Method Article

Relative geographic concentration of creative, other traded, and local industries using establishment data and Harvard's U.S. Cluster Mapping Benchmark Definitions

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A B S T R A C T

This paper examines the relative tendency of industries and industry clusters to be geographically concentrated. Creative industries defined as having distinct artistic creation and production-distribution components are examined. This extends previous observations that creative industries exhibit a relatively high degree of geographic concentration to examine whether two-sided market dynamics contribute to this concentration. Variance in the distribution of business establishments among U.S. metro areas for 978 industries is calculated using County Business Patterns data from the U.S. Census Bureau. The data is mapped to different clusters using Harvard University's U.S. Cluster Mapping Benchmark Definitions. The average variance of each cluster is calculated to measure relative concentration.

- Richard Caves' definition of creative industries is used to identify industries characterized by a two-sided structure.
- Harvard University's U.S. Cluster Mapping Benchmark Definitions are used to map creative industries to specific industry codes and industry clusters.
- These two methods are applied to U.S. County Business Patterns data to examine the relative geographic concentration of two-sided creative clusters.

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A R T I C L E   I N F O

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Specifications Table

| Subject Area: | Economics and Finance |
|---------------|-----------------------|
| More specific subject area: | Jurisdictional competitiveness in the creative industries |
| Method name: | Location quotient |
| Name and reference of original method: | https://www.bea.gov/help/faq/478 |
| Resource availability: | Data file with raw data, calculations, and results |

Method details*

Location quotients are a common method of analyzing geographic concentration. A location quotient can be calculated as an industry’s share of a metropolitan area’s total business establishments divided by the industry’s share of the national total business establishments [1].

Schoales developed an adapted method, referred to as a location share differential (LSD), to also account for the scale of different regions [2]. An LSD can be calculated as a metropolitan area’s share of national business establishments in an industry minus the metropolitan area’s share of all national business establishments.

Location Quotient vs. Location Share Differential

| Motion picture and video production | All industries |
|-------------------------------------|---------------|
| Los Angeles metropolitan area       | a             | b             |
| United States                      | c             | d             |

Location Quotient = \((a/b)/(c/d)\).
Location Share Differential = \((a/c)-(b/d)\).

Schoales states that location quotients show which industries are important in a region whereas LSDs show which regions are important in an industry.

Industries in which there is a wide variability of LSDs among metropolitan areas are much more concentrated in some metropolitan areas than others. If there is a low variance, then the geographic distribution of the industry is similar to the economy as a whole.

The current paper averages the variances of LSDs for groups of similar industries to identify which groups tend to be more geographically concentrated. The relative geographic concentration of a group of industries is referred to as G. A high G indicates a high degree of geographic concentration.

In the following equation for G, \(s_i - s\) represents the LSD for metropolitan area \(m\) and industry \(i\).

Introduction

The high degree of geographic concentration of the creative industries is well established. This paper seeks to isolate creative industries based on their unique two-sided industry structure to help explain this phenomenon. Richard Caves' seminal work on the creative industries highlights the relationship between artistic creators and production/distribution companies as central to these industries. Harvard University’s U.S. Cluster Mapping Benchmark Definitions are used to apply this concept to highly detailed U.S. County Business Patterns data. The analysis shows that the two-sided structure of the creative industries is associated with a higher degree of geographic concentration. This supports the proposition that two-sided network dynamics contribute to the relatively high degree of geographic concentration of the creative industries.

Research methodology

This paper will examine whether creative industries tend to be more concentrated than other traded industries using business establishment data for 2016 from U.S. County Business Patterns data from the U.S Census Bureau combined with industry cluster categories drawn from Harvard University’s U.S. Cluster Mapping Benchmark Definitions. This will help determine whether a higher
degree of geographic concentration is associated with the bifurcated industry structure that is characteristic of the creative industries as described by Caves [3]. Higher geographic concentration supports the hypothesis that two-sided network dynamics contribute to this concentration and the competitive success of specific jurisdictions in these industries [4].

County Business Patterns data provides a very detailed disaggregation of establishments at the NAICS 6-digit level. Industry agglomerations are assumed to exist in regions defined by a high degree of social and economic integration. Metro areas (metropolitan and micropolitan areas) are chosen as the geographic unit of analysis because they demonstrate this integration [5].

Harvard University’s U.S. Cluster Mapping Benchmark Definitions are used to distinguish between traded industries and local industries. Traded industries tend to be concentrated in few regions and serve markets beyond the region in which they are located. They have a high impact on the economic success of their region. Local industries, in contrast, are present in every region and serve the local market [6]. The group of creative industries, all of which are traded industries, is determined using Caves’ definition of creative industries. Three groups are therefore defined: local industries; traded industries (other than creative industries); and creative industries.

