Tourism Analysis, Vol. 18, pp. 559–573
Printed in the USA.

1083-5423/13 $60.00 + .00
DOI: http://dx.doi.org/10.3727/108354213X13782245307830
E-ISSN 1943-3999
www.cognizantcommunication.com

MAPPING SPATIAL TOURISM AND HOSPITALITY EMPLOYMENT CLUSTERS: AN APPLICATION OF SPATIAL AUTOCORRELATION

A. CHHETRI,* C. ARROWSMITH,* P. CHHETRI,† AND J. CORCORAN‡

*School of Mathematical and Geospatial Sciences, RMIT University, Melbourne, Victoria, Australia
†School of Business IT and Logistics, RMIT University, Melbourne, Victoria, Australia
‡School of Geography, Planning and Environmental Management, The University of Queensland, Brisbane, Queensland, Australia

This article analyzes the characteristics and spatial clustering of tourism and hospitality employment clusters in Victoria, Australia. Using cluster theory as the theoretical base, three interrelated research questions are specifically addressed: What industries constitute the tourism and hospitality sector? What broader "groupings" does the sector exhibit? Are these tourism and hospitality industries clustered around strategic areas of economic and resource advantage? Using the Australian and New Zealand Standard Industrial Classification (at the four-digit level), industries explicitly related to tourism and hospitality were first identified and total numbers of individuals working within these industries were aggregated at a level of Statistical Local Area (similar to a suburb or a neighborhood). Results show that in 2006 employment in tourism and hospitality equate to 7.74% of total employment in Australia. "Cafés and restaurants" (22%) is the single largest tourism and hospitality-related employer, followed by "take-away food services" (20%) and "accommodation" (16%). Using factor analysis, four broader functions were extracted to characterize the underlying structure and functional interdependency among tourism and hospitality industries. These functions include: tourism operational services, hospitality services, entertainment services, and infrastructure operational facilities services. Spatial autocorrelation measures have identified five established tourism and hospitality spatial clusters in Victoria, which we argue hold the potential to act as tourism growth foci to create business synergy and generate spill-over effects through regional collaboration, competition, and sharing of pooled resources between firms.

Key words: Tourism and hospitality sector; Cluster theory; Geographical information system (GIS); Spatial autocorrelation

Introduction

Tourism has been seen as a mechanism for regional development with the potential to diffuse economic growth in regional and remote areas (Chhetri, Corcoran, & Hall, 2008; Hall & Page, 2006; Jackson & Murphy, 2006). The development of homogenous clusters is one such business strategy for accelerating economic growth and harnessing tourism

Address correspondence to A. Chhetri, School of Mathematical and Geospatial Sciences, RMIT University, Melbourne, Victoria, Australia. Tel: 03 9925 3277; Fax: 03 9663 2517; E-mail: s3208447@student.rmit.edu.au

development opportunities. There is broad agreement on the fact that economic growth tends to appear in the form of spatial clusters or nodes of high economic activities, often confined in strategic areas of economic and resource advantage. This is often referred to as the "agglomeration effect," where related firms locate near one another to reduce production and distribution costs (Krugman, 1991; Overman & Puga, 2009). For example, retail stores agglomerate when locating in shopping malls because they have access to a large group of potential customers that in turn lower the marketing costs. The agglomeration effect explains the reason why wine producers in California, France, Italy, and Australia are clustered around areas of grape production or why hotels in the Gold Coast (Australia) or Pattaya in Thailand tend to segregate along beach precincts. Clusters in the service sector such as California's Silicon Valley in the US, Bangalore (software development) in India, and Cambridge (biotechnology) in the UK are world-renowned examples of high-performance nodes of economic growth.

However, the globalization of production and consumption of resources and concomitant mass tourist mobility across international borders contests the localized perspective argued by cluster theorists. Furthermore, cluster theory as a policy tool for achieving local economic development goals is often difficult to argue when contemporary business networks in a spatially fragmented global economy are increasingly becoming ubiquitous, instantaneous, and global. Nonetheless, evidence suggest a worldwide adoption of cluster theory to enable fostering collaborative sharing of common resources and building alliances to collectively tackle projects that are unlikely within the capacity of an individual firm. Novelli, Schmitz, and Spencer (2006) also affirmed the purpose of tourism clusters to provide opportunities to engage "SMEs that would normally work in isolation to co-operate and build a successful tourism product in the locality" (pp. 1143).

The term "tourist industry" is widely used in a generic sense to represent a heterogeneous collection of businesses serving tourists' distinctive needs. It includes a range of industries, which connects tourists with attractions through an interdependent set of value-adding services such as the provision of hotels, sightseeing, transportation, or restaurants. The sum total of these services constitutes a typical tourism service supply chain and is often presented to tourists as a single product: "the tour package." Design and development of a tour package, however, requires services not only from the tourism and hospitality industry but also from other industry sectors, which adds further complexity in defining and mapping tourism and hospitality clusters. For instance, in 2006–2007 tourism accounted for 482,000 jobs across Australia, which included construction workers building hotels, dairy farmers producing milk consumed by tourists, computer programmers designing reservation systems, and the lawyers, bankers, and accountants who service tourism clients (Tourism & Transport Forum, 2008). Moreover, adding the number of work hours tends to overestimate the number of full-time jobs. These equivalent full time jobs (EFTJs) do not therefore represent real jobs, given that they are spread over many employees (e.g., in the retail sector or health care). This concern has also being reiterated by a recent study by Backer and Barry (2012), which disputes the methodologies often used in industry to estimate tourism employment and argue for supporting the theory of Partial Industrialization in Tourism (PIIT). Furthermore, obtaining tourism industry data in an accessible and usable form is recognized globally as a significant problem; thus, the use of industry-wide employment data collected by census could be considered a way forward to tackle this problem. New ways of generating tourism industry data at a much finer spatial granularity using actual employment data, instead of statistical estimates, will provide new insights on tourism and hospitality labor market conditions.

Theoretically, whether we expect tourism and hospitality (T&H) industries to cluster or disperse spatially raises another challenge. Studies, including those by Nordin (2003), Michael (2003), and Chhetri et al., (2008), highlight that T&H industries tend to exhibit higher propensity to form clusters in and around tourist destinations. This is predicated on the fact that T&H industries tend to service areas that have tourist attractions. If tourist attractions were more widely dispersed, one would expect the same for T&H industries or employment. If this is the case, the question that requires further investigation is whether tourist attractions are spatially dispersed or clustered and how exhibited patterns relate to supply of labor. There is some degree of

agreement that tourist attractions in regional and remote areas are relatively dispersed in comparison to urban- or city-based attractions. We could expect that clustering of T&H industries would be stronger in urban areas, whereas in rural and regional areas it would largely be dependent on the distribution of tourism attractions. If the spatial pattern is dispersed, we argue any tourism policy built on the assumption of achieving economic efficiency through clustering would be prone to failure. The cluster theory therefore needs to be scrutinized for its applicability in the context of T&H services planning before it can be transmuted into a public policy. The adoption of cluster-based approach for tourism planning thus requires addressing a range of theoretical and methodological issues, including the fundamental questions such as: What is tourism employment cluster? and How do we define and measure it?"

