



Empirical Insights - Mapping the Key Factors that Have an Influence on Clusters Competitiveness

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RESEARCH ARTICLE

Abstract

In today's global economy, clusters have emerged as crucial drivers of regional economic development and competitiveness. This article presents a comprehensive literature review that sheds light on the factors that influence the competitiveness of clusters. Drawing upon a broad range of scholarly sources across various fields, including economics, geography, and management, we synthesize existing research to identify and analyze the key determinants that shape cluster competitiveness. The review highlights the importance of several factors such as industry specialization, knowledge spillovers, innovation networks, infrastructure, and institutional support in enhancing the competitive performance of clusters. Furthermore, the paper critically examines the methodological approaches employed in studying cluster competitiveness, providing valuable insights for policymakers, practitioners, and researchers. By analyzing and evaluating the literature, this paper provides a deeper understanding of the dynamics of cluster competitiveness. Therefore, the research contributes to the growing body of knowledge on this important subject and underscores the significance of clusters in shaping regional economic development and competitiveness.

Keywords: cluster competitiveness; collaboration; factors; innovation; knowledge; trust building

INTRODUCTION

The idea of competitiveness has gained prominence in the modern global economy for academics and decision-makers alike. Interest in the function of clusters-geographical concentrations of linked businesses, specialized suppliers, service providers, and related institutions in a specific field-has grown as a result of the pursuit of competitive advantage. Drawing on an extensive body of academic research that explores how clusters contribute to knowledge creation, innovation, and ultimately the competitive performance of enterprises and regions, this study tries to analyze the complex link between clusters and the development of competitiveness. Clusters have been suggested as a way to boost competitiveness through multiple avenues. They are thought to promote the sharing of knowledge, inspire innovation, and foster the emergence of new enterprises within their confines (Porter, 1998). The closeness of companies, suppliers, and organizations in clusters is believed to create a fertile environment for the exchange of ideas, leading to greater productivity and innovation (Porter, 2000). Additionally, clusters can inspire a competitive atmosphere and a sense of motivation that drives companies to achieve higher levels of success (Malmberg and Power, 2005). The debate surrounding whether clusters can enhance knowledge creation and competitiveness has been ongoing, as the empirical

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evidence supporting this idea is not definitive. Therefore, it is imperative to scrutinize the rigor of empirical findings that support the theoretical arguments for clusters' role in knowledge creation and competitiveness (Malmberg and Power, 2005).

The goals of the study demonstrate a serious and methodical effort to examining the complex function that clusters play in promoting economic growth and competitiveness at the company and regional levels. They place a strong emphasis on using cutting-edge techniques, multidisciplinary viewpoints, and empirical data to improve academic understanding and influence cluster research practice and policy.

This paper aims to shed light on the strategic significance of clusters in fostering innovation, performance, and competitiveness in the global economy. By examining the current state of research on clusters and competitiveness, the paper will explore clusters' practical implications for regional economic development and SME performance (Shakya, 2009, Malakauskaitė and Navickas, 2011, Spirkova et al., 2014). The paper will assess the contribution of clusters to the competitiveness of companies and regions, and synthesize insights from recent research to provide a nuanced understanding of their complex interplay (Shou-hua, 2002, Pop et al., 2020).

The research will also address the paradox of economic geography in an era of global competition, where location continues to hold immense importance despite the forces of globalization (Porter, 1998, Porter, 2000). The goal is to highlight the vast potential of clusters as a strategic tool for economic development and increasing competitive advantage in the global market.

Furthermore, exploring the impact of cluster policies on small and medium-sized enterprises (SMEs) in developing countries is essential (Karaev and Szamosi, 2007). To this end, a closer examination of the relationship between clusters and regional economic performance is necessary, with recent research providing new insights and practical implications for regional policy (Ketels, 2007). By carefully analyzing these issues, it can better understand clusters' potential benefits and drawbacks and develop strategies to maximize their positive impact on economic growth and competitiveness.

MATERIALS AND METHODS

The research methodology for this work involved conducting a literature review. A literature review is an important component of research that involves systematically gathering, evaluating, and synthesizing previously published academic works that are relevant to the research question or topic. During the evaluation process, the credibility, relevance, and methodological integrity of each source was assessed.

As a research approach, a literature review provides a comprehensive examination of academic materials related to a particular subject. It offers a critical evaluation of various sources, including significant discoveries, as well as theoretical and methodological insights into the subject matter. The purpose of literature reviews is to locate, evaluate, and compile the existing documented work that has been generated by academics, practitioners, and researchers (Schira, 1992).

