Creative Differences? Measuring Creative Economy Employment in the US and UK Using Microdata

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ABSTRACT

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Using high-quality administrative microdata spanning 2011-2013, this paper develops new routines to compare creative economies using the creative trident framework, and applies them to the UK and US national and regional contexts. We find the UK creative economy is larger in workforce shares, and grows faster over the study period; the US' is absolutely larger, and is distributed more evenly across industries. Regional results are shaped by deeper differences in national urban systems. The paper highlights possibilities for widely varying national configurations of creative economies, considers potential mechanisms driving differentiation, and reflects on the usefulness of the creative trident approach.

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1) Introduction

In recent years, the creative industries have captured the attention of city-focused policymakers, managers, and academics. Interest can be traced to Allen Scott's (1997) seminal work on the 'cultural economy', and especially Richard Florida's much-debated concept of the 'creative class' (Florida 2002). Motivation for this interest derives in no small way from these authors' contention that culture and creativity might act as renewed sources of local economic prosperity. But the precise mechanisms through which creativity links to prosperity remains the subject of debate, with some authors emphasizing its consumption benefits for specific, valorised knowledge-economy workers (Florida 2002, 2004), while others consider additional gains rooted in production (Scott 1997; Pratt 2008). One clear problem is that, in order to empirically link creative activity and prosperity, researchers require reliable ways of defining and measuring creative industries. At present there is no consensus on how to do so.

This paper contributes to these debates by testing a recent and rigorous approach to the mapping and measurement of creative industries, known as the 'creative trident' (Higgs, Cunningham, and Bakhshi 2008; Bakhshi et al. 2015; Department of Culture Media and Sport 2014). This method aims to improve upon prior approaches, by using occupations as the base unit, then identifying creative industries as those with a critical mass of creative occupations in the workforce ('creatively intense' sectors). This allows for flexible analysis of different parts of the creative workforce, whether inside or outside a given set of creative industries. In the UK, this approach has become influential in public policy, and is likely to see interest globally. However, it has yet to be subjected to careful academic scrutiny.

In order to interrogate the creative trident we first contextualise this approach within the broader creative industries literature. The paper then develops and outlines a series of original routines to sync national-level industry and occupation typologies at a detailed (4-digit) level, focusing on creative industry activities. Those tools are subsequently combined with high quality administrative microdata covering the years 2011 to 2013, in order to offer a comparative analysis of creative industries employment across two large geographies and world-leaders in creative activity, the United States and the United Kingdom, at both national and urban scales. The result is the most careful and detailed multi-level comparison of creative industries in the literature to date, with results that are robust to a series of sensitivity checks, as well as a sampling frame test using alternative US data.. While the comparison of these two economies' creative employment is valuable in itself, our comparative method also offers insights about the validity of the creative trident approach, and points out conceptual challenges and gaps.

We find that the US has a much larger creative workforce than the UK, but that these comprise a larger share of the UK workforce; we also find that creatively-intense industries in the UK (such as design, or film/media/TV) tend to have much lower intensities in their US counterparts. Industries with low creative intensities are dominant in the US, suggesting US creative workers are more evenly dispersed across all industries. Subnational organization of creative activity broadly follows the two countries' urban systems, with a multipolar US distribution and a unipolar UK distribution *across* the set of cities, from largest to smallest. The exception is the distribution of creative specialists, who are more urbanized *within* cities whatever their size. We suggest that these results reflect two organizing logics: an urban logic which shifts creative occupations into a country's largest cities (Scott 2014), and an industry

logic in which a US model of large-scale, 'industrialised' creative activity contrasts with the UK's smaller, more specialised creative economy (Lash and Urry 1984).

The process of conducting the analysis, and the findings, suggests that the concept of creative intensity requires further theorisation, particularly in the context of two very different sets of administrative economic data; it is, as stands, a concept that raises several questions as to its function and usefulness in comparative work. Moreover, the limitations, along with the sets of underlying assumptions necessary to operationalise the concept of creative intensity, as part of the broader trident approach suggest that this current iteration of creative industries definition has yet to fully address the various critiques we discuss in the opening and concluding sections of the paper. Thus policymakers should be cautious as to the extent to which the current DCMS understanding of creative industries can be transferred across national and regional settings.

2) The problem of defining creative industries

The meaning of creative industries has changed over time, and has varied depending on the specific economy under consideration (Ross 2007). Definition has been a core and substantive subject of debate since the initial codification of creative industries by the UK's Department for Culture, Media and Sport in 1998 (DCMS 1998). This codification, with its focus on the production and control of intellectual property, was subject to extensive academic scrutiny as a result of perceived practical and theoretical limitations (e.g Hesmondhalgh 2012, Banks and O'Connor 2018). For some the questions were associated with the conflation of culture and cultural policy with economy (Garnham 2005); the

coherence of the category (Pratt 2005, O'Brien et al 2018); others drew attention to the problems of accurate measurement (debates summarized by Campbell 2019); alongside voices questioning the ability of the industries and occupations collected under the creative industries banner to deliver the economic 'goods' suggested by the policy rhetoric. This was against the backdrop of research questioning the working conditions and labour force demographics of creative occupations, specifically with regard to gender, class, and ethnicity (Conor et al 2015, Saha 2018)

These debates dovetail with a broader academic trend emphasizing the clarity to be gained by examining the economy generally, and often specifically the creative economy, through an occupational and task-oriented lens (Feser, 2003; Markusen et al, 2007; Currid and Stolarick, 2010, Kemeny and Rigby, 2012). The resulting policy response sought to shift the definition towards the practices and activities within occupations, with specific occupations having high levels of activities and practices defined as 'creative' (Bakhshi et al (2012), DCMS 2018). This approach sees creative practice as 'a role within the creative process that brings cognitive skills to bear to bring about differentiation to yield either novel, or significantly enhanced products whose final form is not fully specified in advance' [24]. This understanding has been the basis for British public policy's current understanding of creative industries and the resultant economic indicators, estimates, and evidence of performance (DCMS 2018).

Here 'creative industries' are defined by the level, or intensity, or creative roles (and/or creative occupations) are used in production. This is in the context of business models that are deemed specific to creative industries, including short production runs, lack of advance knowledge on product success, just-in-time methods and clustering – to broader structural

factors including digitisation, increasing consumer spending on taste-based goods, and a growing desire for consuming distinctive and 'authentic' products and services (Bakhshi et al (2012), Hesmondhalgh 2012, O'Brien 2014).

This 'creative trident' method (Higgs, Cunningham, and Bakhshi 2008) is an accounting mechanism that combines these concepts to specify the creative industries in workforce terms. Here, the broader creative industries workforce (dubbed the 'creative economy') consists of all workers in a pre-defined set of creative industries, plus those in creative occupations 'embedded' in non-creative industries. The creative industries workforce then divides into 'creative specialists', in creative occupations, and 'support workers' in other jobs.

To date this approach has not seen the same, sustained level of scrutiny associated with the original iterations of creative industries. Moreover, where academic research has engaged, it has been those scholars associated with *developing* the approach (e.g. Higgs et al 2008, Cunningham 2011, Bridgstock et al 2015, 2016). Hence the need for a critical examination of the kind seen for other major interventions in creative industries scholarship, for example the original DCMS (1998) definition (e.g. Garnham 2005, Hesmondhalgh, 2012); The idea of a 'creative class' suggested by Florida (2002) (e.g. Peck 2005, Markusen, 2006); or the relationship between cultural policy and creative industries (Pratt 2005, Hesmondhalgh and Pratt 2005, Oakley 2009).

This makes the work presented in this paper especially timely and an obvious intervention to the broader literature on the most appropriate lens for understanding creative industries, again across several disciplines (e.g. Banks and O'Connor 2018; O'Brien et al 2017). Moreover, by

empirically testing the creative trident approach in, for the first time, a comparative as well as sub-national context, we raise several questions for further theorisation. Finally, given the way this approach has become institutionalised within British central government's approach to economic statistics for the creative industries, we can expect further 'exports' of this model, in keeping with previous British approaches to transferring policy for this subject (Prince 2014, O'Brien 2015). In particular, discussions of the creative economy have had most impact on the urban scale. Thus, understanding definitions and the representations of the creative economy that those definitions afford (Campbell et al 2017) has crucial implications for cities and urban policy. The rest of the article now turns to the data and methods deployed for our comparative analysis, before concluding on the benefits and limitations of the trident approach.