This article is therefore founded on debates about defining the T&H sector employment and the way it manifests spatially. Using cluster theory as the theoretical base, the idea of harnessing the benefits associated with employment clustering in a geographical sense to stimulate economic growth is investigated. We argue that the analyses presented in this article will provide the necessary evidence base to better inform regional development policies to ameliorate the well-being of the tourism-dependent labor force. This article therefore tackles the aforementioned issues by setting up three interrelated research questions: (i) What industries typically represent the T&H sector?; (ii) What broader "groupings" does the sector exhibit? and (iii) Are these industries at an aggregate level clustered around favorable locations of strategic importance?

The next section commences by introducing cluster theory. The research approach is presented in the third section, followed by a presentation of results and analysis in the fourth section. The article discusses the limitations of this research and concludes with a summary of major findings.

Understanding Cluster Theory

The intellectual antecedents of clusters date back as far as the late 1800s when Alfred Marshall (1890) described externalities of specialized industrial locations. Cluster theory was first developed to capture "externalities" and "agglomeration effects" (Marshall, 1890, 1920; Motoyama, 2008). Von Thunen's location theory in 1829 explaining spatial patterns of economic activity and Weber's theory of industrial location both have similar premises to that of cluster theory. The notion of a "growth pole" (Perroux, 1955) also resembles clustering wherein firms are geographically concentrated in strategic locations to generate multiplier effects and foster rapid innovation. More recently, Porter (2000) conducted a systematic analysis which recognizes that companies cooperate and simultaneously compete to generate wealth when located within a geographic area. He defines a cluster as a "geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (p. 16). In simple terms, cluster theory is about explaining the creation of conducive business environments that encourages firms/organizations to colocate in a strategic area so that the advantages of agglomeration economies and externalities can be availed to reduce costs. It can be considered as a business strategy to enhance competitiveness of firms or a source of economic policy development to create economic growth and regional prosperity.

Porter (2000) developed "a diamond model of cluster" that identified salient conditions that favor the successful creation and development of industrial clusters. The key benefits that he associated with clustering include increased productivity, higher wages, and opportunities for innovation through greater access to specialized inputs (e.g., parts and components, business services). More recently, Michael (2003) suggested "micromarket clustering theory" as one alternative for supporting regional economic growth, particularly through tourism. He identified three different types of clustering. Horizontal clustering occurs when firms are spatially concentrated; diagonal clustering represents the degree to which distinctively different firms performing different functions collaborate. However, these firms produce products independent to each other but later offer them as a single product, such as a tour package. Vertical clustering is when interrelated and interdependent firms collaborate to create a value chain (i.e., value-adding activities) that operate at discrete locations.

A number of fundamental principles underpin the characteristics and patterns of cluster development.

Marshall (1890) states that clustering of companies close to a well-defined geographic area results in many business advantages through achieving agglomeration economies. He termed "trinity of agglomeration" to reflect "local pool of skilled labor," "local supplier linkages," and "local knowledge spillovers." Press (2006) defined agglomeration as a "concentration of economic activity in space, . . . in the most general sense . . . defined as the locus of heightened economic activity" (p. 7). Agglomeration economies provide two sources of efficiency gains (Florax & Plane, 2004). First is through the diversity of product availability, which can be readily exchanged within the agglomeration. It is particularly critical for products whose transaction costs increase strongly with distance. Second is the incentive for firms to colocate and to form an agglomeration to reduce forward and backward transactions and transportation costs due to proximity effect. As such, the creation and development of clusters of high economic activity in a bounded area are not random; they are subjected to two opposing forces. Fujita and Thisse (2002) called these forces "agglomeration" (or centripetal) and "dispersion" (or centrifugal) (p. 5). These forces generate simultaneous push (e.g., congestion) and pull (e.g., reduced transport costs) to attract consumers and firms to produce a spatial configuration of economic activity as an outcome of a complicated balance of forces.

External economy of scale is another reason for clustering of firms. It is different from internal scale, which is achieved when a firm increases production that in turn reduces costs. External scale occurs outside a firm within an industry by increasing the scope of operation to benefit from factors such as better transportation services, access to a joint pool of skilled labor, lower search cost, local intra industry specialization, and availability of local specialized services (Gordon & McCann, 2000; Simmie, 2005). Doeringer and Terkla (1995) assert that clusters at a specific location develop on either "historical accident" or to avail the cost advantages largely associated with immobile factors, which provide benefits for firms to anchor the cluster. Localized externalities are location specific and are largely related to cost advantages due to initial resource endowments and immobile resources. Morkel (1993) recognized Australia's competitive advantage in the natural resources sector, but asserts a strong need to enhance its local competencies to support cluster development. Lade (2006) unfolded the role of human (e.g., strong local leadership, cooperation-appropriate attitude) and nonhuman factors (e.g., presence of strong industrial structure) in creating different forms of tourism business clusters.

In summary, clustering is a complex concept, both theoretically and methodologically. It has multiple meanings, variegated forms, and complex interfirm interactions and linkages. Despite its long history, as stated by Martin and Sunley (2003), "there is a chaotic use of the term cluster, in the sense of conflating and equating quite different type processes and spatial scales of economic localization under a single all-embracing universalistic notion" (p. 10). Feser (1998) also recognizes that there is "no cluster theory *per se*, rather a broad range of theories and ideas that constitute the logic of clusters" (p. 18). There is definitely a strong need to develop a unified theoretical framework for examining clusters (Brown, 2000), particularly the questions raised around the structure and the scale of clusters in the context of tourism (Michael, 2003). Multiple meanings of clustering bring in an element of complexity and create difficulties in formulating and implementing a cluster-based planning model. A sound and robust methodology for defining and delineating clusters in a geographic sense is being raised as a major concern. For instance, vagueness and inaccuracy in defining and constructing clusters remains a subject of constant debate in academic circles (Martin & Sunley, 2003). Glaven's (2008) skeptical remark on the creation of clusters as the outcome of speculative actions also raises contestable ground. The comment by Bresnahan, Gambardella, and Saxenian (2005) is noteworthy of attention, which highlights serious concerns on the "intellectual foundation for largely failed policies that attempt to jump start growth in clusters by directive policy" (p. 117). Torre (2008) also recognizes that cluster is often characterized by a substantial degree of vagueness and inaccuracy, which, with time, increase proportionally with the number of reformulations proposed and has proven difficult to assign precise and well-ordered analytical substance. As a result, the substance varies significantly depending on the public authority or decision maker implementing it (Porter, 2000). Hence, the

term cluster is clearly marred with vagueness and inaccuracy in its spatial representation. As a result, researchers constructed clusters from the reach of innovation activity, to district, and sometimes even regions without the use of a rigorous method or procedure. Virtualization of cluster and globalization of supply chains further make cluster more difficult to formulate and thus make it even harder to plan and implement in practical terms. A robust methodology to identify, characterize, and measure clusters of high economic activity is therefore called upon to test the applicability of cluster theory for tourism planning.

