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Innovation in creative cities: Evidence from British small firms

Neil Lee and Andrés Rodríguez-Pose



Utrecht University

Urban & Regional research centre Utrecht

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Neil Lee and Andrés Rodríguez-Pose

Department of Geography and Environment, London School of Economics
n.d.lee@lse.ac.uk; a.rodriguez-pose@lse.ac.uk

Abstract

Creative cities are seen as important sites for the generation of new ideas, products and processes. Yet, beyond case studies of a few high-profile cities, there is little empirical evidence on the link between local creative industries concentration and innovation. This paper addresses this gap with an analysis of around 1,300 UK SMEs. The results suggest that firms in local economies with high shares of creative industries employment are significantly more likely to introduce entirely new products and processes than firms elsewhere, but not innovations which are simply new to the firm. This effect is not exclusive to creative industries firms and seems to be largely due to firms in medium sized, rather than large, cities. The results imply that creative cities may have functional specialisations in new content creation and so firms are more innovative in them.

Keywords: Creativity, Creative Cities, Creative Industries, Cities, Innovation

JEL: O31; O38; R1; R11; R58

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1. Introduction

Since at least the work of Jacobs (1961), creativity has been seen as vital for economic growth and cities as the focal points of creative activity. Concentrations of innovative firms, workers and institutions may engender a ‘creative milieu’ developing and supporting the production of new ideas (Power 2002; Scott 2006; 2014; Lazzeretti et al. 2008; Stam et al. 2008). This creative environment may help firms develop innovative products, as content production in the core creative sectors is commercialized and/or tacitly diffused by creative service companies. Spillover effects are generated from creative firms, breeding learning processes that favour creation, diffusion, and rapid adoption of new ideas. Creative content may then become a part of the production processes of other sectors, helping them innovate (Müller et al. 2009).

Cities develop functional specialisations, as cities with different characteristics play different roles in production processes (Duranton & Puga 2001; Audretsch et al. 2011; Kourtit et al. 2011). For example, Duranton and Puga (2001) suggest that larger cities may be specialised in new product design while smaller, more affordable cities focus on production processes. In a similar fashion, cities with strong creative sectors may specialise in the production of new ideas. The creative environment of these cities – with their concentrations of designers, artists, and specialists in both new content production and commercialisation – would generate the conditions for the emergence of innovative firms and attract firms hoping to create new products.

‘Creative cities’ are, as a consequence, increasingly considered as motors of economic change (e.g. Lange et al. 2008; Clifton 2008; Chapain et al. 2010; Cohendet et al. 2010). Yet limited quantitative research has directly addressed whether firms in these cities are indeed drivers of innovation and economic growth. Moreover, not all ‘creative cities’ will be the same. Larger cities with strong creative economies may be focused on different elements of production than otherwise similar smaller cities (Andersen & Lorenzen, 2014). This paper covers this gap using the Small Business Survey (SBS) 2010, a dataset of around 1,300 British SMEs. The SBS data is linked to a local measure of whether firms are in the top 25% of UK travel to work areas (local economies) by creative industries employment: a measure of ‘creative cities’. In doing so, the paper presents new evidence on the role of creative cities in innovation and adds to the literature on the geographical determinants of firm innovation.

The results suggest that firms in ‘creative cities’ are more likely to introduce entirely new products and processes than firms elsewhere: controlling for firm characteristics and the size

of the local economy, we find that firms in travel to work areas with high shares of creative industries employment are 4 per cent more likely to introduce entirely new products and 3 per cent more likely to introduce entirely new processes. However, while theory leads us to expect that concentrations of creative firms may provide knowledge spillovers, skilled staff and other sharing of inputs which help creative firms innovate, we uncover no evidence that the creative industries in creative cities are more innovative than firms in other sectors and the ‘creative city effect’ is widespread across all firms rather than exclusive to the creative industries themselves. The advantage of creative cities is only for entirely new innovations, rather than innovations learnt from elsewhere. Moreover, different sizes of city seem to specialise in different types of innovation. In particular, medium sized cities with strong creative economies seem to be particularly important in the creation of new product innovations. Creative cities are genuine breeding grounds of new ideas, rather than spaces where new ideas spillover from creative firms to the surrounding environment.

This paper addresses two important gaps in the literature on this subject. One issue is that empirical evidence has tended to be in the aggregate, with studies testing the link between urban or regional creativity and innovation at an urban or regional level (Kourtit et al. 2011). Second, work has focused on the link between creativity and growth or productivity, rather than innovation. No study has investigated these processes at the firm level and how firm characteristics interact with locational variables. In addressing these gaps, the paper contributes both to the literature on creativity in cities (e.g. Neal 2012; Cohendet et al. 2010; Scott 2006) and empirical research on the link between location and firm level innovation (e.g. Roper et al. 2000; Czarnitzki & Hottenrott 2009; Iammarino & McCann 2006; Lee 2014).

The paper is structured as follows. Section two outlines the links between creativity, innovation and place – it develops three hypotheses for the links between firm innovation and whether the firm is in a creative industry, employs creative workers, or is located in a creative city. Section three outlines our data used to test these hypotheses. Section four presents our results, and section five discusses their relevance for both theory and policy in this area.

