








Investigating Local Economic Trends for Shaping Supportive Tools to Manage Economic Development: San Diego as a Case Study

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Abstract. During the last decades, the urge to support Regions' competitive positioning within the knowledge-based global economy has been perceived as a priority. Given this emerging need, the concept of regional clusters has become increasingly central to support the decision-making process and guide economic development strategies. This paper aims at contributing to the debate on the role of clusters as the key engine of regions economic development, with a specific focus on local clusters. This argument is discussed through actualizing the study on the case of the San Diego Metropolitan Statistical Area (SD MSA), California. Firstly, an insightful review of relevant works on the topic of clusters is offered. Secondly, the attention shifts on the Case of the SD MSA, which is investigated through a twofold methodological approach, validated in compliance to the MAPS LED project. Accordingly, a sample of highly performing local cluster is selected and studied both quantitatively (using indicators) and spatially (through the GIS mapping). Ultimately, the study offers a comprehensive picture about San Diego local economy by coupling quantitative and spatial analysis. In addition, the study offers insights to policy makers on the potentials of clusters spatialisation as a supportive tool for effective decision-making.

Keywords: Local clusters · Policy-making · San Diego · MAPS-LED

1 Introduction

In recent years, supporting the creation of localized economic advantages has been perceived as a central challenge from regions seeking to compete in the fast-changing global economy. In view of this emerging need, the concept of cluster has become increasingly popular by attracting growing consideration from both academics and practitioners. Accordingly, clusters are currently held in high consideration both as unit of analysis for regional economies and as crucial drivers of decision-making. The allure of the latter academic concept has lead through an extensive production of cluster-based scholarly works, which offer a wide array of definition and categorisations [1]. Despite the plethora of academic contributions on the topic, still the most

relevant theorisation about clusters is attributable to Michael Porter [2]. The latter author has conducted extensive studies on clusters by also devising a crucial taxonomy, which subdivides clusters into two categories based on their geographical scope. In this sense, Porter suggests that clusters can be typologically classified as Local and Traded [2, 3]. Accordingly, Local clusters are seen as an inherent element of every region's economic structure as they serve the local market. As opposite, traded clusters occur just in some regions where special competitive advantages are available and serve the global market. The two typologies of clusters differ by nature; however, they play a complementary role in supporting the strengthening of regional economies. Local clusters provide the necessary economic structure to foster the prosperity of traded clusters, which in turn enhance the overall performance of regional economies. By drawing on this backdrop, the present study aims at offering a comprehensive snapshot of the local clusters' panorama in the San Diego area towards pointing out the most relevant features of the local economy. Consistently, the study identifies first, and later spatializes a set of six best performing Local Clusters located within the San Diego area. The focus on the San Diego MSA is justified by the fact that its regional economy is widely recognized as one of the fastest growing and diverse of the nation as a whole. Specifically, the choice to study its local economic pattern is supported by the fact that Local Clusters drive San Diego's local prosperity, covering approximately two-thirds of the region's employment. Indeed, the economic pattern of San Diego is predominantly characterized by a 'small and medium size' business pattern of economic activities serving local market, hence locally producing, and distributing goods and services [5]. In fact, San Diego is not exploiting its international exporting potential, showing a good performance just in the case of the export of components to Mexico [5].

This approach to the study allows the authors to interpret current and potential development trajectories of local economies. The present work targets a wide audience of academics and practitioner by presenting the application of an innovative methodology for the analysis of local clusters and disclosing its potentials to guide decision-making process.