From a policy perspective, cluster theory has proven to be an effective policy tool for stimulating and sustaining economic growth. Michael (2003) highlights the importance in creating economic and social opportunities for small communities through "the development of clusters of complementary firms that can collectively deliver a bundle of attributes to make up a specialised regional product" (p. 133). Leibovitz (2004) also argues for the integration of spatial processes and the structure of tourism clusters into tourism labor force planning. Cluster development has not only been widely adopted in many industrialized countries such as the US, UK, France, Germany, the Netherlands, Portugal, New Zealand, and Japan (Motoyama, 2008), but also has gained popularity in developing countries as a tool to stimulate and sustain economic growth (Doeringer & Terkla, 1995; Schmitz & Nadvi, 1999). Notwithstanding, cluster-based policy options that could potentially stimulate and sustain economic growth through strategic and planned government interventions require careful scrutiny in order to fully evaluate their effectiveness.

The Approach

There are a number of issues in measuring and mapping T&H spatial clusters. Among them two are particularly critical in the development of our approach. *First* is the identification of industries that are related to the tourism and hospitality sector and *second* is the appropriate spatial scale and techniques to determine whether or not a pattern is spatially clustered. Dealing with the first issue, there is no doubt that a range of industries serves tourists; nonetheless, they are not entirely dependent on income from tourism. The use of Tourism Economic Accounts (TEAs) and Tourism Satellite Accounts (TSAs) is one approach that dissects the services that are equally shared by both residents and tourists (e.g., restaurant meals or local transport). This TSA methodology has now been well established in many countries, including the US, Australia, the UK, and Canada, and is recognized by the Organisation for Economic Cooperation and Development (OECD) and World Tourism Organization (WTO). The Australian Bureau of Statistics (ABS, 2006) has developed the Australian Tourism Satellite Account (ATSA) to estimate the economic contribution of tourism to the economy based on input–output model interaction data. The ATSA describes *tourism characteristic industries* to include accommodation, ownership of dwellings, cafés, restaurants and takeaway food services, clubs, pubs, taverns, and bars, all forms of transport, tour operator services, cultural services, casinos and other gambling services, other sports and recreation services. The *tourism connected industries* include automotive fuel retailing, other retail trade, education, and training (ABS, 2011). Despite progress made through the TSA approach, a number of concerns have been raised: Overdependence on the demand-side perspective of TSA, where the employment supported by tourism is calculated through visitor spending, from which estimates for full-time equivalent job share are determined; people employed in industries such as retail or transportation only spend a small part of their job by helping tourists, and their job is not dependent on tourism. We have therefore excluded those industries where tourism and hospitality were not the primary focus. The inclusion of labor input into the tourism industries from other sectors undoubtedly makes sense when estimating the contribution of tourism to the economy. However, we are concerned with the direct employment in T&H industries. The focus is rather on those industries that are directly related to tourism.

In order to avoid confusion in the way tourism, tourist, tourism sector, and tourism industry are defined, we propose to adopt a more open and generic approach in this analysis. We integrated tourism and hospitality industries so that a broader framework of the tourism sector can be developed. In that way, we use the term tourism in a generic sense to include both T&H industries as they are

intrinsically interrelated, interdependent, and parts of the same value chain. In our approach, we propose to ascertain those industries that are directly related to T&H and measure their relationships (e.g., areas offering tourist accommodation are more likely to attract travel agents and tour operators within the same area).

The key principle that underpins clustering is "colocation" of firms. Geographic proximity is paramount in the creation and development of a successful cluster. The key emphasis of spatial theoretical perspective is on understanding the spatial organization of T&H employment. Employment activity is attached to space and space "matters" for labor market outcomes (Fernandez & Su, 2004). We consider colocation of firms and employment within a geographically bounded area is a spatial process, as it relates to making decisions about location choices. Clusters are "spatial artifacts." They represent spatial conglomeration of employment and firms in an optimal or suboptimal location. By virtue of its collective nature, an aggregate level of analysis is logical so that geographic conditions conducive for colocation and coexistence of firms vis-à-vis employment can be investigated. In this article, we introduce the concept of a spatial cluster, which we define as an area of high concentration of aggregate T&H industries or employment surrounded by neighboring areas of high T&H employment. In other words, when an area and its adjacent areas hold a higher employment in the T&H sector they collectively form a T&H spatial cluster. The spatial scope of these clusters, however, could range from a tourist destination, a region, or even a single city. Collectively, these spatial units are deemed a spatial cluster as long as they each have high employment values, are spatially adjacent or contiguous, and create spatial dependency through generating spill-over effects.

The spatial approach adopted in this article to analyze T&H clusters uses down-scaled data at a four-digit level for a lower level of geographic unit [Statistical Local Area (SLA)—similar to a neighborhood or a suburb]. The analyses were conducted on the Australian and New Zealand Standard Industrial Classification (ANZSIC) data collected by the ABS. Employer addresses were recorded in the census and these refer to the main jobs held in the previous week of employment (i.e., the week before census night). The Census Journey to Work (JTW) data contains the number of people working in different types of industry and the place of usual residence as well as the place of work for each individual in Australia.

The ANZSIC scheme is hierarchical and structured at four descriptive levels of Division, Subdivision, Group, and Class. The hierarchical level Class provides increasingly detailed dissections of the broader divisions for the compilation of more specific and detailed statistics**.** In this research, a four-digit code is used at the Class level, which can be linked to SLAs. Multivariate analyses were undertaken on the ANZSIC T&H employment data that contained the number of people employed in different industries for each of the 209 SLAs in Victoria.

Research Methodology

Statistical and spatial analyses were conducted on ANZSIC data in five sequential stages. In stage 1 we identified the industries that are related to T&H using a four-digit ANZSIC code. In stage 2 we compressed these industries into components called "functions" using factor analysis that define the underlying structural dimensions of the T&H sector. These functions were then mapped in stage 3 using GIS. In stage 4, spatial autocorrelation techniques were used to identify local T&H employment spatial clusters. In the final stage, an interpretation of T&H spatial clusters is presented to highlight the profile for each cluster. These stages are discussed below.

Stage 1: Identification of T&H-Related Industries

The first stage of analysis was to identify those industries that are directly related to T&H. ANZSIC data at the four-digit level comprised a total of 717 industries. These industries were individually evaluated for their association with the T&H sector. Industries that were marginally related to the T&H sector were not considered in our research. For example, people employed in a museum as an interpreter for tourists were excluded. Apart from air transport, public transport employment was excluded.

The total counts of employment across these industries within the T&H industries are given in Table 1. Cafés and restaurants (22%) are the largest employer of this sector, followed closely by

Takeaway food services (20%), Accommodation (17%), and Pubs, taverns, and bars (10%), which individually made up more than 10% of the work force each. In 2006, the total number of employees in the T&H industries was 705,064 in Australia, which accounted for 7.74% of total employment.