2. Creative cities and the creative industries

There is a wide and growing literature on the so-called ‘creative cities’ (e.g. Hall, 2000; Scott, 2006, 2014; Evans, 2009). This is a concept which has caught the imagination of researchers and decision-makers alike. Building on high-profile case studies such as New York (Hall,

2000; Currid, 2007), 'creative cities' are regarded as focal points for cultural production, in a world where culture and creativity have gained symbolic value, particularly in economies which are less dependent on raw materials or manufactured goods and increasingly rely on knowledge and innovation. Scott (2014: 569) argues that the old distinction between cities which specialise in industry and those which specialise in culture is breaking down, with some cities becoming a "creative city", i.e. a city where production, work, leisure, the arts and the physical milieu exist in varying degrees of mutual harmony." Similar processes may operate at a more prosaic level, with particular cities developing economies which focus on new content production.

One way of defining 'creative cities' is through their industrial base. In particular, one facet of creative cities is that they may be those with high concentrations of employment in the creative industries – those that "focus on creating and exploiting symbolic cultural product (such as the arts, films and interactive games), or on providing business-to-business symbolic or information services in areas such as architecture, advertising and marketing and design, as well as web, multimedia and software development" (Cunningham & Higgs, 2009: 191-192). As most developed economies have become more and more reliant on non-physical production of aesthetic or intangible goods, these industries are increasingly regarded as fundamental drivers of economic growth and as the cornerstones of innovation (Power 2002; Andari et al. 2007; Stam et al. 2008). As a consequence, the creative sector has been put at the heart of government policies aimed at stimulating employment, innovation, and sustainable economic growth. This has particularly been the case in many developed countries, where governments have attempted to stimulate creative sectors with the aim of triggering a fast-growing and innovative economy (Cooke & De Propris 2011).

Given their increasing salience, it comes as no surprise that a number of attempts have been made to define the creative industries using sectoral data. However, identifying what can be considered as creative industries is not free from controversy. In the UK, the seminal definition is that of the Department for Culture, Media and Sport (DCMS). According to the DCMS definition, creative industries include twelve sub-sectors: Advertising; Architecture; Arts & Antiques; Crafts; Design; Designer Fashion; Video, Film & Photography; Music and the Visual and Performing Arts; Publishing; Software/Electronic Publishing; Digital & Entertainment Media; Radio & TV (DCMS 2010). This broad definition has been criticized on a number of fronts. It includes the arts alongside technology based sectors. It also ignores the wider spread of creativity into other sectors of the economy (Cunningham 2011; Lee & Drever 2013). Last but not least, many new sectors may not be captured in dated standard industrial classifications (Cunningham & Higgs 2009). Yet, despite these criticisms, it has

become the standard definition in the UK, and is widely used by policymakers and researchers (Chapain et al. 2010).

Researchers working on creative industries have over the years built a portrait of the archetypical creative industry. First, the general view is that a creative industry is, by nature, innovative. Creative industries are supposedly based directly on new content production and so should be more innovative. Yet the evidence on this point is inconclusive (Sunley et al. 2008; Lee & Drever 2013; Lee & Rodríguez-Pose 2014), and, despite a wide qualitative literature, the empirical basis of these claims is weak. In one seminal study, Müller et al. (2009) use a sample of around 2,000 Austrian creative industries firms and show that they are significantly more likely to introduce entirely new (original) product innovations than other knowledge-based sectors. However, other work suggests that while the creative industries are an innovative sector, other sectors are often actually more innovative (Chapain et al. 2010). There is less controversy in the view the creative industries are fundamental drivers of innovation in other sectors (Bakhshi et al. 2008; Müller et al. 2009).

Second, creative industries are considered as eminently urban and associated to big cities. An important strand in the literature on creativity and innovation has been built around the role of cities (Currid-Halkett & Stolarick 2013). The creative industries are generally viewed as dependent on the density of specialised workers, suppliers and customers offered by cities (Jayne 2005; Pratt 2006; Chapain & Comunian 2010; Lazzeretti et al. 2008;). The links between the creative industries and the city will vary, depending on factors such as the availability of hard and soft infrastructure, or the strength of local markets (Comunian et al. 2010). Evidence suggests that creative industries also tend to cluster. In the UK large cities like London, Manchester and Edinburgh are big hubs of creative industries employment. But clustering in smaller cities, such as Bath, Brighton and Oxford, is also common (Chapain et al. 2010).

Cities with high shares of creative industries employment may be functionally specialised in new content generation. Studies of urban areas suggest that cities develop functional specialisations in different areas of activity (Duranton & Puga 2001, 2005; Audretsch et al. 2011). One process might be self-selection (Stephan 2011). Innovative firms will sort into cities with high share of creative industries to take advantage of the benefits of location near creative production. Alternatively, firms which are located in these cities for other reasons will find it easier to introduce new products and processes because of a more developed local support infrastructure.

Whether creative firms are more innovative and predominantly urban is, however, subject to contention. Firm-level data has been used in a number of studies to investigate the links between innovation and local characteristics. Maré et al. (2014) combine data for New Zealand firms with six or more employees with census data for local labour markets. They test whether local migrant share influences firm innovation, but find no link when controls are used. Lee (2014) finds that migrant run SMEs are more innovative, but that firms in cities with high shares of migrants are not. However, other studies show that even with controls firms in major cities are more productive (Andersson & Lööf 2011). The balance of evidence from these studies suggests that locational characteristics matters for firm performance and innovation, but that the basic characteristics of the individual firm are far more important (Stephan 2011).

Yet, despite the fast-growing literature on creative cities, little research has directly tested the link between creativity at the local level and innovation at the firm level. The link between urban concentrations of creative industries, workers and innovation in firms has been largely based on case study evidence and assumptions. We try to cover this gap in the literature in our first hypothesis, by testing whether there is something intrinsic about ‘creative cities’ – cities with high shares of either creative industries employment or workers in creative occupations – which makes firms located in them more innovative.

