative: 15,126,000	Non-creatively occupied jobs: 16,020,000
All occupations	Working in creative industries: 1,427,000	Working outside the creative industries: 15,940,000	Workforce: 17,368,000

UK, 2011-2013 average			
	Creative industries	**Non-creative industries**	**All industries**
Creative occupations	Specialists: 809,000	Embedded: 908,000	Creatively occupied jobs: 1,717,000
Non-creative occupations	Non-specialists: 737,000	Non-creative: 26,274,000	Non-creatively occupied jobs: 27,011,000
All occupations	Working in creative industries: 1,546,000	Working outside the creative industries: 27,182,000	Workforce: 28,728,000

Source: American Community Survey, UK Annual Population Survey, Canadian National Household Survey.

Notes: APS data excludes second jobs. Figures exclude small cells and volatile cells. All samples have armed forces jobs removed to align sampling frames. Totals may not sum due to rounding. All counts rounded to the nearest thousand.

Some interesting contrasts are apparent. Canada has the highest share of workers in creative occupations (7.8 per cent of the workforce in 2011), followed by the UK (6.0 per cent of the workforce in 2011-2013) and the US (4.4 per cent). The pattern of embedded creative workers in non-creative industries is similar, with the highest shares in Canada (5.1 per cent of non-creative industries jobs) followed by the UK (3.3 per cent) and then the US (2.7 per cent). However, *within* the creative industries the UK's share of creative specialists is higher than in both Canada and the US (constituting 52.3 per cent of all creative industries employment in the UK, versus 37.4 per cent in Canada and 27.4 per cent in the US). Strikingly, in the US and Canadian creative industries non-specialists outnumber those in creative occupations by about 2.5:1 in the US, and 1.6:1 in Canada. But in the UK, those in creative jobs (809,000) outnumber non-specialists (737,000).

4.3 Creative industries

Table 5 provides more detail on the features of the creative industries in each country. As explained in Section 3, crosswalking industry codes leads to some loss of precision because the most detailed NAICS industry information is not made available in the most suitable US and Canadian data. We therefore use the DCMS' nine Creative Industries groups, which allow for broad like-for-like comparisons.

Table 5 shows the results of the industry-group level comparison. The top panel of the table gives US figures, the middle Canadian figures, the bottom UK figures.

TABLE 5 US, CANADA AND THE UK CREATIVE INDUSTRIES GROUPS

US, 2011-2013 average				
Crosswalked DCMS industry group	Creative intensity	Jobs	Creative jobs	% creative industries jobs
Advertising and marketing	0.171	1,880,000	322,000	18.29%
Architecture	0.212	1,418,000	301,000	13.80%
Crafts	0.141	190,000	27,000	1.85%
Design activities	0.711	320,000	228,000	3.12%
Film, TV, video, radio and photography	0.287	963,000	276,000	9.37%
IT, software and computer services	0.223	2,069,000	459,000	20.10%
Publishing	0.272	1,402,000	381,000	13.65%
Museums, galleries and libraries	0.217	596,000	129,000	5.80%
Music, performing and visual arts	0.486	1,440,000	693,000	14.02%
				100%

Canada, 2011				
Crosswalked DCMS industry group	Creative intensity	Jobs	Creative jobs	% creative industries jobs
Advertising and marketing	0.256	223,000	57,000	15.63%
Architecture	0.151	259,000	39,000	18.12%
Crafts	0.151	53,000	8,000	3.73%
Design activities	0.750	56,000	42,000	3.90%
Film, TV, video, radio and photography	0.223	108,000	59,000	7.54%
IT, software and computer services	0.601	278,000	167,000	19.46%
Publishing	0.330	227,000	75,000	15.92%
Museums, galleries and libraries	0.156	32,000	5,000	2.22%
Music, performing and visual arts	0.427	192,000	82,000	13.47%
				100%

UK, 2011-2013 average				
DCMS industry group	Creative intensity	Jobs	Creative jobs	% creative industries jobs
Advertising and marketing	0.533	142,000	76,000	9.21%
Architecture	0.647	90,000	58,000	5.80%
Crafts	0.557	7,000	4,000	0.48%
Design activities	0.613	106,000	65,000	6.83%
Film, TV, video, radio and photography	0.607	212,000	129,000	13.69%
IT, software and computer services	0.427	523,000	223,000	33.77%
Publishing	0.520	194,000	101,000	12.56%
Museums, galleries and libraries	0.235	82,000	19,000	5.33%
Music, performing and visual arts	0.703	191,000	134,000	12.33%
				100%

Source: American Community Survey, UK Annual Population Survey, Canadian National Household Survey.

Notes: Canada data is for 2011. APS data excludes second jobs. Figures exclude small cells and volatile cells. All samples have armed forces jobs removed to align sampling frames. All counts rounded to the nearest thousand.

We noted earlier the difference in employment structures between the North American and UK creative industries as a whole, with significantly higher shares of creatively occupied workers in UK sub-sectors.

In Table 5, this is apparent in the strikingly different creative intensities for the same groups in the three countries. In the US, only two industry groups (design activities; music, performing and visual arts) have creative intensities above the BFH threshold of 0.3; in Canada, four groups are above this threshold (design; film, broadcast and photography; ICT; and music, performing and visual arts). In the UK, by contrast, only one group (museums, galleries and libraries) is *below* 0.3. Notwithstanding this, the most creatively intense North American industry group, design, has a higher creative intensity in both the US (0.711) and Canada (0.750) than its UK counterpart (0.613). It is also notable that ICT activity is more creatively intense in Canada (0.601) than in either the UK (0.427) or the US (0.233).

The other striking feature of this table is the variation across countries in sub-sectoral composition. In all three countries, the ICT, software and computer services group comprises the biggest slice of the creative industries. However, the UK's creative industries are dominated by this group (over 33 per cent of all jobs) to an extent that appears not to be the case in either the US (20.1 per cent) or Canada (19.46 per cent). More generally, the UK's creative industries have a distinctive employment shape, while the US and Canada have much more in common between them. For example, advertising and marketing (18.3 per cent in the US, 15.6 per cent in Canada) has employment shares over twice the size of its UK counterparts (9.2 per cent). A similar picture emerges in architecture (13.8 per cent US, 18.1 per cent Canada, 5.8 per cent UK). Although this is thought to reflect the US code being wider as it relates to architectural and engineering activities and related technical consultancy. Conversely, for film and broadcast activity, the UK takes a bigger share of creative industries jobs (13.7 per cent) than in both Canada (7.5 per cent) and the US (9.4 per cent).

Tables A9-A11 in Appendix 4 show individual sub-sectors in more detail for the UK, US and Canada respectively.[35] Note that the crosswalking is performed at different levels of industrial resolution, so the results have to be interpreted with some caution, and some disaggregation (e.g. in ICT, software and computer services) is difficult to do.

These tables show that, although the advertising and marketing group appears to have twice as large a share of creative industry jobs in the US and Canada compared to the UK, much of this is explained by the NAICS group – of management, scientific and technical consulting services. This highlights the constraint in our industry-level analysis: the crosswalking is less precise than we would like.[36]

5. ROBUSTNESS CHECKS

What explains these apparent differences? If our analysis is robust, we have identified real, structural differences in the industry workforces in the three countries. Against this are two potentially confounding factors. First, particular industry cells might be driving at least part of the results: these could be outliers in the data, or could reflect problems with a particular concordance. In this section we use a series of sensitivity tests to explore these issues. These tests do not suggest that coding problems cause any major difficulties.

Second, and more fundamentally, there may be issues with the crosswalking exercise, especially with the industry codes (as set out in Section 3). We test this for the US by repeating our main analysis using OES business data, which provides the same occupational codes but a slightly different industry crosswalking. This test also provides reassuring results.

5.1 Sensitivity checks: US

We start by checking the sensitivity of our US results to changing the set of industries (Section 5.2 repeats the tests for Canada). Table 6 gives the results.

To gauge the impact of each test, we show how it shifts the creative economy's share of overall employment, and any change in the average creative intensity of the creative industries. We run tests for all three years to check for any unusual data points. In order to highlight the effect of changes in the industry set, we do not re-allocate creative workers from any dropped industries to embedded creative employment. This means that the true effect of the changes we explore here would be smaller than the results we show below.

TABLE 6 US ROBUSTNESS CHECKS: INDUSTRY CELLS

Dropping poorly UK-US crosswalked cells (1)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	9,172,000	3,457,000	12,629,000	-0.24%	0.035
2012	9,490,000	3,510,000	13,000,000	-0.36%	0.035
2013	9,768,000	3,643,000	13,411,000	-0.51%	0.031

Adjusting fuzzy SIC-ISIC crosswalk cells (2)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	9,856,000	3,457,000	13,313,000	-0.05%	0.000
2012	10,211,000	3,510,000	13,721,000	-0.17%	0.000
2013	10,506,000	3,643,000	14,148,000	-0.32%	0.004

Dropping fuzzy SIC-ISIC crosswalk industry cells (3)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	6,286,000	3,457,000	9,744,000	-2.54%	-0.007
2012	6,358,000	3,510,000	9,869,000	-2.65%	-0.007
2013	6,439,000	3,643,000	10,082,000	-2.80%	-0.003

Dropping Computer systems design and related services (4)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	8,153,000	3,457,000	11,610,300	-1.21%	0.000
2012	8,307,000	3,510,000	11,818,000	-1.32%	0.000
2013	8,546,000	3,643,000	12,190,000	-1.47%	0.004

Source: American Community Survey.

Notes: 1) Industry cells dropped are INDNAICS 5419Z (other professional, scientific and technical services (excluding vets)) and 8129 (other personal services); 2) Industry cells are INDNAICS 3279, 3399M, 5112, 5182, 51913, 5415, 5416, 5419Z, 712; 3) Industry cells dropped are those listed in note 2; 4) Industry cell dropped is INDNAICS 5415, computer systems design and related services. All counts rounded to the nearest thousand.

The first panel drops the two most poorly crosswalked cells: 'photographic activities' and 'translation and interpretation services' are fairly well identified in UK four-digit SIC codes, but are very poorly captured in their four-digit INDNAICS counterparts 5419Z (other professional, scientific and technical services (excluding vets)) and 8129 (other personal services). Dropping these from the analysis removes over 700,000 jobs from the US creative industries. The overall impact on the creative economy's share of US employment is however relatively small, at 0.51 per cent points in 2013 (a move from 9.75 - 9.24 per cent) and rather less than this in previous years. As these two cells have low creative intensities, average intensity rises in the remaining creative industries. This is encouraging, as it suggests the extreme examples of poor crosswalking do not drastically change the overall results.

The second and third panels look at a series of industries for which the initial SIC-ISIC crosswalking generated a substantial loss of detail (as discussed in Section 3, this occurs when the US codes to which the UK codes are matched are more general). These problematic industry cells are set out in Table A12 in Appendix 4. In these cases, four-digit ISIC information may not be detailed enough to pick out 'creative' elements of the industries in question. In turn, this affects the US estimates. In these cases, we generate the relevant UK SIC4 industry shares for the 'excess' ISIC codes (marked in red in Table A7) and use these to adjust the less detailed US industry codes on the other side of the crosswalk.[37]

The second panel gives results for the adjusted industries. There is minimal change to creative intensities in all years, and very little change in creative economy job shares in 2013 (although slightly larger shifts in previous years). Again, this is an encouraging result as it suggests the overall effect of the fuzzy crosswalk is small. The third panel tests the effect of dropping these imperfectly crosswalked cells altogether. This is an extreme step, which results in substantial downward shifts in creative economy job shares: in 2013, for instance, creative economy jobs fall from 9.75 per cent of all US jobs to 6.95 per cent. Such a conservative approach to comparative creative economy measurement would substantially reduce creative economy estimates in the UK too.

The 'fuzzy crosswalk' cells include ICT activity, and the fourth panel highlights the importance of ICT sectors to the US creative economy results. Here we drop only INDNAICS 5415, computer systems design and related services. In 2013, this sector employed nearly two million people in the US, and removing it from creative industries reduces creative economy shares by 1.47 per cent

points in 2013, over half the impact of removing *all* fuzzy cells. The creative intensity in this sector is 0.221, though; so removing it has relatively little effect on average intensities of the industries that remain.

5.2 Sensitivity checks: Canada

Table 7 repeats these exercises for the 2011 Canadian data. The first panel drops the NAICS cells corresponding to the two most poorly crosswalked SIC codes: 'photographic activities' and 'translation and interpretation services'. Removing these codes (NAICS 5149, 8219) shifts Canadian creative economy employment share down by 0.5 per cent points, or about 85,000 jobs, with minimal change in average creative intensity. As with the US estimates, this is encouraging, as it suggests that omitting the worst cases of crosswalking does not drastically change the overall results.

TABLE 7 CANADA ROBUSTNESS CHECKS: INDUSTRY CELLS

Dropping poorly crosswalked cells (1)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	1,311,000	847,000	2,158,000	-0.50%	-0.002
Adjusting fuzzy SIC-ISIC crosswalk cells (2)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	1,415,000	814,000	2,229,000	-0.10%	0.000
Dropping fuzzy SIC-ISIC crosswalk industry cells (3)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	864,000	814,000	1,678,000	-3.20%	-0.015
Dropping Computer systems design and related services (4)					
Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
2011	1,189,000	814,000	2,003,000	-0.89%	-0.008

Source: Canadian National Household Survey.

Notes: 1) Industry cells dropped are NAICS 5419 (other professional, scientific and technical services) and 8129 (other personal services); 2) Industry cells are NAICS 3279, 3399, 5112, 5182, 5191, 5415, 5416, 5419, 712; 3) Industry cells dropped are those listed in note 2; 4) Industry cell dropped is NAICS 5415, Computer systems design and related services.