3) Methodology and data

Different national industry and occupation systems have evolved in parallel over time, typically with a focus on manufacturing industry.[1] Our empirical analysis builds on the efforts of recent years to back-fit these single country systems into international standardised typologies such as ISIC (for industries) and ISCO (for occupations) (International Labour Organisation 2007; UN-DESA 2008). We exploit these international typologies to create a bridge from UK creative occupation codes to their equivalents in the US. Table A1 in the appendix gives our starting set of creative roles, which are defined using the most up to date UK occupation codes available.

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[1] 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 rather harder to do this for parts of the economy - such as creative sectors - where activity is much more service orientated.

We use a series of concordance tables to create a crosswalk from UK to US occupation typologies. We then repeat the exercise for industries. In both cases, this workflow generates three basic scenarios, each of which requires different analytical steps. These are set out in Figure 1. In the first (majority) scenario, we have 1:1 matches from UK - international - US 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.

Figure 1 about here

In the second scenario, there is a less than perfect match. Sometimes a UK or international code will match onto multiple US codes (as in occupations); in other cases (some industries) we will lose some detail in the crosswalking process. In these cases we use decision rules to create best-fit matches and use sensitivity checks to test any contestable assumptions. Figure A2 gives details.[2] In a third, rare 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 very small number of cases where there is no match between a 4-digit UK industry and any 4-digit US equivalent (rather, the match is from SIC4 to NAICS6, a level of detail 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. We also use nine higher-level creative industry groups, as defined by the UK government (Department of Culture Media and Sport 2014) to enable like-for-like comparisons.

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[2] An alternative approach to multiple matches would be to generate weights based on the number of matches, and use these to adjust US employment accordingly. For example, a 1:1 match is weighted 1, a 1:2 match is worth 0.5 on both US 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.

For occupations, we crosswalk from UK Standard Occupational Codes (SOCs) to ISCO 2008 codes to US OCCSOC codes. In most cases we achieve a 1:1 match, or match ISCO cells to several US occupation cells (an even better outcome for precision). Our starting 30 4-digit UK creative occupations codes map to 31 ISCO codes and 48 OCCSOC codes, the latter available at 5 or 6-digit precision. Tables A2 and A3 give more details. For industries, crosswalking is noisier than with occupations: the 31 DCMS 'official' creative industry SICs are crosswalked to ISIC4 international codes, to US NAICS codes and then to 22 predominantly 4-digit IPUMS NAICS (INDNAICS) codes used in our preferred US dataset. Tables A4 and A5 give details.

3.1) Data

For the UK analysis we use Annual Population Survey (APS) microdata for the UK analysis. The APS is the largest household survey in the UK (Office of National Statistics 2015). Each year 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 (Mallon and Cohen 2001; Markusen 2006). We use APS person weights to gross up to national and sub-national totals.

For the US analysis we use the American Community Survey (ACS), which we argue provides best balance of detailed industry and occupational classification and suitability for

sub-national analysis.[3] The ACS is a mandatory 1% survey of the US population, conducted

annually since 2000. Over the study years, the ACS covers information on around 3.5m

households and individuals; like the APS, it is collected on a residence basis. The Minnesota

Population Center's Integrated Public Use Microdata Series (IPUMS) extracts (Ruggles et al.

2010) feature highly detailed, time-consistent occupational information, but provide less

detailed industry information for industries, aggregating NAICS codes to IPUMS NAICS

codes (so-called 'INDNAICS'). For the creative industries codes we are interested in,

coverage is good: in the resulting crosswalk three codes are crosswalked as three digit

NAICS, and the remaining 20 at NAICS4 or above.[4] The ACS also provides information on

self-employment, a crucial consideration for covering creative industries activity. We adjust

the APS and ACS sampling frames to make them identical, by removing Armed Forces

respondents from the US data, and remove second job information from the UK data.[5]

Because the ACS provides less detailed industry information than the ACS, we also use data

from the Bureau of Labor Statistics' Occupational Employment Statistics (OES) program for

sensitivity checks. The OES is a bi-annual survey of 200,000 businesses in the US which uses

highly detailed occupation and industry codes at a minimum of NAICS4, but crucially, does

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[3] We considered a range of other potential data sources. Our interest in dynamics renders the problematic the use of the Decennial Census, since this only allows for analysis every 10 years. Sources of detailed and high-quality industry employment information about the US economy, like the Quarterly Census of Employment and Wages (QCEW) or County Business Patterns, are not suitable since they lack occupational information. The Current Population Survey (CPS), while offering an individual-level panel with occupation and industry information, provide smaller samples that offer less comprehensive coverage than the ACS and OES.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.

[4] Specifically, 11 are crosswalked at NAICS4, 5 at hybrid NAICS4/5 level and 3 at NAICS5 level.

[5] 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% of those in work and 1.84% 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% of employees.

not include self-employed workers, and uses a workplace rather than household sampling frame.

4) Comparing US and UK Creative Industries

This section presents the results of our analysis for 2011-2013. We start by looking at creative occupations in the US and UK; then compare the characteristics of the UK's 'creative industries' with their US counterparts; then, following Bakhshi et al (2012), compare the size, shape and dynamics of the two countries' larger creative economies, with a specific focus on sub-national differences. This comparison then allows us to reflect on the limits of the dynamic mapping approach for work beyond the UK.

4.1) Creative occupations

Our comparative analysis of the creative workforce starts with a set of common 'creative occupations', as given in Table 1. Overall, the US has substantially more creatively occupied jobs than the UK – an average of 6,354,000 for the period 2011-2013, versus 1,717,000 in the UK in the same period – but these comprise a smaller share of the workforce (4.44% for the US vs. 5.97% for the UK). Figures 2 and 3 extend this by looking at how creative occupations are distributed across 4-digit industries in the two countries. Specifically, these break down workforce employment across all industries by creative intensity (the share of creative occupations in each industry).

Figure 2 about here

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The UK workforce is largely distributed into distinct blocs, one of which has very low

creative intensity (15% or less), with others at rather higher intensity (30-35%, 40-65%, 70-

80%, 85-95%). In comparison, the US workforce has a different distribution, with the

majority of workers largely in industries with a low share of creative occupations, and only a

minority in industries with 30% or more creative occupations.

Figure 3 about here

4.2) Creative industries

Next, we look at workforce size and characteristics in the nine 'creative industries' groups

defined by the UK Department for Culture, Media and Sport. As we discuss in Section 2,

these industries are defined on the basis of their outputs, production functions and workforce

characteristics. The top panel of Table 1 gives results for these industry groups in the US,

while the bottom panel repeats the analysis for the UK.

We see striking contrasts between the creative intensities present in the two countries. In the

US, only two industry groups (Design activities; Music, performing and visual arts) have

creative intensities above 0.3, the threshold that officially designates 'creative industries' in

the UK. In Britain, by contrast, only one group (Museums, galleries and libraries) is *below*

this figure. On the other hand, the most creatively intense US industry group, design, has a

higher creative intensity in the US (0.711) than its UK counterpart (0.613). It is notable that

ICT activity is more creatively intense in the UK (0.427) than the US (0.233). We also find

one US industry that is not in the DCMS creative industries list, florists (NAICS 4531), where creative intensity is 0.473.

The other striking feature of this table is the within-composition. In both countries the ICT, software and computer games groups comprise the biggest slice of the creative industries as a whole. However, the UK creative industries are dominated by this group (over 33% of all jobs) in a way that is not the case in the US (20.1%).