H₁ Firms in ‘creative cities’ are more innovative than those elsewhere

The second hypothesis is that creative firms find locations in creative cities particularly important. Research in economic geography and innovation studies has considered the importance of either local economic specialisation or diversity in helping firms innovate. Specialised local economies will help firms access knowledge from other, similar firms, and so create innovations. In contrast, local economic diversity may provide a greater variety of external knowledge sources, pushing firms to innovate in an altogether different way. More recent work on the importance of diversity has stressed the need for related variety, with knowledge spillovers coming from other, related sectors and increasing innovation (Boschma & Iammarino 2009).

There may be similar effects operating within the creative industries. If specialisation is important for the creative industries, creative cities may breed cultures fitting for the creation of innovation, one example being New York (Currid & Connolly 2008). For creative firms, reliant on the production and exchange of tacit knowledge between firms, the benefits of such an environment may be beneficial. In this case, creative firms would be more innovative in

creative cities. Yet if it is local economic diversity which matters – whether related or unrelated – it might be that the creative industries are no more innovative in creative cities than elsewhere. In this case, the innovation processes of creative firms may derive from their relations with other sectors, or be independent of local geographical factors altogether.

H₂ Firms in the creative industries are more innovative in creative cities

A final hypothesis relates to the type of creative cities we consider. Although there has been relatively little differentiation of ‘creative cities’ in the literature, cities with different creative characteristics may have different roles in the economy. For example, Andersen and Lorenzen (2014: 111) argue that in Denmark there are four types of creative cities. ‘Hubs’ are large cities serving as national centres but are also linked into international markets. ‘Hubs’ are surrounded by ‘satellites’, which offer some of the advantages of the former, such as specialised labour markets, but which are cheaper. ‘Clusters’ are cities or towns with specialised industrial clusters and which are not close to ‘hubs’. Finally, ‘quaint’ are smaller towns, which may have an attractive or unique physical environment. In our analysis we focus on two sources of variation – size and whether cities have high shares of creative industries employment. Large cities may suffer from diseconomies which may hinder the development of creative sectors (Lorenzen & Andersen, 2009). However, if following the view that urban scale provides the critical mass needed for firms to create new, innovative products, larger creative cities will be the main drivers of innovation. The third hypothesis tests this:

H₃ Firms in large creative cities are more innovative than those elsewhere

The remainder of this paper tests these hypotheses using a dataset of British SMEs.

3. Data and Model

Data sources

The principal source of data is the Small Business Survey (SBS) 2010, a survey of small and medium sized enterprises (SMEs) employing fewer than 250 people. This is an official UK government survey conducted by the Department for Business Innovation and Skills (BIS). The sample is stratified by size within each of the UK countries (England, Wales, Scotland and Northern Ireland). Around one sixth of the sample are sole-traders, a third micro businesses (1 – 9 employees) and small businesses (10 – 49 employees) and one sixth

medium sized (50 – 249 employees). The sample was drawn randomly across all commercial sectors, with firms identified using the Dun and Bradstreet database.

Each firm is located in a travel to work area (TTWA). This is the standard definition of local labour market in the UK. A TTWA is defined to represent areas with 75% self-containment (i.e. 75% of residents work in the same area – see Coombes & Bond 2008). To link firms to TTWAs we match them with postcode data in the Business Structure Database / Inter-Departmental Business Register (IDBR). A number of firms cannot be matched to the IDBR and local economic data is not available for Northern Ireland. For others, certain questions are missing as they are asked only of random sub-samples of the data – although, as these are randomly decided, they are unlikely to affect the results. After these exclusions are applied, the final sample contains 1,336 firms.

Defining the creative industries and creative cities

Following other research in this area (e.g. Lee & Rodríguez-Pose, 2014), we modify the standard DCMS (2010) definition of creative industries. This consists of 12 sub-sectors as creative sectors: Advertising; Architecture; Arts & Antiques; Crafts; Design; Designer Fashion; Video, Film & Photography; Music and the Visual and Performing Arts; Publishing; Software / Electronic Publishing; Digital & Entertainment Media; Radio & TV. Each of these is defined according to standard SIC codes. However, the DCMS definition gives shares of each SIC code which are included (for example, only 50% of ‘Other publishing activities’ is allocated to the creative industries). To deal with this, only SIC codes in which 50% of more firms are creative are included. Moreover, crafts businesses are too small to be measured in standard business surveys, and DCMS excludes them.¹ The result is the seven sectors defined in Table 1.

Using the DCMS definition, creative cities are those in the top 25% of creative industries employment, containing a share greater than 1.5% of the overall employment in the creative industries employment. 58 from a total of 243 travel to work areas are considered creative by this measure.² Clearly, these TTWAs are not all cities in the classical sense. However, they do represent local economies and including all TTWAs maximizes the sample size.

¹ Based on DCMS (2010) the final definitions for SIC 2007 codes are as follows: Advertising = Advertising Agencies (73.11), Media Representation (73.12); Architecture = Architectural activities (71.11); Arts and Antiques – Not included.