2 Literature Review

The academic and political consideration of clusters is constantly increasing since at least two decades. However, the economic arguments underlying the idea of firms' co-location, have distant roots. The very birth of such long-running cluster concept dates back to the work of the economist Alfred Marshall [6] issued at end of the 19th century. Since then many other scholars have contributed towards expanding knowledge about clusters. Notwithstanding the relevance of such plethora of scholarly works, the very popularisation of the concept of cluster is attributed to Michael Porter [7, 8]. The latter scholar defined clusters as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities." According to this definition, geographic proximity can be considered as the core element enabling both interactions within, and development of clusters. Besides defining the cluster phenomenon, Porter also devised a

four-factors-based model, the so-called diamond model, to explain clusters success. The model included the following elements: (i) factor conditions, (ii) demand conditions, (iii) firm strategy/rivalry, and (iv) Beyond the diamond model and various.

Beyond the diamond model and various other reflections, Porter recently provided a classification of clusters based on their economic scope [2, 3]. The scholar named above has devised a two-category-based framework, which distinguishes traded from local clusters. These two typologies play different, but complementary roles towards supporting the strengthening of regional economies. On the one hand, traded clusters highly concentrate in few regions, which features some specific competitive advantage. As their name suggests, they tend to export products and services, and consequently are significantly exposed to cross- and extra-regional competition. The occurrence of traded clusters in certain territories usually signals the opportunity for the region to achieve high levels of overall economic performances. On the other hand, local clusters are almost equally occurring in every region, since the location choice of the firms composing clusters does not depend on the availability of territorial competitive advantages. Local clusters are strongly tied to the region they are located in, hence are not exposed to cross- and extra-regional competition. This synthetic characterisation of traded and local clusters suggests some considerations. First, traded and local cluster manifest divergent market targets. The former cluster type competes on, and serves for the global market, in contrast, the latter one works within the boundaries of the local market. Second, traded and local clusters have different features in terms of job creation and innovative potential. Traded clusters typically register higher wages, and levels of innovation (in term of patented products or services), while local clusters feature higher employment (which is usually proportional to the region's population size). Despite the clear-cut discrepancies in scope and scale, traded and local cluster still expect to operate jointly. Specifically, local clusters provide the necessary economic infrastructures to foster the prosperity of traded clusters, which in turn enhance regional economic performances. Despite the importance of the dichotomy local vs. traded, it seems that in recent years some part of the academic world has focused more towards the study of local clusters. Such tendency is witnessed by a flourishing production of local-cluster-based scholarly articles [9–12]. Recently Demarchi, Dimaria and Gereffi analysed the co-evolutionary trajectory of local clusters and global value chain towards envisaging the possibility for territories containing local clusters to prosper in the new global scenario. The same argument is also supported by Nadvi and Halder who investigated two case studies in Pakistan and Germany [13]. The growing importance of local cluster calls for consideration from academics to better comprehend the dynamics through which these local forms of economic agglomeration can contribute to the enhancement of local economies.

3 Methodology

In accordance to the claims presented in the introductory paragraph, the essential aim of this work is to snapshotting the local clusters' panorama in the SD MSA towards pointing out the most relevant features of the SD local economy. In other words, the study seeks to disentangle and describe the role played by local clusters, representing

the regional high-specialisation pattern, towards shaping the actual, and influencing the potential structure of San Diego local economy. By drawing on this research objective, the study implements a two-stage methodology by taking cues from the MAPS-LED project.¹ Firstly, the essential attributes of a sample of local clusters are pointed out, by drawing on the quantitative examination of some key indicators. Secondly, the spatialisation of the selected local clusters is accomplished towards highlighting cluster-specific morphological features.

Initially, a set of indicators is selected to streamline the structure of each sampled cluster. These indicators have been collected for the length of time 1998–2014, using the U.S. Cluster Mapping Project as the main data source [14]. The indicators can be classified into three categories representing the following features of clusters:

- Composition, which is indicated by the number of establishments per year;
- Economic structure, which is signalled by Location Quotient, National Employment Share, Employment, and Wage;
- Innovation Ecosystem, which is quantitatively described by Poverty rate, job creation, patent count, patent count growth, Venture Capital per \$10,000 GDP, Total receiving high school diploma or more, Total with some college or associate degree, Total completing a bachelor's degree or more, and Cluster strength).