Stage 2: Quantifying the T&H Functions

Principal component analysis (PCA) has been employed to identify latent components from a set of interrelated variables. A reduced number of new variables, known as components, are obtained from highly correlated variables, in this case, the T&H industries. Where loadings on components were greater than 0.4, these variables were retained. Industries where the total number of jobs is less than 200 were excluded. The Kaiser–Meyer–Olkin was calculated and its value 0.811 clearly exceeded the 0.5 levels that indicate acceptability of the use of PCA. Varimax rotation identified a solution in which high component loadings were maximized. The selected model generated by PCA with varimax rotation enabled the identification of four

Table 1
Industrial Composition of the Tourism and Hospitality (T&H) Industries

T&H Industries	People Employed in the T&H Sector	Total Employment in the T&H Sector (%)	Total Employment (Include All Industries) (%)
Cafés and restaurants	157,484	22.34	1.73
Takeaway food services	144,772	20.53	1.59
Accommodation	117,707	16.69	1.29
Pubs, taverns, and bars	72,349	10.26	0.79
Clubs (hospitality)	44,077	6.25	0.48
Air and space transport	38,433	5.45	0.42
Travel agency and tour arrangement services	29,925	4.24	0.33
Catering services	24,864	3.53	0.27
Casino operation	12,242	1.74	0.13
Food and beverage services, nfd	11,906	1.69	0.13
Other gambling activities	7,704	1.09	0.08
Museum operation	6,411	0.91	0.07
Airport operations and other air transport support services	6,302	0.89	0.07
Nature reserves and conservation parks operation	6,143	0.87	0.07
Passenger car rental and hiring	6,140	0.87	0.07
Scenic and sightseeing transport	4,526	0.64	0.05
Amusement parks and centers operation	3,779	0.54	0.04
Amusement and other recreation activities, nec	2,872	0.41	0.03
Zoological and botanic gardens operation	2,571	0.36	0.03
Cafes, restaurants, and takeaway food services, nfd	1,398	0.20	0.02
Sport and recreation activities, nfd	1,338	0.19	0.01
Sport and physical recreation activities, nfd	1,082	0.15	0.01
Accommodation and food services, nfd	552	0.08	0.01
Parks and gardens operations, nfd	155	0.02	0.00
Amusement and other recreation activities, nfd	145	0.02	0.00
Heritage activities, nfd	131	0.02	0.00
Gambling activities, nfd	56	0.01	0.00
Total jobs in tourism and hospitality sector	**705,064**	**100**	**7.74**
Total jobs in all industries	**9,104,187**		
Employment in the T&H sector to total employment	**705,064**	**7.74**	

nfd, not further defined; nec, not elsewhere classified.

components with eigenvalues greater than 1 (refer to Table 2). These components were also tested for internal reliability using Cronbach's alpha.

Industries that load heavily on component 1 are: Nature reserves and conservation parks operation, Accommodation, Travel agency and tour arrangement services, Scenic and sightseeing transport, and Amusement parks and centers operation. This has been labeled the *Tourism Operational Services* component. It accounts for 44% of the total variance. Component 2 is defined by: Takeaway food services, Clubs (hospitality), Cafés, restaurants, and takeaway food services [not further defined (nfd)], Pubs, taverns, and bars, and Food and beverage services, (nfd). This component is named the *Hospitality Services* component. This component explains about 13% of the total variance.

Component 3 is heavily loaded on three industries—Museum operation, Casino operation, and Catering services—and explains 9% of the variance. This component is named the *Entertainment Services* component. Three industries defining component 4 are: Airport operations and other air transport support services, Air and space transport, and Passenger car rental and hiring. Total variance explained by this component is approximately 7%. This component is named the *Infrastructure Operational Facilities Services*.

Stage 3: Mapping Spatial Concentrations of Tourism and Hospitality Employment

In order to map T&H employment, the total number of people employed in T&H industries was aggregated and then mapped using GIS. Figure 1 depicts the spatial variability in T&H employment as a proportion of total employment in Victoria. It shows that the share of employment in T&H to total employment is relatively lower in the Melbourne metropolitan area, although actual counts are relatively high. High concentration of T&H employment can be seen along the coastal areas. Popular tourism destinations such as the Great Ocean Road in the southwest, Phillip Island southeast of Melbourne, and areas around the alpine regions to the northeast are of high T&H employment concentrations.

In addition to aggregate mapping of T&H employment, the functions identified in stage 2 were also

Table 2
Rotated Factor Loadings

Tourism and Hospitality Industries	1	2	3	4	Eigenvalue	Cronbach's α
Tourism Operational Services					8.32	0.86
8922 Nature reserves and conservation parks operation	0.870	0.168	–0.079	–0.022		
4400 Accommodation	0.844	0.313	0.305	0.062		
7220 Travel agency and tour arrangement services	0.844	0.388	0.069	0.121		
5010 Scenic and sightseeing transport	0.688	0.090	0.311	0.053		
9131 Amusement parks and centers operation	0.439	0.329	0.157	–0.051		
Hospitality Services					2.46	0.82
4512 Takeaway food services	0.205	0.834	0.024	0.122		
4530 Clubs (hospitality)	0.417	0.726	–0.081	0.016		
4510 Cafés, restaurants, and takeaway food services, nfd	0.220	0.673	0.149	–0.014		
4520 Pubs, taverns, and bars	0.212	0.633	0.198	0.012		
4511 Cafés and restaurants	0.368	0.586	0.292	0.035		
4500 Food and beverage services, nfd	0.356	0.568	0.379	0.068		
Entertainment Services					1.81	0.76
8910 Museum operation	0.212	0.195	0.870	0.007		
9201 Casino operation	0.049	–0.113	0.797	–0.041		
4513 Catering services	0.188	0.339	0.729	0.378		
9209 Other gambling activities	0.336	–0.002	0.751	0.036		
Infrastructure Operational Facilities Services					1.40	0.72
5220 Airport operations and other air transport support services	–0.023	0.016	0.017	0.989		
4900 Air and space transport	0.097	0.058	0.034	0.981		
6611 Passenger car rental and hiring	0.112	0.042	0.171	0.692		

