Sport Clusters and Community Resilience in the United States

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Abstract

How to enhance community resilience to natural disasters is a major question for researchers and policymakers. Although researchers agree that sport generates community benefits, few scholarly efforts in sport management have been invested in understanding the sport-resilience association. This paper attempts to address whether and how sport clusters—the clustering of sport industries—are associated with community resilience across locations. To achieve this, geographically weighted regression and visualization techniques are applied to macro-level data of the clustering of 13 separate sport industries and community resilience across 3,142 U.S. counties. The results indicate that, overall, the clustering of 8 sport industries was significantly associated with community resilience and further demonstrate the existence of spatially heterogeneous associations in magnitudes and signs of community resilience in sport clusters. The findings of this paper have the potential to help community sport scholars and policymakers implement location-specific resilience policies through sport industry development.

Keywords: community resilience, sport clusters, spatially heterogeneous effects, geographically weighted regression (GWR)

With the growing risk of natural and artificial hazards, many populations are exposed to potential physical injury, property damage, and infrastructure destruction, causing an increase in uncertainty, stress, and anxiety (Callaghan & Colton, 2008). Governments and organizations have thus sought to prepare for and recover from unforeseen adverse events more efficiently by implementing community resilience-building activities (Magis, 2010). Community resilience, as noted by Berger (2017), is defined as "the capacity . . . to deal with a major crisis by adapting and growing while minimizing causalities and preserving a fair quality of life for all its citizens and maintaining its core values and identity" (p. 7). Enhanced resilience allows communities to mitigate vulnerability, reducing losses from unexpected crises or disruptions (Cutter et al., 2013). In this regard, scholars and policymakers have recently made enhancing community resilience to hazards a major part of the community agenda (Lam et al., 2016). Building a resilient community is closely linked to leveraging community resources in socioeconomic conditions that influence effective community risk management and policy (Renn, 2008). Hence, understanding how community resources function to enhance resilience in a community plays a critical role in creating a resilience portfolio (Cohen et al., 2013).

Sport is based on the capacities and capabilities of a set of community capitals, including assets, resources, and realizable opportunities (Budd et al., 2017). Sport is an activity-complex economy emerging from the joint location of a particular set of sport firms in a production chain so as to form an activity complex through a forward linkage (i.e., when a firm is situated at the location of its customer firm) and/or a backward linkage (i.e., when a firm is situated at the location of a supplying firm) (Parr, 2002). Hence, local sport businesses produce an activity-complex economy in association with community facilities and supporting infrastructure (Budd et al., 2017). Numerous sport entities provide a range of socioeconomic benefits and spillovers, such as employment opportunities (Barry et al., 2016), improved infrastructure (Gratton et al., 2005), a sense of community (Kerwin et al., 2015), community pride (Kellett et al., 2008), social integration (Kristiansen et al., 2015), public health benefits (Edwards & Rowe, 2019), and community commitment (MacIntosh et al., 2015). Consequently, each community has unique social and physical resources that may determine different development levels of both its sport industries and community resilience.

Developing an empirical assessment of different associations between multiple sport industries and community resilience is important because positive assets of sport industries may intertwine with and contribute to building community resilience. As individual action is connected to broader community structures (Ibarra et al., 2005), management research examines the vast economic and social (macro-level) systems in which individual (micro-level) organizations are embedded (Roberts et al., 1978). However, sport management scholars have mainly focused on individual sport organizations/clubs (micro-level) in a community (Kihl et al., 2014) and across communities (Doherty & Cuskelly, 2020), with less attention to community-based sport delivery systems (macro-level) across communities. A certain level of financial, administrative, and infrastructural support for community sport services may flow from broader government or nongovernmental agencies that are not necessarily within one community only. As such, sport can be analyzed in the context of the macro-level value cocreation system, so-called "sport clusters" (Shilbury, 2000), rather than the micro-level perspective (Woratschek et al., 2014). Hence, an opportunity exists for research investigating how macro-level sport clusters are associated with community resilience.

To fill these gaps, this study aims to explore a macro-level association between sport clusters and community resilience. Specifically, we attempt to (1) examine whether the clustering of various sport industries influences community resilience, (2) identify whether the effect of sport clusters on community resilience is spatially heterogeneous, and (3) build place-based sport cluster development strategies for improving community resilience. To address our research objectives, we applied spatial econometric methods and visualization analytics to macro-level secondary data of sport clusters and community resilience across 3,142 counties in the United States.

This research innovation takes place at the boundaries and intersections of the management and geography disciplines, which enhances both theoretical and methodological contributions to the sport and resilience management literatures. Recent sport management research points out limitations of cluster theory, in general, and sport clusters, in particular: the under-exploration of heterogenous development of macro-level sport clusters (Gerke & Pria, 2018) and their economic and noneconomic impacts on the community (Grieve & Sherry, 2012). Furthermore, 'one-size-fits-all' sport policies based on micro-level findings may be poorly informed and overlook unique location-specific situations. Hence, an interdisciplinary approach tackles this limitation by identifying not only the configuration of spatially heterogenous sport clusters but also their associations with community resilience, and how the spatially varying associations can inform policymakers and professionals about location-specific policies and strategies for both sport infrastructure and community resilience.

Literature Review

Community Resilience

Resilience is defined as "the ability of a social system to respond to and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat" (Cutter et al., 2008, p. 599). The concept of resilience has been applied to a range of fields, including psychology (Werner, 1995), ecology (Adger, 2000), and community science (Cutter et al., 2008; Magis, 2010). Scholars have advanced arguments for a wide array of critical dimensions of community resilience. For example, Norris et al. (2008) considered community resilience to be a set of interconnected adaptive capacities based on resources, encompassing economic growth, community competence, information and communication, and social capital. Cutter et al. (2008) also provided a set of metrics as indicators for measuring community resilience, including economic, social, community capital, institutional, and infrastructural components. These definitions and metrics indicate that resilience develops from multidimensional resources in a community (Wilson, 2012).

While there is no precise definition of community resilience, people in a resilient community are more likely to be prepared for, respond to, and recover quickly from disruptive events than those who live in a less resilient community (Mayunga, 2007). While much research on community resilience has been focused on its definitions and measurements, less attention has been paid to the association between sport infrastructure and community resilience. Tourism researchers have found that tourism affects local communities economically (Allen et al., 1993), socially (Liu & Var, 1986), and culturally (Lankford & Howard, 1994). Recently, researchers have also investigated the role of tourism clusters in shaping economic resilience (Lee et al., 2020b) and emphasized the importance of community tourism development in the face of contemporary crises and natural disasters (Tsai et al., 2016).

Prior research on sport management has applied the concept of resilience to athletes (Fletcher & Sarkar, 2012), sports teams (Morgan et al., 2013), and sport clubs~~organizations~~ (Wicker et al., 2013). Scholars have mainly identified psychological or orgnizational factors to predict resilience from a sports performance perspective and have explored how athletes, sports performers, and teams develop resilience in response to adversity (Galli & Gonzalez, 2015). Furthermore, scholars~~researchers~~ have found that the health and community sectors have high levels of organizational resilience (Stephenson et al., 2010), which enables businesses within these sectors, such as community sport clubs, to recover from natural disasters (Wicker et al., 2013). However, the concept of resilience has been only narrowly applied to sport-specific contexts or environments at a micro-level, despite the potential role of sport as a community resource that may influence community resilience.