As before, the second and third panels focus on industries for which initial SIC-ISIC crosswalking generates a loss of detail (see Table A12 in Appendix A4). The second panel applies the APS-based adjustment outlined in Section 5.1, and as with the US test, encouragingly leads to minimal change to counts, shares or average creative intensity. The third panel drops the 'fuzzy' cells altogether: as with the equivalent US test, this takes out a substantial slice of creative industries activity (losing 564,000 jobs), which in turn reduces creative economy employment shares by 3.2 per cent points compared to our main estimates. Again, this is a more conservative approach than we would wish to use in our main analysis. The fourth panel drops the ICT sector (computer systems design and related services: NAICS 5415) from the creative industries set. This removes just 53,000 workers from the creative industries, a much smaller number than in the US, and results in minimal changes to the overall creative economy figures.

5.3 Crosswalking and sampling frame tests

This section tests the sensitivity of our results to the crosswalk we have constructed. To do this we re-run our main US results using an alternative dataset, the Occupational Employment Statistics (OES) occupation codes remain the same, but the industry coding changes (from three-five digit INDNAICS and NAICS in the ACS to consistent four-digit NAICS in the OES). Given the particular challenges of crosswalking industries (see Section 3), this test should give us some sense of the sensitivity of the industry results to a particular set of crosswalking steps.

However, there are also confounding factors impacting the test, namely that the OES sampling frame differs in two important ways from the ACS. First, the OES is a business survey, not a household survey, and excludes the self-employed. We therefore compare OES results to ACS estimates with self-employed respondents removed. Second, and more profoundly, the two surveys get their information in different ways: OES questionnaires are sent to HR managers in a firm, while ACS questionnaires go to a named individual in a household. In turn, this may lead to structural differences in answers to some questions (for example, on pay, working hours or job description).

Table 8 gives the results: the top panel gives OES estimates, the second panel ACS estimates, the third panel gives OES-ACS differences in counts and percentage points, and for comparison purposes a fourth panel provides UK estimates from the APS, again with self-employed removed. Comparing the two US estimates, it is noticeable that the OES estimates shift substantially from year to year, while the ACS provides more consistent estimates. We therefore average both time series and compare these. For creative industries employment, ACS and OES estimates are very close together (with the average difference 2011-2013 just 27,000 jobs). For embedded creative jobs, the OES provides consistently smaller estimates (with the average difference 1.93 million). In turn, this leads to creative economy estimates 1.9 million lower in the OES than the ACS. Differences in shares are rather smaller, however, at 0.3 percentage points (creative industries jobs), 1.47 percentage points (embedded jobs) and 1.16 percentage points (creative economy jobs).

It seems plausible that a combination of methodological differences (asking managers in the OES, workers in the ACS) accounts for a non-trivial portion of this difference. This helps to assuage our core concern - that the industry crosswalk available in ACS data is problematic.

TABLE 8 CROSSWALKING CHECK ON US RESULTS USING OES DATA, AND COMPARISON TO UK RESULTS

US OES, no self-employed						
	Creative industries		Embedded		Creative economy	
Year	Total	% of all jobs	Total	% of all jobs	Total	% of all jobs
2011	7,990,000	6.29%	1,381,000	1.09%	9,371,000	7.38%
2012	9,973,000	5.68%	1,872,000	1.07%	11,845,000	6.75%
2013	6,807,000	8.06%	1,052,000	1.25%	7,859,000	9.31%
Ave	8,257,000	6.68%	1,435,000	1.14%	9,692,000	7.81%

US ACS, no self-employed						
	Creative industries		Embedded		Creative economy	
Year	Total	% of all jobs	Total	% of all jobs	Total	% of all jobs
2011	7,964,000	6.28%	3,290,000	2.59%	11,254,000	8.87%
2012	8,244,000	6.38%	3,343,000	2.59%	11,586,000	8.97%
2013	8,482,000	6.45%	3,468,000	2.64%	11,950,000	9.09%
Ave	8,230,000	6.37%	3,367,000	2.61%	11,597,000	8.97%

Differences ACS-OES						
	Creative industries		Embedded		Creative economy	
Year	Total	% points	Total	% points	Total	% points
2011	26,000	0.01%	-1,908,000	-1.51%	-1,882,000	-1.49%
2012	1,730,000	0.70%	-1,471,000	-1.52%	259,000	2.22%
2013	-1,675,000	-1.61%	-2,416,000	-1.39%	-4,091,000	0.22%
Ave	27,000	-0.30%	-1,932,000	-1.47%	-1,905,000	-1.16%

UK APS, no self-employed						
	Creative industries		Embedded		Creative economy	
Year	Total	% points	Total	% points	Total	% points
2011	1,019,000	4.17%	698,000	2.86%	1,717,000	7.03%
2012	1,098,000	4.48%	724,000	2.96%	1,822,000	7.44%
2013	1,100,000	4.43%	771,000	3.10%	1,871,000	7.53%
Ave	1,072,000	4.36%	731,000	2.97%	1,803,000	7.33%

Source: Occupational Employment Statistics, American Community Survey, UK Annual Population Survey.

Notes: ACS and APS panels exclude the self-employed to ensure consistency with OES. APS data excludes second jobs to ensure consistent sampling frame with US data. Figures exclude small cells and volatile cells.

However, the test also points up some differences in the occupational results. Specifically, estimates for embedded jobs – employment numbers for people in creative occupations in non-creative industries – are consistently far apart. Note that precisely the same occupation codes are being used in both cases, so this leaves two possibilities. It is possible that this result is being driven by differences elsewhere in industry typologies – that is, our crosswalk for the OES gives the same result as the ACS data for the creative industries, but not for other industries.

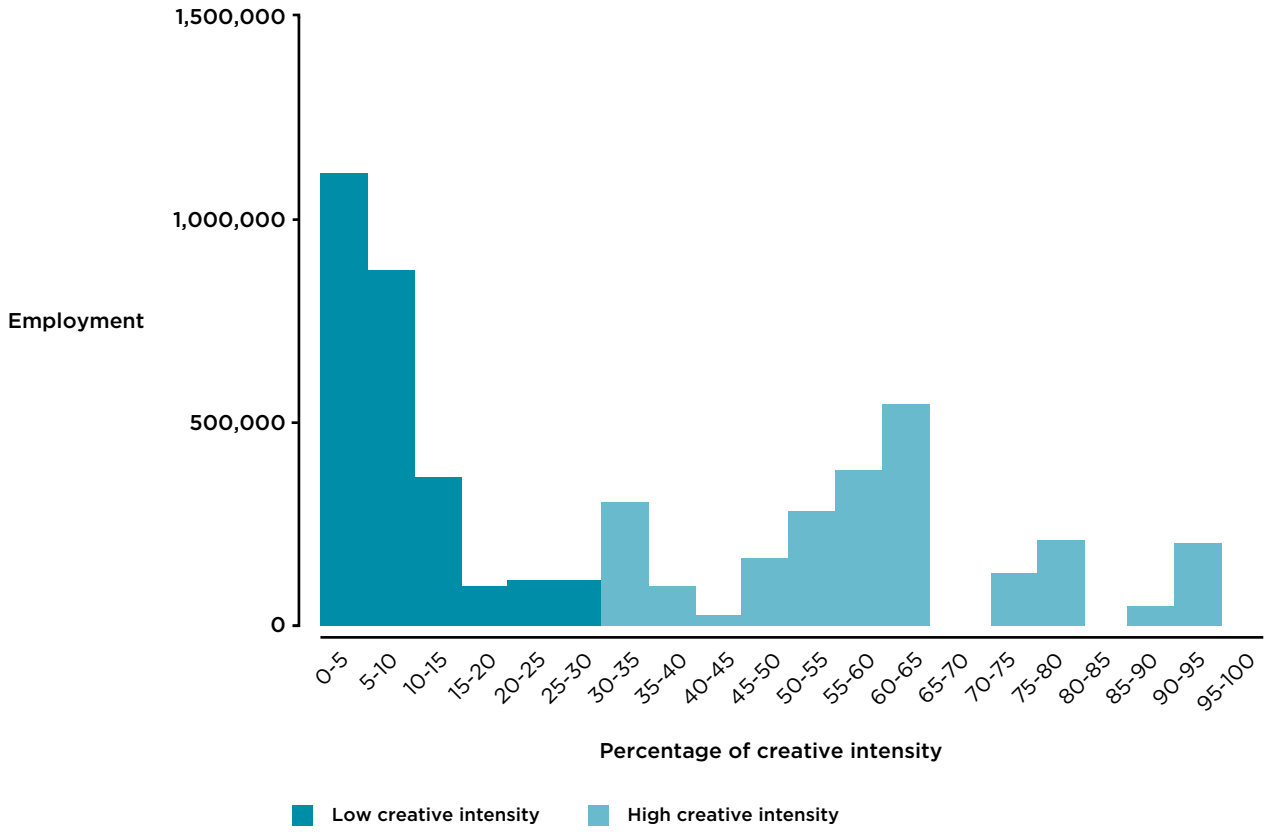
It is also possible that some difference in the sampling frames of the ACS and OES is generating the result. For example, asking businesses and households about the industries they work in is likely to produce consistent results; asking firms about their workforces and (non-self-employed) individuals/households about their occupations is arguably likely to lead to greater differences. If this is correct, we need to think about which estimates we should prefer: the ACS samples substantially more respondents than the OES, and it is notable that OES estimates for the creative industries are more volatile over time than those in the ACS. Further research is needed to explore these possibilities.[38]

6. INTENSITY ANALYSIS

In Nesta's Dynamic Mapping study, the creative industries were identified as industries that had particularly high proportions of employment in creative occupations. This was assessed by analysing the distribution of creative occupations across industries in the UK. This revealed a bimodal distribution of creative employment with a group of industries being clearly distinguished by their high proportion of creative occupation employment. In this section, we analyse the distribution of creative occupations across industries in the US and Canada to see whether we are able to identify this phenomenon in the North American data too.

Figures 1-3 explore the differences in the distribution of employment of creative occupations across industries, for the UK, US and Canada respectively. Each shows employment across different creative intensity buckets. By way of comparison, blocks above and below the 30 per cent creative intensity threshold that was found in BFH's data to partition industries into creative and other industries in the UK are coloured differently. Figure 1 updates the analysis in BFH and confirms the bimodal distribution of industries above and below the 0.3 threshold intensity in BFH. Note that this key result holds even when second jobs are excluded from the UK data, as they are here.

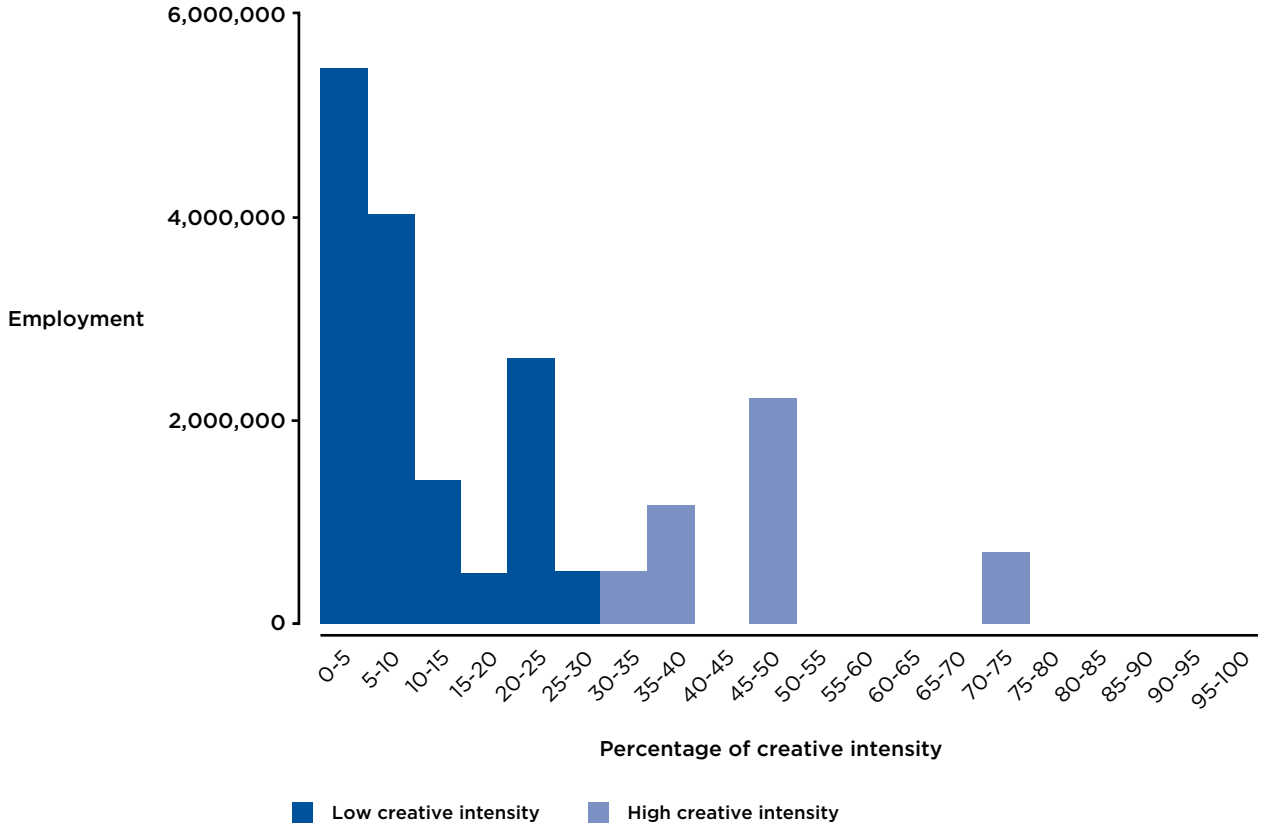
FIGURE 1 **DISTRIBUTION OF CREATIVE JOBS BY INTENSITY, UK, 2011-2013**



Source: UK Annual Population Survey.