Relative geographic concentration $G$ for each type of industry $t$ is measured by the average variance of the differences between the share of metro areas’ establishments in a particular industry and their share in all industries,

$$G_t = \frac{\sum_{i=1}^{n} \text{var}(s_i - s)}{n}$$

where $s_i$ is the national share of establishments in industry $i$ for metro area $m$, $s$ is the national share of all establishments for metro area $m$ and, and $n$ represents the number of industries of the type being measured.

As an example, office supply stores is identified by the benchmark definitions as a local industry. County Business Patterns data shows that this industry is not very concentrated in any metro areas much more than any others. The highest difference $(s_i-s)$ in this industry for any metro area is 0.4%. This means that, in the metro area with the highest concentration of office supply stores, the difference between the actual share and what the share would be if the geographic distribution for this industry were the same as the overall economy is only 0.4 percentage points. Geographic concentration does not vary much from expected for any metro area. This industry, in fact, shows the least variance of any industry.

$G_{local}$ is the average variance of all industries defined as local. $G_{traded}$ and $G_{creative}$ are calculated similarly. Examples of creative industries include artists, motion picture production, and music publishers. Examples of other traded industries include petrochemical manufacturing, guided missile and space vehicle manufacturing, and semiconductor manufacturing. Examples of local industries include office supply stores, restaurants, and car washes. We would expect to see a greater geographic variability for traded industries relative to local industries. Within traded industries we also hypothesize a significantly greater variability of creative industries, as defined by Caves, relative to other traded industries.

Data analysis and results

As Fig. 1 illustrates, the average variance of traded industries was found to be greater than that of local industries, as expected. The chart also illustrates that the average variance of creative industries was much greater than that of other traded industries.

Differences between traded industries and local industries, and between creative industries and other traded industries were both highly significant (p<0.001, see Table 1). This confirms that these creative industries have a significantly greater tendency to be geographically concentrated.

The U.S. Cluster Mapping Benchmark Definitions organize traded industries into traded clusters based on an overall measure of relatedness between individual industries across a range of linkages, including input-output measures, use of labor occupations, and co-location patterns of employment and establishments [7]. Fig. 2 ranks traded clusters by the average variance for their component industries. This method is the same as was used to distinguish between local, traded, and creative
Figure 1. Spatial Concentration of Creative Industries is Demonstrated by Average Geographic Industry Variance by Industry Type.

Table 1
Significance measures comparing average variance for local industries, creative industries, and other traded industries showing the tendency for creative industries to be more geographically concentrated.

Panel A. t-Test: Two-Sample Assuming Unequal Variances

|                | Local          | Other Traded   |
|----------------|----------------|----------------|
| Mean           | 4.31053E-06    | 1.55697E-05    |
| Variance       | 6.69981E-11    | 7.5373E-10     |
| Observations   | 303            | 639            |
| Hypothesized Mean Difference | 0              |                |
| df             | 837            |                |
| t Stat         | -9.513482179   |                |
| P(T<=t) one-tail | 9.51833E-21   |                |
| t Critical one-tail | 1.646676169    |                |
| P(T<=t) two-tail | 1.90367E-20   |                |
| t Critical two-tail | 1.962802273   |                |

Panel B. t-Test: Two-Sample Assuming Unequal Variances

|                | Other Traded   | Creative       |
|----------------|----------------|----------------|
| Mean           | 1.55697E-05    | 5.11472E-05    |
| Variance       | 7.5373E-10     | 3.50344E-09    |
| Observations   | 639            | 36             |
| Hypothesized Mean Difference | 0            |                |
| df             | 36             |                |
| t Stat         | -3.584705123   |                |
| P(T<=t) one-tail | 0.000496304    |                |
| t Critical one-tail | 1.688297714   |                |
| P(T<=t) two-tail | 0.000992607    |                |
| t Critical two-tail | 2.028094001   |                |
Fig. 2. Spatial Concentration of Creative Clusters is Demonstrated by Average Geographic Variance $G$ of Traded Clusters.
industries but this time it further groups the traded and creative industries according to the clusters they are assigned to in the benchmark definitions.

This figure indicates which clusters tend to be the most geographically concentrated. The creative clusters are either entire traded clusters on their own as defined by the benchmark definitions or the creative industry components of other traded clusters (as noted in parentheses in Fig. 2). As the figure shows, the creative clusters, shown with darker bars, tend to be among the most geographically concentrated, comparable to clusters that are related to natural endowments such as mining, oil, and marine-related industries, with video production and distribution at the top.