Sport and Community Resilience

Sport infrastructure and participation in sports, including recreational activities, provide a community with both economic and noneconomic benefits (Grieve & Sherry, 2012), which further determine the resilience of the community. From the economic perspective, some studies have shown that investment in sport infrastructure in cities has led to the investment of non-sport infrastructure (e.g., Gratton et al. 2005) and government subsidies for minor league baseball teams and stadiums are positively associated with the change in local per capita income (Agha, 2013). However, the vast majority of studies has indicated few significant economic benefits from the presence of sport infrastructure. For example, Noll and Zimbalist (1997) argued that a new sport facility has an extremely small benefit or a negative effect on economic activity and employment. Eckstein and Delaney (2002) acknowledged that publicly funded stadiums generate minimal economic windfalls. Other scholars have found that professional sport facilities have no impact on community income and employment (Coates & Humphreys, 2003) but a positive effect on surrounding residential house values (Feng & Humphreys, 2018). Furthermore, previous studies have found the mixed economic impacts of sport events. For instance, while medium-sized sport events may increase both economic activity and opportunity costs (Taks et al., 2011), smaller-sized events have a higher potential for positive economic impact (Agha & Taks, 2015). Recently, Agha and Taks (2018) showed that resident spending behavior during sport events has no change and positive negative effects are relatively equivalent; thus overall economic impact is negligible.

From the noneconomic perspective, researchers have identified various subcategories of noneconomic impacts of sport facilities: social impacts, community visibility, political impacts, and developmental impacts (Grieve & Sherry, 2012). Social impacts refer to the psychological benefits received by community residents who do not attend sporting events (Crompton, 2004), such as the civic pride residents experience due to the presence of sports teams and mega-events (Groothuis & Rotthoff, 2016). Community visibility often accompanies the developments of sport facilities and identification with elite sporting teams and players (Crompton, 2001). Putnam (2000) argued that sport facilities designed to service both elite and general sporting communities may result in the development of social capital within a community. The political impacts of sport facilities may consist of (1) political collaboration across government agents and sport organizations and (2) the political capital required to push sport facilities through the construction process (Grieve & Sherry, 2012). Finally, developmental impacts include both benefits (e.g., new sport facilities) and costs (e.g., traffic congestion) to the community.

When sport contributes to wider community issues, in areas such as economic development and employment, there was a greater likelihood of achieving outcomes that were inclusive and sustainable (Coalter, 2007b). As sport has the potential to develop social capital at the community level (Coalter, 2005, 2007a), the community needs to create spaces for social interaction and accommodate the critical mass of people during events (Gehl, 2010). From the community planning perspective, Gehl (2010) suggested that sport-driven economic growth should provide an enhanced quality of life, social diversity, and equal access to all community residents. As rapid economic growth may lead to a reduction in life quality for marginalized residents, economic opportunity and the provision of better public service should be focused on vulnerable neighborhoods (Gehl, 2011). By combining the perspectives of the social benefits of sport (Coalter, 2007b) and the notion of livable cities (Gehl, 2010), Pye et al. (2015) proposed that sport-based urban planning should consider both economic and social benefits, such as physical and mental health; economic development and sustainability; community development; crime reduction and community safety; and education and employment.

Sport Clusters

Sport, like geography, needs to study spatial variations in the impact that sport industries and sporting activities have on the landscape (Wise & Kohe, 2020). According to the sport value framework (Woratschek et al., 2014), sport organizations and facilities create value propositions in the configuration of a value network in a certain community, and sport customers co-create value by integrating resources inside and outside the network. From the community development perspective, sport has the potential to deliver geographically driven social benefits (Coalter, 2005), which are facilitated by good community planning (Gehl, 2011). Researchers suggest that localized sport industries, which Shilbury (2000) termed sport clusters, are an interesting empirical context to analyze the sport value framework (Gerke et al., 2020).

Sport clusters, as a new sport delivery system, are often defined as geographical concentrations of interconnected sport industries such as organizations of professional athletes, sport facilities, equipment manufacturers, retailers, and promoters (Gerke et al., 2015; Shilbury, 2000). This means that the community-level sport cluster consists of various types of sport industries in a particular community. Most research on sport clusters has focused on one generic sport industry, such as surfing (Stewart et al., 2008), skateboarding (Kellett & Russell, 2009), or horseracing (Parker & Beedell, 2010). However, sport clusters emerge from multiple sport industries rather than one generic industry. Shilbury (2000) argued that sport clusters should combine different localized sport industries, either providing different products and services in the same sport or providing the same product with regard to different sports. Hence, we define sport clusters as multiple concentrations of different location-specific sport industries.

It is assumed that sport, as an activity-complex economy, contributes to the development of a set of community assets and resources to prepare for, respond to, and recover from crises and disasters. As sport facilities abound in a community, the potential levels of optional activities within the community widen, and the potential number of social activities rises (Gehl, 2010), possibly leading to a resilient community. However, extant studies have argued that community resilience may facilitate rapid growth of sport infrastructure and events. Kaufman and Wolff (2010) argued that the creation of social benefits from sport may rely on the existence of specific social conditions, such as social consciousness, meritocracy, responsible citizenship, and interdependence. Smith (2009) found that cities that already have high levels of community cohesion are more likely to benefit from major sports events than communities with lower community cohesion. As the literature on sport-driven community resilience is limited, our study focuses on whether the formation of sport-related facilities, organizations, and industries in a community strengthens or weakens the community resilience. The analyses conducted here are therefore novel in understanding the association between sport and community resilience.

Spatial Heterogeneity in Sport Clusters

Previous studies on industry clusters have highlighted the location-based nature of a cluster, also called spatial conditionality, which describes the influence of features of the local environment on the directionality or strength of predictor variables (e.g., sport clusters) and response variables (e.g., community resilience) (Breitenecker & Harms, 2010; Jang et al., 2018). Spatial conditionality, including the physical and socioeconomic landscape (e.g., natural, social, and economic resources) of regions, influences industry development (Breitenecker & Harms, 2010). The structure and distribution of sport clusters in a community are diverse and based on the endowed features of the community. Hence, the development of sport clusters relies upon the characteristics of the specific area in which they are placed (Gerke & Pria, 2018). For example, proximity to an ocean or river could be one locational factor in the marine sport cluster. Sports requiring particular infrastructure (e.g., golf, car racing, and mountain sports) are closely linked to geographical environments and regional resources. Thus, local resources influence the anchoring of sport clusters and connect them to related economic activity (Gerke & Pria, 2018). In this respect, spatial conditionality can play an important role in shaping localized sport clusters.

However, community benefits following sport facility development may accrue unevenly across different residents of a community, often favoring affluent neighborhoods (Jones, 2001).