Then, the study delineates cluster-specific morphology, representative of the regional high specialisation pattern, both at the County and the urban level. In view of this objective, it has been set up a relationship between NAICS codes, strictly connected to the classification of Clusters operated by Delgado et al. [15] and Land Use data, which reflect the Regional Growth Forecast of the SANDAG Public Agency [16]. The rationale of the spatialisation process is rooted in the acknowledgment that each Land Use code can be combined with the economic activities that are classified through NAICS codes, allowing to create a morphology of subclusters and, in turn, clusters.

The general methodology mentioned above [17] is applied to the case of the San Diego MSA, by sampling the regional local clusters and analysing them through quantitative indicators and spatial investigation. Given the exploratory nature of the research, the sample size determination is based on the criterion of high-specialisation, considering that the specialisation pattern is measured by the value of the Location Quotient (LQ) of a cluster and that a LQ greater than 1 indicates a concentration of the cluster higher than average. As a result, the list of case studies - content of the present investigation - includes the six most performing local clusters in terms of high-specialisation, thus, with a LQ greater than 1, specifically: Local Personal Services (Non-Medical); Local Household Goods and Services; Local Hospitality Establishments; Local Commercial Services; Local Real Estate, Construction, and Development; Local Industrial Products and Services.

Shape files and Metadata have been gathered from the main US authorities' web sites. The process of data gathering has represented one of the main challenges over the workflow of the study, as it has required an intensive online research of reputable

¹ <http://www.cluds-7fp.unirc.it/maps-led.html>.

sources. The following Table 1 shows the metadata used throughout the implementation of the study:

Table 1. Metadata about the San Diego Metropolitan Statistical Area.

Data Name	Authority	Data Typology	Years
San Diego Metropolitan Statistical Area Delineation	U.S. Census Bureau	Metadata	2009
U.S. Nation Boundaries	Census.Gov	Shapefile	2014
American Continent Boundaries	Arcgis.com	Shapefile	2012
State with County Boundary	SANDAG	Shapefile/Metadata	2014
Municipal Boundaries	SANDAG	Shapefile/Metadata	–
Census	SANDAG	Shapefile/Metadata	2010
Zoning Base	SANDAG	Shapefile/Metadata	2015
Land Use	SANDAG	Shapefile/Metadata	2008
Air Runways	SANDAG	Shapefile/Metadata	–
County - Medical Services	SANDAG	Shapefile/Metadata	–
Zip Codes	SANDAG	Shapefile/Metadata	2015
Colleges	SANDAG	Shapefile/Metadata	–
Hospitals	SANDAG	Shapefile/Metadata	–
Transportation	SANDAG	Shapefile/Metadata	–
Jurisdiction	SANDAG	Shapefile/Metadata	–

As we will see in the next section, this research activity, conducted at the parcel level, will allow to give a physical meaning to the abstract units of the industrial sectors and to observe their level of concentration in specific areas of the San Diego MSA.

4 Discussion and Results

Consistently with the methodology described in the previous paragraph the sample of six clusters has been firstly investigated through a quantitative lens towards analysing the indicators accounting for clusters': (i) composition, (ii) economic structure, and (iii) innovation ecosystem.

The study of the clusters' composition revealed a general increase in the number of firms belonging to the six local clusters selected in the San Diego MSA, during the time frame 1998–2014. The highest increase in number of firms was registered for the Real Estate Local Cluster, with an increase of firms of 100%. The other components of the sample showed lower increases in the indicator number of firms (e.g. the 20% of increase in the case of the establishments of the Local Commercial Services Cluster). The investigation on clusters' economic structure suggests a general tendency of the best performing clusters towards improving their structure. In this sense, the percentage change in employment (for the entire sample of clusters) from 1998 to 2014, increased by 30%, with a certain loss of jobs in the years 2007–2011, probably due to the

economic downturn that hit the global economy. Also, the percentage change in Wages by County from 1998 to 2014 increased, without any diminution, neither in the economic crisis period. The percentage change in Patents by County from 1998 to 2014 showed some up and downs until 2008, when it started increasing until 2014. In 2014 an increase of 60% of patents has been appreciated in comparison with the levels of 2008. The National Employment Share by County considering its percentage change in the selected length of time, presented an increase until 2007, when it was registered a peak. From 2007 to 2010 a decrease in the specialisation has been recorded, then the indicator started back to increase until 2014. The location quotient showed the same trend as the national employment share, as they both represent the specialisation of local clusters.