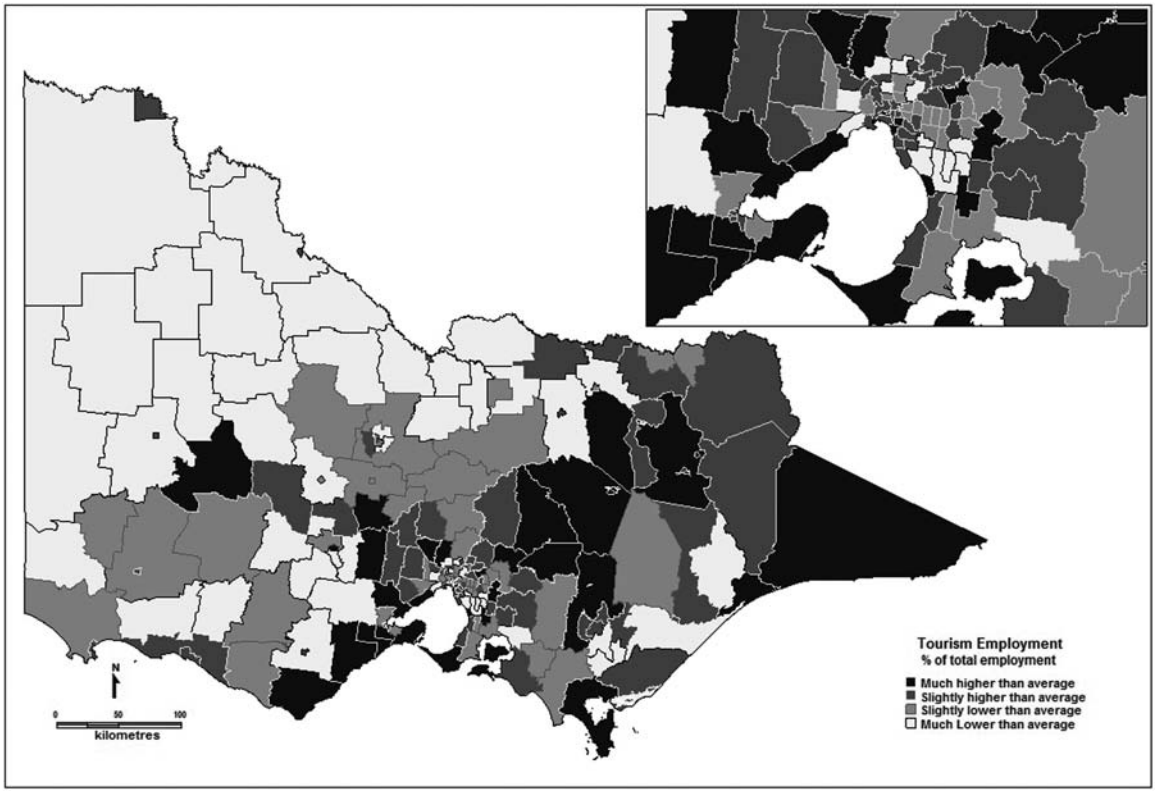

Figure 1. Employment landscape of the tourism and hospitality sector in Victoria, Australia.

individually mapped. These maps depict the levels of employment in the T&H sector for each of the components. Figure 2 illustrates the spatial variability in employment (i.e., number of jobs) associated with *Tourism Operational Services*, *Hospitality Services*, *Entertainment Services*, and *Infrastructure Operational Facility Services*. This figure also shows that *Tourism Operational Services* are more widely distributed across the state. *Hospitality Services* are more concentrated in Melbourne and other regional cities/towns. Central Melbourne has emerged as a hub for *Entertainment Services*; however, there are regional towns that also offer such services. Employment in *Infrastructure Operational Facility Services* largely congregates around airports and transport-oriented transit hubs to support tourist movements.

This stage explored the levels of concentration within an area. However, to what extent this spatial distribution creates spatial clusters between areas of T&H employment was yet to be quantified. Stage 4 employed measures of spatial autocorrelation to examine the degree of spatial patterning, which is discussed in details in next section.

Stage 4: Quantifying Spatial Clusters of T&H Employment

Mapping the percentage of tourism employment to total employment (Fig. 1) has identified spatial concentrations of T&H employment in Victoria. These show spatial concentrations of employment within an area (i.e., percentage of tourism employment to total employment); however the "externalities generated from the heightened economic activity in an area, and its spill-over effects" on its neighbors are yet to be examined.

An approach based on spatial autocorrelation techniques is employed to quantify spatial clustering of T&H employment. This spatial approach is appropriate for geographic data where a spatial dependence in observations often exists. To account

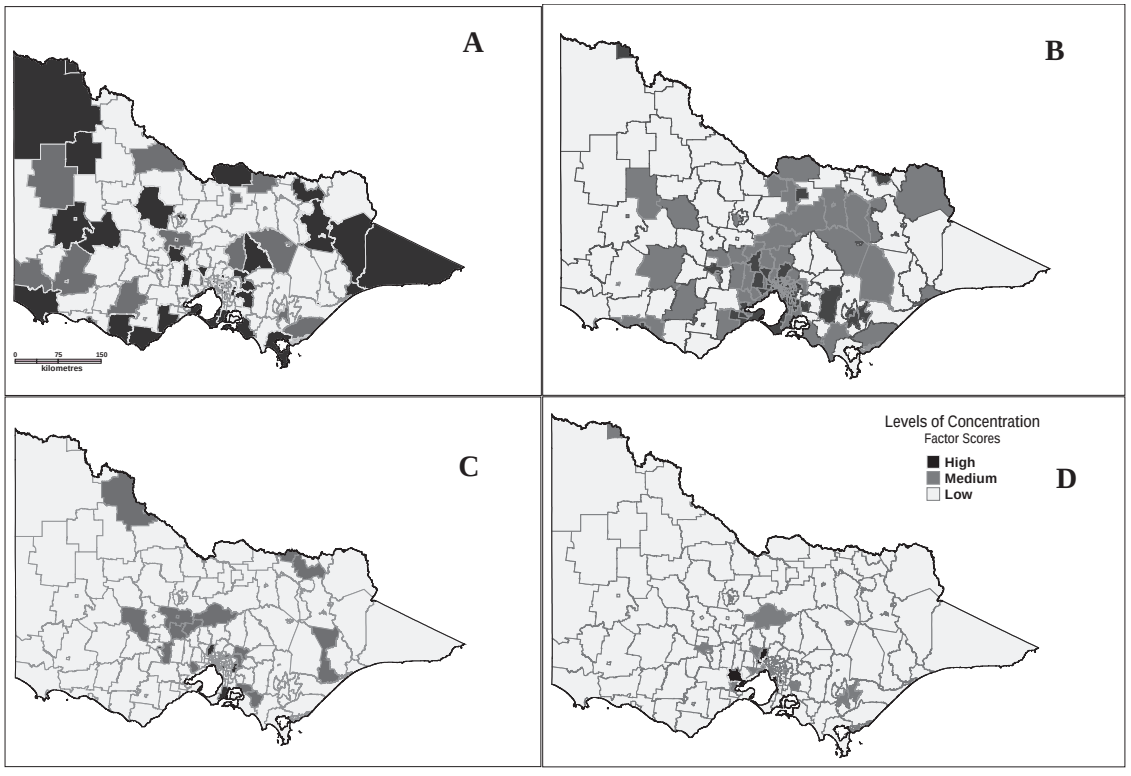

Figure 2. Spatial variability in the tourism and hospitality sector employment. (A) Tourism Operational Services, (B) Hospitality Services, (C) Entertainment Services, and (D) Infrastructure Operational Facilities Services.

for this, a distance matrix, capturing those spatial relationships of areas based on proximity, adjacency, or connectivity, needs to be computed. One commonly used technique to calculate the degree of spatial autocorrelation in geographic observations is Moran's *I* (Moran's *I* is a measure of spatial autocorrelation, 1950) statistic. Moran's index, or Moran's *I*, is a measure of spatial autocorrelation based on feature locations and attribute values (ESRI, http://www.esri.com/). Moran's *I* examines whether or not similar values occur close to each other, or whether features (an area, for instance) with similar values are randomly dispersed.