For example, a new stadium acts as a means of privatizing public space and reasserting commercial control over a landscape formerly inhabited by minority or less affluent residents (Fainstein & Fainstein, 1986). When positive economic and negative community capital resilience coexist, the overall community resilience can be either enhanced or reduced. This argument suggests that researchers need to identify the spatially varying association (i.e., spatial heterogeneity) between sport clusters and community resilience across communities. Spatial heterogeneity refers to spatial variability or nonstationarity, which indicates “the relationships among the independent and dependent variables to vary over space” (Mennis & Jordan, 2005, p. 249). In this study, spatial heterogeneity can derive from either unevenly distributed sport clusters across areas, which lead to different resilience outcomes, or uneven outcomes of community resilience under the input of similar sport clusters.

To identify spatial heterogeneity in the association between sport clusters and community resilience, we employed geographically weighted regression (GWR) and visualization techniques to analyze spatial data, which are different from those used to analyze nonspatial data (Gilbert & Chakraborty, 2011). GWR is an advanced spatial analytical technique used to address spatial heterogeneity in a regression model by providing local parameter estimates for every observation point (Kim, Jang, Kang, & Kim, 2020). Because the GWR method typically provides a better model performance than traditional regression methods, GWR-based models have been applied in a range of disciplines, including marketing (Jang & Kim, 2018), innovation (Jang et al., 2018), hospitality (Kim et al., 2020), leisure (Kim & Nicholls, 2016a), and public health (Yang & Matthews, 2012). Despite the benefits and prevalence of GWR, however, no study to date has employed it to explore spatial heterogeneity in sport management. This study contributes to the sport management literature and, more specifically, the sport cluster literature by addressing location-specific associations between sport clusters and community resilience.

When sport clusters are empirically analyzed, the sport value framework distinguishes between three levels of sport clusters: the intra-, micro-, and meso-level (Gerke et al., 2020). The intra-level analysis considers the cluster organizations; the micro-level includes relationships between cluster organizations; and the meso-level refers to the network of all organizations within a cluster. However, a macro-level analysis, which considers sport industries outside of the cluster, has not been included in the sport value framework (Gerke et al., 2020). Hence, this study focuses on the macro-level perspective, considering both intra-community and inter-community analyses (Lee et al., 2020a) when examining location-specific associations between sport clusters and community resilience. Specifically, the intra-community analysis includes the sport-resilience association within a community, whereas the inter-community analysis considers spatial spillovers of community-level associations among neighboring communities. Figure 1 presents a conceptual framework that investigates the spatially heterogeneous effect of sport clusters, consisting of multiple clusters of sport industries, on community resilience within and across communities.

[Insert Figure 1 about here]

Methods

Variables and Data Collection

To explore spatially varying associations between sport clusters and community resilience, we selected the United States, excluding Alaska and Hawaii, as the study area and used counties as the unit of analysis due to the data availability for both localized industry clusters (Lee et al., 2020a) and community-based resilience (Cutter et al., 2016). This approach can resolve the potential modifiable areal unit problem (MAUP) bias that could influence the results of statistical analyses due to the choice of analysis unit boundaries when the analysis unit is changed (Cheng & Li, 2011; Kim & Nicholls, 2016b).

The dependent variable was the level of community resilience, which was measured by the 2015 Baseline Resilience Indicators for Community (BRIC) index. The BRIC index was designed to quantify the level of resilience across counties and provides periodic updates on the baseline level of resilience based on a 5-year term (Cutter et al., 2016). Because of its design characteristics, the BRIC index can provide a useful standard for comparing counties to one another and explore the diversity of a county's resilience. In the BRIC index, resilience is defined as "a multifaceted concept, which includes social, economic, institutional, infrastructural, ecological and community elements" (Cutter et al., 2010, p. 6). Thus, the BRIC index comprises 49 indicators in the categories of social (e.g., educational attainment), economic (e.g., employment rate), infrastructural (e.g., number of major roads), community capital (e.g., place attachment), institutional (e.g., jurisdictional coordination), and environmental elements (e.g., local food suppliers). Overall, the BRIC index provides a comprehensive composite index as a static snapshot of the inherent capacity of community resilience at the county level (Cutter et al., 2013).

Sport clusters were the independent variables in this study. Each sport cluster can be classified as the specialization of business establishments engaged in similar sport facilities or sporting activities (Eschenfelder & Li, 2007). Given the various types of sport industry (e.g., sport facilities, equipment manufacturers, retailers, and promoters) (Gerke et al., 2015; Shilbury, 2000), the North American Industrial Classification System (NAICS) provides a useful reference for classifying business establishments in the sport industry. The NAICS is a coding system that categorizes firms or organizations of similar industry activities at the national level (U.S. Census Bureau, 2015). Although the sport industry has not been treated as a stand-alone industrial sector in the NAICS, sport-related industrial activities are included in some of the main industries, such as arts, entertainment, and recreation (NAICS 71); manufacturing (NAICS 31–33); and wholesale trade (NAICS 41–43) (Eschenfelder & Li, 2007). Based on the NAICS classifications, clusters of 13 sport industries were selected as variables for measuring sport clusters.

Next, the location quotient (LQ) was used to measure the level of concentration of a particular sport industry (i.e., sport cluster) at the county level (Lee et al., 2020a; 2020b). The LQ is a local descriptor for industrial specialization, providing information on how strongly a specific industry is represented in a region (Cromley & Hanink, 2012). A typical LQ is a ratio that contrasts regional employment in a given industry sector with a large reference region (i.e., U.S.). An LQ value greater than one indicates that the focal county is more specialized in the given industry than the national average. An LQ of less than one denotes that the county has a relatively low level of the given industry compared with the national average. Figure 2 shows the spatial distribution of the dependent variable (i.e., community resilience).

[Insert Figure 2 about here]

Finally, we controlled four county-level demographic and socioeconomic factors that might affect the development and properties of sport clusters (Gerke & Pria, 2018) and community vulnerability or resilience (Cutter et al., 2008) in a given county. First, population needs to be controlled when predicting community resilience because scholars have found an association between community-level sport facilities and population (Powell et al., 2004). Second, due to the higher levels of leisure-time inactivity among people living below the poverty line regardless of race/ethnicity (Crespo et al., 2000), the level of poverty in a given county was measured by the percentage of the population below the federal poverty level (Poverty). Third, race/ethnic characteristics were considered because they increase human vulnerability to a hazard across U.S. counties (Cutter et al., 2003). Hence, the proportion of minority (non-White) population was used to represent ethnic diversity for each county. Finally, the index of household composition and disability (i.e., household composition) was controlled because communities with more senior, junior, disabled and single-parent households are less likely to fully recover in the wake of a disaster compared to communities that are less vulnerable (Juntunen, 2005). Table 1 shows the description of dependent, independent, and control variables and their sources.

[Insert Table 1 about here]

Data Analysis

Statistical analyses were conducted using various software programs, including SPSS (version 21.0), R (version 3.5.3), ArcGIS (version 10.3.1), and GWR4. First, an ordinary least squares (OLS)-based aspatial model (OLS model) was employed to examine whether a variety of sport clusters influence the community resilience metric. The OLS model is proposed in Equation (2):

$$\text{Community Resilience}_i = \beta_0 + \beta_k \, LQ_k + \beta_m \, CONTROL_j + \varepsilon \qquad (2)$$

where Community Resilience$_i$ is the value of the 2015 BRIC index in county i; ε is the error term; β_0 is the intercept; and β_k (k = 1, 2, …12, 13) and β_m (m = 1, 2, 3, 4) denote parameter estimates for independent (sport clusters) and control (demographic and socioeconomic) variables.