An additional technique for doing a thorough literature review is grounded theory. According to (Wolfswinkel et al., 2019), it entails a systematic approach to data gathering and analysis to develop or discover a theory using the evidence gathered from the literature.

As a research methodology, the literature review is a systematic, precise, and repeatable process for locating, assessing, and combining the current corpus of finished academic works. According to (Schira, 1992, Paul and Criado, 2020, Wee and Banister, 2016, Rowley and Slack, 2004, Laghrabli et al., 2015, Xiao and Watson, 2017), it is a crucial phase in the research process that aids in defining and clarifying the direction of the new study.

In broad terms, the literature review is a fundamental step in the research process that aids in developing a theoretical framework, designing a research technique, placing the study within the larger academic context, and interpreting the results. In the subject of research, it is essential for producing new information, developing theoretical understanding, and guiding evidence-based decision-making.

In the pursuit of understanding and enhancing cluster competitiveness, the research unfolds in three distinct stages as presented in Table 1.

Stage 1 - Literature review

The initial stage of this research involves conducting a comprehensive literature review to examine existing studies on cluster competitiveness. This literature review encompasses various disciplines such as economics, management, geography, and regional development. By synthesizing and analyzing a diverse range of scholarly sources, including academic journals and research reports, we aim to identify the key factors that influence cluster competitiveness. This stage provides the foundation for understanding the theoretical frameworks and empirical evidence underpinning cluster competitiveness.

Stage 2 - Ranking factors

In the second stage of the research process, we employ a systematic approach to rank the identified factors

influencing cluster competitiveness. This ranking process allows us to prioritize the factors that have the most significant impact on cluster competitiveness, providing valuable insights for policymakers and practitioners.

Stage 3 - Description of the determinant factors

The final stage of the research entails a detailed description and analysis of the determinant factors identified in the previous stages. Each factor, including industry specialization, knowledge spillovers, innovation networks, infrastructure, and institutional support, is examined in depth to understand its role in shaping cluster competitiveness. Through the classification the research elucidates the mechanisms through which these factors influence the competitive performance of clusters. This stage contributes to a comprehensive understanding of the complex dynamics of cluster competitiveness and informs strategies for enhancing regional economic development.

Table 1. The research stages

STAGES	DESCRIPTION
Stage 1 Literature review	Identifying gaps in the literature and new trends in the analysis of the relationships between the components of competitiveness and the ways in which different models evaluate them. The step involved establishing the leading questions (Ovallos-Gazabon et al., 2017), searching and downloading publications from scientific databases, and analysing data.
Stage 2 Ranking factors	Based on the results, a first systemic technique under systems dynamics was proposed, which comprised components such as: industry specialization, knowledge spillovers, innovation networks, infrastructure, institutional support, links, location.
Stage 3 Description of the determinant's factors	This was accomplished by using a variety of strategies. Following an examination of the specialist literature, a classification was done using the concepts that occurred most frequently.

Source: Author's own development

RESULTS AND DISCUSSIONS

This section presents findings that are the result of a meticulous examination of empirical data, which was conducted with the highest level of methodological rigor. The outcomes are articulated precisely, with a strong emphasis on impartial and objective evaluation. In this section, we comprehensively analyze the constituents that influence cluster competitiveness and their interrelationships.

Moreover, this segment employs tables, through this visual representation, readers are afforded a lucid and succinct comprehension of the factors that underpin competitiveness. The presented findings are comprehensive, objective, and rigorous. They provide a clear and precise understanding of the determinants of competitiveness, backed by empirical data. Therefore, this analysis is valuable for those looking to understand the factors influencing competitiveness and those seeking to craft strategies to enhance competitiveness.

Clusters have been the subject of significant interest among scholars, governments, and corporations alike. Research has been conducted on both a global and European scale and has addressed a wide range of factors, with competitiveness being a particularly notable focus. What characteristics define a cluster as competitive?

Assessing competitiveness within industry clusters is a complex task that requires the examination of a variety of factors that influence their effectiveness. This synthesis aims to review the different methodologies presented in academic literature for assessing cluster competitiveness. The existing body of literature on evaluating competitive factors within clusters highlights a range of methodologies, including both qualitative and quantitative approaches.

A framework for analyzing a country's or region's competitive edge, Porter's diamond model focuses mostly on industrial clusters (Vlados, 2019, Rugman and D'cruz, 1993).

Four factors determine a country's or region's competitive edge, according to Porter's "diamond model" in the context of national competitiveness (Imali and Wei, 2012, Sarturi et al., 2016, Jurksiene and Pundziene, 2014, Hoja et al., 2022).