Moran's *I* is an index that ranges from −1.0 to +1.0 where values close to −1.0 show clustering of high and low values clustered together, whereas values of high next to high or low next to low values will result in an index close to +1.0. A value close to 0 indicates no clustering, or random dispersion.

This test statistic takes the form:

$$I = \frac{N}{(N-1)S^2 w} \sum_{i=1}^{N} \sum_{j=1}^{N} w_{ij}(x_i - \bar{x})(x_j - \bar{x}), \quad (1)$$

where w_{ij} is an element of the spatial weight matrix W, x_i is observation $i = 1, \ldots, N$, and $S^2(N-1)^{-1}\sum_{i=1}^{N}(x_i - \bar{x})$.

The binary weight matrix W can be extended to a more general spatial weight matrix. A general spatial weight matrix uses a combination of distance measures to express the proximity between spatial units. For instance, one such method is to define W where the i, jth element is defined as follows:

$$w_{ij} = \begin{cases} \exp(-cd_{ij}), & for \quad d_{ij} \le D_{\max} \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

where d_{ij} is the distance between unit i and unit j, $D_{\max}$ is the maximum allowable distance between

any *i* and *j* before spatial proximity becomes redundant, and *c* is the decay parameter. A high value of *c* indicates that regional interactions are very proximate, whereas a lower value would suggest that interactions are more spread out over the state space.

The Moran's *I* index is a global measure in that it includes the entire geographic area under study to determine a single value. Therefore, it does not indicate the localized clustering of employment for a particular region. To explore this, we applied the Local Indicators of Spatial Association (LISA) that decomposes global measures such as Moran *I* into contributions for each area. Local Moran *I* statistics enable the spatial clustering of similar or dissimilar values to be mapped for every observation across a geographic space.

LISA statistics enable the detection of regions where autocorrelation is unusually different; there are clusters of positive or negative autocorrelation; and abnormal observations in the data (Anselin, 1995). A common measure of localized spatial autocorrelation is the Local Moran's *I* statistic, which is defined as:

$$I_i = \frac{N}{(N-1)S^2}(x_i - \bar{x})\sum_{j=1}^{N} w_{ij}(x_j - \bar{x}) \qquad (3)$$

As with the global statistic, a value close to 1 indicates positive spatial autocorrelation, a negative value suggests negative autocorrelation, and zero indicates no autocorrelation.

In our analysis, we computed a spatial weights matrix using the "first-order contiguity," where areas with common borders are defined as neighbors. That is, if two spatial units have a common border of nonzero length then they are considered to be "neighbors" and assigned a value of 1, and otherwise they are attributed a value of zero (not neighbors). The computed Moran's *I* for the distribution of T&H employment was 0.59, which indicates positive spatial autocorrelation, suggesting observations are spatially dependent. That is, SLAs that are close together have similar values compared with those that are distance apart. This suggests that there might be a tendency for "spill-over effect" whereby high concentration of the T&H employment at a particular place exerts a positive effect on its neighbors. We can therefore infer that areas of high concentration of T&H employment are more likely to be surrounded by high employment values.

The scatter diagram in Figure 3 shows the relationship between total employment (*x*) in T&H industries and the "spatial lag" of *x* (i.e., the average of all employment values of *x* for its neighbors). The

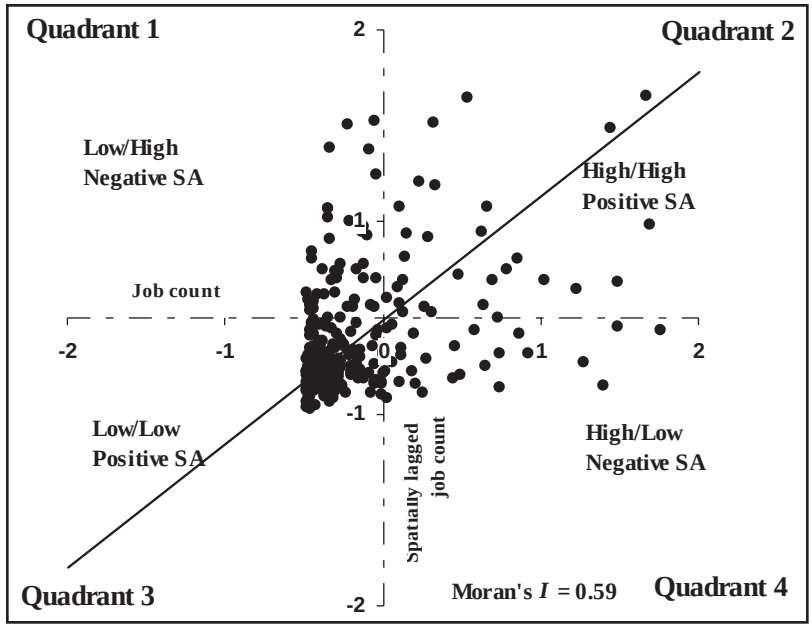

Figure 3. Local Moran scatterplot.

slope of the regression line is the Local Moran's *I*, which can be interpreted as the correlation between variable *x* and spatial lag. The *Z* scores indicate that there is less than 1% likelihood that clustering could be the result of random chance.

Four quadrants can be conceptualized to interpret the results. Quadrant 1 represents those SLAs that have lower concentration of T&H employment surrounded by SLAs with high concentration of T&H employment. Quadrant 2 consists of those SLAs with high value of T&H employment surrounded by SLAs with high values. These areas are called "hotspots," as they reflect positive spatial autocorrelation—a state of high-high (HH). These are the spatial clusters representing high T&H employment. Quadrant 3 contains low concentration of T&H employment in SLAs surrounded by SLAs also with low concentration. These areas have lower or very little T&H employment activity, which suggests limited tourism opportunities in these areas. Quadrant 4 represents high employment concentration SLAs with low concentration of T&H employment neighbors. These are isolated pockets with the potential to grow as successful spatial clusters, given the initial impetus for tourism development already exists. Among these areas, Mildura in the northwest, and Wilson's Promontory to the south have high concentrations but are surrounded by lower level of employment in T&H.