The same variables from the OLS model were utilized in a GWR-based spatial model (GWR model) to explore spatially varying associations between the sport clusters of 16 industries and the community resilience metric. The GWR model is shown in Equation (3):

$$\text{Community Resilience}(u_i, v_i)_i = \beta_{i0}(u_i, v_i) + \beta_{ik}(u_i, v_i)\, LQ_k + \beta_{ij}(u_i, v_i)\, CONTROL_j + \varepsilon_i \quad (3)$$

where i refers to county i; $\beta_{i0}(u_i, v_i)$ is the intercept in county i; $\beta_{ik}(u_i, v_i)$ is the parameter estimate for the independent variable k int county i; and $\beta_{ij}(u_i, v_i)$ is the parameter estimate for the independent variable j in county i. A bi-square kernel function with adaptive bandwidth in GWR was selected due to the geographically unequal size of county units, based on Lee et al. (2020a). An optimization process, which can minimize the corrected Akaike Information Criterion (AIC_c), was used to define the optimal kernel size (Kim et al., 2020b).

Finally, local parameter estimates of significant variables and local R^2, which were generated by the GWR model, were mapped to visualize the spatial variability in the association between sport clusters and community resilience across 3,142 U.S. counties.

Results

OLS Model

Table 2 contains the descriptive statistics and correlation coefficients for the variables. The results showed that there were relatively weak correlations, with the highest coefficient of 0.501 between poverty and household composition. Before interpreting the OLS regression results, we tested assumptions of normality, linearity, homoscedasticity, and absence of multicollinearity in the OLS model. The results showed a normal predicted probability (P-P) plot, equally distributed points in the scatterplot of the residuals, and variance inflation factor (VIF) values below 5, which result in normality assumptions of the OLS model.

[Insert Table 2 about here]

Table 3 reports the estimation results of the aspatial OLS model. The results revealed that, overall, the clustering of eight sport industries was significantly associated with community resilience. Specifically, the clustering of spectator sport (LQ711210) and promoters of performing arts, sports, and similar events with facilities (LQ711310) were positively associated with community resilience ($\beta_1 = 0.013$ and $\beta_4 = 0.009$, respectively), whereas the clustering of other sport clusters (other spectator sports, promoters of performing without facilities, golf courses and country clubs, sporting and athletic goods manufacturing, sporting goods stores, and sports and recreation institution) was negatively associated with community resilience ($\beta_3 = -0.003$, $\beta_5 = -0.015$, $\beta_6 = -0.007$, $\beta_9 = -0.014$, $\beta_{11} = -0.019$, and $\beta_{13} = -0.008$, respectively). These findings demonstrate that the clustering of a particular sport industry may or may not lead to a resilient community, and the sport-resilience association can vary depending on the type of industry.

[Insert Table 3 about here]

GWR Model

As shown in the results of the GWR model (Table 3), the sport-resilience association varied across communities (i.e., U.S. counties). Although the OLS model predicted the positive association between the clustering of spectator sport (LQ711210) and community resilience, the GWR model demonstrated that the association can be negative ($\beta_{GWR\ Min}$= -0.535) or positive ($\beta_{GWR\ Max} = 0.089$). This means that the concentration of spectator sport may increase community resilience in some counties while decreasing it in other counties. A similar phenomenon occurred for the clustering of other spectator sports (LQ711219), which ranged from -0.010 to 0.013 ($\beta_{GWR\ Mean}$= -0.002), and other variables used in the model.

To provide a better understanding of these differences, Figure 3 maps the spatial distribution of GWR-based local coefficients for one exemplary variable (Spectator sport: LQ711210) across US counties. As shown in the upper panel in Figure 3, the clustering of spectator sport businesses was likely to have a positive association with community resilience in various (brown- and red-colored) counties. Such positive associations were more pronounced across counties of Texas, Louisiana, Mississippi, Tennesse, Kentucky and other neighboring states. On the contrary, the clustering of spectator sport businesses had a negative association with community resilience in (blue-colored) counties across northern states such as Minnesota, North Dakota and South Dakota. These results reveal the existence of county-specific variations in the sport clusters–community resilience association ("intra-community analysis"). From the inter-community spillover perspective, the lower panel in Figure 3 shows that associations between spectator sport clusters and community resilience across neighboring counties were positively clustered (i.e., high clustering coefficients: hot spot) in the south and northeast (red-colored states or negatively clustered (i.e., low clustering coefficients: cold spot) in the north (blue-colored) states.

[Insert Figure 3 about here]

In the same vein, Figure 4 illustrates spatially varying associations between the clustering of other sport businesses (i.e., other spectator sport, promoters of performing with/without facilities, golf courses and country clubs, sporting and athletic goods manufacturing, sporting goods stores, and sports and recreation institution) and community resilience. These results also indicated that the association of certain sport clusters with community resilience varies across different geographic areas. Finally, the last panel in Figure 4 reveals that our model (i.e., community resilience is the function of sport clusters, demographic, and socioeconomic variables) performed better in the east (dark-colored) counties than in the west (light-colored) counties. These results show that the model performance of the sport-community resilience model is not consistent for U.S. counties.

[Insert Figure 4 about here]

Discussion

This study attempts to empirically investigate the macro-level sport-resilience association, in terms of (1) whether the clustering of sport industries influences community resilience and (2) how the association between sport clusters and community resilience varies across communities. To address these objectives, aspatial and spatial econometric analyses were employed to macro-level empirical data of sport clusters (i.e., LQs) and community resilience (i.e., BRIC index) across 3,142 U.S. counties. The results of the OLS (aspatial) model indicated that, overall, the clustering of spectator sport and promoters of performing arts, sports, and similar events with facilities was positively associated with community resilience, whereas the concentration of other sport industries (e.g., other spectator sports and golf courses and country clubs) were negatively associated. The mixed findings imply that while sport clusters may play a critical role as providers of sport-related services or programs and provide positive economic outcomes, their overall impact on community resilience can be either positive or negative.

Furthermore, the GWR (spatial) model showed the existence of a county-specific association of sport clusters with community resilience across different sport industries. This result implies that the combination of the local environment with the clustering of a specific sport industry may play a crucial role in enabling the rise or decline of community resilience. For instance, when examining the association between spectator sport clusters and community resilience, there existed positive (red-colored) and negative (blue-colored) associations across counties, which indicates intra-community (i.e., individual county-specific) spatial heterogeneity in this association. Meanwhile, the south (e.g., Texas) and northeast (e.g., Ohio and Indiana) states form a clustered hot spot (red-colored) region where the positive sport-resilience association spills over into neighboring states and counties, indicating the presence of inter-community spatial effects. These macro-level findings imply the underlying heterogeneity of the association between sport clusters and community resilience, as moderated by other local (non-sport) assets and resources.