Table 1 about here

More broadly, the composition of employment in creative industries differs among our two study countries, suggesting a particular character to each country's creative industries. Industries like Architecture, and Advertising and Marketing comprise much smaller proportions of total creative industry employment in the UK than in the US. Conversely, for Film and broadcast activity, the UK takes a considerably larger share of creative industries jobs (13.7%) than in the US (9.4%).

The final column looks at industry group employment shares across the whole workforce, not just the creative industries. Again, some striking differences emerge. In terms of national employment shares, US advertising and marketing industries are almost three times larger than their UK counterparts (1.32% vs. 0.49%) and architecture is at least three times larger (0.99% vs. 0.31%). Conversely, UK employment shares are larger for design (0.37% vs. 0.22% for the US). These patterns also hold for both film/broadcast (0.74% vs. 0.67%) and ICT/software (1.82% vs. 1.45%).

Finally, we compare the two countries' 'creative economies', defined using the standard Creative Trident concept (Higgs, Cunningham, and Bakhshi 2008). This exercise requires setting a common set of creative industries: we use the nine industry groups used above. The substantive differences in creative workforce characteristics should be borne in mind when interpreting the results.

Table 2 about here

Table 2 shows the national creative economies and their basic components between 2011 and 2013. The top panel gives results for the US, the bottom panel the UK. In absolute terms, the US creative economy is (not surprisingly) substantially larger. In 2013 the US creative economy comprised over 14m employees, with 10.6m in the creative industries and 3.6m in embedded jobs. By contrast the UK had 2.5m employed in the creative economy in 2013, with 1.6m in the creative industries.

Looking at shares of all jobs, the countries' creative economies are rather closer together: in 2011 the UK creative economy comprised 8.18% of all jobs, the US 9.48%. Table 1 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% p.a. in the US and 4.7% p.a. in the UK. Most of the UK's 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.

Table 3 shows the 'Creative Tridents' in detail. 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 panel gives results for the US, and the bottom panel, results for the UK.

Table 3 about here

Some interesting contrasts emerge here. The UK has a higher share of workers in creative occupations (5.9% of the workforce in 2011-2013) than the US (4.6% of the workforce). The pattern of embedded creative workers in non-creative industries is similar, with the highest shares in the UK (3.3%) and then the US (2.7%). *Within* the creative industries, the UK's share of creative specialists is also higher (52.3% of all creative industries employment, versus 27.4%). Strikingly, in US creative industries, non-specialists outnumber those in creative occupations by about 2.5:1. But in the UK, those in creative jobs (809,000) outnumber non-specialists (737,000) by a ratio of 1:1.9.

4.4) Sensitivity checks

On the face of it, our analysis shows real structural differences in the creative workforce, some core creative industries and wider 'creative economy' in the US and UK. 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. Second, and more fundamentally, there may be issues with the level of industry detail available in the ACS.

We use a series of sensitivity tests to explore these issues. Results are given in Appendix C. To test for outliers and crosswalking decisions, we drop the most poorly crosswalked cells; drop cells for which crosswalking leads to loss of industry detail; and drop all ICT activity, an influential sector. In the Appendix, Table B1 shows that results closely resemble our main findings, suggesting that outliers or coding errors are not a factor. To further test the industry detail issue, we re-run our main analysis using OES data, which provides much more detailed industry information than the ACS. (To align the OES and ACS sampling frames, we remove self-employed respondents from the former.) Table B2 shows little change from ACS creative estimates to those in the adjusted OES. However, estimates for embedded jobs – people in creative occupations in non-creative industries – are quite far apart in 2011 and 2012. Sampling frame differences are likely to explain much or all of this: OES questionnaires will go to an HR manager in a firm, while ACS questionnaires go to a named individual in a household. Asking managers about their workforces and individuals / households about their occupations is likely to produce rather different findings.

5) Creative City-regions in the US and UK

As our discussion of the problem of defining creative industries noted, much creative industry and economy policy has played out in the urban and sub-national setting as cities respond to various economic and social challenges. As a result, the urban scale is an important level for exploring and testing definitions.

We now turn to the comparison of creative employment across each country's urban system. For simplicity, we present results for 2013 only, as they are not materially different from 2011 and 2012. To maximize geographical comparability, we use NUTS2 regions for the UK, and OMB-defined Metropolitan Areas, each of which combines administrative units as a means of approximating functionally-integrated labour-market areas. Tables B3 and B4 in the Appendix show the top 25 regions in terms of creative employment counts and shares, respectively; these cities contain over 80% of total national creative economy employment.[6]

We describe the patterns briefly here before presenting them graphically. In shares, the national creative economies are unevenly distributed across two distinct urban systems. In the US, two Bay Area metros and DC have creative employment occupying close to a fifth of total employment in each case, followed by a mix of medium-sized and smaller regional economies. Boston, New York and Los Angeles are all further down the rankings, reflecting their more highly diversified economies (Storper et al, 2015). In the UK, the share of creative employment in Inner London is comparable to that of San Jose. Berkshire, Buckinghamshire & Oxfordshire, Surrey East and West Sussex, and Outer London have shares of creative employment that resemble the middle and lower tier of the top 25 in the US. The remainder of UK regions have considerably lower shares than any in the top 25 of the US urban system. Interestingly, these international differences flow mainly from the concentration of workers in creative industries, as opposed to creative workers who are embedded in non-creative sectors, with UK cities having far higher shares of these creative specialists than their US counterparts. Moreover, this pattern matches the aggregate national picture, where the set of creative industries are more specialized in creative tasks than the US.

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[6] Tables for the full range of NUTS2 regions and metropolitan areas available upon request.

Figure 4 about here

Figure 4 visualizes these shares, with Greater (Inner plus Outer) London combined into a single entity.[7] We can see that the major US-UK difference is that creative specialists are far more urbanized than their US counterparts.

Looking at employment counts further emphasizes cross-country differences in urban scale and polycentricity. In each national context, the largest cities top the rankings. Absolute counts of creative employment in New York and Los Angeles are considerably larger than any UK city; even combining Inner and Outer London, New York's estimated creative economy is twice its alpha city counterpart in the UK (Beaverstock, Smith, and Taylor 2000). The far more multipolar American urban system is also evident in the employment counts. Not only are its largest cities larger, it has many more large cities overall. Consequently, after New York, LA, and Washington, the remainder of high-creative employment cities in the US are absolutely larger than nearly every other region in the UK in the top 25.

Figure 5 about here

For a clean comparison, Figure 5 shows the distribution of creative employment and its components across the top 25 cities, with the largest city indexed to 1. This allows us to see

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[7] Arguably, one might also combine certain contiguous and relatively integrated US regions together, into Combined Statistical Areas (CSAs), as defined by the OMB. This is challenging to do systematically, given our inability to completely identify micropolitan components of CSAs, at least in public-use Census microdata. That said, it would be possible to combine elements found in Tables 5 and 6, for instance San Francisco and San Jose, and Washington DC and Baltimore. However, the payoff for doing so is considerably lower than for unifying London's Inner and Outer regions. Shares in US component metros are relatively similar, hence while the Bay Area and the DC regions' creative economies would grow somewhat larger in absolute terms, shares would remain comparable, as would the overall international distinction between mono- and polycentricity.

how creative jobs are arrayed across the urban system.In other words, in these figures Greater London and New York act as reference points for the remainder of their national creative economies. The figure shows that creative jobs – whether considered as a whole or broken down into components – are much more strongly concentrated in Greater London than they are in any particular city in the US. This result holds across all categories, although it is strongest for creative industries, and weakest for specialist creative workers.

Overall, subnational results highlight how each nation's creative employment is distributed in a spatially uneven manner. More importantly, fundamental differences in urban hierarchy shape the contrasts between these distributions. Just as the UK is unipolar, structured around the capital, the US is multipolar, with New York, Los Angeles, Washington and other large cities playing functionally different, but nonetheless relatively equivalently important roles in the national space economy. This seems to translate directly into the absolute size of local creative employment. In terms of employment shares, a number of smaller and more specialized localities enter the rankings, most obviously San Jose, containing the traditional core of Silicon Valley high-technology activities. Nonetheless, the general contrast between mono- and polycentricity holds. Additionally, the relative and absolute scale of creative employment is larger for cities in the middle of the two countries' distributions. The only exception to this pattern among components of overall creative employment are specialists, who play larger roles in UK creative employment than in the US.