It also covers various dimensions of competitiveness such as:

1. Factor conditions, i.e. the position;
2. An industry's competitive environment, related industries, including those that directly or indirectly complement the activities of the company under study;
3. The strategy, structure, and rivalry of companies in the nation or region under study;
4. The conditions of demand for the products or services offered by the companies.

Valuable information for policy and management decision-making can be obtained by assessing and comparing the cluster competitiveness of various areas using the GEM model (Yuanyuan, 2008, Xinjian and Junhai, 2011).

The "GEM" framework has three main components, see table 2. The third component is "Markets" which includes

external and local market orientation. "Groundings" is the second component, which comprises resources and infrastructure. The third component is "Enterprises" which covers suppliers and related industries and the firm's strategy and structure. The GEM analysis includes six determinants in total, arranged into three pairs, which are used to elucidate these aspects further (Padmore and Gibson, 1998, Bhawsar and Chattopadhyay, 2018).

Table 2. GEM determinants

CATEGORY	DETERMINANTS
Groundings (supply determinants)	∇ Resources refer to natural, obtained, or created endowments that are accessible
	∇ Infrastructure includes structures and organizational frameworks that facilitate resource access and economic tasks.
Enterprises (structural determinants)	∇ Related and supplier industries- the cluster makes use of the products and services provided by nearby companies.
	∇ Firm structures, strategies, and rivalries- in this context, companies are defined as entities that are directly associated with the value chain of the business range inside the cluster. How well-organized, confident, and flexible are they?
Markets (demand determinants)	∇ Local markets- the readiness of buyers to collaborate with the local cluster and regional markets.
	∇ Access to external markets- refers to accessibility not limited to local markets and need not be tied to the global market. It comprises export and trade limitations, entry barriers, and established market ties.

Source: Author's own development according to (Padmore and Gibson, 1998)

Bhawsar and Chattopadhyay's study 2018 utilizes the Analytical Hierarchical Process (AHP) technique to formulate a composite indicator aimed at quantifying the competitiveness of industry clusters. This approach underscores the importance of multiple factors in the assessment process.

Wang et al. (2016) attempted to examine the competitiveness of two city vehicle clusters in China: Changsha and Liuzhou. To do this, they created an index with 16 variables divided into three categories: competitive power, competitive potential, and development environment. The Analytic Hierarchy Process (AHP) technique, with weights chosen by a panel of 65 experts, was used in combination with an intelligent optimization tool (Wang et al., 2016, Bhawsar and Chattopadhyay, 2018), see Table 3.

Table 3. Cluster competitiveness evaluation - index system

I INDEX	II INDEX	III INDEX
Competitive Strength	R&D competitiveness	R&D expenses / revenue (%) percentage of technical and engineering staff (%) The quantity of patents (parts)
	Supply chain competitiveness	The supply chain's degree of completion (%) Value scale of industrial facilities
	Production competitiveness	Total industrial output value Industrial added value
	Market competitiveness	Market share (%) Tax rate of capital Product export rate (%)
Competitive Potentials	Competitive cooperative effect	Local matching rate (%)
	Technologic innovation effect	Output rate of new products (%)
	Cluster cultures	Cluster cultural value (score)
Development Environment	Regional overall economic situation	Regional per capita GDP value
	Policies and laws environment	Policy planning (articles)
	Science and technology and Education environment	Colleges and universities (number)

Source: Author's own development according to Wang et al. (2016)

The framework proposed by (Bhawsar and Chattopadhyay, 2015) offers more than just a theoretical approach to industrial cluster competitiveness. It serves as a practical tool for both policymakers and researchers alike. The framework is based on four key concepts: the sectoral factors that highlight the benefits of agglomeration, territorial factors that encompass infrastructure and urban development indicators, and organizational factors that explore the competitiveness of large, established enterprises, which are crucial for the growth of small and medium-sized enterprises (SMEs), as presented in Table 4. The incorporation of government components, such as policy acts, further amplifies the practicality of their framework (Bhawsar and Chattopadhyay, 2015, Bhawsar and Chattopadhyay, 2018).

Table 4. Cluster competitiveness framework

CONSTRUCTS	INDEXES
Territorial factors	Infrastructure for transportation and education Infrastructure related to utilities and others
Sectoral factors	Relations between Labor and Labor rivalry Information leaking Business Ownership Collaboration and networking Specialization in clusters
Organizational factors	Market dominance Innovation and technology Networking and Internationalization Strategies Performance financially management of the environment Responsiveness towards government
Government elements	Financial assistance Promotional assistance Administrative assistance

Source: Author's own development according to Bhawsar and Chattopadhyay (2015)

The model created by Zaccarelli et al. (2008) for evaluating cluster competitiveness is an indispensable tool for businesses. In research conducted by (Sarturi et al., 2016), the model was highlighted for its usefulness. The analysis of eleven critical criteria in the model provides a comprehensive evaluation of cluster competitiveness, as stated by (Sarturi et al., 2016), as presented in Table 5. Businesses can use this model to make informed decisions and gain a competitive edge (Sarturi et al., 2016). Through the combination of different elements, this research aims to shed light on a new and innovative conceptual framework. The main goal is to identify the unique characteristics of this fresh paradigm, which will pave the way for a new comprehensive conceptual model that addresses issues related to innovation, information dissemination, cluster dynamics, and operational and strategic dimensions.