This research, which combines management and geography disciplines, contributes to research in community resilience and sport management. First, this study provides a better understanding of the association between community-based sport clusters and overall resilience. Prior research on community resilience has focused primarily on how to define and measure it (e.g., Cutter et al., 2016) and its association with tourism development (Tsai et al., 2016) or tourism clusters (Lee et al., 2020b). In addition, sport scholars have examined the clustering of one generic sport industry (e.g., surfing and horseracing) and whether sport infrastructure and events have economic and noneconomic impacts on the community, positively or negatively. However, a more birds-eye question in sport management could be: can a community enhance its overall resilience through the sport cluster development? With the example of the association between the clustering of 13 sport industries and community resilience across U.S. counties, this research contributes to the knowledge on the question of whether sport infrastructure and businesses in a community contribute to the development of a set of community assets and resources to prepare for, respond to, and recover from crises and disasters. Even if all sport industries are not positively related to community resilience, this study shows strong empirical evidence on which sport industry may strengthen or weaken the overall resilience of each U.S. county.

Second, this research also contributes to the industry cluster literature by offering place-based sport and resilience management policies. Prior studies of the cluster theory do not provide insight into whether the policies of one particular industrial cluster aremore effective in comparison with others (Motoyama, 2008). The findings of spatially heterogeneous associations will affect policy decision and administration in taking into account sport and resilience development activities and impacts that may be location-specific and may spill over one community to its neighbors. Location-specific associations may propose that a ‘one-size-fits-all’ sport management policy is not effective in fostering community resilience. The GWR model used in this study extends the scope of the sport management questions to “what effects exist, where, and how well,” identifying specific communities with significant effects from the clustering of specific sport industries. In other words, what specific sport cluster development may lead to a resilient community can be drawn (Table 4). For example, some counties in Tennessee (e.g., Carroll and Madison) and Wisconsin (e.g., Dane and Marathon) can benefit from developing clusters of spectator sport and other spectator sport, respectively. In addition, some counties (e.g., Lapeer and Sanilac) in Michigan can benefit from the cluster development of promoters of performing with facilities, whereas others (Kalamazoo and Calhoun) from the cluster development of promoters of performing without facilities. As such, policymakers can use localized associations to inform discussions of place-based sport cluster development strategies and policies for enhancing community resilience.

[Insert Table 4 about here]

Finally, this study also contributes to the methodological aspect of sport management literature. Our findings suggest the presence of complicated patterns in the association between sport clusters and community resilience that cannot be explained using the traditional OLS model. That is, the development and sustainability of a particular sport industry are influenced by location-specific factors based on spatial conditionality, including demographic (e.g., the proximity of specialized suppliers and labor) and socioeconomic (e.g., social relationships and community knowledge) characteristics (Gerke et al., 2015). This study demonstrates that the GWR model performed better than the OLS model in the comparison of R^2 and Leung's F test. The R^2 value of the GWR model (mean: 0.465; minimum: 0.196; maximum: 0.924) is higher than that of the OLS model (0.437) and Leung's F test is 1 : 0.890. Previous studies (Anselin, 1998; Kim et al., 2020a) indicated that model misspecification could be caused by missing variables and localized spatial effects, including spatial dependence and spatial heterogeneity, which are important for identifying the association between sport clusters and community resilience. These results support the benefits of using the GWR model rather than the OLS model. Our method is aligned with Lee et al.'s (2019) recent conclusion that the GWR model offers a better foundation for prediction and explanation than the corresponding OLS model. Consistent with previous findings in tourism and hospitality research (Kim et al., 2020a, 2020b; Lee et al., 2020a), the findings of this study suggest that the GWR model is more useful and powerful for measuring the macro-level spatial effects of sport clusters on community resilience.

Limitations and Future Studies

Despite the significant implications of this study, it has several limitations. First, this study used the spatial clustering of economic and labor statistics in sport industries as the measurement of sport clusters, as suggested by previous literature (Lee et al., 2020a, 2020b). However, sport clusters can be characterized by cognitive clustering based on perceptual and managerial linkages among organizations or organizational clustering based on complementary linkages (Gerke & Pria, 2018). Hence, future studies should collect and quantify the socioeconomic proximity of sport organizations in each community and measure spatial heterogeneity using two variables.

Additionally, we used the employment-based LQ index to indicate the local specialization of a particular sport industry. However, if different industrial units of measurement (e.g., establishments, payroll, and sport participants) are used to identify sport clusters and sporting activities in a particular region, different outcomes may arise, even with the same research model. Thus, future researchers should utilize different metrics and compare their outcomes with the findings of this study to provide more comprehensive conclusions in the studies of sport cluster and resilience management.

Finally, this study assumed a direct effect of sport clusters on community resilience. However, potential mediators or predictors exist in this relationship. Intangible benefits from sport clusters, such as city pride, community engagement, and human development, are significant effects of sport clusters that influence community resilience (Atkinson et al., 2008; Johnson et al., 2007). In addition, location-specific factors could be used to predict the development and clustering of a specific sport industry within a particular region, which could influence the association between sport clusters and community resilience. Therefore, future researchers could include these variables in an analysis to provide additional data.

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Table 1. Operationalization of Variables and Data Sources

Variable	Operational definition (unit: county)	Source	Year
BRIC score	Baseline resilience indicators for community (BRIC) metric index	HVRI	2015
LQ711210	LQ of NAICS 711210 (Spectator sport)	USBLS	2015
LQ711211	LQ of NAICS 711211 (Sports teams and club)		
LQ711219	LQ of NAICS 711219 (Other spectator sports)		
LQ711310	LQ of NAICS 711310 (Promoters of performing sports events with facilities)		
LQ711320	LQ of NAICS 711320 (Promoters of performing sports events without facilities)		
LQ713910	LQ of NAICS 713910 (Golf courses and country clubs)		
LQ713940	LQ of NAICS 713940 (Fitness and recreational sports centers)		
LQ713990	LQ of NAICS 713990 (All other amusement and recreation industry)		
LQ339920	LQ of NAICS 339920 (Sporting and athletic goods manufacturing)		
LQ423910	LQ of NAICS 423910 (Sporting goods merchant wholesalers)		
LQ451110	LQ of NAICS 451110 (Sporting goods stores)		
LQ532292	LQ of NAICS 532292 (Recreational goods rental)		
LQ611620	LQ of NAICS 611620 (Sports and recreation institution)		
Population	Number (in 10,000s) of people for each county	ACS	2011-2015
Poverty	Proportion of population below poverty line for each county		
Ethnic diversity	Proportion of minority race/ethnicity for each county		
Household composition	Index of over age 65, below age 17, older than age 5 with a disability, and single-parent households for each county		

Note: LQ: Location quotient; NAICS: North American Industry Classification System; HVRI: Hazards & Vulnerability Research Institute; USBLS: U.S. Bureau of Labor Statistics; ACS: American Community Survey.