Figure 2 repeats this analysis for the US, and shows a different distribution dominated – in employment terms – by low-intensity industries, though still bimodal. In comparison to the UK, there are relatively few industries which employ more than 30 per cent of their workforce in creative occupations: as we saw in the previous section, these correspond to the design industry; music, visual and performing arts industries; plus the 'traditional' parts of publishing (excluding online publication of content, or our proxies for photography and translation activities); movies, and libraries. There is one industry that is not in the DCMS creative industries list but which has a creative intensity of more than 30 per cent, florists (NAICS 4531) with a creative intensity of 0.473. In 2013, 102,513 people were employed in the US floristry industry (3.06 per cent of all creative industries employment in 2013), of whom 48,536 were in creative occupations. As a result, if the chart was coloured according to whether the creative occupations employment was inside or outside our creative industries definition it would not look substantively different.

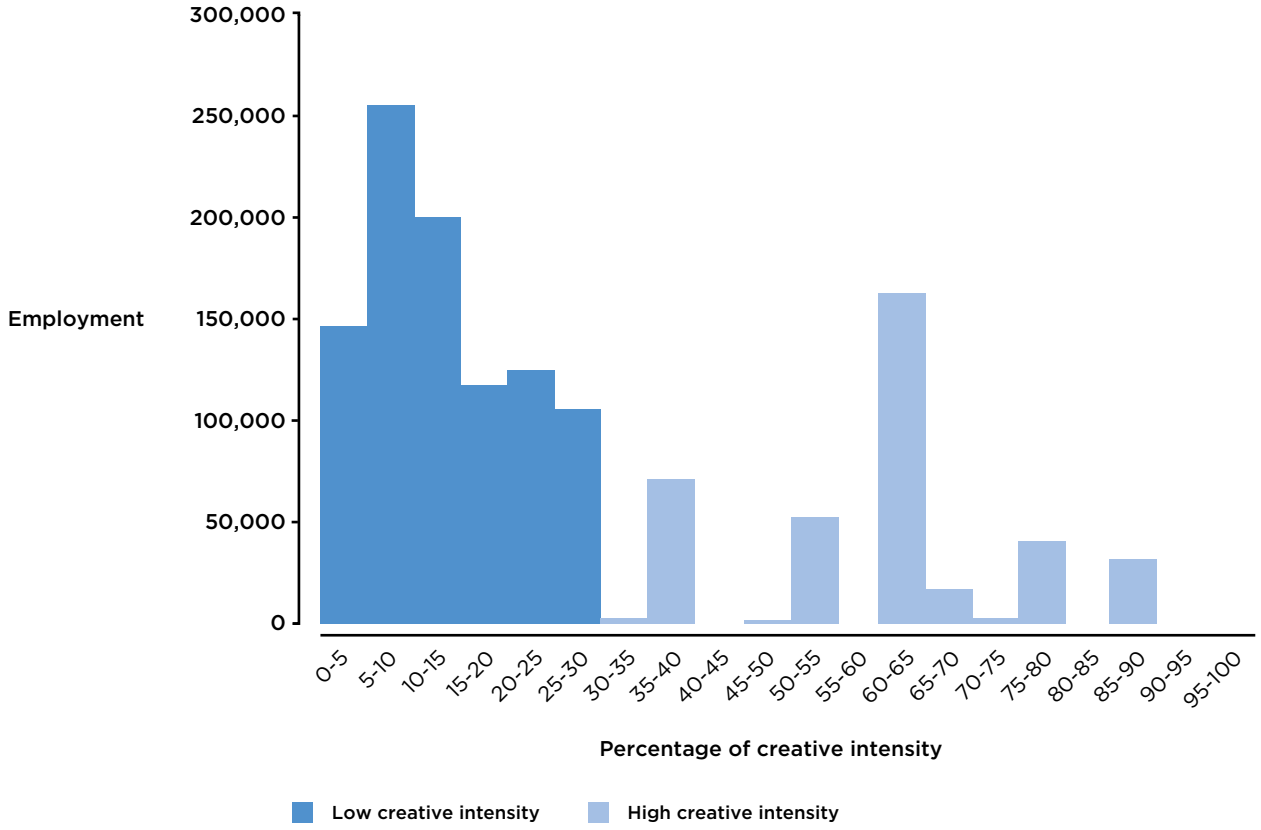
FIGURE 2 DISTRIBUTION OF CREATIVE JOBS BY INTENSITY, US, 2011-2013



Source: American Community Survey.

Figure 3 plots the distribution for Canada in 2011, and also shows a bimodal distribution which lies somewhere between the UK and US in structure. Employment at higher levels of creative intensity is more unevenly distributed than in the UK, but it is proportionately more significant than in the US. Figure 3 includes a couple of Canadian industries which employ a high proportion of creative occupations, but which do not correspond to industries crosswalked from the DCMS's creative industries list for the UK. These are clay product and refractory manufacturing (NAICS 3271), and manufacturing and reproducing magnetic and optical media (NAICS 3346), where the creative intensities in 2011 were 0.477 and 0.315 respectively. The numbers of creative workers employed in these industries, however, are such that if the chart was coloured according to whether the creative occupations employment was inside or outside our creative industries definition it would not look substantively different.

FIGURE 3 DISTRIBUTION OF CREATIVE JOBS BY INTENSITY, CANADA, 2011



Source: Canadian National Household Survey.

What should we conclude from this analysis? The key result is that in all three countries, we have two distinct groups of industries, 'creative' and 'non-creative', represented by the bimodal distribution of creative intensity. This confirms the key insights of the Dynamic Mapping that creative intensity provides a coherent way to identify creative industries. We can also see that the composition of these industry sets differs slightly from country to country.

7. THE GEOGRAPHY OF THE CREATIVE ECONOMY IN THE US AND UK

We now turn to look at the geography of the creative economy in the US and UK (the two countries for which we have sub-national data at the requisite geographical resolution). To do this, we use metro areas (MSAs) for the American analysis and NUTS2 units for the UK. As set out in Section 3, we need to choose spatial units that both resemble actual local economies, and minimise the differences; given the residence-based identifiers in our data, we prioritise representing economic realities over fine locational grain. US metro areas are named after their main cities, but NUTS2 areas are not. To help us better interpret the UK results, we thus rename NUTS2 units that are built around a city or cities.

We start with a simple comparison of job counts. Tables 9 and 10 give employment counts for US metros and UK NUTS2 areas respectively, focusing on the 20 areas with the highest counts in 2012 and 2013.[39] In each case, the left hand panel covers 2012, and the right hand panel 2013.

The counts data underline the much bigger scale of the US creative economy in raw employment terms. The largest US metro, New York-Newark-New Jersey had a creative economy of over 1.1 million in 2012, rising to above 1.2 million in 2013. This is bigger than the top four UK NUTS2 areas combined, and more than twice the size of London's (NUTS1) creative economy workforce. In US metros, creative industries' workforces are also typically much larger than counts of creative workers embedded in other sectors, a position reversed in UK cities. The US top 20 also exhibits much less change in the two-year period than its British counterpart; while London and parts of the Greater South East stay at the top of the UK distribution, there is rather more movement in NUTS2s that broadly cover conurbations such as Greater Manchester, Greater Glasgow and Leeds-Bradford.

TABLE 9 US CREATIVE ECONOMY EMPLOYMENT COUNTS BY METRO AREA, 2012 (LEFT) AND 2013 (RIGHT) TOP 20 METRO AREAS

Metropolitan area, 2012 OMB delineations	Creative industries	Embedded	Creative economy
New York-Newark-Jersey City, NY-NJ-PA	931,000	238,000	1,170,000
Los Angeles-Long Beach-Anaheim, CA	642,000	154,000	796,000
Washington-Arlington-Alexandria, DC-VA-MD-WV	462,000	104,000	567,000
Chicago-Naperville-Elgin, IL-IN-WI	384,000	129,000	513,000
San Francisco-Oakland-Hayward, CA	299,000	72,000	372,000
Dallas-Fort Worth-Arlington, TX	243,000	98,000	341,000
Boston-Cambridge-Newton, MA-NH	249,000	74,000	323,000
Atlanta-Sandy Springs-Roswell, GA	240,000	71,000	310,000
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	227,000	70,000	297,000
Houston-The Woodlands-Sugar Land, TX	207,000	70,000	277,000
Seattle-Tacoma-Bellevue, WA	213,000	50,000	262,000
Miami-Fort Lauderdale-West Palm Beach, FL	191,000	53,000	244,000
Minneapolis-St. Paul-Bloomington, MN-WI	151,000	66,000	217,000
Denver-Aurora-Lakewood, CO	158,000	48,000	207,000
Phoenix-Mesa-Scottsdale, AZ	138,000	49,000	187,000
Detroit-Warren-Dearborn, MI	134,000	48,000	181,000
San Diego-Carlsbad, CA	128,000	41,000	169,000
San Jose-Sunnyvale-Santa Clara, CA	132,000	34,000	166,000
Baltimore-Columbia-Towson, MD	129,000	36,000	165,000
Austin-Round Rock, TX	98,000	38,000	136,000

Metropolitan area, 2013 OMB delineations	Creative industries	Embedded	Creative economy
New York-Newark-Jersey City, NY-NJ-PA	946,000	258,000	1,204,000
Los Angeles-Long Beach-Anaheim, CA	658,000	156,000	814,000
Washington-Arlington-Alexandria, DC-VA-MD-WV	463,000	101,000	564,000
Chicago-Naperville-Elgin, IL-IN-WI	392,000	129,000	520,000
San Francisco-Oakland-Hayward, CA	313,000	82,000	395,000
Boston-Cambridge-Newton, MA-NH	276,000	76,000	352,000
Dallas-Fort Worth-Arlington, TX	244,000	95,000	339,000
Atlanta-Sandy Springs-Roswell, GA	242,000	82,000	324,000
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	214,000	82,000	295,000
Houston-The Woodlands-Sugar Land, TX	218,000	74,000	291,000
Seattle-Tacoma-Bellevue, WA	220,000	52,000	272,000
Miami-Fort Lauderdale-West Palm Beach, FL	194,000	53,000	246,000
Minneapolis-St. Paul-Bloomington, MN-WI	170,000	63,000	234,000
Denver-Aurora-Lakewood, CO	167,000	42,000	209,000
Phoenix-Mesa-Scottsdale, AZ	145,000	51,000	196,000
San Jose-Sunnyvale-Santa Clara, CA	144,000	41,000	185,000
Detroit-Warren-Dearborn, MI	132,000	48,000	179,000
San Diego-Carlsbad, CA	137,000	37,000	174,000
Baltimore-Columbia-Towson, MD	133,000	40,000	172,000
Austin-Round Rock, TX	118,000	33,000	150,000

Source: American Community Survey.
Notes: Figures exclude small cells and volatile cells.

TABLE 10 UK CREATIVE ECONOMY EMPLOYMENT COUNTS BY NUTS2 AREAS, 2012 (LEFT) AND 2013 (RIGHT) TOP 20 NUTS2 AREAS

NUTS2 name, 2012	Creative industries	Embedded	Creative economy	NUTS2 name, 2013	Creative industries	Embedded	Creative economy
Inner London	218,000	93,000	311,000	Inner London	231,000	103,000	334,000
Outer London	214,000	79,000	292,000	Outer London	194,000	84,000	278,000
Surrey East and West Sussex	107,000	49,000	157,000	Berkshire, Buckinghamshire and Oxfordshire	107,000	63,000	170,000
Berkshire, Buckinghamshire and Oxfordshire	100,000	50,000	150,000	Surrey East and West Sussex	102,000	59,000	161,000
Bristol and Avon	67,000	36,000	103,000	Bristol and Avon	66,000	43,000	108,000
East Anglia	59,000	39,000	98,000	East Anglia	62,000	37,000	99,000
Bedfordshire and Hertfordshire	63,000	27,000	90,000	Bedfordshire and Hertfordshire	56,000	36,000	91,000
Hampshire and Isle of Wight	51,000	39,000	89,000	Greater Manchester	52,000	34,000	85,000
Greater Manchester	52,000	30,000	82,000	Hampshire and Isle of Wight	50,000	33,000	82,000
Glasgow-Dumfries-Inverclyde	47,000	31,000	78,000	Leeds-Bradford	51,000	28,000	80,000
Leicestershire, Rutland and Northamptonshire	39,000	31,000	70,000	Glasgow-Dumfries-Inverclyde	41,000	29,000	70,000
Essex	45,000	24,000	69,000	Essex	45,000	24,000	69,000
Leeds-Bradford	40,000	29,000	68,000	Leicestershire, Rutland and Northamptonshire	37,000	29,000	65,000
Aberdeen and surrounds	41,000	24,000	65,000	Birmingham-Black Country-Wolverhampton-Coventry	35,000	27,000	62,000
Birmingham-Black Country-Wolverhampton-Coventry	36,000	24,000	60,000	Aberdeen and surrounds	38,000	24,000	62,000
Kent	37,000	23,000	60,000	Derby-Nottingham	38,000	24,000	61,000
Derby-Nottingham	30,000	26,000	56,000	Kent	37,000	25,000	61,000
Herefordshire, Worcestershire and Warwickshire	32,000	21,000	53,000	Herefordshire, Worcestershire and Warwickshire	32,000	21,000	54,000
Shropshire and Staffordshire	23,000	20,000	43,000	Shropshire and Staffordshire	26,000	23,000	49,000
Dorset and Somerset	25,000	18,000	42,000	Cardiff-Newport	26,000	15,000	41,000

Source: UK Annual Population Survey.

Notes: Some NUTS2 units are renamed. Cells with underlying counts < 800 suppressed. Second jobs removed.

The counts data conforms to our intuitions about where the creative economy is found in both countries: in the US, New York has the largest number of creative economy jobs, followed by LA, Washington DC, Chicago and San Francisco (which would move above Chicago in 2012 and 2013, and Washington DC in 2013, if the city is combined with the San Jose/South Bay metro). In the UK, London dominates, with contiguous areas such as Surrey and Hertfordshire also featuring high in creative economy employment counts table. For a recent detailed study of the London creative economy, see the report by GLA economics (Togni, L., 2015).[40] Perhaps surprisingly, we find larger creative economy counts in 'Greater Bristol' (Bristol and the rest of the former Avon County) than Greater Manchester, with particularly strong growth in the former across the two years.