² The creative cities are divided into three size classes: 167 firms (12.5 percent) are in ‘large creative cities’ with more than 350,000 employees, 247 (18.5 percent) are in ‘medium-sized creative cities’

The creative cities are relatively diverse in their characteristics. Some, such as Edinburgh, Manchester or London fulfil the role of major hubs. They are major cities with a strong reputation for creative industries activity. Smaller cities in the South and East of England, such as Brighton, Oxford or Peterborough, are satellites to these hubs. Clusters and quaints are found in more rural areas and/or relatively small local economies, such as Pitlochry and Ludlow. These will have different creative industries specialisms in them – Pitlochry, for example, is known for its tourist trade and a large theatre. Relatively few of these are formerly industrial sites. Some areas – Bradford or Scarborough, for example, are not affluent cities. A slim majority (30) of the TTWAs are located in the South and East of England, however. Overall, while there is a bias towards more affluent parts of the UK, creative cities are geographically spread and, although large cities are over-represented, some smaller cities and rural areas also host creative economies.

Defining innovation

Innovation is a highly complex, context dependent phenomenon for which there are many potential definitions. A classical definition of innovation is the “successful implementation of a new product, service, or process, which for most activities entails their commercial success” (Gordon & McCann, 2005: 525). Following this definition, innovation is not limited to new products – new services or processes are also included in our definition.

While understanding innovation in most sectors is complicated enough, understanding innovation in the creative industries is particularly difficult (Müller et al. 2009). The creative

with more than 50,000 employees and the remainder (38 firms, 3 percent) are in ‘creative rural areas’ with fewer than 50,000 employees. Large creative cities are: Bristol, Cardiff, Edinburgh, Glasgow, Guildford & Aldershot, Leeds, Manchester & Southampton. Medium sized creative cities are: Banbury, Basingtoke, Bath, Bournemouth, Bradford, Brighton, Cambridge, Carlisle, Cheltenham & Evesham, Chester & Flint, Chichester & Bognor Regis, Colchester, Crawley, Dundee, Harlow & Bishop's Stortford, Harrogate & Ripon, Hull, Inverness & Dingwall, Ipswich, Kettering & Corby, Luton & Watford, Newbury, Norwich, Oxford, Peterborough, Reading & Bracknell, Stevenage, Tunbridge Wells, Warwick & Stratford-upon-Avon, Worthing, Wycombe & Slough. Finally, 38 (3 percent) are in creative rural areas or small TTTWAs: Aberystwyth & Lampeter, Barnstaple, Brecon, Bridlington & Driffield, Bridport & Lyme Regis, Cardigan, Kidderminster, Kingsbridge & Dartmouth, Ludlow, Monmouth & Cinderford, Penzance & Isles of Scilly, Pitlochry, Pwllheli, Scarborough, Skye & Lochalsh. Note that the results from a separate approach, using the share of creative industries employment, are very similar.

industries are diverse and some sectors, such as software companies may have classical 'product' outputs. In this case, simple measures of product innovation may apply. Other parts of the creative industries, however, mostly offer services which are inputs into processes of production elsewhere. For example, advertising agencies may offer particular services to clients, services which allow other firms to successfully commercialise new products.

In many parts of the creative industries, new innovations simply take the form of subtle or aesthetic changes to existing products or processes. Stoneman (2009: 4) outlines the concept of soft innovation: "changes in goods and services that primarily impact on sensory or intellectual perception and aesthetic appeal rather than functional performance". These changes are primarily focused on product innovations, but can be related to process innovations. Soft innovations are not limited to the creative industries, but are particularly important in creative sectors.

The literature on innovation in the creative industries has some important implications for the choice of innovation indicators. Measures such as patenting or R&D spending – which are common for innovation research in other sectors, but biased to technological change – are less likely to be suitable for the creative industries. Alongside this, innovation measures need to encapsulate new products and services offered by creative industries firms, as well as new processes introduced as part of changes in their internal production system. Finally, innovation literature suggests that one of the innovative outputs from creative industries firms is likely to be innovation in other sectors of the economy. Testing whether firms in local economies with high shares of creative industries employment are more innovative is one way of addressing this.

The SBS asks firms about both product and process innovation activity through the question:

"I'd now like you to think about innovation within your business i.e. new products and processes. Have you introduced new or significantly improved products or services in the past twelve months?"

Based on this, our basic product innovation variable is whether a firm has introduced a new or significantly improved product or service onto the market in the past 12 months. This is useful, as it will include both new products, which may be applied in some parts of the economy, as well as new services which may be offered by other firms, including some in the creative industries. Following this, firms are asked the following question:

“Have you introduced new or significantly improved processes in the last twelve months?”

This is used as the measure of process innovation. It is also possible to distinguish between innovations which are original or those which are simply new to the firm (following Lee & Rodríguez-Pose 2013). There will be fewer entirely original innovations, but these may be more valuable. These original innovations are likely to derive from the recombination of existing knowledge in other areas, or the link between innovations which are new to the firm and learnt from elsewhere, with firms applying ideas already produced elsewhere.

This gives six variables: (1) any product or service innovation; (2) original or new to the market product or service innovation; (3) learnt or new to the firm product or service innovation; (4) any process innovation; (5) original or new to the market process innovation; and (6) learnt or new to the firm process innovation. Each variable is a binary which is zero, if the firm does not innovative in this way, and one, if the firm does.

Table 2 around here

Table 2 gives information on innovation in creative cities and those in less-creative cities. There are 584 firms located in creative cities. Firms in creative cities are particularly likely to introduce new product innovations: almost 52% of firms in creative cities do this, compared to only 48% of other firms. This advantage is particularly pronounced for entirely new product innovations, with 12.4% of firms in less creative cities doing this, compared to 15.7% inside. Similarly, while firms in creative cities are more likely to introduce new processes, this is more likely to be the case for entirely new processes (9.1% compared to 6.5%) than those simply new to the firm (31.5% compared to 31.8%). In short, firms in creative cities introduce more entirely new product and process innovations than firms elsewhere.