The study of Clusters' innovation ecosystem targets that, as we have seen, have been divided in the two categories of Performance indicators and Business environment indicators, have been collected for the period 2008–2013. Over the selected period, the poverty rate increased for all the strongest local clusters, showing a rising gap in society in terms of equality. The job creation has been found negative for the year 2008 in most of the local clusters, while it has been registered generally positive in the years 2011–2013. It seems that every selected cluster manifest, to a certain extent, a tendency towards innovation. This is witnessed by the increasing number of patents counted in the years 2008, 2011, and 2013. Concerning the Business Environment indicators, the venture capital investment is very small especially for local industrial products and clusters seems to have a similar behaviour. This first stage of the study has disclosed some quantitative features of the selected clusters; however it falls somewhat short of providing links to connect local economic phenomena with a detailed spatial dimension. In this sense, the analysis of indicators needs to complement with the spatialisation of clusters. The spatialisation of the six selected clusters within the boundaries of San Diego MSA has been carried out by considering 5-digit zip codes as the main territorial unit. Accordingly, the authors have collected and processed the entire set of 185 zip codes composing the San Diego MSA, namely from the zip code 91901 to 92199.

The mapping enables an in-depth understanding of the relevance of the urban scale in the way of disclosing concentration and localisation of the sampled clusters. Such urban-level analysis displays clear-cut differentiations in the spatial configuration of the selected clusters. The spatial pattern and economic features allow the authors outlined two macro categories.

The first category, namely “supporting clusters”, includes Local Hospitality (in light blue), Local Personal Services (in orange), and Local Industrial Services (in purple). These clusters feature a scattered spatial configuration, which is likely to depend on the typology of services that such clusters are expected to provide. The clusters mentioned above are mainly located in proximity to the most important touristic sites: on the coastal area, in the downtown area, La Jolla area, and in the inland areas.

The second category, namely “specific clusters”, includes Real Estate (in yellow), commercial services (in red) and Household Goods (in green). These clusters manifest a concentrated morphology, and feature high specialisation (e.g. the location quotient of the real estate cluster is 1.3%). Considering the Real Estate cluster, it is possible to

observe that it is concentrated around University City area, because of the presence of high skilled labour pool specialized in the design and construction of high-tech laboratories for the facilities and firms located around the UCSD campus. The other two clusters, namely the Local Commercial Services (in red) and Local Household Goods (in green) are localized in specific areas. The former is located in the downtown area, where there is more density and therefore more presence of customers and tourists, while the latter is located close to the Mexican border. This cluster has been found to be located at the southern limit of the city of San Diego, bordering with Mexico, where it reveals a greater concentration of establishments.

5 Conclusions and Further Studies

The present study investigates the case of local clusters in the San Diego County, California. Drawing insights from previous research activities carried out in compliance to MAPS-LED project, the aim has been to define the local clusters' panorama in the SD area towards pointing out the most relevant features of its local economy. Specifically, the study has disclosed the attributes of the regional high-specialization pattern in the way of understanding its influence on the County's economic structure. The paper suggests a novel methodology for mapping local cluster based on quantitative indicators, drawing insights from the idea developed by the Land Development Code Commerce City of Colorado [18].

The implemented methodological approach has aimed at displaying where clusters are physically localized within an urban territorial scale.