When making comparisons between the New York-Newark-New Jersey Metro area and the two London NUTS2 areas, it is important to be aware that the Metro area is considerably larger, both in terms of population and geographic size, including as it does parts of New Jersey and Long Island (the surface area of the metro area is 6,687 square miles with a 2010 census population of 18.9 million. The surface area of London is 609 square miles with a 2011 census population of 8.2 million).[41] To try and make the closest possible comparison between the two largest cities of the US and Western Europe, we examine creative economy employment in the geographic area that accounts for the great majority of regular London commuting i.e. the Greater South East (this consists of the London NUTS1 region: inner London, outer London; the South East NUTS1 region: Berkshire, Buckinghamshire, Oxfordshire, Surrey, East and West Sussex, Kent, Hampshire and Isle of Wight; and the Eastern NUTS1 region: Bedfordshire, Hertfordshire, East Anglia and Essex). Research by the Greater London Authority has found that the majority of inward-bound commuters are from these areas, with half of all inbound commuters from the South East and almost four in ten inbound commuters from the Eastern region.[42] The Greater South East corresponds to around 15,300 square miles, and so is significantly larger than the Metro area. However, it has a 2011 census population of 22.7 million inhabitants which is broadly comparable.[43] While not a perfect comparator, we consider this to be the closest available geography to the New York-Newark-New Jersey Metro area in the UK APS we have available.

Many of the NUTS2 areas included within this are also those with the highest levels and proportions of creative economy employment in the UK. The results are shown in Table 11. When the Greater South East is examined we find levels of creative economy employment that are slightly higher than that of the New York metro area. The proportion of the workforce employed in the creative economy, at 12.3 per cent, is comparable to that of the New York-Newark-New Jersey metro area (12.6 per cent), although, as we will see, lower than a number of other urban areas in the US.

TABLE 11 CREATIVE ECONOMY EMPLOYMENT AND SHARES IN THE UK'S GREATER SOUTH EAST

	Greater South East 2012			Greater South East 2013		
	Creative industries	Embedded	Creative economy	Creative industries	Embedded	Creative economy
Counts total	894,000	423,000	1,316,000	884,000	464,000	1,345,000
% share	8.4%	4.0%	12.3%	8.1%	4.2%	12.3%

TABLE 12 US CREATIVE ECONOMY EMPLOYMENT SHARES BY METRO AREA, 2012 (LEFT) AND 2013 (RIGHT) TOP 20 METRO AREAS

Metropolitan area, 2012 OMB delineations	Creative industries	Embedded	Creative economy
San Jose-Sunnyvale-Santa Clara, CA	14.98%	3.84%	18.82%
Washington-Arlington-Alexandria, DC-VA-MD-WV	15.14%	3.42%	18.56%
San Francisco-Oakland-Hayward, CA	13.55%	3.28%	16.82%
Huntsville, AL	13.40%	1.88%	15.28%
Seattle-Tacoma-Bellevue, WA	11.95%	2.79%	14.75%
Denver-Aurora-Lakewood, CO	11.25%	3.44%	14.69%
Austin-Round Rock, TX	10.41%	4.03%	14.44%
Bridgeport-Stamford-Norwalk, CT	10.74%	3.31%	14.06%
Raleigh, NC	10.28%	3.47%	13.75%
Provo-Orem, UT	10.49%	3.02%	13.51%
Ann Arbor, MI	10.03%	3.46%	13.49%
Boston-Cambridge-Newton, MA-NH	10.28%	3.04%	13.32%
Los Angeles-Long Beach-Anaheim, CA	10.73%	2.57%	13.30%
Manchester-Nashua, NH	9.73%	3.48%	13.21%
Trenton, NJ	9.56%	3.41%	12.97%
Columbia, MO	8.03%	4.85%	12.88%
Santa Cruz-Watsonville, CA	10.24%	2.60%	12.85%
Santa Fe, NM	10.37%	2.35%	12.71%
New York-Newark-Jersey City, NY-NJ-PA	10.00%	2.56%	12.55%
Atlanta-Sandy Springs-Roswell, GA	9.64%	2.83%	12.47%

Metropolitan area, 2013 OMB delineations	Creative industries	Embedded	Creative economy
San Jose-Sunnyvale-Santa Clara, CA	15.78%	4.50%	20.28%
Washington-Arlington-Alexandria, DC-VA-MD-WV	14.99%	3.28%	18.27%
San Francisco-Oakland-Hayward, CA	13.80%	3.62%	17.42%
Austin-Round Rock, TX	11.80%	3.30%	15.10%
Seattle-Tacoma-Bellevue, WA	12.20%	2.90%	15.09%
Provo-Orem, UT	11.86%	3.21%	15.06%
Huntsville, AL	12.90%	2.09%	14.99%
Raleigh, NC	11.09%	3.63%	14.72%
Denver-Aurora-Lakewood, CO	11.70%	2.96%	14.66%
Bridgeport-Stamford-Norwalk, CT	11.15%	3.23%	14.38%
Boston-Cambridge-Newton, MA-NH	11.13%	3.07%	14.21%
Ann Arbor, MI	9.49%	4.63%	14.11%
Fort Collins, CO	10.68%	3.07%	13.76%
Los Angeles-Long Beach-Anaheim, CA	10.76%	2.56%	13.32%
Trenton, NJ	10.72%	2.43%	13.15%
New York-Newark-Jersey City, NY-NJ-PA	10.01%	2.72%	12.73%
Baltimore-Columbia-Towson, MD	9.76%	2.92%	12.67%
Atlanta-Sandy Springs-Roswell, GA	9.39%	3.16%	12.56%
Minneapolis-St. Paul-Bloomington, MN-WI	9.14%	3.40%	12.54%
Colorado Springs, CO	9.99%	2.49%	12.48%

Source: American Community Survey.
Notes: Figures exclude small cells and volatile cells.

TABLE 13 UK CREATIVE ECONOMY EMPLOYMENT SHARES BY NUTS2 AREAS, 2012 (LEFT) AND 2013 (RIGHT) TOP 20

NUTS2 name, 2012	Creative industries	Embedded	Creative economy	NUTS2 name, 2013	Creative industries	Embedded	Creative economy
Inner London	14.39%	6.11%	20.49%	Inner London	14.85%	6.64%	21.49%
Berkshire, Buckinghamshire and Oxfordshire	8.74%	4.40%	13.14%	Berkshire, Buckinghamshire and Oxfordshire	9.26%	5.42%	14.67%
Outer London	9.48%	3.49%	12.97%	Surrey East and West Sussex	7.67%	4.46%	12.13%
Surrey, East and West Sussex	8.20%	3.74%	11.94%	Outer London	8.39%	3.64%	12.02%
Bedfordshire and Hertfordshire	7.35%	3.20%	10.55%	Bedfordshire and Hertfordshire	6.37%	4.05%	10.43%
Hampshire and Isle of Wight	5.68%	4.33%	10.01%	Bristol and Avon	5.75%	3.73%	9.48%
Bristol and Avon	5.97%	3.19%	9.16%	Hampshire and Isle of Wight	5.55%	3.62%	9.17%
Leicestershire, Rutland and Northamptonshire	4.87%	3.86%	8.73%	East Anglia	5.45%	3.22%	8.67%
Herefordshire, Worcestershire and Warwickshire	5.21%	3.48%	8.70%	Herefordshire, Worcestershire and Warwickshire	5.20%	3.44%	8.64%
East Anglia	5.20%	3.46%	8.66%	Leicestershire, Rutland and Northamptonshire	4.54%	3.54%	8.08%
Cheshire	4.98%	3.65%	8.63%	Essex	5.22%	2.86%	8.07%
Essex	5.41%	2.92%	8.33%	Cardiff-Newport	5.04%	2.88%	7.92%
Glasgow-Dumfries-Inverclyde	4.86%	3.23%	8.09%	Kent	4.65%	3.11%	7.76%
Cornwall and Isles of Scilly	4.84%	3.24%	8.08%	Leeds-Bradford	4.98%	2.76%	7.74%
Kent	4.85%	3.04%	7.89%	Cheshire	4.42%	2.98%	7.39%
Dorset and Somerset	4.44%	3.20%	7.64%	Cornwall and Isles of Scilly	4.80%	2.51%	7.31%
Cardiff-Newport	4.09%	3.07%	7.16%	Glasgow-Dumfries-Inverclyde	4.23%	3.06%	7.28%
Greater Manchester	4.46%	2.54%	7.00%	North Yorkshire	3.81%	3.46%	7.27%
Leeds-Bradford	3.92%	2.82%	6.74%	Greater Manchester	4.34%	2.85%	7.19%
North Yorkshire	3.06%	3.42%	6.48%	Dorset and Somerset	4.43%	2.69%	7.12%

Source: UK Annual Population Survey.

Notes: Some NUTS2 units are renamed for largest metros. Cells with underlying counts < 800 suppressed. Second jobs removed.

Tables 12 and 13 switch to employment shares, which give us a sense of the relative size of the creative economy compared to the local economy as a whole. This approach 'penalises' cities with large and diverse economies, such as New York and LA, which both drop some way down the top 20 tables. Overall, US cities such as San Jose-Santa Clara-Sunnyvale (15.8 per cent), Washington DC and surrounds (14.9 per cent), San Francisco-Oakland (13.8 per cent), Seattle (12.2 per cent), Austin (11.8 per cent). San Jose-Santa Clara-Sunnyvale and Washington DC exhibit the highest creative industries shares, with 15 of the top 20 metro shares showing employment shares over 10 per cent in 2013. In the same year, the top five metros have creative economy shares of: 20.3 per cent (San Jose), 18.3 per cent (DC), 17.4 per cent (San Francisco) and 15.1 per cent (Austin and Seattle).

In the UK, the workforce share of the creative industries only exceeds 10 per cent in the case of Inner London (14.9 per cent in 2013). Creative economy shares are 21.5 per cent for Inner London in 2013, 14.7 per cent for Berkshire, Buckinghamshire and Oxfordshire, 12.1 per cent for Surrey, East and West Sussex, and 12.0 per cent for Outer London. The NUTS areas in and around London have the highest percentage shares in the UK, with only Bristol and Avon (9.5 per cent) approaching them. London and a number of the Home Counties still dominate the rankings, and creative employment shares elsewhere are substantially lower than in the main US creative concentrations. As with the counts data, US creative industries shares are typically three or four times higher than employment shares of embedded creative workers; in the UK, London exhibits a creative industries core, with creative industries employment having a significantly higher share of the workforce than embedded creative workers. In other UK cities the shares of creative industry workers and those in other sectors are, however, much more even.

8. DISCUSSION

This paper compares the creative economies of the US, Canada and the UK. It does so by extending the results of the Dynamic Mapping analysis conducted by Bakhshi et al. (2013) for the UK to the US and Canada. We crosswalk UK-designated occupation and industry codes to their US and Canadian equivalents, using international standards (ISCO and ISIC) as a bridge. Using rich microdata, we produce a series of descriptive results at national and sub-national level. We also analyse creative intensities to further explore cross-country differences.

Our research confirms that creative intensity is a meaningful discriminator between creative and other industries, and can thus be used to understand differences in industry structures across countries. Taken together, our results suggest that there are important national differences in the three countries' creative industries, as well as the wider creative economy. To recap, our main findings are as follows.

First, although the US's creative economy employs in absolute terms larger numbers than either Canada's or the UK's, in terms of workforce share, Canada's creative economy is the largest of the three, with 12.9 per cent of all employment in 2011, vs. 9.5 per cent in the US and 8.2 per cent in the UK.

Second, both the US and UK creative economies have grown over the 2011-2013 period, on average by 3.1 per cent p.a. in the US and 4.7 per cent p.a. in the UK. Most of the UK's creative economy employment growth between 2011 and 2012 was accounted for by employment growth in the creative industries, but in 2012-13, growth in embedded creative employment was higher.

Third, Canada has the largest share of workers in creative occupations across all industries (7.8 per cent in 2011, vs. 5.9 per cent in the UK and 4.6 per cent in the US), and the largest share of creative workers embedded in non-creative industries. However, within the creative industries, the UK's share of creative specialists is higher than in both Canada and the US (52.3 per cent, versus 37.4 per cent and 27.4 per cent respectively), and the UK is the only country of the three where creative specialists outnumber non-specialists inside the creative industries.

Fourth, we also find substantial differences in the internal structure of employment in the creative industries across the three study countries. The US and Canada have similar employment distributions across creative industry groups, but both differ markedly from the UK. In terms of national employment shares, for example, US and Canadian advertising and marketing industries are almost three times larger than their UK counterparts (1.32 per cent and 1.28 per cent respectively, vs. 0.49 per cent) and the US and Canadian architecture sectors are at least three times larger (0.99 per cent and 1.49 per cent, vs. 0.31 per cent). Although this is considered in the latter context to relate to the US codes in this context including wider engineering activities. Conversely, UK employment shares are larger for design (0.37 per cent vs. 0.22 per cent for the US and 0.31 per cent for Canada). These patterns also hold for both the film, TV, video, radio and photography group (0.74 per cent vs. 0.67 per cent and 0.62 per cent, respectively) and ICT/software (1.82 per cent vs. 1.45 per cent and 1.60 per cent, respectively).

Fifth, sub-national analysis for the US and UK workforces also highlights some big differences between the creative economy in the two countries. As noted earlier, it is hardly surprising to find larger US creative workforces in cities, but the magnitude of the differences is worth highlighting because they will generate agglomeration economies for creative economy firms and their workers. The largest US metro, New York-Newark-New Jersey had a creative economy workforce of over 1.1 million in 2012, rising to above 1.2 million in 2013. This is bigger than the top

four UK NUTS2 areas combined, and more than twice the size of the whole of London's creative economy workforce. However, when we examine the Greater South East of England (London and the South East and Eastern regions) as a whole, we obtain levels, and proportions, of creative economy employment that are comparable with the New York-Newark-New Jersey metro area. There remain, though, a number of US metro areas that employ a higher proportion of their workforces in the creative economy than both New York-Newark-New Jersey and the UK's Greater South East.