4. Model and Results

The model and variables

Our basic model is a simple innovation production function. The unit of analysis is each firm, while the dependent variable is if the firm has introduced a new innovation in the previous year. The model is specified as follows:

$$\text{INNOV}_i = \alpha + \beta_1 \text{CREATIVE}_i + \beta_2 \text{CI}_i + \beta_3 \text{CI} * \text{CREATIVE}_i + \beta_4 \text{FIRM}_i + \beta_5 \text{CITY} + \varphi + \varepsilon \quad (1)$$

for firm 'i'. Where,

INNOV is one of the six measures of product and process innovation outlined above,

CREATIVE is a binary variable which takes the value one if the firm is located in a creative city,

CI is a binary variable which is one if the firm is in the creative industries (see Table 1 for definitions),

CI*CREATIVE is an interaction term between the creative city and creative industry variables,

FIRM is a set of variables for the basic characteristics of the firm, these being whether the firm is a sole trader, age, legal structure, whether the firm has experienced a recent change of ownership, has multiple sites, the size of the firm and sector,

CITY is represented by two controls – the log of employment in the TTWA and a dummy variable for London,

' φ ' are sectoral dummies (15, of which the CI variable is one) and ' ε ' is the error term.

The two city control variables need some justification. First, we control for city size with the logged value of the total number of employees taken from the ABI. Larger cities are considered to have greater competitive pressures, allow specialised production, and help firms learn from each other. However, they may also have to cope with greater congestion. Moreover, the benefits of city size will differ according to different types of firms (Rigby & Brown 2013). If larger cities help firms create new ideas, through specialised inputs or a diversity of knowledge sourcing, larger cities should produce more original innovation. If cities help firms learn from each other, the larger cities may create new learned innovations (Lee & Rodríguez-Pose 2013). Firms in larger cities should, therefore, introduce more innovations (Duranton & Puga 2011).

Our second city control variable is a dummy variable for whether a firm is located in London. This is for two reasons. First, innovation in London may differ significantly from that in other cities (Wood 2009). Second, because London has a high share of creative industries employment, it is used ensure that results are not driven by a ‘London’ effect. Past work has shown that creative industries firms in London are less innovative than expected (Lee & Drever 2013).

The age of a firm will also matter, with older firms less likely to produce new innovations, as they will have a larger stock of products which are already on the market. There are three age controls: firms which are younger than 4, those between 4 and 10 and firms older than ten (the reference category).

Exporting is an important determinant of innovation (Anon Higon & Driffield 2011). Exporting firms may develop products suited for new markets and be able to introduce products and processes from elsewhere. A control for whether a firm exports is included.

Ownership will also be an important factor in innovation. Firms which are Public Limited Companies (PLCs) will face shareholder pressure, which may make them more innovative (Lee & Rodríguez-Pose 2013). A control for whether a firm is a PLC is used. New owners may bring new products or processes to the firm, leading us to introduce a control for whether firms have changed owners in the past three years. We expect this to be positively related to innovation, but only innovation which is new to the firm and not the market.

Similarly, firms operating from multiple sites will have exposure to more competition and access to external knowledge from a wider range of sources.³ Thus, they would be expected to introduce more innovations.

Other forms of external knowledge sourcing may also affect innovation (Aslesen & Freel 2012). We therefore introduce a control for whether firms take advice from elsewhere. Larger firms have more resources to introduce new innovations. We use four dummy variables for firm size to control for this (note that using the log of firm size changes the results little).

The characteristics of the management team also matter. First, we control for the level of education, measured by whether the person responsible of the firm or plant has a qualification. Qualified managers should introduce more innovations. The size of the

³ Ideally, we would control for whether the firm is a branch plant or the headquarters. However, the SBS unfortunately does not provide data on this. We are grateful to a referee for this point.

management team is also an important determinant of the capability of the firm and a dummy variable is used for whether a firm has multiple directors.

Finally, minority ethnic run firms may have access to external knowledge sourcing, while diverse teams may have a greater diversity of perspective and so be able to come up with innovative products and processes. Evidence suggests that firms with diverse management teams may be more innovative (Nathan & Lee 2013; Lee 2014). We also include a control for whether the firm is majority ethnic led.

All variables included in the analysis are presented in Table 3.

Table 3 around here

Probit regression results

In order to analyse whether firm in creative cities are more innovative, we resort to a simple binary probit model with robust standard errors. Marginal effects are presented for clarity in interpretation.

The results of the analysis are given in Table 4. Columns 1 – 3 present the results for product innovation; columns 4 – 6 consider process innovation. For each, the overall innovation measure is considered first, followed by ‘original’ innovations (entirely new) and ‘new to the firm’ innovations.

Table 4 around here

The most relevant result is that there seems to be no effect from location in a creative city on overall product innovation, although the coefficient is positive (Table 4, regression 1). For products which are new to the firm the coefficient for location in a creative city is negative and insignificant. However, there is a significant positive effect from location in a creative city on new product innovation, albeit at only the 10% level (Table 4, regression 2). Controlling for city size, firm size, age, ownership and other firm activities, firms in creative cities are 4 percent more likely to introduce original innovations than those outside.