6) Conclusion: The continued problem of defining creative industries

Writing in 2005, Nicholas Garnham argued that the British adoption of 'creative', as opposed to 'cultural', industries as a core element of cultural and industrial policy 'assumes that we already know, and thus can take for granted, what the creative industries are, why they are important and thus merit supporting policy initiatives' (2005: 16). As our opening discussion suggested, the years since have seen continued and considerable debate over this taken for granted category. In the current iteration, the debates focus less on the broad theoretical underpinnings of the category and more on the technical aspects of demarcation, with the trident approach adopted by the British government as the 'state of the art'.

Our analysis has attempted to test the usefulness of this approach in a comparative setting. We compare creative economies and their components in two major economies, at national and urban level, as well as making a more general comment on the usefulness of the trident approach. On the former point we find striking differences: the US has substantially more creatively occupied jobs than the UK, but these comprise a smaller share of each nation's workforce (4.44% vs 5.97%); the UK creative industries grew faster than its US counterpart over the 2011-2013 study period; and industries with low creative intensities are dominant in the US, suggesting US creative workers are more evenly dispersed across all industries. Subnational organization of creative activity broadly follows the two countries' urban systems, with a multipolar US distribution and a unipolar UK distribution *across* the set of cities, from largest to smallest. The exception is the distribution of creative specialists, who are more urbanized *within* cities whatever their size.

We suggest this pattern of results reflects two organizing logics. First, an urban logic: different US and UK urban systems allow for different spatial distributions of creative activities and firms. Given that large cities have particular affordances for creative activity (Scott 2014; (Lorenzen and Andersen 2009), it is not surprising that the UK's creative economy is London-dominated, while in the US it is spread across a number of large urban cores. Second, an industry logic: the sheer size of the US creative economy compared to its UK counterpart suggests that in the former creative activity is industrialised, and the rest of the economy is 'culturalised' (Lash and Urry 1984). Creative labour inputs inside the UK's creative industries are, in comparison to the US, 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 UK *non-creative* industries have the biggest share of creative workers. And even conditional on urban location, US creative industries have less creatively intense workforces, employing fewer specialists.

This analysis raises important questions for theories of creative industries, alongside practical policy interventions. On the latter, it is clear that the differences we identify mean that there can be no single, common, 'one size fits all' form of creative industries policy intervention. The policy needs of the UK, for example, with its London-centric creative economy and smaller regional centres lacking critical mass for creative activity to properly cluster, are very different to the needs of the USA and specific American cities.

The differences we have demonstrated, and the associated lessons, are not reserved for policy. There are practical areas for further research. We use two countries, albeit large creative economies. Other countries may have different mappings. Better data is required to push research in this area, for example across the rest of the OECD. Second, our data does

not allow us to look at tasks within occupations. We assume that the set of creative occupations in both countries is identical, but it is possible that these industry and urban logics also influence the task set within those occupations. Further research is needed here too.

In terms of theories of creative industries and the creative economy, our analysis raises doubts over the extent to which the idea that creative intensity can be used to identify a single, global set of 'creative industries'. Country-level industrial organisation shapes creative intensity, and this is partly driven by national economic size, industry mix and industry competitive position. Urban system characteristics also play a role, and interact with industrial organisation factors. That might suggest the intensity concept is of limited use in itself for international comparisons – but the notion of creative intensity, and the trident, can productively be used as *inputs*, rather than as totalizing models, in richer comparisons of the creative economy.

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Figures and tables

Figure 1. Crosswalk workflow.
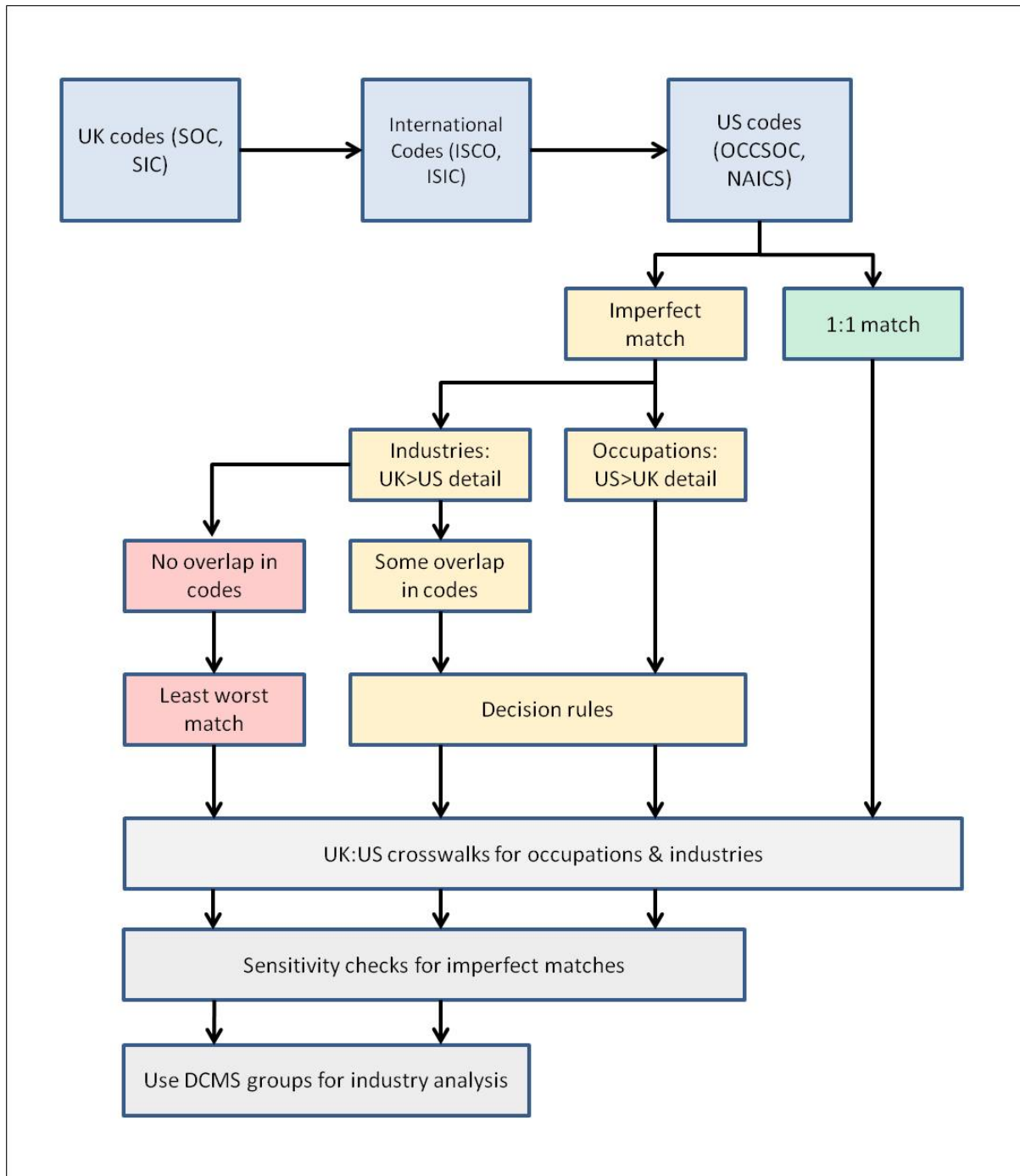
Figure 2. Industry distribution of jobs by creative intensity, UK, 2011-2013