Stage 5: Interpreting T&H Spatial Employment Cluster

Figure 4 illustrates that there are 27 SLAs that have largely formed five distinct T&H spatial clusters in the State of Victoria. "CBD-based, urban attraction, gateway-driven cluster" is a metropolitan destination, which provides diversified and high-volume T&H services. It attracts a strong inflow and outflow of tourists. It is a base destination from which tourists undertake day trips to visit destinations in Melbourne's surrounding areas. This cluster provides services particularly in Accommodation,

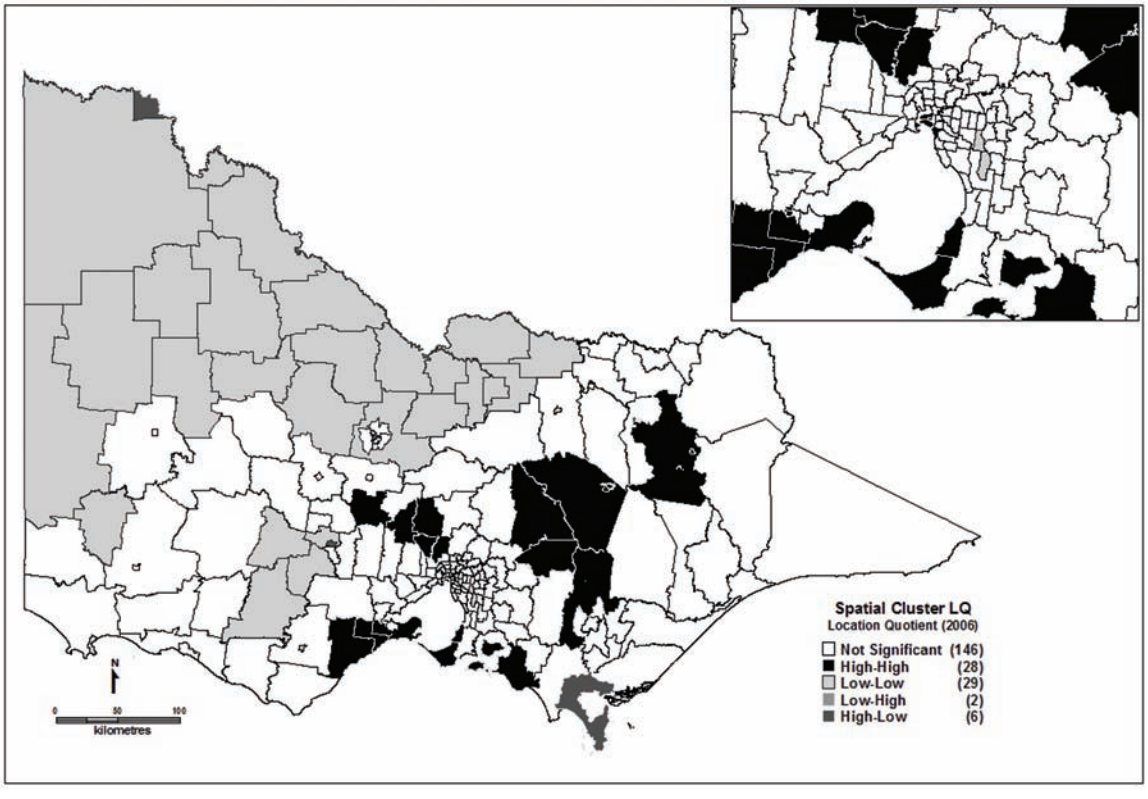

Figure 4. Spatial tourism clusters in Victoria, Australia.

Cafés and restaurants, and Casino operations. This cluster also provides well-integrated transportation and intermodal services to tourists who plan to travel to other tourist destinations by air, bus, or train.

"Nature-based national parks, snow-based alpine destination cluster" is a natural environment destination, which is located at a relatively long distance from metropolitan Melbourne with sparsely distributed settlement systems. It offers a range of recreational activities including skiing, hiking, and downhill mountain biking, particularly during the snow session. This cluster is also known for wine tourism, particularly in Yarra Ranges.

"Nature-based Phillip Island-driven cluster" is largely driven by Penguin Parade and nature-based tourism. Sea change and peri urban lifestyle are the significant drivers of generating demand for T&H services. The cluster is also attractive as a second beach home for affluent Melbournians who make frequent visits to the area. It is also the home of V8 car racing event, which generates sessional demand for employment.

"Great Ocean Road-aligned, beach-oriented, coast-based cluster" constitutes approximately 9% of total T&H employment. This cluster is a peripheral urban destination with a relatively small population base, located in the vicinity of a metropolitan destination.

"Gold fields, heritage-oriented cluster" is related to recreational activities associated with gold fields in the historic township of Sovereign Hills and Bendigo-Castlemaine area. Although interspersed with urban townships, this cluster largely represents a peripheral rural destination with a more dispersed settlement pattern and a larger geographical extent with a strong inflow of tourists.

Limitations

The spatial approach adopted in this article is subject to a number of limitations. The term spatial clustering has been defined to specifically measure "spill-over effects" on neighboring areas. The concentration of T&H employment within an area (e.g., a food precinct area or a congregation of hotels along a tourist attraction such as a river or lake), however, sits outside the ambit of this definition. In addition, the measure of spatial autocorrelation such as Moran's *I* or LISA can be highly sensitive to a change in spatial scale. This issue is often referred as Modified Area Unit Problem (MAUP), meaning a change in the census boundary could potentially generate different patterns of spatial clustering. It is therefore important to undertake sensitivity analysis of clustering to different spatial scales. Furthermore, the shape and size of census units can generate spatial clusters that can be visually misleading. For example, the size of the East Gippsland SLA to the extreme east of the state appears to be a large cluster, but in real terms represents only a small employment base. Finally, the spatial cluster as identified in this article is a morphological representation of T&H employment; the processes that create such patterns, however, have not been examined. Further research into the application of spatial econometrics techniques is therefore called upon to enable modeling the factors that create spatial clustering of T&H employment.

Conclusions

In this article we discussed the concept of cluster theory and measured the degree to which T&H industries are functionally linked and spatially clustered across the State of Victoria in Australia. Results show that employment in the T&H sector equates to about 7.7% of total employment in Australia. Cafés and restaurants are the largest employer of labor in the T&H sector, followed closely by Takeaway food services and Accommodation. Four broad components were identified through the application of factor analysis that characterize the underlying structure of the T&H sector. These include *Tourism Operational Services*, *Hospitality Services*, *Entertainment Services*, and *Infrastructure Operational Facilities Services*. Spatial variability in these components has been detected with some, such as *Infrastructure Operational Facility Services*, revealing a more concentrated pattern around service hubs and intermodal nodes such as airports and the main railway station. On the contrary, tourism operational services are more widely dispersed around popular tourism destinations in regional Victoria.

Using the T&H spatial employment clusters identified in this article, opportunities available to those industries reliant on T&H can be geographically identified. There are five distinct T&H spatial

employment clusters consisting of 27 SLAs, indicating significant tourism activity in Victoria. Spatial clusters and functional linkages identified in this article now provide a new evidence base for the adoption of a cluster-based tourism planning approach. We argue that the advantage of a cluster-based policy lies in its collective nature to stimulate, sustain, or support business activities and services chains between interrelated and interdependent firms.

Given the size of employment in the T&H sector, there is no doubt that these T&H spatial clusters have the potential to act as growth centers (i.e., high-capacity/high-through-put nodes) to facilitate interfirm collaboration and sharing of pooled resources and markets. We asserted the proposition that there is little need to stimulate and promote tourism across every town or across the entire region. That is because the benefits associated with tourism, such as better transportation services, access to skilled labor, and lower search cost, can be availed so long as these towns are functionally integrated and physically connected with these growth clusters. It is envisaged that dispersion of tourism-led economic growth could be supported and better coordinated through well-established T&H spatial employment clusters.