In US metros, creative industries workforces are also typically much larger than counts of creative workers embedded in other sectors, a position generally reversed in the UK: only inner London has a core of creative industries workforce employment share that compares in magnitude to the top US cities.

Sixth, and underlying all these results, we confirm that the distribution of creative intensity across industries is bimodal in both the US and Canada – not just the UK – suggesting that creative intensity is a good way to distinguish between creative and non-creative industries. This is reassuring, and echoes the findings of our earlier report on creative economy employment in the EU (Nathan, Pratt and Rincon-Aznar, 2015).

The UK's creative economy is the smallest of the three countries (as a proportion of the workforce), but its creative industries have the highest creative intensities. One interpretation of the latter finding is that the UK's creative industries are more specialised in creative work than either their US or Canadian counterparts, or equivalently that US and Canadian creative industries make greater use of non-creative labour. The US has the largest creative economy in counts, but this comprises a smaller share of all employment than in Canada. US creative industries also have the lowest average creative intensities, and with creative workers most dispersed across all industry cells. Canada's creative employment counts are very similar to those of the UK. Canada, however, has the largest share of workers in creative occupations, and the largest share of creative workers embedded in non-creative industries.

There are a number of possible interpretations for these findings, all of which warrant further study. One is that creative labour inputs inside the UK's creative industries may be more important for producing goods and services in those industries than in the US or Canada. The US creative industries workforce may employ higher proportions in roles like finance, logistics and management. What is also striking is that Canadian *non-creative* industries have the biggest share of creative workers, followed by the UK and with the US some way behind this.

What also stands out is that the creative economy is substantially larger in a number of US cities than those in the UK, and this may help US localities enjoy stronger agglomeration economies. In terms of workforce share of creative economy employment, only London and parts of the UK's Greater South East are comparable to the biggest US conurbations such as the New York, LA, San Francisco Bay Area, Washington DC and Austin metros.

This exercise also suggests a number of areas for future research: we briefly discuss a couple here. First, deeper analysis looking in detail at North American-UK differences would be desirable, including the formal testing for the extent and nature of agglomeration economies and spillovers in the different countries. Second, further spatial analysis using workplace-based data would help to delineate the locational patterns of creative economy work, and (ideally) to look at much more local agglomerations of activity. Third, similar comparative exercises should be undertaken in other parts of the world, including in Asia and the Americas, where good labour market data is available. In all cases, research – and ultimately policy – would greatly benefit from the addition of more detailed and internationally consistent industry coding to key datasets. Larger samples for Canadian household and labour force data would also allow for sub-national analysis, and exploration of time trends.

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APPENDICES

Appendix 1 / DCMS creative occupations and industries

TABLE A1 CREATIVE OCCUPATIONS

SOC2010	SOC2010 Descriptor
1132	Marketing and sales directors
1134	Advertising and public relations directors
1136	Information technology and telecommunications directors
2135	IT business analysts, architects and systems designers
2136	Programmers and software development professionals
2137	Web design and development professionals
2431	Architects
2432	Town planning officers
2435	Chartered architectural technologists
2451	Librarians
2452	Archivists and curators
2471	Journalists, newspaper and periodical editors
2472	Public relations professionals
2473	Advertising accounts managers and creative directors
3121	Architectural and town planning technicians
3411	Artists
3412	Authors, writers and translators
3413	Actors, entertainers and presenters
3414	Dancers and choreographers
3415	Musicians
3416	Arts officers, producers and directors
3417	Photographers, audio-visual and broadcasting equipment operators
3421	Graphic designers
3422	Product, clothing and related designers
3543	Marketing associate professionals
5211	Smiths and forge workers
5411	Weavers and knitters
5441	Glass and ceramics makers, decorators and finishers
5442	Furniture makers and other craft woodworkers
5449	Other skilled trades not elsewhere classified

Source: DCMS 2014.
Red text = not in Bakhshi, Freeman and Higgs 2013.

TABLE A2 **CREATIVE INDUSTRIES**

SIC07	SIC07 Descriptor
32.12	Manufacture of jewellery and related articles
58.11	Book publishing
58.12	Publishing of directories and mailing lists
58.13	Publishing of newspapers
58.14	Publishing of journals and periodicals
58.19	Other publishing activities
58.21	Publishing of computer games
58.29	Other software publishing
59.11	Motion picture, video and television programme production activities
59.12	Motion picture, video and television programme post-production
59.13	Motion picture, video and television programme distribution
59.14	Motion picture projection activities
59.2	Sound recording and music publishing activities
60.1	Radio broadcasting
60.2	Television programming and broadcasting activities
62.01	Computer programming activities
62.02	Computer consultancy activities
70.21	Public relations and communication activities
71.11	Architectural activities
73.11	Advertising agencies
73.12	Media representation
74.1	Specialised design activities
74.2	Photographic activities
74.3	Translation and interpretation activities
85.52	Cultural education
90.01	Performing arts
90.02	Support activities to performing arts
90.03	Artistic creation
90.04	Operation of arts facilities
91.01	Library and archive activities
91.02	Museum activities

Source: DCMS 2014.
Red text = not in Bakhshi, Freeman and Higgs 2013.

Appendix 2 / Creative occupations crosswalking

TABLE A3 SOC – ISCO CROSSWALK

SOC2010	SOC2010 Descriptor	ISCO08	ISCO08 Descriptor
1132	Marketing and sales directors	1221	Sales and marketing managers
1134	Advertising and public relations directors	1222	Advertising and public relations managers
1136	Information technology and telecommunications directors	1330	Information and communications technology services managers
2135	IT business analysts, architects and systems designers	2511	Systems analysts
2136	Programmers and software development professionals	2512	Software developers
2137	Web design and development professionals	2513	Web and multimedia developers
2431	Architects	2161	Building architects
2432	Town planning officers	2164	Town and traffic planners
2451	Librarians	2622	Librarians and related information professionals
2452	Archivists and curators	2621	Archivists and curators
2471	Journalists, newspaper and periodical editors	2642	Journalists
2472	Public relations professionals	2432	Public relations professionals
2473	Advertising accounts managers and creative directors	2431	Advertising and marketing professionals
3121	Architectural and town planning technicians	3112	Civil engineering technicians
3411	Artists	2651	Visual artists
3412	Authors, writers and translators	2641	Authors and related writers
3413	Actors, entertainers and presenters	2655	Actors
3414	Dancers and choreographers	2355	Other arts teachers
3415	Musicians	2652	Musicians, singers and composers
3416	Arts officers, producers and directors	2654	Film, stage and related directors and producers
3417	Photographers, audio-visual and broadcasting equipment operators	3431 3521	Photographers Broadcasting and audiovisual technicians
3421	Graphic designers	2166	Graphic and multimedia designers
3422	Product, clothing and related designers	2163 3432	Product and garment designers Interior designers and decorators
3543	Marketing associate professionals	2431	Advertising and marketing professionals
5211	Smiths and forge workers	7221	Blacksmiths, hammersmiths and forging press workers
5411	Weavers and knitters	7318	Handicraft workers in textile, leather and related materials
5441	Glass and ceramics makers, decorators and finishers	7314	Potters and related workers
5442	Furniture makers and other craft woodworkers	7522	Cabinet-makers and related workers
5449	Other skilled trades not elsewhere classified	7316	Sign writers, decorative painters, engravers and etchers

Red text = not in Bakhshi, Freeman and Higgs 2013. **Blue highlight** = adjusted bad crosswalk.

TABLE A4 US CREATIVE OCCUPATIONS: ISCO - OCCSOC CROSSWALK

ISCO08	ISCO08 Descriptor	OCCSOC	OCCSOC Descriptor
1221	Sales and marketing managers	112020	Marketing and Sales Managers
1222	Advertising and public relations managers	112031	Public Relations and Fundraising Managers
1330	Information and communications technology services managers	113021	Computer and Information Systems Managers
2511	Systems analysts	151121 151111	Computer and Information Research Scientists Computer Systems Analysts
2512	Software developers	151130 151130	Software Developers, Applications Software Developers, Systems Software
2513	Web and multimedia developers	151134	Web Developers
2161	Building architects	171010	Architects, Except Landscape and Naval
2164	Town and traffic planners	193051	Urban and Regional Planners
2622	Librarians and related information professionals	254021 259011	Librarians Audio-Visual and Multimedia Collections Specialists
2621	Archivists and curators	254010	Archivists, Curators
2642	Journalists	273020 273041	Reporters and Correspondents Editors
2432	Public relations professionals	273031	Public Relations Specialists
2431	Advertising and marketing professionals	131161	Market Research Analysts and Marketing Specialists
3112	Civil engineering technicians	173020 173031	Civil Engineering Technicians Surveying and Mapping Technicians
2651	Visual artists	271010	Fine Artists, Including Painters, Sculptors, and Illustrators
2641	Authors and related writers	273042 273043	Technical Writers Writers and Authors
2655	Actors	272011	Actors
2355	Other arts teachers	253000 272040	Self-Enrichment Education Teachers Teachers and Instructors, All Other
2652	Musicians, singers and composers	272040	Music Directors and Composers; Musicians and Singers
2654	Film, stage and related directors and producers	271010 272012 274030	Art Directors Producers and Directors Film and Video Editors
3431	Photographers	274021	Photographers
3521	Broadcasting and audiovisual technicians	274011 274012 274013 274014 274031 274099	Audio and Video Equipment Technicians Broadcast Technicians Radio Operators Sound Engineering Technicians Camera Operators, Television, Video, and Motion Picture Media and Communication Equipment Workers, All Other
2166	Graphic and multimedia designers	271010 271020	Multimedia Artists and Animators Graphic Designers
2163	Product and garment designers	271020	Commercial and Industrial Designers, fashion designers, all other designers
3432	Interior designers and decorators	271020	Interior Designers, Merchandise Displayers and Window Trimmers, Set and Exhibit Designers

7221	Blacksmiths, hammersmiths and forging press workers	514022 514199	Forging Machine Setters, Operators, and Tenders, Metal and Plastic Metal Workers and Plastic Workers, All Other
7318	Handicraft workers in textile, leather and related materials	516041	Shoe and Leather Workers and Repairers
7314	Potters and related workers	519195 517011	Molders, Shapers, and Casters, Except Metal and Plastic Cabinetmakers and Bench Carpenters
7522	Cabinet-makers and related workers	517021 517130	Furniture Finishers Model Makers, Wood Patternmakers, Wood
7319	Handicraft workers not elsewhere classified	271012	Craft Artists

Red text = not in Bakhshi, Freeman and Higgs 2013. **Blue highlight** = adjusted bad crosswalk

Occupational crosswalking is done using concordance tables from ONS (2010), BLS (2012) (2012) and IPUMS (2015). We first crosswalk from SOC2010 codes to ISCO08, then from ISCO to OCCSOC codes for the US data. In each case we attempt a 1:1 match where the crosswalk allows this. Where it does not we follow the decision rules set out in Section 3 to deal with multiple matches, marginal cases and possible errors in the crosswalk itself. We identify, in red, occupations not originally designed as creative by Bakhshi et al. (2013) but subsequently denoted creative by DCMS (2014).

In the SOC-ISCO crosswalk we find one case of possible error in the crosswalk, where SOC5449 (other skilled trades not elsewhere classified) is matched to ISCO7316 'Sign writers, decorative painters, engravers and etchers'. We amend this to ISCO7319 'Handicraft workers not elsewhere classified' and proceed on this basis.

In the ISCO-OCCSOC crosswalk, we are mapping four-digit ISCO cells onto much more detailed US occupational categories. We find a series of cases where ISCO cells map on to the same OCCSOC cell on more than one occasion, and use decision rules to assign these to 1:1 matches. We also have one case of possible error in the crosswalk, at least in terms of identifying creative occupations. Specifically:

1. OCCSOC 273041 (Editors) maps to ISCO categories 2642 'Journalists' and 2641 'Authors and writers'. Descriptors from BLS (2012) and ILO (2009) are inconclusive, so we give this to ISCO 2642 'Journalists'.
2. OCCSOC 271012 (Craft artists) maps to ISCO 'Visual artists' (2651), 'Potters and related workers' (7314), and 'Other handicraft workers' (7319). BLS 2012 descriptors say 'Create or reproduce hand-made objects for sale and exhibition using a variety of techniques, such as welding, weaving, pottery, and needlecraft.' We assign the category to ISCO 7319.
3. OCCSOC 273043 (Writers and Authors) maps to ISCO 'Advertising and marketing professionals' (2431) 'Authors and related writers' (2641). Based on descriptors we assign this to ISCO 2641.
4. ISCO 3112, 'Civil engineering technicians' includes OCCSOC codes 331021 (First-Line Supervisors of Fire Fighting and Prevention Workers) and 332020 (Fire Inspectors and Investigators) and 474011 (Construction and Building Inspectors) as well as 173020 (Civil Engineering Technicians) and 173031 (Surveying and Mapping Technicians). Here, we are concerned that the first two occupational categories are not creative in the sense defined by BFH and intended by DCMS. Analysis of descriptors from BLS (2012) and ILO (2009) confirm this, so we drop these two cells from the final crosswalk.