Source: APS 2011-2013
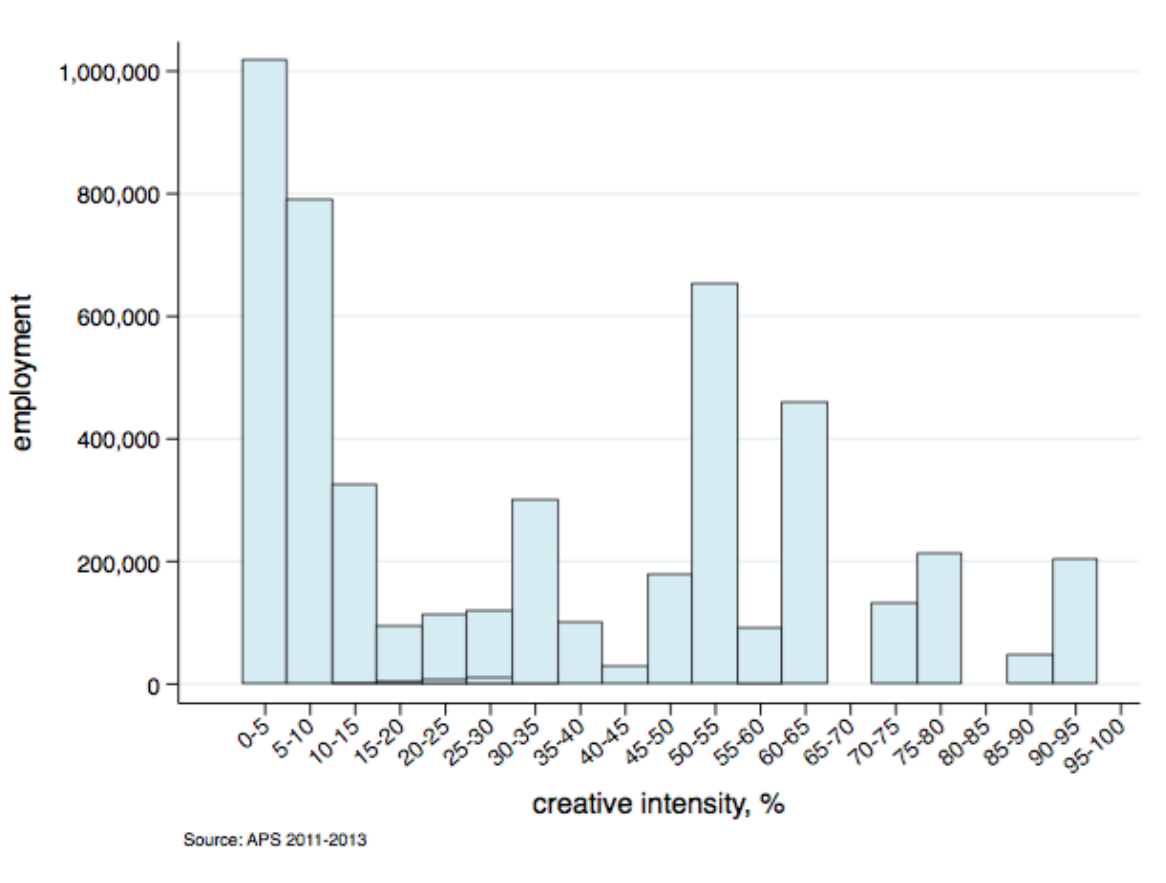
Figure 3. Distribution of creative jobs by intensity, US
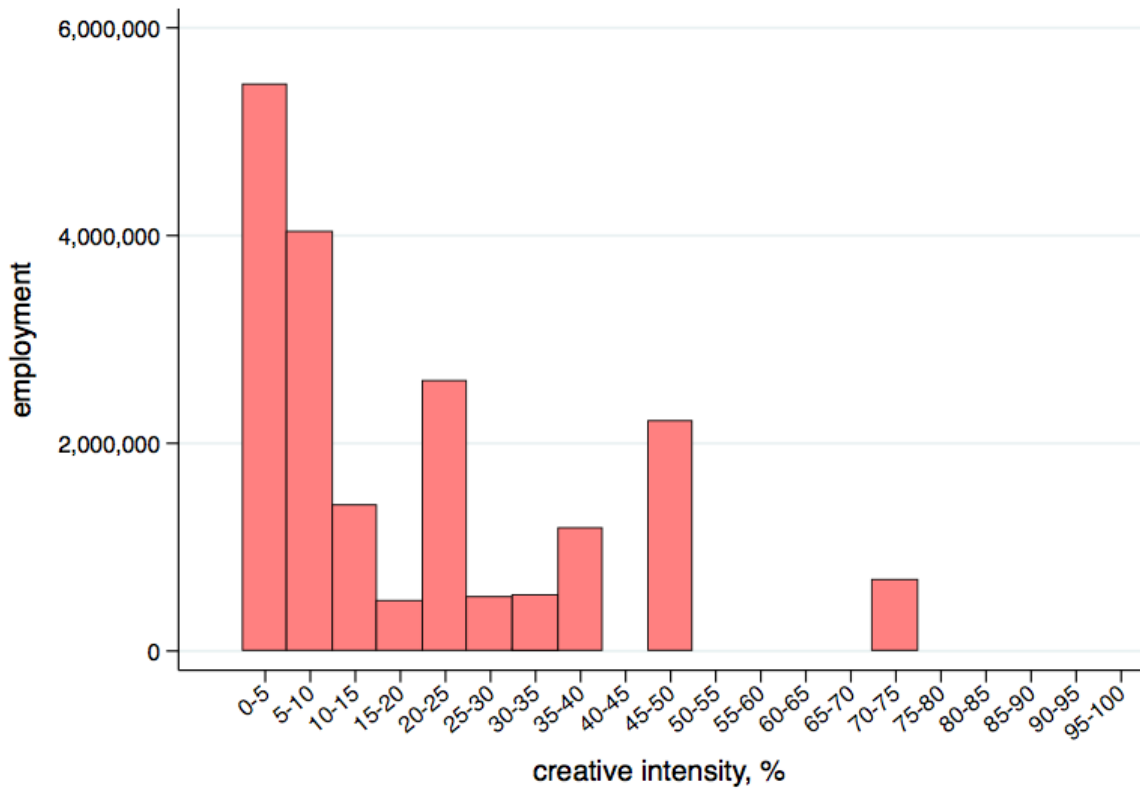
Source: ACS 2011-2013