Table 2. Descriptive Statistics of Variables and Correlation Coefficients

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. BRIC score	1.000																	
2. LQ711210	0.008	1.000																
3. LQ711211	-0.040	.184**	1.000															
4. LQ711219	0.009	.433**	-0.034	1.000														
5. LQ711310	-0.024	0.072	0.078	0.010	1.000													
6. LQ711320	-.086*	0.026	.164**	-0.026	.423**	1.000												
7. LQ713910	.063**	0.002	-0.059	0.010	-0.036	-0.064	1.000											
8. LQ713940	.044*	0.040	-0.016	-0.003	0.023	0.012	0.040	1.000										
9. LQ713990	-.071**	-0.002	-0.029	0.000	-0.010	-0.017	0.001	0.018	1.000									
10. LQ339920	-0.068	-0.018	0.062	-0.033	0.007	0.001	-0.024	-0.006	-0.001	1.000								
11. LQ423910	0.020	0.029	0.016	0.028	-0.005	0.058	-0.008	-0.001	-0.007	0.006	1.000							
12. LQ451110	.081**	0.017	0.013	-0.011	-0.036	.119**	.056*	.050*	0.044	-0.021	0.011	1.000						
13. LQ532292	-.085*	-0.027	-0.062	-0.024	-0.035	-0.061	0.058	0.023	0.012	-0.001	0.021	.195**	1.000					
14. LQ611620	0.013	0.032	-0.015	0.006	-0.011	0.057	.109**	0.046	-0.002	-0.015	.165**	.191**	0.037	1.000				
15. Population	0.026	.079**	.330**	-0.009	.193**	.298**	0.024	.050*	-0.009	-0.004	0.031	.088**	-0.050	.115**	1.000			
16. Poverty	-.473**	-0.019	0.049	-0.030	.108**	-0.007	-.125**	-.057**	-0.032	0.045	-0.033	-.159**	-0.012	-.189**	-.057**	1.000		
17. Ethnic diversity	-.372**	0.058	.154**	-0.024	.225**	.162**	-.090**	0.010	-0.037	0.051	-0.023	-.047*	-0.062	0.051	.233**	.470**	1.000	
18. Household composition	-.255**	-0.014	-0.046	0.003	-.087**	-.143**	-.141**	-.073**	-.065**	0.029	-0.018	-.262**	-0.041	-.241**	-.167**	.501**	.222**	1.000
Mean	2.73	0.41	0.23	0.78	0.13	0.20	0.67	0.35	0.98	0.51	0.57	0.61	2.58	0.46	1.00	16.81	22.41	1.99
SD	0.15	2.44	0.77	5.95	0.79	0.79	1.95	3.04	7.61	6.44	4.72	1.14	16.28	1.20	3.20	6.52	19.90	0.52

Note: SD denotes standard deviation.

* $p < 0.05$, ** $p < 0.01$.

Table 3. Results of OLS regression and GWR models

Variable	OLS coefficient	GWR coefficient		
		Min.	Mean	Max.
Intercept	2.973	2.071	2.749	3.100
LQ711210: Spector sport	0.013†	-0.535	0.006	0.089
LQ711211: Sports teams and club	-0.002	-0.014	-0.001	0.017
LQ711219: Other spectator sports	-0.003*	-0.010	-0.002	0.013
LQ711310: Promoters of performing arts, sports, and similar events with facilities	0.009†	-0.017	-0.003	0.016
LQ711320: Promoters of performing arts, sports, and similar events without facilities	-0.015†	-0.015	-0.002	0.005
LQ713910: Golf courses and country clubs	-0.007*	-0.0104	-0.0001	0.0000
LQ713940: Fitness and recreational sports centers	0.001	-0.000019	0.000002	0.000023
LQ713990: All other amusement and recreation industry	-0.003	-0.005	-0.002	0.001
LQ339920: Sporting and athletic goods manufacturing	-0.014†	-0.000013	-0.000001	0.000021
LQ423910: Sporting goods merchant wholesalers	-0.003	-0.000008	-0.000001	0.000036
LQ451110: Sporting goods stores	-0.019†	-0.000009	0.000000	0.000034
LQ532292: Recreational goods rental	-0.002	-0.000006	0.000000	0.000031
LQ611620: Sports and recreation institution	-0.008*	-0.000047	0.000001	0.000012
Population	-0.001	-0.000005	0.000002	0.00027
Poverty	-0.002	-0.006	-0.003	-0.001
Ethnic diversity	-0.003**	-0.007	-0.002	0.000
Household composition	-0.006	-0.009	-0.004	0.002
R^2	0.437	0.196	0.465	0.924
Adjusted R^2	0.374		0.402	
Condition index		3.472	14.894	24.384
Residual sum of squares	0.335		0.298	

Note: Leung's F test is 1: 0.890; AIC_c: Corrected Akaike's information criterion.
† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table 4. List of Top 10 Counties according to Positive GWR Local Coefficients

Rank	LQ711210	LQ711219	LQ711310	LQ711320
1	Carroll (TN)	Dane (WI)	Lapeer (MI)	Kalamazoo (MI)
2	Madison (TN)	Marathon (WI)	Sanilac (MI)	Calhoun (MI)
3	Henderson (TN)	Gogebic (MI)	Genesee (MI)	Ingham (MI)
4	Escambia (FL)	Vilas (WI)	Oakland (MI)	Cass (MI)
5	Santa Rosa (FL)	Iowa (WI)	Macomb (MI)	Shiawassee (MI)
6	Tuscaloosa (AL)	Doria Ana (NM)	Livingston (MI)	Saginaw (MI)
7	Mobile (AL)	Macomb (MI)	Ingham (MI)	St. Joseph (MI)
8	Jones (MS)	Houghton (MI)	Wayne (MI)	Livingston (MI)
9	Harrison (MS)	Forest (WI)	Washtenaw (MI)	Oakland (MI)
10	Rankin (MS)	St. Clair (MI)	Clinton (MI)	Bayfield (WI)

Rank	LQ713910	LQ339920	LQ451110	LQ611620
1	Dona Ana (NM)	Dona Ana (NM)	Dona Ana (NM)	Raleigh (WV)
2	Navarro (TX)	Butler (KS)	Logan (WV)	Kanawha (WV)
3	Ellis (TX)	Cleveland (OK)	Mingo (WV)	Wyoming (WV)
4	Hill (TX)	Shawnee (KS)	Fayette (WV)	St. Tammany Parish (LA)
5	Limestone (TX)	Sedgwick (KS)	Raleigh (WV)	Orleans Parish (LA)
6	Freestone (TX)	Macon (MO)	Kanawha (WV)	Harrison (MS)
7	Clark (TX)	Oklahoma (OK)	Crittenden (KY)	Pike (MS)
8	Madison (KY)	Dodge (MN)	Livingston (KY)	Forrest (MS)
9	Dallas (TX)	Pulaski (KY)	McCracken (KY)	Dyer (TN)
10	Walker (TX)	Dickinson (KS)	Wyoming (WV)	Lamar (MS)

Note: LQ711210 (Spectator sport); LQ711219 (Other spectator sports); LQ711310 (Promoters of performing arts, sports, and similar events with facilities); LQ711320 (Promoters of performing arts, sports, and similar events without facilities); LQ713910 (Golf courses and country clubs); LQ339920 (Sporting and athletic goods manufacturing); LQ451110 (Sporting goods stores); LQ611620 (Sports and recreation institution).