TABLE A5 **CANADIAN CREATIVE OCCUPATIONS: ISCO – NOC-S CROSSWALK**

ISCO08	ISCO08 Descriptor	NOC-S	NOC-S descriptor
1221	Sales and marketing managers	A131	Sales, Marketing and Advertising Managers
1222	Advertising and public relations managers	F024	Professional Occupations in Public Relations and Communications
1330	Information and communications technology services managers	A122	Computer and Information Systems Managers
2511	Systems analysts	C071	Information Systems Analysts and Consultants
2512	Software developers	C073 C074 C183	Software Engineers Computer Programmers and Interactive Media Developers Systems Testing Technicians
2513	Web and multimedia developers	C075	Web Designers and Developers
2161	Building architects	C051 C052	Architects Landscape Architects
2164	Town and traffic planners	C053	Urban and Land Use Planners
2622	Librarians and related information professionals	F011 A341	Librarians Library, Archive, Museum and Art Gallery Managers
2621	Archivists and curators	F012 F013 B022	Conservators and Curators Archivists Professional Occupations in Business Services to Management
2642	Journalists	F022 F023	Editors Journalists
2431	Advertising and marketing professionals	E033 F024	Business Development Officers and Marketing Researchers and Consultants Professional Occupations in Public Relations and Communications
3112	Civil engineering technicians	C131 C134	Civil Engineering Technologists and Technicians Construction Estimators
2651	Visual artists	F036	Painters, Sculptors and Other Visual Artists
2641	Authors and related writers	F021	Authors and Writers
2655	Actors	F035	Actors and Comedians
2355	Other arts teachers	F034 F036	Dancers Painters, Sculptors and Other Visual Artists
2652	Musicians, singers and composers	F032 F033	Conductors, Composers and Arrangers Musicians and Singers
2654	Film, stage and related directors and producers	F031 A342	Producers, Directors, Choreographers and Related Occupations” Managers
3431	Photographers	F121	Photographers
3521	Broadcasting and audiovisual technicians	F122 F124 F125 F126	Film and Video Camera Operators Broadcast Technicians Audio and Video Recording Technicians Other Technical and Co
2166	Graphic and multimedia designers	F123 F141	Graphic Arts Technicians Graphic Designers and Illustrators

2163	Product and garment designers	C152 F143	Industrial Designers Theatre, Fashion, Exhibit and Other Creative Designers
3432	Interior designers and decorators	F142	Interior Designers
7221	Blacksmiths, hammersmiths and forging press workers	J192 H325	Forging Machine Operators Blacksmiths and Die Setters
7318	Handicraft workers in textile, leather and related materials	F145 H512	Patternmakers Tailors, Dressmakers, Furriers and Milliners
7314	Potters and related workers	J124	Concrete, Clay and Stone Forming Operators
7522	Cabinet-makers and related workers	H122	Cabinetmakers
7319	Handicraft workers not elsewhere classified	F144	Artisans and Craftspersons

Red text = not in Bakhshi, Freeman and Higgs 2012.

Occupational crosswalking is done using concordance tables from ONS (2010) and Statistics Canada (2012; 2012). We reproduce the crosswalk from SOC2010 codes to ISCO08, as in the US, then map from ISCO08 to Canadian NOC2011 and NOC-S codes. In each case we attempt a 1:1 match where the crosswalk allows this. Where it does not we follow the decision rules set out in Section 3 to deal with multiple matches, marginal cases and possible errors in the crosswalk itself. We identify, in red, occupations not originally designed as creative by Bakhshi et al. (2013) but subsequently denoted creative by DCMS (2014).

As discussed above, in the SOC-ISCO crosswalk we find one case of possible error in the crosswalk and amend this. In the ISCO-NOC-S crosswalk, we are mapping four-digit ISCO cells onto more detailed Canadian occupational categories, a similar scenario to the US. We find two cases where ISCO cells map onto different NOC-S codes, specifically:

1. NOC-S A131 (Sales, Marketing and Advertising Managers) maps to ISCO categories 1221 'Sales and marketing managers' and 1222 'Advertising and public relations managers'. Descriptors are inconclusive, so we give this to ISCO 1222, 'Advertising and public relations managers'.
2. NOC-S F031 (Producers, Directors, Choreographers and Related Occupations) maps to ISCO 2642 'Journalists' and ISCO 2654 'Film, stage and related directors and producers'. Descriptors clearly suggest we assign the category to ISCO 2654, 'Film, stage and related directors and producers'.

Appendix 3 / Creative industries crosswalk

TABLE A6 SIC – ISIC CROSSWALK

SIC07	SIC07 Descriptor	ISIC4	ISIC4 Descriptor
32.12	Manufacture of jewellery and related articles	3211	Manufacture of jewellery and related articles
32.11	Striking of coins		
58.11	Book publishing	5811	Book publishing
58.12	Publishing of directories and mailing lists	5812	Publishing of directories and mailing lists
58.13	Publishing of newspapers	5813	Publishing of newspapers, journals and periodicals
58.14	Publishing of journals and periodicals	5813	Publishing of newspapers, journals and periodicals
58.19	Other publishing activities	5819	Other publishing activities
58.21	Publishing of computer games	5820	Software publishing
58.29	Other software publishing		
59.11	Motion picture, video and television programme production activities	5911	Motion picture, video and television programme production activities
59.12	Motion picture, video and television programme post-production	5912	Motion picture, video and television programme post-production activities
59.13	Motion picture, video and television programme distribution	5913	Motion picture, video and television programme distribution activities
59.14	Motion picture projection activities	5914	Motion picture projection activities
59.2	Sound recording and music publishing activities	5920	Sound recording and music publishing activities
60.1	Radio broadcasting	6010	Radio broadcasting
60.2	Television programming and broadcasting activities	6020	Television programming and broadcasting activities
62.01	Computer programming activities	6201	Computer programming activities
62.02	Computer consultancy activities	6202	Computer consultancy and computer facilities management activities
62.03	Computer facilities management activities		
70.21	Public relations and communication activities	7020	Management consultancy activities
70.22	Business and other management consultancy activities		
71.11	Architectural activities	7110	Architectural and engineering activities and related technical consultancy
71.12	Engineering activities and related technical consultancy		
73.11	Advertising agencies	7310	Advertising
73.12	Media representation		
74.1	Specialised design activities	7410	Specialized design activities
74.2	Photographic activities	7420	Photographic activities
74.3	Translation and interpretation activities	7490	Other professional, scientific and technical activities n.e.c.
74.9	Other professional, scientific and technical activities n.e.c.		
85.52	Cultural education	8542	Cultural education
90.01	Performing arts	9000	Creative, arts and entertainment activities
90.02	Support activities to performing arts		
90.03	Artistic creation		
90.04	Operation of arts facilities		

91.01	Library and archive activities	9101	Library and archives activities
91.02	Museum activities	9102	Museums activities and operation of historical sites and buildings
91.03	Operation of historical sites and buildings and similar visitor attractions		

Red text = not in Bakhshi, Freeman and Higgs 2013. **Green highlight** = fuzzy crosswalk from SIC-ISIC. **Grey highlight** = bad match. All groups included but subject to sensitivity tests.

TABLE A7 US CREATIVE INDUSTRIES: ISIC - INDNAICS CROSSWALK

ISIC4	ISIC4 Descriptor	INDNAICS	INDNAICS Descriptor
3211	Manufacture of jewellery and related articles	3279 3399M[1]	Miscellaneous nonmetallic mineral products Sporting and athletic goods, and doll, toy, and game manufacturing
5813	Publishing of newspapers, journals and periodicals	51111	Newspaper publishers
5811 5812 5819	Book publishing Publishing of directories and mailing lists Other publishing activities	5111Z[2]	Periodical, book, and directory publishers (except newspapers)
5820	Software publishing	5112 51913	Software publishing Internet publishing and broadcasting and web search portals
5911 5912 5913 5914	Motion picture, video and television programme production activities Motion picture, video and television programme post-production activities Motion picture, video and television programme distribution activities Motion picture projection activities	5121	Motion pictures and video industries
5920	Sound recording and music publishing activities	5122	Sound recording industries
6010 6020	Radio broadcasting Television programming and broadcasting activities	515	Broadcasting, except Internet
6201	Computer programming activities	5415	Computer systems design and related services
6202	Computer consultancy and computer facilities management activities	5182	Data processing, hosting, and related services
7110	Architectural and engineering activities and related technical consultancy	5413	Architectural, engineering, and related services
7310	Advertising	5418	Advertising and related services
7410	Specialized design activities	5414	Specialized design services
7420	Photographic activities	8129	Other personal services
7490	Other professional, scientific and technical activities n.e.c.	5419Z[3] 5416	Other professional, scientific and technical services (excluding vets) Management, scientific and technical consulting services
8542	Cultural education	611M3[4]	Other schools, instruction and educational services
9000	Creative, arts and entertainment activities	711	Independent artists, performing arts, spectator sports and related industries

9101	Library and archives activities	5191ZM[5]	Other information services, except libraries and archives, and except internet publishing and broadcasting and web search portals
		51912	Libraries and archives
9102	Museums activities and operation of historical sites and buildings	712	Museums, art galleries, historical sites, and similar institutions

Red text = not in Bakhshi, Freeman and Higgs 2013. **Green highlight** = fuzzy crosswalk from SIC-ISIC. **Grey highlight** = bad match. All groups included but subject to sensitivity tests.

Key for hybrid cells:

1 = NAICS 33992 (sporting goods) and 33993 (toys, dolls and games).

2 = NAICS 5111 except 51111.

3 = NAICS 5419 except 54194.

4 = NAICS 6116 and 6117.

5 = NAICS 5191 except 51912 and 51913.

Industry crosswalking is done using concordance tables from UN-DESA (2008), US Census Bureau (2012) and IPUMS (2015). We first crosswalk from SIC2007 codes to ISIC Revision 4, then from ISIC to NAICS 2007 codes. In the case of the ACS we use INDNAICS codes, which are NAICS codes crosswalked from the Survey's original Census Industry codes. In most cases INDNAICS are identical to NAICS; levels of detail vary from three-digit to five-digit. In the case of the DCMS creative industries, the majority are available at NAICS4 level. In a couple of cases, as shown in Table A6, INDNAICS descriptors vary slightly from standard NAICS descriptors in order to accommodate crosswalking in closely related sectors at different levels of detail and eliminate double counting. For example, we have a detailed NAICS coding on newspaper publishing (51111) but less detailed information for all other publishing. In this case a four-digit NAICS code (5111) is used, but newspaper publishing is excluded and the descriptor is 'Periodical, book, and directory publishing (except newspapers)'.

In each case we attempt a 1:1 match where the crosswalk allows this. Where it does not we follow the decision rules set out in Section 4 to deal with multiple matches, marginal cases and possible errors in the crosswalk itself. We identify, in red, industries not originally designed as creative by Bakhshi et al. (2012) but subsequently denoted creative by DCMS (2014).

As set out in Section 3, industry crosswalking is less precise than occupational crosswalking at all stages of the crosswalking process. We identify, in green, industries where the initial SIC-ISIC crosswalking is fuzzy: in Section 5 we use an APS-based workaround to test the extent to which this induces error in the US estimates. At the INDNAICS stage, we have a number of cases where ISIC codes are collapsed into single INDNAICS codes, as well as multiple matches and two bad matches. Specifically:

1. Large parts of the publishing industry (ISICs 5811 'Book publishing', 5812 'Publishing of directories and mailing lists', 5819 'Other publishing activities') collapse into the INDNAICS codes 51111 (Periodical, book, and directory publishers except newspapers) and 5191 (Other information services, and internet publishing and broadcasting and web search portals (except libraries and archives)).
2. The INDNAICS cell 5191ZM (Other information services, except libraries and archives, and internet publishing and broadcasting and web search portals) maps to multiple ISIC cells (5813 'Newspapers', 5819 'Other publishing', 5920 'Sound recording and music publishing activities', 6010 'Radio broadcasting', 6020 'Television programming and broadcasting activities', 5191 'Libraries and archives'). The INDNAICS descriptor specifies that 'This industry group comprises establishments, not classified to any other industry, primarily engaged in providing other information services. The main components are news syndicates, libraries and archives, and other information search services on a contract basis'. On this basis we ascribe the INDNAICS cell to ISIC 5191 and drop it from other matches.

3. All film industry ISICs (5911, 5912, 5913, 5914) all collapse to the same INDNAICS code (5121 Motion picture and video Industries).
4. Radio and TV broadcasting ISIC codes have the same INDNAICS code (515 Broadcasting, except Internet).
5. INDNAICS cell 5418 (Advertising, public relations, and related services) maps to two ISIC cells (6202 'Computer consultancy and computer facilities management activities', and 7310 'Advertising'). Based on descriptors we assign it to ISIC 7310.
6. SIC code 7021 (Public relations and communication activities) maps to ISIC 7020 'Management consultancy', which makes it one of the many SIC-ISIC fuzzy match cases. The ISIC cell then maps to INDNAICS 5416 (Management, scientific and technical consultancy services), which is a bad match. Elsewhere in the crosswalk SIC 7310 (Advertising) maps to INDNAICS 5418 (Advertising, public relations and related services), which covers the industry activity we need. We therefore drop the first instance of NAICS 5416, although we use it elsewhere (see note 8).
7. ISIC cell 7420 'Photographic activity' maps to a number of apparently unrelated INDNAICS cells (5182 Data processing, hosting, and related services, 5419Z Other professional, scientific and technical services (excluding vets), 711 Independent artists, performing arts, spectator sports and related industries, 8129 Other personal services). More detailed NAICS codes provide a precise match to photography, but these codes are unavailable for ACS or other US labour force data. In this case we keep INDNAICS 8129, other personal services, as the least worst option, but this is arguably a bad match: we drop it completely in a robustness check.
8. The SIC cell for translation/interpretation activities (74.3) maps to a much larger ISIC cell (7490, 'Other professional, scientific and technical activities not elsewhere classified'), and this then maps to the two INDNAICS codes 5419Z (Other professional, scientific and technical services, excluding vets) and 5416 (Management, scientific and technical consulting services). This is arguably a bad match: we drop these cells completely in a robustness check.
9. INDNAICS cell 711 (Independent artists, performing arts, spectator sports and related industries) maps to ISIC cells 7490 'Other professional services' and 9000 'Creative, arts and entertainment'. Based on descriptors we assign this to 9000.