Figure 4. Comparative distribution of shares of creative employment, US and UK, 2013
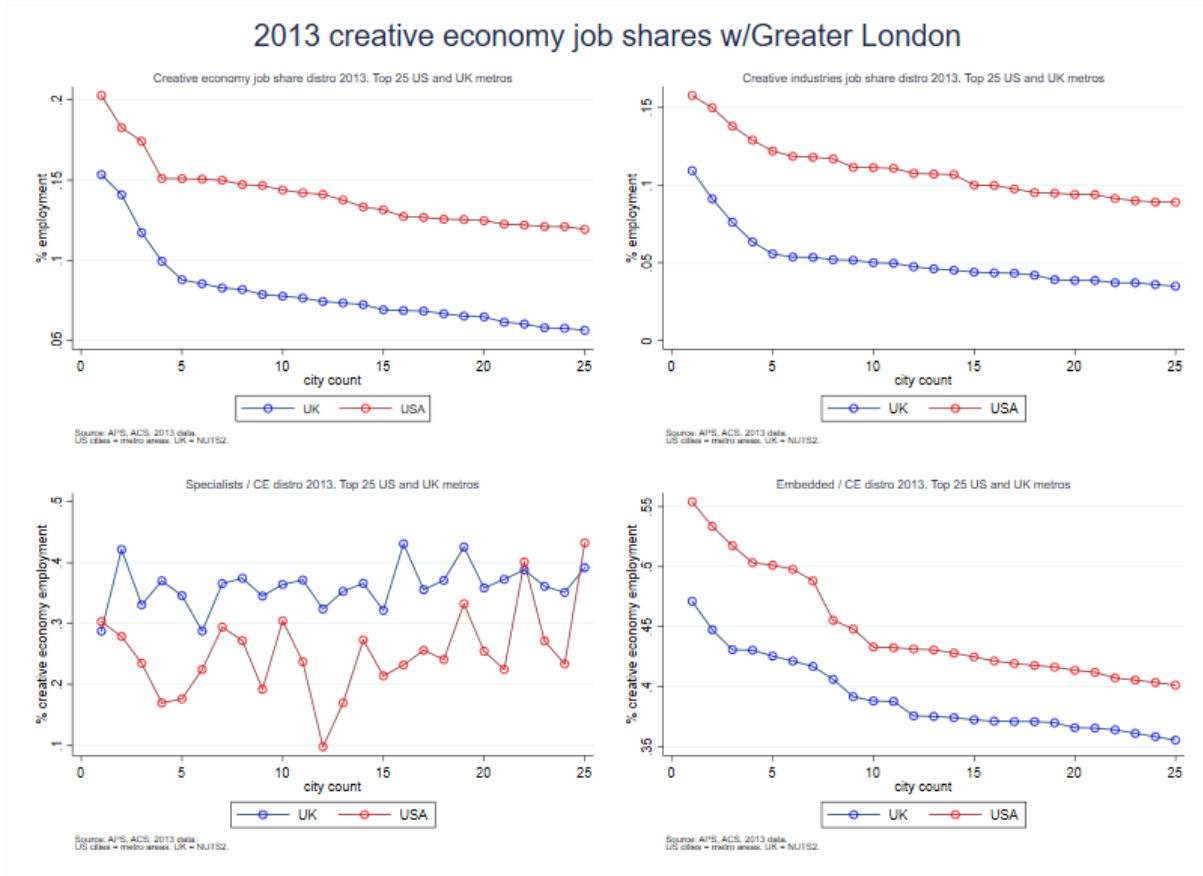
Figure 5. Comparative indexed distribution of creative employment, US and UK, 2013
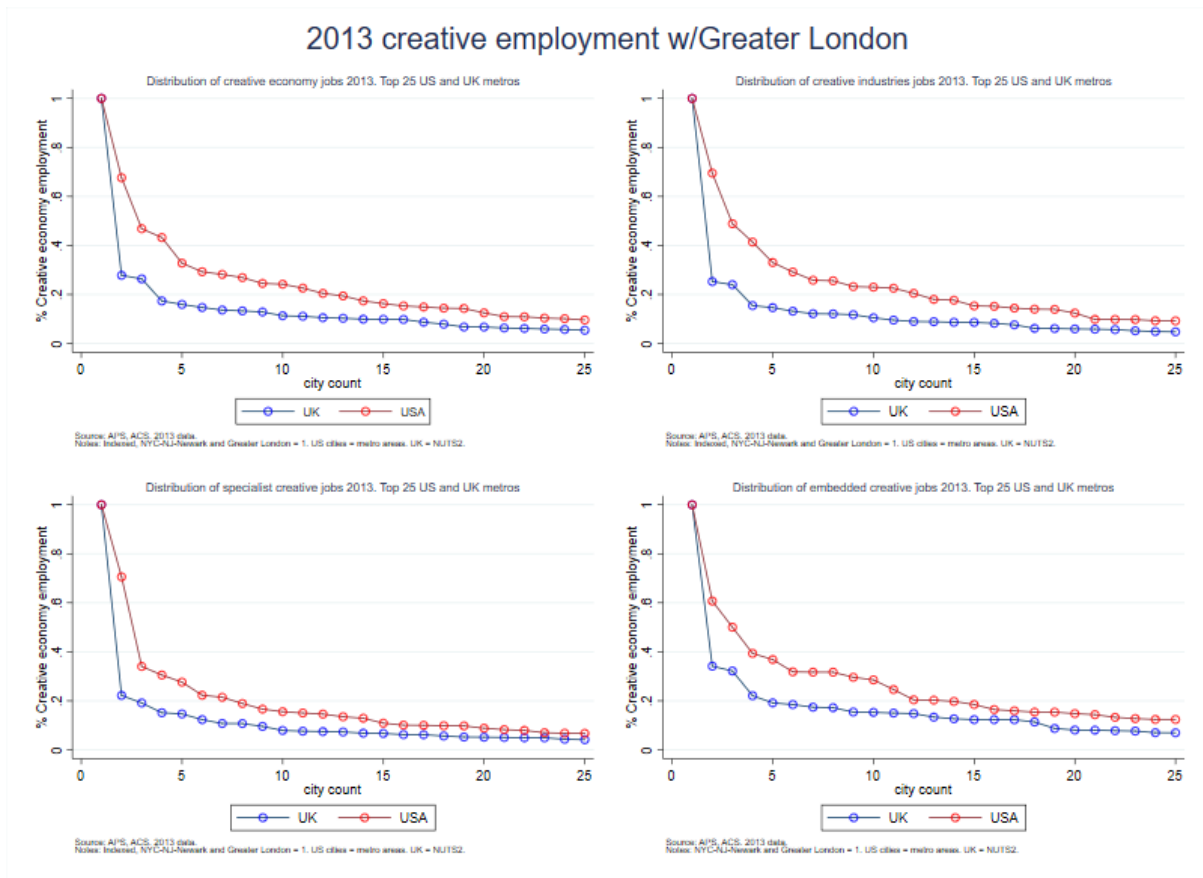
Table 1. US/ UK creative industries groups.

US, 2011-2013 average					
Industry group	**Creative intensity**	**Jobs**	**Creative jobs**	**% Creative industries jobs**	**% All jobs**
Advertising and marketing	0.171	1,880,000	322,000	18.29%	1.32%
Architecture	0.212	1,418,000	301,000	13.80%	0.99%
Crafts	0.141	190,000	27,000	1.85%	0.13%
Design activities	0.711	320,000	228,000	3.12%	0.22%
Film, TV, video, radio and photography	0.287	963,000	276,000	9.37%	0.67%
IT software and computer services	0.223	2,069,000	459,000	20.10%	1.45%
Publishing	0.272	1,402,000	381,000	13.65%	0.98%
Museums, galleries and libraries	0.217	596,000	129,000	5.80%	0.42%
Music, performing and visual arts	0.486	1,440,000	693,000	14.02%	1.01%
				100%	*7.19%*

UK, 2011-2013 average					
Industry group	**Creative intensity**	**Jobs**	**Creative jobs**	**% Creative industries jobs**	**% All jobs**
Advertising and marketing	0.533	142,000	76,000	9.21%	0.49%
Architecture	0.647	90,000	58,000	5.80%	0.31%
Crafts	0.557	7,000	4,000	0.48%	0.03%
Design activities	0.613	106,000	65,000	6.83%	0.37%
Film, TV, video, radio and photography	0.607	212,000	129,000	13.69%	0.74%
IT software and computer services	0.427	523,000	223,000	33.77%	1.82%
Publishing	0.520	194,000	101,000	12.56%	0.68%
Museums, galleries and libraries	0.235	82,000	19,000	5.33%	0.29%
Music, performing and visual arts	0.703	191,000	134,000	12.33%	0.66%
				100%	*5.38%*

Source: American Community Survey, UK Annual Population 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. All counts rounded to the nearest thousand.

Table 2. Employment in the US and UK creative economies

Year	(a) Creative industries		(b) Embedded		(a+ b) Creative economy	
US, 2011-2013						
	total	% all jobs	total	% all jobs	total	% all jobs
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	

Year	(a) Creative industries		(b) Embedded		(a+b) Creative economy	
UK, 2011 - 2013						
	total	% all jobs	total	% all jobs	total	% all jobs
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.

Notes: Creative economy defined as in Bakhshi et al (2012). 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.

Table 3. Creative tridents for the US and UK.

US, 2011-2013 average			
	Creative industries	**Non-creative**	**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

UK, 2011-2013 average			
	Creative industries	**Non-creative**	**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.

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.

ONLINE APPENDICES

Appendix A / Creative occupations and industries crosswalking

Table A1. Starting set of creative occupations.

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

Source: DCMS 2014.

Figure A1. Decision rules for imperfect matches and non-matches.