In terms of process innovation the results are similar. Firms in creative cities are not more likely than firms outside to introduce new processes (Table 4, regression 4). However, a distinction between new and learnt processes is evident. Whereas firms in creative cities are

3% more likely to introduce entirely new processes (Table 4, regression 5), they do not differ from firms elsewhere in their capacity to adopt learnt processes (Table 4, regression 6).

There is even less evidence that firms in the creative industries are more innovative than other firms. While the coefficient for new product innovation is positive, it is insignificant (Table 4, regression 2). Indeed, creative industries firms appear less likely than firms in other sectors to adopt innovations which are already introduced elsewhere (Table 4, regression 3). One reason for this may be the diversity of firms in the sector, with some particularly innovative relative to others. Other research using a larger sample, but the same measure of innovation, finds creative industries are more likely to introduce entirely new product innovations, but not more likely to introduce innovations new to the firm (Lee & Rodríguez-Pose 2014). Alternatively, it may simply be that the link between innovation and the creative industries is less clear than often portrayed. For process innovation, there is no evidence whatsoever that creative firms are more innovative (Table 4, regressions 4-6).

This suggests that hypothesis 1 – that firms in creative cities would be more innovative – is only partially true. The results suggest that creative cities provide an advantage in the production of entirely new products and processes, but not innovation generally.

The other city controls give insights into the determinants of firm innovation. Firms in larger TTWAs are more likely to introduce product innovations which are new to the firm. This does not apply to firms in London, however, indicating that innovation in London may operate according to different rules (Wood 2009). As expected, younger firms are more innovative, as are those which export. Ownership is less important than anticipated, although firms which have changed owners are likely to introduce learned products and less likely to introduce entirely original ones – presumably as their owners introduced products from other companies or past experience. The qualifications of the owners and the size of the management team do not matter. However, attitude is very important: firms which take external advice and aim to grow are significantly more innovative than those which do not (Fitjar & Rodríguez-Pose 2013).

Creative firms in creative cities

Next, we consider whether firms in the creative industries more innovative in creative cities. Table 5 presents the results of the creative city, firm, and interaction variables. As before, firms in creative cities introduce more entirely new product and process innovations, but creative firms are not necessarily more innovative. In addition, none of the interaction effects

are significant – suggesting that the impact of creative firms in creative cities is rather limited. Creative industries firms in creative cities are not more innovative than those in other cities. Overall, these results provide no support for hypothesis 2, that creative industries firms in creative cities are particularly innovative.

Table 5 around here

There is one caveat to this view. With original product innovation (Table 5, regression 2) the coefficient on the creative firms is negative, whereas in the basic model it is positive. The creative firm / creative city interaction is positive, and relatively large in magnitude. This suggests there may be a large effect, imprecisely measured in this case, rather than no effect at all. This is a potentially useful area of future research for researchers when larger sample sizes become available.

Testing for different city sizes

The literature on creative cities stresses the importance of different types of city in innovation processes – and evidence has suggested that the creative industries tend to cluster in relatively large cities. Testing whether our results are driven by large or medium sized creative cities is important empirically, to assess whether the results are just proxies for agglomeration, and whether different types of creative city play particular roles in fostering innovation (Andersen & Lorenzen, 2014). We therefore re-run the basic regressions using the split categories outlined above – large creative city, medium sized creative cities and rural areas with strong creative economies – in order to assess whether this is the case. The results are presented in table 6.

Table 6 around here

The results show that medium sized creative cities – akin to satellites in Andersen and Lorenzen’s classification (2014) – are particularly important for product innovation, but that for process innovation it is a combination of large and medium-sized cities – or hubs and satellites – which matters. In columns 1 and 2, which consider any new product or service and product or services which are new to the market, not just the firm. In both cases there is a significant and positive effect from location in a medium sized creative city. The marginal effect is 0.08, almost double in magnitude than the overall measure presented in table 4. For large creative cities the effect is not significant, but it is approaching significance at standard levels ($p = 0.14$). For new process innovation, the results differ slightly. While the effect on

both large and medium sized cities is positive, in no case is it significant. Overall, the effect for product innovation is driven primarily by firms in medium-sized creative cities. The effect for process innovation appears to derive from a combination of different city types.

5. Conclusions

Creative cities are seen as important locations for production, where the boundaries between cultural activity and production are merged (Scott, 2014). Cities with high shares of employment in the creative industries may serve a particular function in the spatial economy – in particular, in this paper we have suggested that cities with high share of employment in the creative industries may be home to more innovative firms. We have used data for British SMEs to show that, controlling for city size, firm level characteristics and selection effects, the results suggest that firms located in the most creative cities – defined as those with high shares of creative industries employment – are more likely to introduce entirely new products and entirely new processes than firms elsewhere.⁴ We find less evidence that this effect applies to firms in the creative industries.

In short, firms in local economies with strong creative economies introduce more radical innovations. There are a number of potential explanations for this. Creative cities may have the support infrastructure necessary for innovation and other firms which can help commercialise creative content. The creative industries are an important part in the production processes of other firms and because of this co-location in a particular city may help these firms innovate. Alternatively, our results may be explained by consumption rather than production reasons. Founders of innovative firms may locate in creative cities because that is where the founders want to live (Stephan 2011). As the result is robust to selection effects, it is unlikely to be driven by the composition of firms. However, we can only test for observable characteristics so it is possible that some unobserved aspect of firms in creative cities makes them more innovative. And a final potential explanation is that the causality is reversed, with the creative industries attracted to cities with thriving, innovative economies.