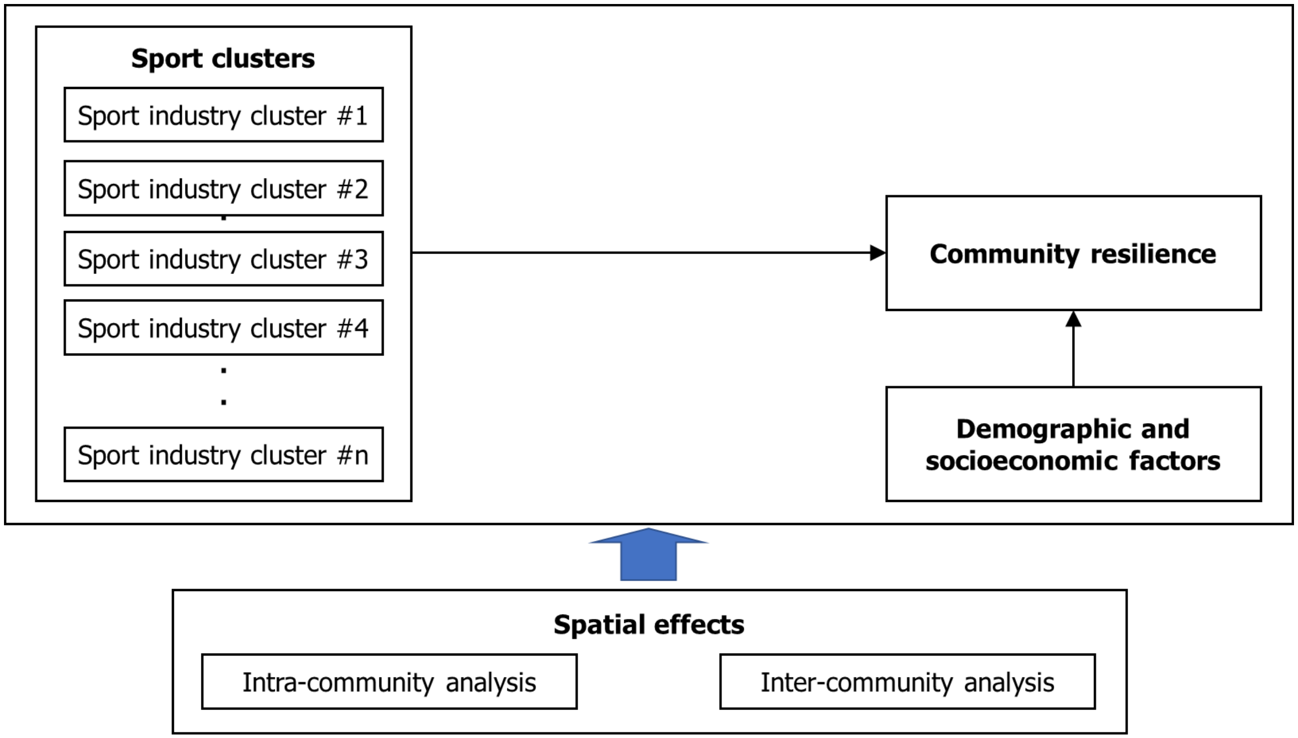

Figure 1. Conceptual Framework

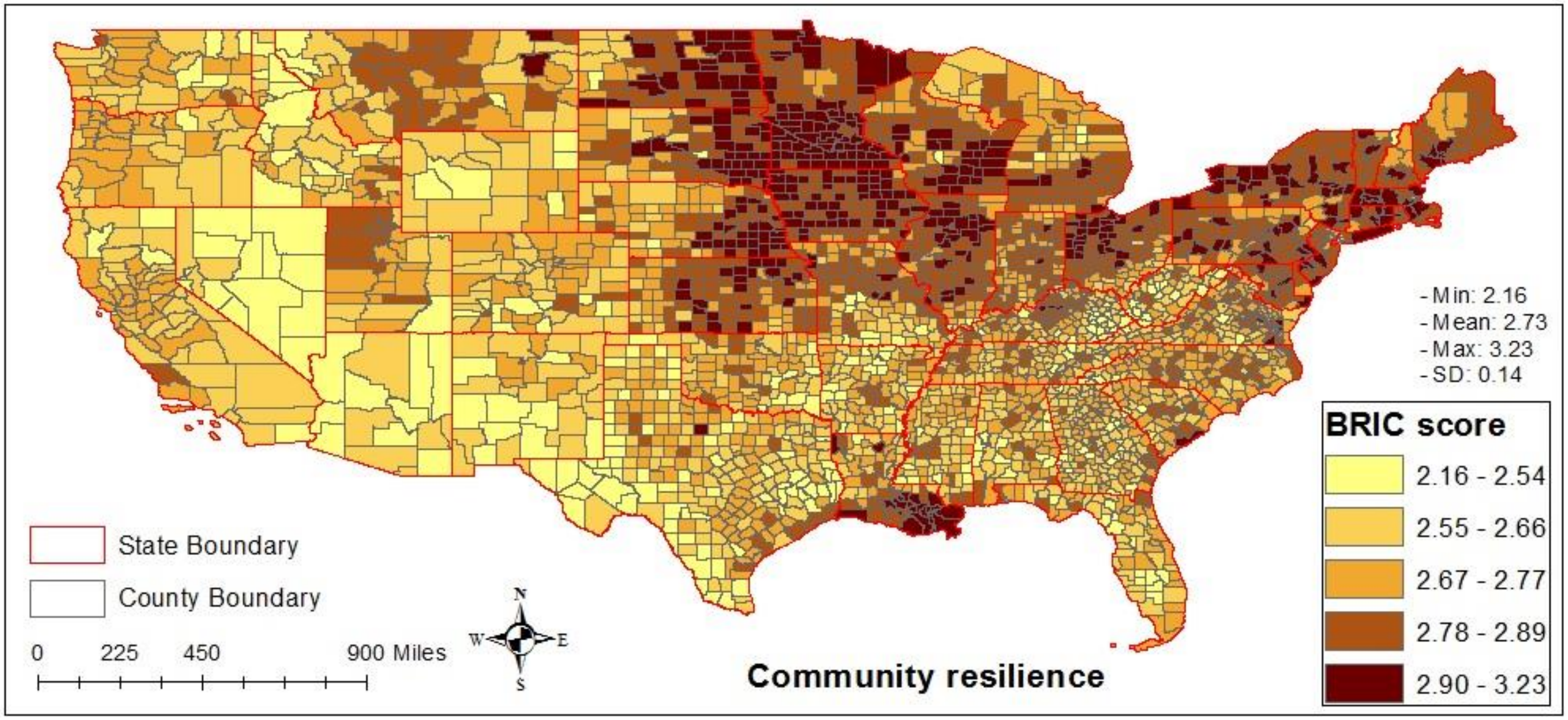

Figure 2. Spatial Distribution of Community Resilience

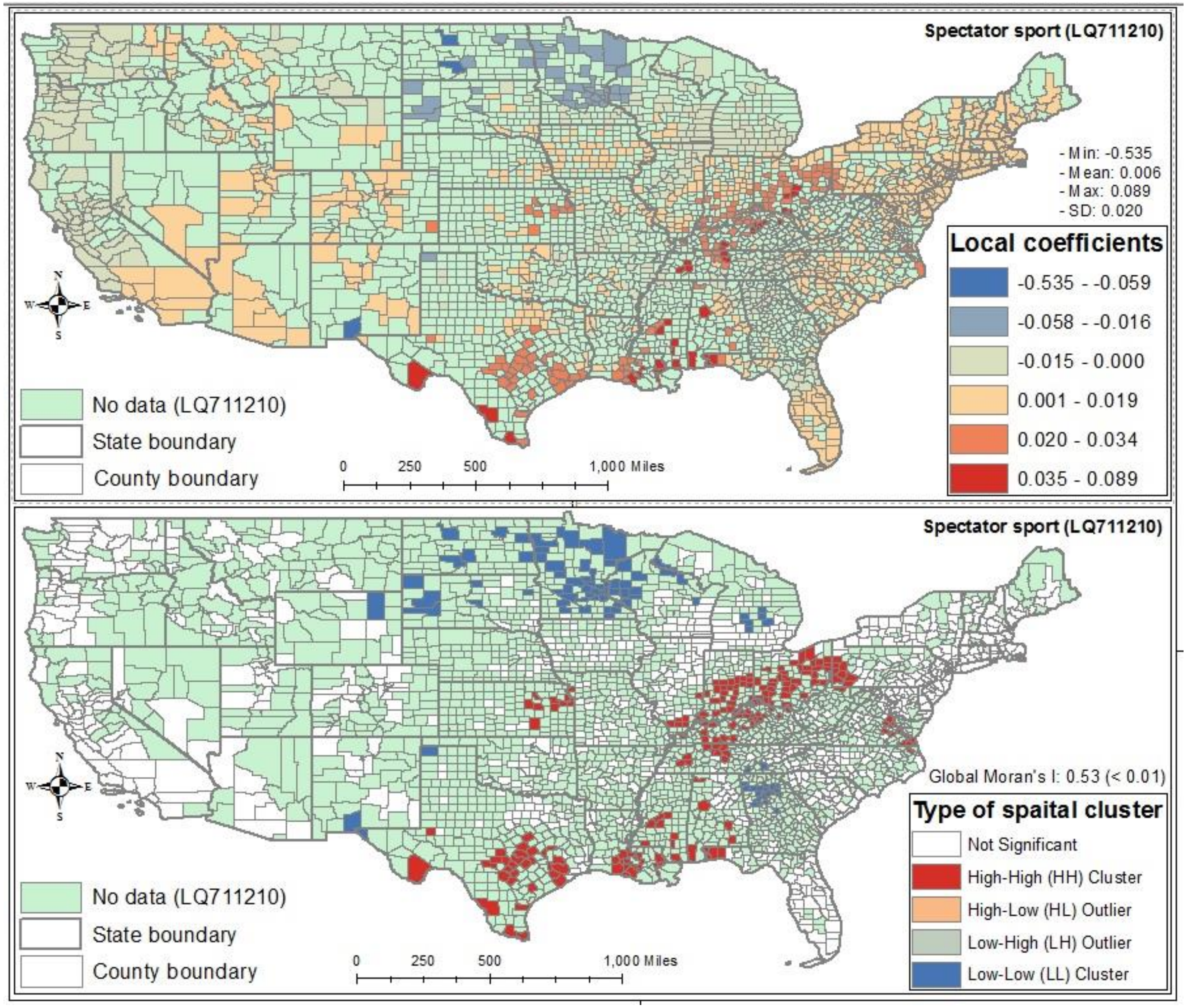