Rule 1 / Use descriptor fields on both sides to select a match on the basis of the free-text description of the cell	**Match**
Rule 2 / When a UK cell maps onto multiple US cells, look for matched US cells based on descriptor …	
… then drop US cells unless included in possible matches for other cells	**Match**
Rule 3 / Highlight any remaining 'marginal matches', e.g. where descriptors have limited overlap	Match → Sensitivity tests
Rule 4 / Highlight any cases for which these rules do not result in a UK-US match. If possible create a least-worst match	**Least worst match** → Sensitivity tests
Rule 5 / Highlight any errors in the concordance table, suggest, alternative go to 1	

Table A2. 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	Photographers
		3521	Broadcasting and audiovisual technicians
3421	Graphic designers	2166	Graphic and multimedia designers
3422	Product, clothing and related designers	2163	Product and garment designers
		3432	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

Table A3. 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	Computer and Information Research Scientists
		151111	Computer Systems Analysts
2512	Software developers	151130	Software Developers, Applications
		151130	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	Librarians
		259011	Audio-Visual and Multimedia Collections Specialists
2621	Archivists and curators	254010	Archivists, Curators
2642	Journalists	273020	Reporters and Correspondents
		273041	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	Civil Engineering Technicians
		173031	Surveying and Mapping Technicians
2651	Visual artists	271010	Fine Artists, Including Painters, Sculptors, and Illustrators
2641	Authors and related writers	273042	Technical Writers
		273043	Writers and Authors
2655	Actors	272011	Actors
2355	Other arts teachers	253000	Self-Enrichment Education Teachers
		272040	Teachers and Instructors, All Other
2652	Musicians, singers and composers	272040	Music Directors and Composers; Musicians and Singers

Table A3 continued.

ISCO08	ISCO08 Descriptor	OCCSOC	OCCSOC Descriptor
2654	Film, stage and related directors and producers	271010	Art Directors
		272012	Producers and Directors
		274030	Film and Video Editors
3431	Photographers	274021	Photographers
3521	Broadcasting and audiovisual technicians	274011	Audio and Video Equipment Technicians
		274012	Broadcast Technicians
		274013	Radio Operators
		274014	Sound Engineering Technicians
		274031	Camera Operators, Television, Video, and Motion Picture
		274099	Media and Communication Equipment Workers, All Other
2166	Graphic and multimedia designers	271010	Multimedia Artists and Animators
		271020	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	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
		514199	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	Molders, Shapers, and Casters, Except Metal and Plastic
		517011	Cabinetmakers and Bench Carpenters
7522	Cabinet-makers and related workers	517021	Furniture Finishers
		517130	Model Makers, Wood
			Patternmakers, Wood
7319	Handicraft workers not elsewhere classified	271012	Craft Artists

Notes: Source for concordance tables: ONS (2010), BLS (2012) and IPUMS (2015). Blue highlight = adjusted bad crosswalk.

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.

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 4-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 2641, 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 in section 3. Analysis of descriptors from BLS (2012) and ILO (2009) confirm this, so we drop these two cells from the final crosswalk.

Table A4. SIC - ISIC crosswalk

SIC07	SIC07 Descriptor	ISIC4	ISIC4 Descriptor
32.12	Manufacture of jewelry and related articles	3211	Manufacture of jewelry and related articles
32.11	Striking of coins	3211	Manufacture of jewelry and related articles
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	5820	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	6202	Computer consultancy and computer facilities management activities
70.21	Public relations and communication activities	7020	Management consultancy activities
70.22	Business and other management consultancy activities	7020	Management consultancy activities
71.11	Architectural activities	7110	Architectural and engineering activities and related technical consultancy
71.12	Engineering activities and related technical consultancy	7110	Architectural and engineering activities and related technical consultancy

Table A4 continued.

SIC07	SIC07 Descriptor	ISIC4	ISIC4 Descriptor
73.11	Advertising agencies	7310	Advertising
73.12	Media representation	7310	Advertising
74.1	Specialised design activities	7410	Specialized design activities
74.2	Photographic activities	7420	Photographic activities
74.3 74.9	Translation and interpretation activities Other professional, scientific and technical activities n.e.c.	7490	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	9000	Creative, arts and entertainment activities
90.03	Artistic creation	9000	Creative, arts and entertainment activities
90.04	Operation of arts facilities	9000	Creative, arts and entertainment activities
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	9102	Museums activities and operation of historical sites and buildings

Notes: Concordance tables used are from UN-DESA (2008), US Census Bureau (2012) and IPUMS (2015). Green highlight = fuzzy crosswalk from SIC-ISIC. Grey highlight = bad match. All groups included but subject to sensitivity tests.

Table A5. US creative industries: ISIC - INDNAICS crosswalk

ISIC4	ISIC4 Descriptor	INDNAICS	INDNAICS Descriptor
3211	Manufacture of jewelry and related articles	3279	Miscellaneous nonmetallic mineral products
3211	Manufacture of jewelry and related articles	3399M[1]	Sporting and athletic goods, and doll, toy, and game manufacturing
5813	Publishing of newspapers, journals and periodicals	51111	Newspaper publishers
5811	Book publishing	5111Z[2]	Periodical, Book, and Directory Publishers except newspapers
5812	Publishing of directories and mailing lists	5111Z[2]	Periodical, Book, and Directory Publishers except newspapers
5819	Other publishing activities	5111Z[2]	Periodical, Book, and Directory Publishers except newspapers
5820	Software publishing	5112	Software publishing
5820	Software publishing	51913	Internet publishing and broadcasting and web search portals
5911	Motion picture, video and television programme production activities	5121	Motion pictures and video industries
5912	Motion picture, video and television programme post-production activities		
5913	Motion picture, video and television programme distribution activities		
5914	Motion picture projection activities		
5920	Sound recording and music publishing activities	5122	Sound recording industries
6010	Radio broadcasting	5122	Sound recording industries
6020	Television programming and broadcasting activities	5122	Sound recording industries
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]	Other professional, scientific and technical services (excluding vets)
		5416	Management, scientific and technical consulting services

Table A5 continued

ISIC4	ISIC4 Descriptor	INDNAICS	INDNAICS Descriptor
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
9000	Creative, arts and entertainment activities	5191ZM[5]	Other information services, except libraries and archives, and except internet publishing and broadcasting and web search portals
9000	Creative, arts and entertainment activities	51912	Libraries and archives
9102	Museums activities and operation of historical sites and buildings	712	Museums, art galleries, historical sites, and similar institutions

Notes: Concordance tables used are from UN-DESA (2008), US Census Bureau {(2012) and IPUMS (2015). 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.

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 3-digit to 5-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 4-digit NAICS code (5111Z) 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.

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: that is, we lose some detail when crosswalking from SIC to ISIC (even if we gain detail in the ISIC – INDNAICS stage). 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 5111Z (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.

Appendix A references

Bureau of Labor Statistics (2012). ISCO08-SOC crosswalk. Washington, DC, BLS.

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UN-DESA (2008). International Standard Industrial Classification of All Economic Activities: Revision 4. Statistical papers Series M No. 4/Rev.4. New York, United Nations.

US Census Bureau (2012). Concordances: 2007 NAICS to ISIC4. US Census.

Appendix B: Additional results

Table B1. Sensitivity checks of US estimates to various challenges

Year	Creative industries	Embedded	Creative economy	Change in % CE	Change in intensity
Dropping poorly UK-US crosswalked cells (1)					
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)					
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)					
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)					
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. Creative economy defined as in Bakhshi et al (2012).

Table B2. Crosswalking check on US results using OES data, and comparison to UK results.