Table 5. Cluster competitiveness factors

FACTORS	DESCRIPTION
Geographical Concentration	Businesses and institutions within the cluster are located in close proximity to one another geographically; the ideal concentration has the closest possible proximity.
Scope of viable and Relevant business	The amount of diversity among the operations and activities that make up the cluster, which includes everything from product marketing to product manufacture.
Specialization of Companies	Specialization refers to the extent to which companies within a cluster focus on certain products and services.
Balance with no Privileged positions	This component looks at the existence of businesses that have easy access to raw materials or that control specific aspects of the production process, both of which may have an effect on the competitiveness of a cluster.
Complementarity Through the use of Subproducts	This element evaluates whether procedures are in place to reuse trash or materials intended for recycling—items produced during manufacturing that have reached the end of their useful lives.
Cooperation between Companies in the Business cluster	That amount of cooperation is connected with the extent of unplanned and voluntary cooperation amongst the businesses in the cluster.
Selective replacement of Companies in the cluster	A basic aspect of economic dynamics is selective substitution between enterprises, which is defined by a constant influx and outflow of business units from the market.
Uniformity of the Technological level	This factor refers to how uniform the technologies used inside the cluster are; a cluster's competitiveness would not be enhanced by notable technical differences.
Community culture Adapted to the cluster	A region becomes adapted to a cluster when its social behavior is integrated into the cluster's existence, operation, and growth. Work authority, a common set of values, and other unified values result from this adaption.
Evolutionary character Through the Introduction of (new) Technologies	The existence of a competency focused on the cluster's development, acknowledgment, adaptation, and adoption of new technologies
Cluster-oriented result Strategy	Performance and the deliberate presence of directing the decisions and activities of participating firms are linked to the cluster-oriented outcomes approach.

Source: Author own development according to (Sarturi et al., 2016)

It is crucial to identify a list of significant traits and indicators to evaluate the competitiveness of clusters. This study delves into the pivotal factors that determine the competitiveness of a cluster. The information provided earlier was essential in formulating a set of indicators that would be tested through experimentation. These indicators hold the potential to provide substantial insights that can be leveraged to enhance the overall effectiveness of the paper and are centralised in Table 6.

Table 6. Factors affecting clusters' competitiveness

CATEGORY	OPERATIONAL INCLUSIONS
Cluster management	∇ Persistence of the outcomes
	∇ Establishment of network activities amongst worldwide clusters that are complimentary or analogous influencing
	∇ Actions to improve the branch's reputation
	∇ Generally speaking, robust representativeness of clusters encouraging collaboration between companies, creating networks and clusters that are connected, and coordinating their efforts to innovate.
Cluster operational activities	∇ Competent workforce in vital industries
	∇ Cluster businesses pool their operational, risk, and/or venture capital to create joint financing.
	∇ Dedication and continuous private investment above and beyond government support
	∇ A solid vision is a fundamental component.
	∇ Clearly defined goals, a well-crafted action plan, and an unambiguous mechanism to oversee the strategy's execution
	∇ A realistic goal and strategy of action
Cluster dynamism	∇ Support services for technology transfer
	∇ Essential elements include supplier and supporting industry quality and intensity links as well as firm competitiveness.
	∇ Receptivity to the cluster's businesses being replaced
	∇ Low levels of dependence on outside help more capacity
	∇ Possibility and intention of expanding into other markets; openness to the cluster's enterprises being replaced
Government	∇ The ability of businesses to continuously adapt their knowledge and abilities in response to changing market conditions
	∇ Unambiguous cluster-related legal, regulatory, and policy frameworks
	∇ Proper intellectual property framework rules pertaining to collaboration
	∇ Financial accessibility
Innovation & technology	∇ The capacity for innovation among cluster participants
	∇ Innovation and R&D expenditures made by the cluster as a whole as well as by the enterprises within it the cluster's adoption of new technologies
	∇ Relationships between corporate demands and research collaborations between businesses, academic institutions, and research centres
Cluster links	∇ System of values and principles promotion of technical innovation
	∇ Value propagation system
	∇ Organizations operating inside a cluster are united by common values and concepts, act with trust and cooperation, and follow common governance practices.
	∇ Collaboration amongst members of the cluster
	∇ In order to utilize the resources of the cluster, members must possess a certain level of dedication and organizational ability.
	∇ Members of the cluster complement each other
Situational conditions	∇ The intricate value chain that the cluster's members have created
	∇ The specializations of the firm complement each other
	∇ The distribution and the number of cluster members
	∇ Insufficient dedication and continuous private funding beyond government support
	∇ The concentration of enterprises based on a particular location's demographic
	∇ Specialized labor force