Figure 3. Spatial Distribution of GWR-based Local Coefficients for Spectator Sport Cluster (LQ711210)

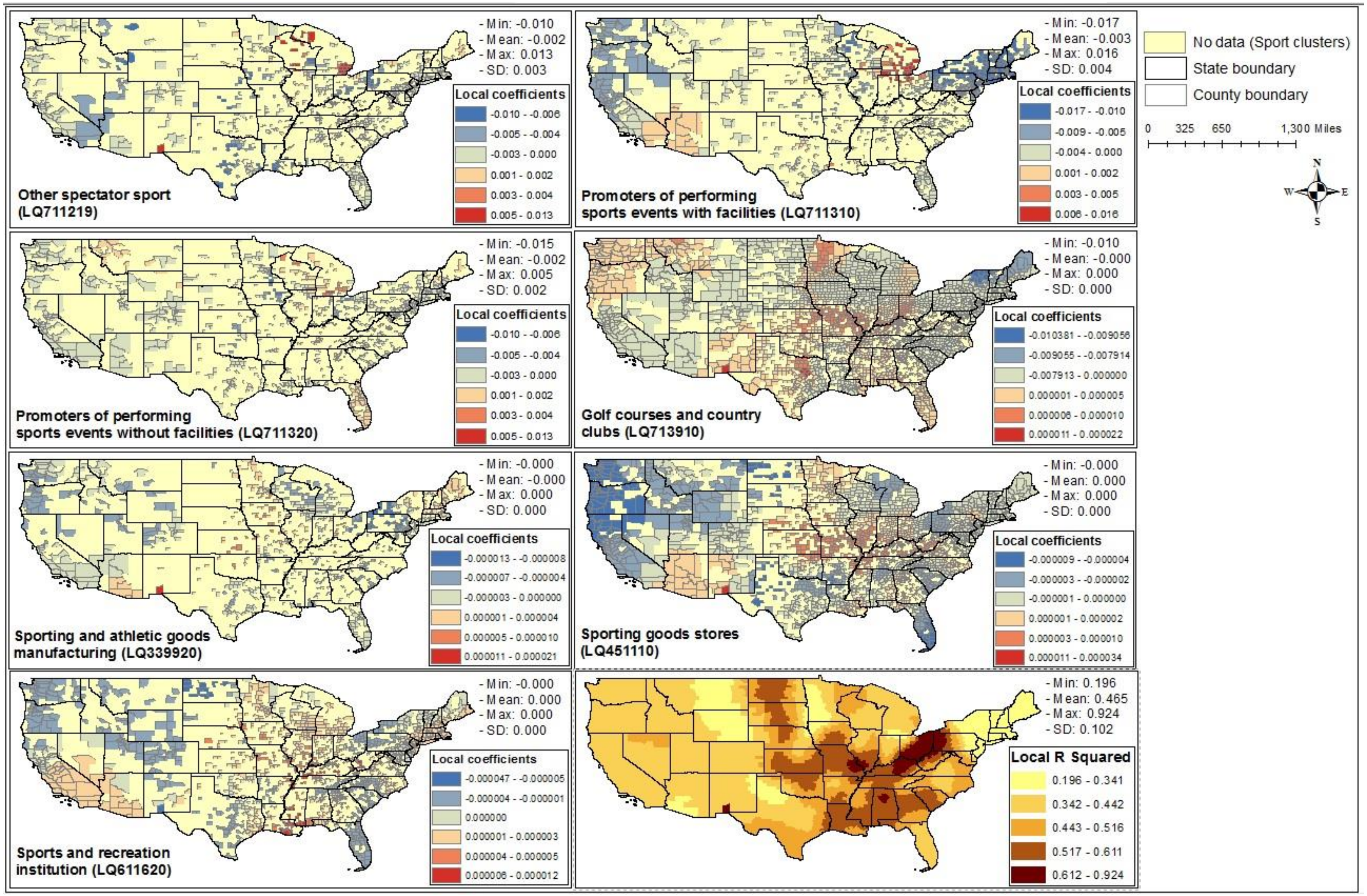

Figure 4. Spatial Distribution of Local Coefficients for Other Sport Clusters and Local R^2