From a tourism management perspective, the evidence gathered in this research highlights management implications. The evident spatial clustering of T&H employment suggests the need to deploy a destination marketing strategy to promote developments in core strategic areas. The built up agglomerative economies and associated externalities around T&H employment clusters, as argued by Johansson and Quigley (2004), could potentially be "the hallmark of regional development in the 21century" in Victoria. T&H employment clusters represent agglomerative economies that provide a broad tourism infrastructure base essential for creating and managing an integrated tourism services supply chain. As the resources for tourism infrastructure development projects decline over the years, the need to strategize investment in high performing areas to optimize service delivery provisions with finite resources becomes critical.

Through further investment in tourism infrastructure and R&D, new tourism opportunities can be created and the existing capacity of destinations to service a large volume of tourists with diversified product demand can be enhanced. The competitive advantage of geostrategic positioning of spatial employment clusters can be harnessed to create optimal tourist circuits through a hub-and-spoke service model. T&H spatial clusters can act as base anchors on a high-volume tourist route to encourage longer stay and a wider geographic convergence of tourist visit. However, we argue that it would require a concerted tourist plan and industry-wide supply chain strategies, such as brokering dialogue between firms, providing "subsidies" for organizations to perform a coaching role, and resourcing common training and skills upgrade and promoting international linkages, to stimulate cooperative and vibrant T&H spatial employment clusters of global significance.

Acknowledgments

This article is based on research funded through the Australian Research Council Discovery program, project #DP0878877.

References

Anselin, L. (1995). Local indicators of spatial association—LISA. *Geographical Analysis*, *27*, 93–115.

Australian Bureau of Statistics. (2006). *2006 Census data by location.* Retrieved from http://www.censusdata.abs.gov.au/ABSNavigation/prenav/PopularAreas?collection=census/period=2006

Australian Bureau of Statistics. (2011). *Australian national accounts: Tourism satellite account, 2010–11*. Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/4CAA392893D4EA0BCA257B570014E8E5?opendocument

Backer, E., & Barry B. (2012). *Partial industrialization in tourism: Modelling Ballarat.* Paper presented at the CAUTHE Conference, Melbourne.

Bresnahan, T., Gambardella, A., & Saxenian, A. (2005). 'Old economy' inputs for 'new economy' outcomes: Cluster formation in the New Silicon Valleys. In S. Breschin & F. Falerba (Eds.), *Clusters, networks and innovation* (pp. 113–119). New York: Oxford Press.

Brown, R. (2000). Cluster dynamics in theory and practice with application to Scotland (Regional and Industrial Policy Research Paper Number 38). Glasgow, UK: European Policies Research Centre, University of Strathclyde.

Chhetri, P., Corcoran, J., & Hall C. M. (2008). Modelling the spatial patterns of tourism-related employment for South East Queensland—A spatial econometric approach. *Tourism Recreation Research, 33*(1), 25–38.

Doeringer, P. B., & Terkla, D. G. (1996).Business strategy and cross-industry clusters. *Economic Development Quarterly, 9*, 225–237.

Fernandez, R. M., & Su, C. (2004). Space in the study of labor markets. *Annual Review of Sociology, 30*, 545–569.

Feser, E. (1998). Old and new theories of industry clusters. In M. Steiner (Ed.), *Clusters and regional specialisation on geography, technology and networks* (pp.18–40). London: Pion Limited.

Florax, R. J. M., & Plane, D. A. (2004). *Fifty years of regional science. Advances in spatial science*. Berlin, Germany: Springer Verlag.

Fujita, M., & Thisse, J. F. (2002). *Economics of agglomeration: Cities, industrial location and regional growth*. Cambridge, UK: The Press Syndicate of the University of Cambridge.

Glavan, B. (2008). Coordination failures, Cluster theory and entrepreneurship: A critical view. *Quarterly Journal of Austrian Economics, 11*, 43–59.

Gordon, I. R., & McCann, P. (2000). Industrial clusters: Complex, agglomerations and/or social network? *Urban Studies, 37*, 513–532.

Hall, C. M., & Page, S. (2006). Tourism and recreation planning and policy. In C. M. Hall & S. Page (Eds.), *The geography of tourism and recreation: Environment, place, and space* (3rd ed., pp. 315–332). London: Routledge.

Jackson, J., & Murphy, P. (2006). Clusters in regional tourism. An Australian case. *Annals of Tourism Research, 33*(4), 1018–1035.

Johansson, B., & Quigley, J. M. (2004). Agglomeration and networks in spatial economies. *Regional Science, 83*, 165–176.

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy, 99*(33), 483–499.

Lade, C. (2006). Tourism clusters on the Murray River: Success factors and barriers. *Australasian Journal of Regional Studies, 12*(3), 321–342.

Marshall, A. (1890). *Principles of economies* (Vol. 1). London: Macmillan.

Marshall, A. (1920). *Principles of economics*. London: Macmillan. London.

Martin, R., & Sunley, P. (2003). Deconstructing clusters: Chaotic concept or policy panacea? *Journal of Economic Geography, 3*(1), 5–35.

Michael, E. J. (2003). Tourism micro-clusters. *Tourism Economics, 9*(2), 133–145.

Moran, P. A. P. (1950). Notes on continuous stochastic phenomena. *Biometrika 37*(1), 17–23.

Morkal, A. (1993). Industry clusters and value-system strategies for Australia. In G. Lewis, A. Morkel, & G. Hubbard (Eds.), *Australian strategic management* (pp. 388–399). Sydney: Prentice Hall Australia.

Motoyama, Y. (2008). What was new about the cluster theory? *Economic Development Quarterly, 22*(4), 353–363.

Nordin, S. (2003). *Tourism clustering and innovation—Paths to economic growth and development*. Oestersund, Sweden: European Tourism Research Institute, Mid-Sweden University.

Novelli, M., Schmitz, B., & Spencer, T. (2005). Network, clusters and innovation in tourism: A UK experience. *Tourism Management, 27*, 1141–1152.

Overman, H. G., & Puga, D. (2009). *Labour pooling as a source of agglomeration: An empirical investigation* (CEPR Discussion Paper No. DP7174). Retrieved from http://ssrn.com/abstract=1345701.

Perroux, F. (1955). Note Sur Notion De Pole de Croissance. *Economique Appliqee, 7*, 307–320.

Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly,14*, 15–34.

Press, K. (2006). *A life cycle for clusters? The dynamic of agglomeration, change and adaptation.contribution to economics*. Heidelberg, Germany: Physica-Verlag.

Schmitz, H., & Nadvi, K. (1999). Clustering and industrliazation. *World Devlopment, 27*, 1503–1514.

Tourism & Transport Forum. (2008). *National tourism employment atlas 08.* Retrieved from www.ttf.org.au/DisplayFile.aspx?FileID=226

Tourism Victoria. (2010). *Facts and figures*. Retrieved from http://www.tourism.vic.gov.au/component/content/article/18-research/218-facts-and-figures.html