⁴ A referee noted a potential problem in that our results are ‘self-fulfilling’ with firms in creative cities being expected to be more innovative, but defined according to their share of (innovative) creative industries firms. However, we do not believe this to be a problem. First, because creative industries firms do not appear to be more innovative than others, at least according to the measure used here. Second, because, as we control systematically for firm characteristics, we show that the results apply for firms regardless of their similarities and differences.

Cities also perform different roles in the spatial economy. Our results show that, in the case of the UK, cities with high shares of creative industries employment may serve as the sites of new content generation and the production of new ideas. However, it is important not to overstate the role of place in firm level innovation: the key determinants of firm level innovation remain basic firm characteristics and activities, with location secondary as a factor (Mare et al. 2013). Nevertheless, location in this case does seem to play a role, especially for the generation and introduction of new products and processes. While the link between local creative industries and innovation has been documented in the qualitative literature, this is the first study to consider it econometrically.

Why does the result not apply to creative industries firms? The results were indicative of an effect, albeit one which was imprecisely measured. One reason may be the diversity of effects within creative industries firms. However, other research suggests that firms can adopt different innovation processes to cope with relative isolation (Fitjar & Rodríguez-Pose 2011). This may be the case with creative industries firms: those outside of core creative areas may have adapted strategies to cope, rely more on interaction with other possible sources of innovation. This is a potentially useful subject for future research.

Future work may want to develop on this paper in several ways. First, this paper has used a relatively small sample. Future studies may want to use a larger sample of firms overall and it would be particularly useful to expand the number of creative industries firms. Second, the six measures of innovation here are useful in identifying the source of innovation in creative cities. But more, and more nuanced, measures of innovation would introduce new insights. Finally, while the use of selection effects is an important contribution, they are only limited to observable characteristics. Firm level panel data would help isolate causal effects.

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Table 1. Creative industries definition

Creative Industries	Industries included in this category	Codes (SIC 2003)
Advertising	Advertising	74.40
Architecture	Architecture & Engineering	74.20
Video, Film & Photography	Reproduction of video recording; Photographic activities; Motion picture and video production; Motion picture and video distribution; Motion picture projection.	22.32, 74.81, 92.11, 92.12, 92.13
Music and the visual and performing arts	Publishing of sound recordings; Reproduction of sound recording; Artistic and literary creation and interpretation; Operation of arts facilities; Other entertainment activities not elsewhere classified; Other recreation activities not elsewhere classified.	22.14, 22.31, 92.31, 92.32, 92.34, 92.72
Publishing	Publishing of books; Publishing of newspapers; Publishers of journals and periodicals; Other publishing; News agency activities.	22.11, 22.12, 22.13, 22.15, 92.40
Software, computer games and electronic publishing	Reproduction of computer media; Publishing of software; Other software consultancy and supply.	22.33, 72.21, 72.22
Radio and TV	Radio and television activities.	92.20

Source: Adapted from DCMS, 2010. Note: No industries match the Art & Antiques, Design sector or the Digital and Entertainment media. We do not include Art and Antiques and Designer Fashion as only a small share of firms in these industries are considered 'creative industries'. No industry codes match Crafts and Design.

Table 2. Percentage of firms innovating by each measure

Sample:		Product or service innovation:			Process innovation:		
<i>By firm type</i>	<i>No of firms</i>	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>
CI Firm		49.1	17.7	30.1	45.6	7.7	38.6
Non-CI Firm		49.7	13.5	35.8	38.7	7.7	31.0
<i>By city type</i>							
Creative city	584	51.8	15.7	35.7	40.6	9.1	31.5
Less-creative city	752	48.0	12.4	35.2	38.3	6.5	31.8
<i>Total</i>	1,336	49.6	13.9	35.4	39.3	7.7	31.7

Source: Small Business Survey, 2010

Table 3. Variables and definitions

	Variable	Source
Creative city	Firm is located in 25% of TTWAs with highest share of creative industries employment	BRES
Creative firm	Firm is in creative industries	SBS
TTWA Employment (ln)	Number of employees in TTWA (ln)	BRES
London	London dummy variable	SBS
Age <4	Firm aged below 4	SBS
Age 4 - 10	Firm aged 4 - 10	SBS
Exports	Firm exports	SBS
PLC	Firm is public limited company	SBS
Changed ownership	Firm has changed ownership in last 3 years	SBS
Multiple sites	Firm has multiple sites	SBS
Advice	Firm seeks external advice	SBS
Aims to grow	Firm aims to grow	SBS
Owner has qualification	Owner of firm has a qualification	SBS
Multiple directors	Firm has >1 directors	SBS
Minority Ethnic led	Firm is led by member of minority ethnic group	SBS
Size	Three size dummies for: 1-9, 10-49, 50 – 100, 100 +	SBS
Sector	One of 15 sector dummies (if not creative industries firm): Agriculture, hunting and forestry; Fishing; Mining and Quarrying; Manufacturing; Electricity, gas and water; Construction; Wholesale & retail, repair of motor vehicles; Hotels and restaurants; Transport, storage and communication; Financial intermediation; Real estate, renting and business activities; Public admin. and defence; Education; Health and social work; Other community, social and personal.	

Sources: Small Business Survey (SBS) 2010, Business Register and Employment Survey (BRES) 2010.