TABLE A8 **CANADIAN CREATIVE OCCUPATIONS: ISIC – NAICS CROSSWALK**

ISIC4	ISIC4 descriptor	NAICS07	NAICS07 descriptor
3211	Manufacture of jewellery and related articles	3279 3399	Other Nonmetallic Mineral Product Manufacturing Other Miscellaneous Manufacturing
5811 5812 5813 5819	Book publishing Publishing of directories and mailing lists Publishing of newspapers, journals and periodicals Other publishing activities	5111	Newspaper, Periodical, Book, and Directory Publishers
5820	Software publishing	5112	Software publishers
5911 5912 5913 5914	Motion picture, video and television programme production activities Motion picture, video and television programme post-production activities Motion picture, video and television programme distribution activities Motion picture projection activities	5121	Motion Picture and Video Industries
5920	Sound recording and music publishing activities	5122	Sound Recording Industries
6010	Radio broadcasting	5151	Radio and Television Broadcasting
6020	Television programming and broadcasting activities	5152	Cable and Other Subscription Programming
6201 6202	Computer programming activities Computer consultancy and computer facilities management activities	5415	Computer Systems Design and Related Services
7020	Management consultancy activities	5416	Management, Scientific and Technical Consulting Services
7110	Architectural and engineering activities and related technical consultancy	5413	Architectural, Engineering, and Related Services
7310	Advertising	5418	Advertising, Public Relations, and Related Services
7410	Specialized design activities	5414	Specialized Design Services
7420	Photographic activities	5419	Other Professional, Scientific, and Technical Services
7490	Other professional, scientific and technical activities n.e.c.	5416	Management, Scientific, and Technical Consulting Services
8542	Cultural education	6116	Other Schools and Instruction
9000	Creative, arts and entertainment activities	7111 7113 7715	Performing Arts Companies Promoters of Performing Arts, Sports, and Similar Events Independent Artists, Writers, and Performers
9101	Library and archives activities	5191	Libraries, archives and information services
9102	Museums activities and operation of historical sites and buildings	7121	Museums, Historical Sites, and Similar Institutions

Red text = not in Bakhshi, Freeman and Higgs 2013. **Green highlight** = fuzzy crosswalk from SIC-ISIC. **Grey highlight** = bad match. All groups included but subject to sensitivity tests.

Industry crosswalking from UK SIC codes to ISIC codes reproduces the crosswalk already done for the US above. We then crosswalk from ISIC to NAICS 2007 codes using Statistics Canada (Statistics Canada 2012).

In each case we attempt a 1:1 match where the crosswalk allows this. Where it does not we follow the decision rules set out in Section 4 to deal with multiple matches, marginal cases and possible errors in the crosswalk itself. We identify, in red, industries not originally designed as creative by Bakhshi et al. (2012) but subsequently denoted creative by DCMS (2014).

As set out in Section 3 and explained in the US crosswalk, industry crosswalking is less precise than occupational crosswalking at all stages of the crosswalking process. We identify, in green, industries where the initial SIC-ISIC crosswalking is fuzzy: in Section 5 we use an APS-based workaround to test the extent to which this induces error in the Canadian estimates.

In the ISIC-NAICS stage of the crosswalk, we again have a number of cases where ISIC codes are collapsed into single four-digit NAICS codes, as well as some cases of multiple matches and two bad matches. Specifically:

1. Publishing industry ISICs (5811 'Book publishing', 5812 'Publishing of directories and mailing lists', 5813 'Publishing of newspapers, journals and periodicals', 5819 'Other publishing activities') collapse to the NAICS codes 5111 (Newspaper, Periodical, Book, and Directory Publishers) and 5191 (Other Information Services).
2. The NAICS cell 5191 (Other information services) maps to multiple ISIC cells (5820 'Software publishing', 5920 'Sound recording and music publishing activities', 6010 'Radio broadcasting', 6020 'Television programming and broadcasting activities') as well as 5191 'Libraries and archives'. The NAICS descriptor states: 'This industry group comprises establishments, not classified to any other industry, primarily engaged in providing other information services. The main components are news syndicates, libraries and archives, and other information search services on a contract basis'. On this basis we ascribe the INDNAICS cell to ISIC 5191 and drop it from other matches.
3. All film industry ISICs (5911, 5912, 5913, 5914) all collapse to the same NAICS code (5121 Motion Picture and Video Industries).
4. NAICS 5418 (Advertising, Public Relations, and Related Services) appears in two ISIC cells: 7020 'Management consultancy activities' and 7310 'Advertising'. The ISIC 7020 descriptor states that it 'excludes advertising activities, see 7310 … [and] market research and public opinion polling, see 7320'. On this basis we match from ISIC 7310 and drop the ISIC 7020 – NAICS 5418 correspondence.
5. SIC code 7021 (Public relations and communication activities) maps to ISIC 7020 'Management consultancy', which makes it one of the many SIC-ISIC fuzzy match cases. The ISIC cell then maps to NAICS 5416 (Management, scientific and technical consultancy services), which is a bad match. Elsewhere in the crosswalk SIC 7310 (Advertising) maps to NAICS 5418 (Advertising, Public Relations, and Related Services), which covers the industry activity we need. We therefore drop the first instance of NAICS 5416, although we use it elsewhere (see note 6).
6. The SIC cell for translation/interpretation activities (74.3) maps to a much larger ISIC cell (7490, 'Other professional, scientific and technical activities not elsewhere classified'), and this then maps to the two NAICS codes 5419Z (Other professional, scientific and technical services, excluding vets) and 5416 (Management, scientific and technical consulting services). This is arguably a bad match: we drop these cells completely in a robustness check.
7. ISIC cell 7420 'Photographic activity' maps to a number of apparently unrelated NAICS cells (5182 Data processing, hosting, and related services, 5419 Other professional, scientific and technical services, 7115 Independent artists, writers and performances, 8129 Other personal services). More detailed NAICS codes provide a precise match to photography, but these codes are unavailable for CNHS or Canadian labour force data. In this case we keep NAICS 8129, other personal services, as the least worst option, but this is arguably a bad match: we drop it completely in a robustness check.

Appendix 4 / Additional sub-sectoral information

TABLE A9 DCMS CREATIVE INDUSTRIES, 2011-13

SIC07	SIC07 Descriptor	DCMS industry group	Intensity	Jobs	Creative jobs	% creative industries jobs	% all jobs
70.21	PR and communication activities	Advertising and marketing	0.620	19,000	12,000	1.25%	0.07%
73.11	Advertising agencies		0.525	94,000	50,000	6.10%	0.33%
73.12	Media representation		0.497	29,000	14,000	1.86%	0.10%
71.11	Architectural activities	Architecture	0.647	90,000	58,000	5.80%	0.31%
32.12	Manufacture of jewellery and related articles	Crafts	0.557	7,000	4,000	0.48%	0.03%
74.1	Specialised design activities	Design activities	0.613	106,000	65,000	6.83%	0.37%
59.11	Motion picture video and TV production	Film, TV, video, radio and photography	0.714	62,000	44,000	3.99%	0.21%
59.12	Motion picture video and TV post-production		0.637	11,000	7,000	0.70%	0.04%
59.13	Motion picture video and TV distribution		0.214	7,000	2,000	0.44%	0.02%
59.14	Motion picture projection		0.081	18,000	1,000	1.16%	0.06%
60.1	Radio broadcasting		0.623	17,000	11,000	1.10%	0.06%
60.2	TV programming and broadcasting		0.536	51,000	27,000	3.26%	0.18%
74.2	Photographic activities		0.790	47,000	37,000	3.04%	0.16%
58.21	Publishing of computer games	IT software and computer services	0.300	2,000	1,000	0.13%	0.01%
58.29	Other software publishing		0.390	18,000	7,000	1.20%	0.06%
62.01	Computer programming activities		0.556	223,000	124,000	14.42%	0.78%
62.02	Computer consulting activities		0.327	279,000	91,000	18.02%	0.97%
91.01	Library and archive activities	Museums, galleries and libraries	0.237	49,000	12,000	3.20%	0.17%
91.02	Museum activities		0.233	33,000	8,000	2.13%	0.11%
59.2	Sound recording and music publishing	Music performing and visual arts	0.547	11,000	6,000	0.70%	0.04%
85.52	Cultural education		0.382	29,000	11,000	1.87%	0.10%
90.01	Performing arts		0.797	42,000	34,000	2.75%	0.15%
90.02	Support activities to performing arts		0.521	11,000	6,000	0.74%	0.04%
90.03	Artistic creation		0.914	74,000	67,000	4.78%	0.26%
90.04	Operation of arts facilities		0.420	23,000	10,000	1.48%	0.08%
58.11	Book publishing	Publishing	0.467	43,000	20,000	2.82%	0.15%
58.12	Publishing of directories and mailing lists		0.237	3,000	1,000	0.16%	0.01%
58.13	Publishing of newspapers		0.469	46,000	22,000	2.99%	0.16%
58.14	Publishing of journals and periodicals		0.604	49,000	30,000	3.19%	0.17%
58.19	Other publishing activities		0.367	34,000	12,000	2.19%	0.12%
74.3	Translation and interpretation activities		0.855	19,000	16,000	1.21%	0.06%

Source: Annual Population Survey.

Red text indicates below BFH creative intensity threshold. Figures exclude small cells and volatile cells, and second jobs. Both samples have armed forces jobs removed to align sampling frames. All counts rounded to the nearest thousand.

TABLE A10 **DCMS CREATIVE INDUSTRIES, 2011-13**

INDNAICS	INDNAICS Descriptor	DCMS industry group	Intensity	Jobs	Creative jobs	% creative industries jobs	% all jobs
5416	Management scientific and technical consulting	Advertising and marketing	0.129	1,387,000	179,000	13.49%	0.97%
5418	Advertising and related services		0.290	494,000	143,000	4.81%	0.35%
5413	Architectural, engineering and related services	Architecture	0.212	1,418,000	301,000	13.80%	0.99%
3279	Miscellaneous non-metallic mineral products	Crafts	0.126	79,000	10,000	0.76%	0.05%
3399M[1]	Sporting and athletic goods; doll, toy and game manufacturing		0.152	111,000	17,000	1.08%	0.08%
5414	Specialized design services	Design	0.711	320,000	228,000	3.12%	0.22%
5121	Motion pictures and video industries	Film, TV, video, radio and photography	0.361	394,000	142,000	3.83%	0.28%
515	Broadcasting except Internet		0.236	569,000	134,000	5.54%	0.4%
5112	Software publishing	IT, software and computer services	0.195	70,000	13,000	0.67%	0.05%
5182	Data processing hosting and related services		0.132	105,000	14,000	1.02%	0.07%
5415	Computer systems design and related services		0.229	1,894,000	432,000	18.41%	1.32%
51912	Libraries and archives	Museums, galleries and libraries	0.325	226,000	74,000	2.20%	0.16%
712	Museums art galleries historical sites and similar institutions		0.150	370,000	55,000	3.60%	0.26%
5122	Sound recording industries	Music, performing and visual arts	0.274	30,000	8,000	0.29%	0.02%
611M3[2]	Other schools, instruction and educational services		0.499	698,000	348,000	6.80%	0.49%
711	Independent artists, performing arts, spectator sports and related industries		0.473	712,000	337,000	6.93%	0.50%
51111	Newspaper publishers	Publishing	0.336	279,000	94,000	2.72%	0.20%
5111Z3	Periodical book and directory publishers (except newspapers)		0.367	281,000	103,000	2.74%	0.20%
51913	Internet publishing, broadcasting and web search portals		0.280	77,000	22,000	0.75%	0.05%
5191ZM[4]	Other information services (except libraries and archives; internet publishing and broadcasting and web search portals)		0.327	40,000	13,000	0.39%	0.03%
5419Z[5]	Other professional, scientific and technical services (except vets)		0.374	385,000	144,000	3.74%	0.27%
8129	Other personal services		0.016	339,000	5,000	3.30%	0.24%

Source: Annual Population Survey.

Red text indicates below BFH creative intensity threshold. Figures exclude small cells and volatile cells, and second jobs. Both samples have armed forces jobs removed to align sampling frames. All counts rounded to the nearest thousand.

Key for hybrid cells:

1 = NAICS 33992 (sporting goods) and 33993 (toys, dolls and games)

2 = NAICS 6116 and 6117

3 = NAICS 5111 except 51111

4 = NAICS 5191 except 51912 and 51913

5 = NAICS 5419 except 54194. All counts rounded to the nearest thousand.

TABLE A11 DCMS CREATIVE INDUSTRIES CROSSWALKED TO CANADIAN INDUSTRIES, 2011

NAICS	NAICS descriptor	Crosswalked DCMS industry group	Intensity	Jobs	Creative jobs
5418	Advertising, public relations, and related services	Advertising and marketing	0.227	71,000	16,000
5416	Management, scientific and technical consulting services		0.269	152,000	41,000
5413	Architectural, engineering and related services	Architecture	0.153	259,000	39,000
3279	Other non-metallic mineral product manufacturing	Crafts	0.205	8,000	2,000
3399	Other miscellaneous manufacturing		0.143	45,000	6,000
5414	Specialized design services	Design	0.756	56,000	42,000
5121	Motion picture and video industries	Film, TV, video, radio and photography	0.528	61,000	32,000
5122	Sound recording industries		0.732	5,000	3,000
5151	Radio and television broadcasting		0.546	40,000	22,000
5152	Pay and specialty television		0.514	2,000	1,000
5112	Software publishers	IT, software and computer services	0.650	29,000	19,000
5182	Data processing, hosting, and related services		0.320	10,000	3,000
5415	Computer systems design and related services		0.607	239,000	145,000
5111	Newspaper, periodical, book and director publishers	Publishing	0.394	65,000	26,000
5191	Other information services		0.370	45,000	17,000
5419	Other professional, scientific and technical services		0.357	88,000	32,000
8129	Other personal services		0.041	28,000	1,000
7121	Heritage institutions	Museums, galleries and libraries	0.149	32,000	5,000
6116	Other school and instruction	Music, performing and visual arts	0.259	104,000	27,000
7111	Performing arts companies		0.638	29,000	18,000
7113	Promoters (presenters) of performing arts, sports and similar events		0.137	16,000	2,000

Source: Annual Population Survey.