The core of the clusters spatialisation process has been represented by the connection between NAICS codes and the Land Use categories of the San Diego County. Such process allowed to build up a descriptive picture of clusters at the Local level, giving a physical meaning to the abstract units of the industrial sectors and observing their level of concentration in specific areas of the examined County.

The mapping activity allowed to understand where clusters are more concentrated, and also to observe their level of concentration. As shown in Fig. 1, although clusters are concentrated in the inner city area, they look geographically dispersed. Moreover, it emerged the multi-scalarity of the geographic concentration of cluster, so that each territorial unit, at different scales, provides an independent structure able to give important information and describe some significant aspects of that particular territorial dimension.

The cluster occurrence characterizes each area also in terms of innovation and specialisation, as indicated by the increasing number of patents and Location Quotient, and deduced by the strict connection between clusters, innovation and specialisation theorised by Michael Porter. Additionally, several innovation initiatives are active in the San Diego area, with a crucial role in spurring Local Economic Development, increasing jobs, attracting new businesses, and empowering local communities. The analysed clusters further show a high propensity to physical transformations driven by urban planning tools, that help also to augment innovation. Moreover, unlike the other regions of the U.S., San Diego presents a richness in terms of clusters' variety and local employment, that should be leveraged further for expanding the region's ability to

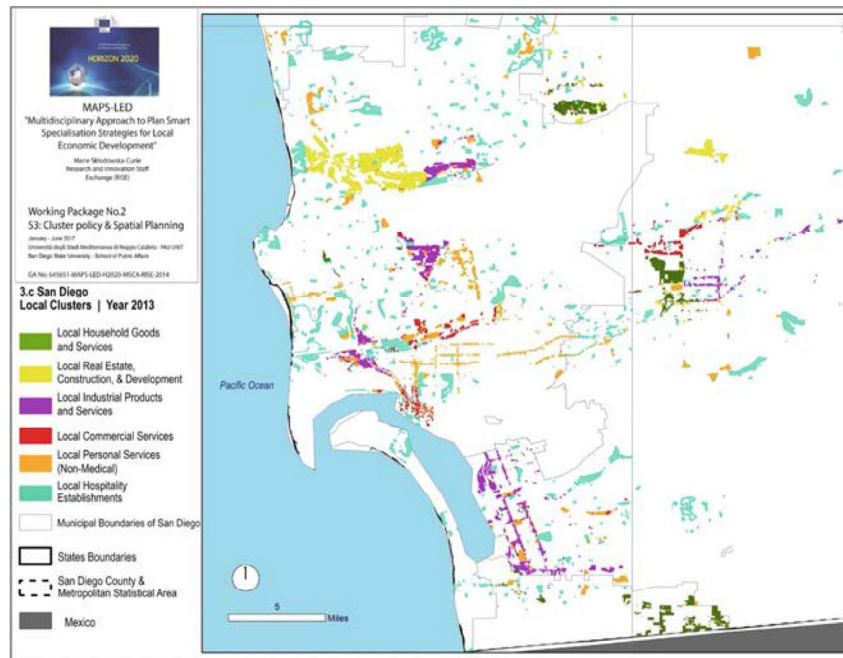


Fig. 1. San Diego County, local cluster spatialisation.

attract investments and reinforce the economic structure through the consolidation of professional networks.

The work is a lens that has the potential to give to the policy-makers a real picture of the existing economic trends at the urban level, identifying the structure of specific economies, their specialisation and the role played by clusters. Thus, if paired with the analysis of social indicators and sided by policy initiatives for spatial planning, the visualisation methodology can help as a supportive tool in taking place-based decisions for the future pockets of development, within the Smart Growth Framework.

This analytic instrument can reveal what are the features that influence regional growth, showing what are the factors that characterize a region by making it unique. Moreover, considering that the cluster activation, with its geographical concentration, is highly related to innovation, “the cluster approach is part of a set of innovation system approaches” [19]. Accordingly, the mapping methodology can be a tool first for regional policy makers to design and implement the Smart Specialisation Strategy framework. Furthermore, in view of the fact that clusters do not rely on administrative boundaries, this work can be extremely useful for entrepreneurs and its lens can help entrepreneurs and regions to see each other, defining new opportunities for the growth of new businesses, the implementation of new joint ventures and investments, and the creation of new jobs.