Table 4. Basic probit regressions: City characteristics and innovation

	(1)	(2)	(3)	(4)	(5)	(6)
	Product or service innovation:			Process innovation:		
	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>
Creative city	0.0452 (0.0325)	0.0413* (0.0215)	-0.000623 (0.0304)	0.0231 (0.0315)	0.0315** (0.0150)	-0.0101 (0.0294)
Creative firm	-0.0988 (0.0755)	0.00826 (0.0501)	-0.112* (0.0641)	0.0340 (0.0765)	-0.00348 (0.0367)	0.0316 (0.0721)
TTWA employment, ln	0.0173 (0.0142)	-0.00769 (0.00863)	0.0246* (0.0135)	0.0102 (0.0138)	-0.0122* (0.00657)	0.0229* (0.0129)
London	-0.199*** (0.0639)	0.0183 (0.0463)	-0.194*** (0.0501)	-0.144** (0.0592)	0.0407 (0.0434)	-0.164*** (0.0464)
Age <4	0.310*** (0.0582)	0.116* (0.0621)	0.215*** (0.0766)	-0.0350 (0.0716)	-0.0196 (0.0329)	-0.0228 (0.0670)
Age 4 - 10	0.0810** (0.0361)	0.0222 (0.0244)	0.0607* (0.0354)	0.0956*** (0.0361)	0.0348* (0.0197)	0.0534 (0.0341)
Exports	0.169*** (0.0347)	0.106*** (0.0262)	0.0587* (0.0346)	0.0788** (0.0352)	0.0514*** (0.0196)	0.0195 (0.0323)
PLC	-0.0103 (0.0344)	0.00769 (0.0225)	-0.0219 (0.0326)	0.0345 (0.0335)	-0.0104 (0.0165)	0.0451 (0.0309)
Changed ownership	0.0940* (0.0554)	-0.0488* (0.0293)	0.143** (0.0559)	0.0902 (0.0566)	0.0101 (0.0273)	0.0750 (0.0537)
Multiple sites	-0.0123 (0.0378)	0.0342 (0.0259)	-0.0490 (0.0347)	0.00802 (0.0369)	-0.00458 (0.0164)	0.0126 (0.0346)
Advice	0.106*** (0.0295)	0.0273 (0.0190)	0.0776*** (0.0279)	0.147*** (0.0285)	0.00288 (0.0143)	0.141*** (0.0264)
Owner has Qualification	0.0346 (0.0371)	0.00488 (0.0238)	0.0288 (0.0347)	-0.0330 (0.0365)	0.00858 (0.0173)	-0.0422 (0.0350)
Multiple directors	0.0388 (0.0356)	0.0240 (0.0218)	0.00980 (0.0336)	0.0297 (0.0340)	0.0111 (0.0161)	0.0175 (0.0318)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,305	1,296	1,296	1,301	1,291	1,301
Pseudo R ²	0.0643	0.0681	0.0475	0.0872	0.0539	0.0750

*Marginal effects presented. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All models include 16 sector dummies (one of which is creative industries) and three size dummies. Sample size varies due to perfect prediction groups.*

Table 5. Interaction effects: Creative firms in creative cities

	(1)	(2)	(3)	(4)	(5)	(6)
	Product or service innovation:			Process innovation:		
	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>
Creative city	0.0454 (0.0335)	0.0367* (0.0222)	0.00400 (0.0314)	0.0253 (0.0324)	0.0279* (0.0153)	-0.00361 (0.0304)
Creative firm	-0.0973 (0.0921)	-0.0170 (0.0569)	-0.0924 (0.0812)	0.0782 (0.0971)	-0.0279 (0.0374)	0.0965 (0.0946)
Creative firm * Creative city	0.0103 (0.0993)	0.0469 (0.0766)	-0.0308 (0.0937)	-0.0664 (0.0909)	0.0551 (0.0803)	-0.0936 (0.0758)
Controls	YES	YES	YES	YES	YES	YES
Observations	1,310	1,301	1,301	1,306	1,296	1,306
Pseudo R2	0.0576	0.0664	0.0421	0.0729	0.0546	0.0591

*Marginal effects presented. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ All models include 16 sector dummies (one of which is creative industries) and three size dummies. Sample size varies due to perfect prediction groups.*

Table 6. Different creative city sizes and innovation

	(1)	(2)	(3)	(4)	(5)	(6)
	Product or service innovation			Process innovation		
	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>	<i>Any</i>	<i>New to market</i>	<i>New to the firm</i>
London	-0.0985* (0.0531)	0.0346 (0.0385)	-0.127*** (0.0450)	-0.0907* (0.0498)	0.0182 (0.0279)	-0.106** (0.0432)
Large creative cities	0.0433 (0.0452)	0.0303 (0.0323)	0.0141 (0.0423)	0.0345 (0.0446)	0.0180 (0.0243)	0.0139 (0.0408)
Medium creative city	0.0801** (0.0377)	0.0651** (0.0287)	0.0125 (0.0361)	0.0409 (0.0375)	0.0251 (0.0204)	0.0148 (0.0350)
Small creative city	-0.0736 (0.0866)	-0.0253 (0.0565)	-0.0698 (0.0777)	-0.0884 (0.0805)	-0.0113 (0.0406)	-0.0735 (0.0713)
Creative firm	-0.100 (0.0752)	0.00447 (0.0496)	-0.110* (0.0643)	0.0333 (0.0767)	-0.00537 (0.0364)	0.0326 (0.0720)
Controls	YES	YES	YES	YES	YES	YES
Observations	1,305	1,296	1,296	1,301	1,291	1,301
Pseudo R2	0.0647	0.0709	0.0459	0.0880	0.0494	0.0738

*Marginal effects presented. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ All models include 16 sector dummies (one of which is creative industries) and three size dummies. Sample size varies due to perfect prediction groups.*