Red text indicates below BFH creative intensity threshold. Figures exclude small cells and volatile cells, and second jobs. Both samples have armed forces jobs removed to align sampling frames. All counts rounded to the nearest thousand.

TABLE A12 **LOSS OF DETAIL FROM SIC TO ISIC CROSSWALKING**

SIC07	Descriptor	ISIC equivalent	Descriptor
3212	Manufacture of jewellery and related articles	3211	Manufacture of jewellery and related articles
3211	Striking of coins		
5821	Publishing of computer games	5820	Software publishing
5829	Other software publishing		
6202	Computer consultancy activities	6202	Computer consultancy and computer facilities management activities
6203	Computer facilities management activities		
7021	Public relations and communication activities	7020	Management consultancy activities
7022	Business and other management consultancy activities		
743	Translation and interpretation activities	7490	Other professional, scientific and technical activities n.e.c.
749	Other professional, scientific and technical activities n.e.c.		
91.02	Museum activities	9102	Museums activities and operation of historical sites and buildings
9103	Operation of historical sites and buildings and similar visitor attractions		

TABLE A13 **'MARGINAL' CREATIVE OCCUPATIONS**

ISCO08	Descriptor
1221	Sales and marketing managers
1222	Advertising and public relations managers
1330	Information and communications technology services managers
2511	Systems analysts
2512	Software developers
2513	Web and multimedia developers

ENDNOTES

1. International Standard Classification of Occupations.
2. International Standard Industrial Classification.
3. For occupations we use US OCCSOC (Occupation Standard Occupational Classification Code) codes and Canadian NOC-S (National Occupational Classification-Statistics) codes. For industries we use North American Industry Classification System (NAICS) 2007 codes and the closely related INDNAICS (Industry, NAICS classification) codes. The NAICS framework is designed to produce comparable industry statistics for the USA, Canada and Mexico. NAICS coding is identical in the US and Canada to four-digit detail, and for some sectors to five-digit detail. Our preferred US dataset, the American Community Survey, uses INDNAICS codes which are based on crosswalking US Census industry codes to NAICS07. For the industries we are interested in, 20/23 sectors are measured using four or five-digit NAICS codes and three are measured using three-digit NAICS. The OES dataset which we use for robustness tests uses standard NAICS codes.
4. Due to its smaller size, the American Community Survey offers somewhat noisier count estimates compared with alternative datasets such as the Decennial Census. However, Decennial individual-level microdata is not publicly available after 2000.
5. Portfolio working is particularly common for creative workers. Removing second jobs will thus affect creative economy workers more than others, and will have the effect of reducing total creative economy employment. Conversely, removing armed forces employment reduces the size of the non-creative workforce (so raises the creative economy's employment share). We can see both effects in our data. For example, in 2012 our analysis finds 2.487 million jobs in the UK creative economy (8.7 per cent of all employment) while the DCMS analysis finds 2.55 million creative economy jobs (8.5 per cent of all employment).
6. Sub-national data was not available for Canada due to disclosure restrictions.
7. NUTS stands for Nomenclature of Territorial Units for Statistics. These are the geographical units used by the European Union. In the UK NUTS1 corresponds to regions, and the devolved administrations. NUTS2 and NUTS3 correspond to subregional geographies, with NUTS3 having the highest level of spatial resolution.
8. This area covers: Inner London, Outer London, Berkshire, Buckinghamshire and Oxfordshire, Surrey, East and West Sussex, Bedfordshire and Hertfordshire, Hampshire and Isle of Wight, East Anglia, Kent and Essex.
9. GLA Intelligence (2014) 'Commuting in London.' Census Information Scheme 2014-16.
10. The analysis closest to ours is King et al. (2009), who conduct a cross-country analysis for the US, Canada and Sweden. However, they adopt a much simpler treatment that aggregates occupations into four groups based on Creative Class concepts, and groups industries into four blocs.
11. Specifically, BFH set the threshold so it lies an equal distance from the mean distributions of DCMS' 2011 lists of 'creative' and 'non-creative' industries. The threshold is then used to reclassify industries between creative and non-creative categories, before further sensitivity checks are run.
12. King et al. (2009) conduct a cross-country analysis of job structures within industries for the US, Canada and Sweden. They use a single year of data and adopt simple typologies that aggregate occupations into four groups based on Creative Class concepts, and group industries into four blocs. Falk et al. (2011) cover productivity and employment in the creative industries across EU27 countries, between 2000 and 2008. They use business data (rather than labour force data) and use NACE1.1 codes (rather than the current NACE2 codes we use). Boix et al. (2010) compare geographies of creative industry activity in the UK, France, Italy and Spain, using a single year of data (between 1999 and 2007 depending on the country) and two-digit SIC/NACE codes. Boix et al. (2014) extend this analysis using three-digit NACE codes on the same years of data.
13. Occupational Crosswalk for SOC codes.
14. Concordance tables, in this instance, are tables that show the relationship between the national occupational coding classification and the international occupational coding classification.
15. An alternative approach would be to start with an agreed set of US/Canadian creative occupations and industries, and crosswalk these to UK industries and occupations using the same method.
16. The NAICS system provides a common industry coding framework for the US and Canada. The two countries' industry codes thus share the same high-level structure but differ at the most detailed five and six digit-level. In our case we are almost always working with four-digit codes: we use the same crosswalk and make changes as appropriate.
17. Due to its size, the American Community Survey offers somewhat noisier count estimates, as compared with the Decennial Census. However, Decennial individual-level microdata is not publicly available after 2000. This is another reason to measure ACS-derived counts of employment against values derived from the OES, keeping in mind differences in each dataset's sampling frame.
18. Specifically, 11 are crosswalked at NAICS4, five at hybrid NAICS4/5 level and three at NAICS5 level.
19. The ACS also provides spatial identifiers from PUMAS (areas of at least 100,000 people) upwards, giving us a further flexibility if required. Working at PUMA level would require restricting the analysis to urban areas where the sample size per unit is greatest.
20. The extent of second jobs in the APS is not huge in terms of the wider workforce. In the aggregated 2013 data 1,148,956 people reported a second job: 3.89 per cent of those in work and 1.84 per cent of all respondents. The APS does not include those living in communal establishments (except for student halls or NHS housing). As such, it will include anyone in the armed forces except those living in communal establishments. For this analysis, we remove ACS respondents working in the armed forces. In the 2013 data this accounts for 0.67 per cent of employees.
21. Outside RDC access, Statistics Canada can provide bespoke runs of the full CLFS data. We asked StatCan to provide us with illustrative coverage for the industry*occupational data pulls needed.
22. It is possible to aggregate in shares from local authorities to TTWAs using postcode weights (e.g. Gibbons et al. 2008) but this does not permit analysis in counts. NUTS2 areas are also part of a common EU-wide spatial coding system, and also provide comparability with sub-national EU analysis in future research projects.
23. Ideally we would also want to specify more local spatial units that can pick up these small area differences. In practice neither of our datasets can be used for 'hyperlocal' analysis.
24. Originally designed for manufacturing sectors, industry codes such as SICs were able to pick out both broad 'industry space' and specific inputs/output industries within these (e.g. optical equipment => cameras => camera lenses). These typologies have, in recent years, been increasingly developed to include service sector activities. It is still harder to do this for parts of the economy - such as

creative sectors - where activity is much more service-orientated.

25. UN-DESA (2008) gives an overview of the ISIC4 standard. ILO (2007) gives an overview of ISCO08.
26. An alternative approach to multiple matches would be to generate weights based on the number of matches, and use these to adjust US/Canadian employment accordingly. For example, a 1:1 match is weighted 1, a 1:2 match is worth 0.5 on both US/Canada cells, a 1:3 match is worth 0.33 and so on. The drawback to this approach is that it takes no account of match quality and could therefore include some bad or irrelevant matches. Decision rules would therefore also be required in this case.
27. We use the following concordance tables: SOC2010 – ISCO08 – taken from ONS (2010) 'Mapping Standard Occupational Classification 2010.' (SOC2010) unit group with size of organisation to ISCO08 unit group, http://bit.ly/1DUa4gj (accessed 9 February 2015); ISCO08 – OCCSOC (US ACS) – two sources. BLS (2012) ISCO08-SOC crosswalk, http://1.usa.gov/1Dx6Ukl (accessed 9 February 2015); IPUMS Occupation Crosswalk - OCC and OCCSOC ACS and PRCS Samples, http://bit.ly/1AaTPwo (accessed 9 February 2015).
28. In the original concordance table SOC5449 (other skilled trades not elsewhere classified) is matched to ISCO7316 (sign writers, decorative painters, engravers and etchers). We amend this to ISCO7319 (Handicraft workers not elsewhere classified) and proceed on this basis.
29. We use the following concordance tables: ISCO08 – NOC2011 – NOC-S6 – two sources. Statistics Canada Concordance: International Standard Classification of Occupations (ISCO) 2008 to National Occupational Classification (NOC) 2011, http://bit.ly/1Dx7YVA (accessed 9 February 2015); Statistics Canada Concordance: National Occupational Classification (NOC) 2011 to National Occupational Classification for Statistics (NOC-S) 2006, http://bit.ly/1J6IO0o (accessed 9 February 2015).
30. We use the following concordance tables: SIC07/NACE revision 2 – ISIC4 – taken from United Nations Statistics Division, Correspondence between ISIC Rev 4 and NACE Rev 2, http://bit.ly/1DcxmPY (accessed 9 February 2015). Descriptors from Central Statistics Office Ireland NACECoder, http://bit.ly/1DcxuPw (accessed 9 February 2015). ISIC4 – NAICS07 – INDNAICS – two sources. US Census Bureau Concordances: 2007 NAICS to ISIC4, http://1.usa.gov/1DcxNdi (accessed 9 February 2015); IPUMS Codes for Industry (IND) and NAICS Industry (INDNAICS) in the 2003-onward ACS/PRCS Samples, http://bit.ly/1Dcy0x3 (accessed 9 February 2015).
31. The methodology of the crosswalk for the CCI SIC/SOC was initially developed in Pratt, A. C. (1997) The cultural industries production system: a case study of employment change in Britain, 1984-91. Environment and Planning A 29 (11):1953-1974. In this the technique is first described as a way to use the 4 digit disaggregation and re-aggregating the codes for the CCI. This methodology was used to generate the DCMS (2004) Data evidence toolkit; the UNESCO (2009) Framework for Cultural Statistics; the UNCTAD (2008, 2010); and the UNESCO (2013) Creative economy report (using a variant developed for cultural trade). Methodologies are discussed in both reports.
32. Specifically, three are crosswalked at NAICS3-level, 11 are crosswalked at NAICS4-level, five at hybrid NAICS4/5-level and three at NAICS5-level. In a couple of cases, as shown in Table A6 in Appendix A3, INDNAICS descriptors vary slightly from standard NAICS descriptors in order to accommodate crosswalking in closely related sectors at different levels of detail and eliminate double counting. For example, we have a detailed NAICS coding on newspaper publishing (51111) but less detailed information for all other publishing. In this case a four-digit NAICS code (5111) is used, but newspaper publishing is excluded and the descriptor is 'Periodical, book, and directory publishing (except newspapers)'.
33. We use the same SIC/NACE-ISIC concordance table as for US industries, plus the following table to link from ISIC to NAICS: Statistics Canada Concordance between the North American Industry Classification System (NAICS) 2007 and the International Standard Industrial Classification (ISIC), Revision 4, http://bit.ly/1DcyUK3 (accessed 9 February 2015).
34. In BFH, 'volatile' industries are defined as those that move "from creative to non-creative or vice versa [in terms of intensity], or which change by more than one-fifth relative to its lowest value" (p35) between 2009 and 2010 (the last year of the analysis). Our data set ends in 2013, so we will apply this test between 2012 and 2013. 'Small sample' SICs are defined for the UK APS data as those where sector employment totals are lower than 800. We apply the same tests to the US data.
35. In the UK we can see that industries that are relatively small in employment terms, such as computer games publishing (SIC 5821) and the publishing of directories and mailing lists (SIC 5812), are included despite having creative intensities below the BFH threshold of 0.3. More significantly, so are a few low-intensity sectors that employ a lot of people, notably motion picture projection (SIC 5914), libraries and archives (SIC 9101) and museums (SIC 9102). In part, this reflects real concerns that creative tasks are imperfectly captured in SOC codes, and so low intensities in these sectors may not reflect 'true' levels of creativity. This seems less likely to be the case with activities such as mailing list publishing or movie projection, where inclusion likely reflects the departmental focus of the DCMS operates.
36. As we discuss in Section 3, at the extreme we have two UK industries - photographic activities (SIC 74.2) and translation/interpretation services (SIC74.3) - with no direct equivalents in the US data.
37. The intuition here is: the UK industry cells represent the economic activity we wish to compare with its US equivalent. We worry that precise comparison is not possible because of imprecision in the first stage of the crosswalk, from SIC to ISIC, which generates 'excess'. The resulting US industry cells will then be less precise than we want. We want to remove this excess industry activity from the US cells. We do this by going back from the problematic ISIC codes to the additional SIC codes they match to, and using the UK employment shares of these cells to generate a fuzzy measure of the excess in the US cells. We then subtract this excess in the robustness test.
38. BFH run a similar test in the UK comparing LFS estimates to those from the ASHE business survey. However, they do not show headline employment estimates for creative industries or embedded jobs. Further research should reproduce our test on UK data.
39. Data for all areas is available on request, as are counts for 2011.
40. Togni, L. (2015) 'The creative industries in London.' GLA Economics Working Paper 70.
41. Source: US 2010 census and UK 2011 census.
42. GLA Intelligence (2014) 'Commuting in London.' Census Information Scheme 2014-16.
43. Source: UK 2011 census.

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