The economic structure of clusters based on Porter's methodology can bring also some challenges linked to the fact that each specific place has its own clustering model,

thus, by “standardising” the process the risk is to miss the dynamics related to the aggregation process of some specific places. Moreover, the statistical mapping is not sufficient to identify clusters’ methodologies, because of the existence of inconsistencies and gaps in the databases. This can make difficult the interpretation but also the comparison of data. The necessity to overcome these limitations consider a further step that validates the statistical findings and includes qualitative information and analysis that will be combined with the quantitative methodology.

Further studies will establish the role of Community Planning Areas in supporting the growth of local clusters. This will be done on the basis of the land use categories defined by the Plans, the morphology of clusters and the significance of their concentration. This correlation will include the investigation of the occurrence of localized competitive advantage linked to territorial-specific economic attributes.

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References

1. Cruz, S.C.S., Teixeira, A.A.C.: The evolution of the cluster literature: shedding light on the regional studies-regional science debate. *Reg. Stud.* **44**(9), 1263–1288 (2010)
2. Porter, M.E.: The economic performance of regions. *Reg. Stud.* **37**(6–7), 549–578 (2003)
3. Delgado, M., Porter, M.E., Stern, S.: Clusters, convergence, and economic performance. *Res. Policy* **43**(10), 1785–1799 (2014)
4. Bevilacqua, C., Spisto, A., Cappellano, F.: The Role of Public Authorities in supporting Regional Innovation Ecosystems: the cases of San Diego and Boston regions (USA). In: *International Research Conference 2017: Shaping Tomorrow’s Built Environment Conference Proceedings*, Salford, UK, pp. 1005–1018 (2017)
5. Porter, M. E.: *Clusters of Innovative Initiative* (2001)
6. Marshall, A.: *Principles of Economics*. Macmillan and Co., London (1890)
7. Porter, M.E.: Clusters and the new economics of competition. *Harvard Bus. Rev.* **76**(6), 77–90 (1998)
8. Porter, M.E.: Porter on the competitive advantage of clusters. *Strategic Direction*, 21 (1999)
9. Mytelka, L., Farinelli, F.: Local Clusters, Innovation Systems and Sustained Competitiveness. In: *UNU/INTECH Discussion Papers*, pp. 7–37 (2000)
10. Porter, M.E.: Economic development: local clusters in a global economy. *Econ. Dev. Q.* **14**(1), 15–34 (2000)
11. Brenner, T.: *Local Industrial Clusters: Existence, Emergence, and Evolution*. Routledge, London (2004)
12. Brenner, T.: Identification of local industrial clusters in Germany. *Reg. Stud.* **40**(9), 991–1004 (2006)
13. Nadvi, K., Halder, G.: Local clusters in global value chains: exploring dynamic linkages between Germany and Pakistan. *Entrepreneurship Reg. Dev.* **17**(5), 339–363 (2005)
14. U.S. Cluster Mapping. *Cluster Mapping Methodology*. <http://www.clustermapping.us/content/cluster-mapping-methodology>. Accessed 10 May 2017
15. Delgado, M., Bryden, R., Zyontz, S.: *Categorisation of traded and local industries in the US economy*. Mimeo (2014)

16. SANDAG: San Diego Forward. The Regional Plan (2015)
17. Bevilacqua, C., et al.: MAPS-LED Multidisciplinary Approach to Plan Smart Specialisation Strategies for Local Economic Development (2015)
18. Land Development Code Commerce City, Colorado, pp. 1–111. Article V. Uses and Accessory Structures (2015)
19. Terstriep, J.: Cluster Mapping - Analysis Grid. Institute for Work and Technology (2008)