US OES, no self-employed						
Year	**Creative industries**		**Embedded**		**Creative economy**	
	Total	**% Of all jobs**	**Total**	**% of all jobs**	**Total**	**% of all jobs**
2011	7,990,000	6.29%	7,990,000	1.09%	7,990,000	7.38%
2012	9,973,000	5.68%	9,973,000	1.07%	9,973,000	6.75%
2013	6,807,000	8.06%	6,807,000	1.25%	6,807,000	9.31%

US ACS, no self-employed						
Year	**Creative industries**		**Embedded**		**Creative economy**	
	Total	**% Of all jobs**	**Total**	**% of all jobs**	**Total**	**% of all jobs**
2011	7,964,000	6.28%	7,964,000	2.59%	7,964,000	6.28%
2012	8,244,000	6.38%	8,244,000	2.59%	8,244,000	6.38%
2013	8,482,000	6.45%	8,482,000	2.64%	8,482,000	6.45%

Differences OES-ACS						
Year	**Creative industries**		**Embedded**		**Creative economy**	
	Total	**% Points**	**Total**	**% Points**	**Total**	**% Points**
2011	*-26,000*	*0.01%*	*-26,000*	*-1.51%*	*-26,000*	*-1.49%*
2012	*-1,730,000*	*-0.70%*	*-1,730,000*	*-1.52%*	*-1,730,000*	*-2.22%*
2013	*1,675,000*	*1.61%*	*1,675,000*	*-1.39%*	*1,675,000*	*0.22%*

UK APS, no self-employed						
Year	**Creative industries**		**Embedded**		**Creative economy**	
	Total	**% Of all jobs**	**Total**	**% of all jobs**	**Total**	**% of all jobs**
2011	1,019,000	4.17%	1,019,000	2.86%	1,019,000	7.03%
2012	1,098,000	4.48%	1,098,000	2.96%	1,098,000	7.44%
2013	1,100,000	4.43%	1,100,000	3.10%	1,100,000	7.53%

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. Creative economy defined as in Bakhshi et al (2012).

Table B3. Shares of Creative Employment in US Metropolitan Areas and UK NUTS2 Regions, 2013

Metropolitan area, 2013 OMB delineations	Creative Industries	Embedded	Creative Economy	NUTS2 name	Creative Industries	Embedded	Creative Economy
San Jose-Sunnyvale-Santa Clara, CA	15.8%	4.5%	20.3%	Inner London	14.9%	6.6%	21.5%
Washington-Arlington-Alexandria, DC-VA-MD-WV	15.0%	3.3%	18.3%	Berkshire Buckinghamshire & Oxfordshire	9.3%	5.4%	14.7%
San Francisco-Oakland-Hayward, CA	13.8%	3.6%	17.4%	Surrey East and West Sussex	7.7%	4.5%	12.1%
Austin-Round Rock, TX	11.8%	3.3%	15.1%	Outer London	8.4%	3.6%	12.0%
Seattle-Tacoma-Bellevue, WA	12.2%	2.9%	15.1%	Bedfordshire and Hertfordshire	6.4%	4.1%	10.4%
Provo-Orem, UT	11.9%	3.2%	15.1%	Bristol and Avon	5.8%	3.7%	9.5%
Huntsville, AL	12.9%	2.1%	15.0%	Hampshire and Isle of Wight	5.5%	3.6%	9.2%
Raleigh, NC	11.1%	3.6%	14.7%	East Anglia	5.4%	3.2%	8.7%
Denver-Aurora-Lakewood, CO	11.7%	3.0%	14.7%	Herefordshire Worcestershire & Warwickshire	5.2%	3.4%	8.6%
Bridgeport-Stamford-Norwalk, CT	11.2%	3.2%	14.4%	Leicestershire Rutland & Northamptonshire	4.5%	3.5%	8.1%
Boston-Cambridge-Newton, MA-NH	11.1%	3.1%	14.2%	Essex	5.2%	2.9%	8.1%
Ann Arbor, MI	9.5%	4.6%	14.1%	Cardiff-Newport	5.0%	2.9%	7.9%
Fort Collins, CO	10.7%	3.1%	13.8%	Kent	4.6%	3.1%	7.8%
Los Angeles-Long Beach-Anaheim, CA	10.8%	2.6%	13.3%	Leeds-Bradford	5.0%	2.8%	7.7%
Trenton, NJ	10.7%	2.4%	13.1%	Cheshire	4.4%	3.0%	7.4%
New York-Newark-Jersey City, NY-NJ-PA	10.0%	2.7%	12.7%	Cornwall and Isles of Scilly	4.8%	2.5%	7.3%
Baltimore-Columbia-Towson, MD	9.8%	2.9%	12.7%	Glasgow-Dumfries-Inverclyde	4.2%	3.1%	7.3%
Atlanta-Sandy Springs-Roswell, GA	9.4%	3.2%	12.6%	North Yorkshire	3.8%	3.5%	7.3%
Minneapolis-St. Paul-Bloomington, MN-WI	9.1%	3.4%	12.5%	Greater Manchester	4.3%	2.8%	7.2%
Colorado Springs, CO	10.0%	2.5%	12.5%	Dorset and Somerset	4.4%	2.7%	7.1%

Source: American Community Survey, UK Annual Population Survey.

Notes: APS data excludes second jobs. All samples have armed forces jobs removed to align sampling frames. See Section 3 for column definitions.

Table B4. Counts of Creative Employment in US Metropolitan Areas and UK NUTS2 Regions, 2013

Metropolitan area, 2013 OMB delineations	Creative Industries	Embedded	Creative Economy	NUTS2 name	Creative Industries	Embedded	Creative Economy
New York-Newark-Jersey City, NY-NJ-PA	946,192	257,522	1,203,714	Inner London	230,823	103,183	334,006
Los Angeles-Long Beach-Anaheim, CA	657,853	156,348	814,201	Outer London	193,594	83,942	277,536
Washington-Arlington-Alexandria, DC-VA-MD-WV	462,617	101,329	563,946	Berkshire Buckinghamshire & Oxfordshire	107,267	62,755	170,022
Chicago-Naperville-Elgin, IL-IN-WI	391,580	128,857	520,437	Surrey East & West Sussex	101,904	59,280	161,184
San Francisco-Oakland-Hayward, CA	312,656	81,933	394,589	Bristol and Avon	65,657	42,550	108,207
Boston-Cambridge-Newton, MA-NH	276,202	76,244	352,446	East Anglia	62,103	36,774	98,877
Dallas-Fort Worth-Arlington, TX	244,388	94,849	339,237	Bedfordshire & Hertfordshire	55,918	35,569	91,487
Atlanta-Sandy Springs-Roswell, GA	242,233	81,599	323,832	Greater Manchester	51,604	33,812	85,416
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	213,537	81,646	295,183	Hampshire and Isle of Wight	49,889	32,594	82,483
Houston-The Woodlands-Sugar Land, TX	217,664	73,507	291,171	Leeds-Bradford	51,315	28,404	79,719
Seattle-Tacoma-Bellevue, WA	219,860	52,198	272,058	Glasgow-Dumfries-Inverclyde	40,548	29,323	69,871
Miami-Fort Lauderdale-West Palm Beach, FL	193,719	52,516	246,235	Essex	44,563	24,400	68,963
Minneapolis-St. Paul-Bloomington, MN-WI	170,351	63,353	233,704	Leicestershire Rutland & Northamptonshire	36,613	28,520	65,133
Denver-Aurora-Lakewood, CO	167,117	42,316	209,433	Birmingham-Black Country-Wolverhampton-Coventry	34,958	27,070	62,028
Phoenix-Mesa-Scottsdale, AZ	145,230	50,894	196,124	Aberdeen and surrounds	38,142	23,535	61,677
San Jose-Sunnyvale-Santa Clara, CA	143,659	40,975	184,634	Derby-Nottingham	37,771	23,655	61,426
Detroit-Warren-Dearborn, MI	131,808	47,626	179,434	Kent	36,761	24,631	61,392
San Diego-Carlsbad, CA	136,526	36,994	173,520	Herefordshire Worcestershire & Warwickshire	32,356	21,430	53,786
Baltimore-Columbia-Towson, MD	132,528	39,610	172,138	Shropshire and Staffordshire	26,000	22,586	48,586
Austin-Round Rock, TX	117,609	32,845	150,454	Cardiff-Newport	26,267	14,971	41,238

Source: American Community Survey, UK Annual Population Survey.

Notes: APS data excludes second jobs. All samples have armed forces jobs removed to align sampling frames. See Section 3 for column definitions.