Factors specific to some industries may explain why not all creative industries are ranked near the top. For example, the toy and game industry which ranks at the bottom, may be less collaborative in its creative process and not exhibit the same clustering tendencies as other creative industries. Some industries can tend to operate more efficiently if they are located close to consumers rather than creators. Art dealers may be an example of this. Other clusters may include components that are geographically distributed as well as geographically concentrated. Footwear, for example, includes footwear manufacturing, a component of the industry that may tend to seek low-cost locations.

Discussion

Creative industries, such as film and television, music, publishing, visual and performing arts, and fashion, are increasingly seen as central to the development of highly productive, knowledge-based economies [8]. It is well established that creative industries have a relatively high tendency to be geographically concentrated [2,9,10]. Understanding why this is the case is important for jurisdictions that seek to compete in these industries.

Research on industry clusters highlights the impact on jurisdictional competitiveness of relationships between firms and industries in city-regions [11,12]. Factors such as the circulation of knowledge among proximate firms, shared inputs including labour, strong local demand, or transportation costs can impel firms in the same or related industries to locate close to one another for economic advantage [13]. While firms can benefit from clustering together, there can also be forces driving greater dispersion, such as firms seeking lower real estate costs or less competition. Whether firms are driven together or driven apart can depend on factors such as what industry they are in or whether their industry is rapidly innovating [2,14,15].

We would expect firms in rapidly innovating industries to be highly clustered in centres where the pace of new product development and competition are intense. Industries that follow this pattern include the creative industries as well as finance, management, and high-technology [2,9,16]. Florida and Mellander suggest that these are the types of industries that would tend to generate extreme wealth [17]. The very high level of geographic concentration of the creative industries and their potential for very high incomes support these hypotheses.

A high-quality workforce is central to the competitiveness of knowledge intensive industries. Robert Lucas has proposed that the main engine of growth is, in fact, human capital and the ability to move from the production of less to more sophisticated products [18]. This factor is increasingly important as economies shift to a post-industrial economic structure, driven by innovation and creativity, and seek to develop differentiated products at an accelerated pace [16].

Many sources of agglomeration economies in the creative industries are similar to those found in other industries, but there are also some unique features [13,14,19,20]. Creative industries may be less constrained than manufacturing to locate close to natural resources or physical capital and may be less sensitive to transportation costs. Creative industries, though, tend to outsource major parts of the production process, relying on tacit knowledge and transaction-intensive shared rules, behavioural codes, and informal production networks. They also tend to pool risk among multiple firms and projects and utilize industry-specific distribution networks. These factors can foster co-location [11,16,19].

Unique characteristics of the creative industries can result in the formation of two distinct production components. Richard Caves described creative industries as having have a characteristic structure defined by collaborative working relationships between creative artists and the firms that
publish and distribute their work [3]. Caves’ creative industries include book and magazine publishing, visual arts, performing arts, sound recording, film and television, fashion, and toys and games.

Producers and distributors in the creative industries can tend to locate close to a large pool of human capital to access talent and maintain scale flexibility in an environment of uncertain future production needs. Creative workers may choose to work close to multiple production firms to enhance the quantity and quality of their employment opportunities. Proximity to other creators also provides information on trends and access to potential collaborative opportunities. Schoaels found average pay for creative workers to be positively correlated with creative industry density but not with population density, suggesting that it is not enough to be in a large city, creators need to be where the industry is concentrated [2].

Conclusion

This paper demonstrates that the two-sided structure of the creative industries is associated with a higher degree of geographic concentration. Two-sided networks create a powerful self-reinforcing dynamic that can generate rapid growth and contribute to the extremely high degree of geographic concentration of the creative industries. Success in a two-sided network depends on the attraction of members of both groups, leveraging their capacity to attract each other [4].

Competing in the creative industries, therefore, entails being a hub of creative activity, attracting creative artists on the one hand and attracting producers and distributors on the other. Jurisdictions seeking to become leaders in the creative industries should focus on leveraging the mutual attraction of those involved in the creative process.

Future work could examine differing characteristics among creative industries that can account for their relative degree of geographic concentration. Mapping of the data, including time-series, could provide insight into the regional distribution of creative industries and their pattern of development. Analysis of non-U.S. data would extend the findings to enable an assessment of the global competitiveness of creative jurisdictions.

Declarations of Interest

None.

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