Source: Author's own development

There are several elements that contribute to the competitiveness of a cluster, such as the system of governance, innovation programs, management techniques, and collaborative ventures. Analysing the impact of these factors necessitates a comprehensive approach that entails examining macro, mezzo, and micro levels of investigation, such as the external economic climate, the internal workings of the cluster, and the unique attributes of individual organizations. Notably, the interplay between cooperation and competition within clusters plays a decisive role in determining their sustainability and success.

Cluster competitiveness is governed by a number of factors, such as closeness and information exchange, management strategies, adaptability, teamwork, governance, and the ratio of cooperation to rivalry inside the cluster. Together, these elements create an environment that fosters innovation, productivity, and worldwide competitiveness.

CONCLUSIONS

The exploration of the factors influencing cluster competitiveness in this study demanded an integrated and comprehensive approach, leveraging insights from various disciplines. This methodology incorporated a multidisciplinary examination that utilized a broad spectrum of findings and analytical methods, facilitating a more nuanced understanding of the intricate processes operating within these complex ecosystems.

Given the fluid nature of clusters and their interactions with broader economic, social, and environmental contexts, a thorough comprehension of their unique challenges was crucial. This comprehensive framework enabled the author to uncover deeper insights into the key determinants of cluster competitiveness, shedding light on the diverse elements that contribute to their success.

The body of literature examining competitiveness encompasses various fields, such as economics, management, and regional development. Integrating these differing perspectives posed a significant challenge, as it required reconciling divergent viewpoints and methodological approaches.

To address this challenge, the author established clear definitions and consistent criteria for measuring cluster competitiveness, ensuring a robust and reliable analysis. It was imperative to account for the distinctive characteristics of each case, avoiding overly broad generalizations that might obscure the unique aspects of individual clusters.

By adopting this approach, the study achieved a comprehensive and coherent analysis, providing valuable insights into the complex dynamics of cluster competitiveness and offering a solid foundation for further research and policy development in this area.

By means of this thorough analysis, the research study clarified the ways in which these elements impact cluster competitive performance, providing significant insights for improving regional economic growth.

Additionally, an extensive collection of empirical evidence and theoretical frameworks are encapsulated in the study shown in tables 2, 3, 4, 5, and 6, offering a precise and explicit explanation of the factors influencing cluster competitiveness. Our study adds to a thorough knowledge of the intricate dynamics driving cluster competitiveness by combining quantitative and qualitative techniques, including a variety of models and frameworks.

These findings can be helpful in establishing agricultural clusters by providing actual facts from analysis and combined ideas to guide the creation and design of such clusters. Furthermore, cluster development plans can be modified to take advantage of the criteria that were ranked in order of priority. This will help allocate resources and efforts to areas that have the most potential to boost competitiveness. Stakeholders, including farmers, agribusinesses, government agencies, research institutions, and community groups, can work together to develop evidence-based policies and programs targeting the improvement of agricultural clusters. It is also important to continuously monitor and assess the performance of agricultural clusters, using the knowledge obtained to improve strategy and adjust to shifting external and market conditions.

By integrating findings from each stage of research, stakeholders can develop informed and strategic approaches to building and strengthening agricultural clusters, ultimately contributing to the competitiveness and sustainability of the agricultural sector. The research examined the impact of clusters from a generalized perspective, which introduces limitations in drawing precise conclusions applicable to specific industries. As a result, broad findings may not accurately reflect the nuances of individual sectors.

Future studies should aim to overcome these limitations by incorporating data with a wider scope, followed by a more tailored focus on individual domains such as agri-food. This approach allows for an exploration of both overarching trends and specific industry characteristics, offering a comprehensive view of the role of clusters.

To gain a more profound understanding of the benefits of clustering, it is beneficial to compare outcomes across different industries. Such comparative analyses can generate robust data, providing a basis for developing more effective and impactful cluster policies. By examining how clusters influence various sectors, researchers can identify commonalities and unique features, contributing to informed policymaking that supports cluster-based economic growth and competitiveness.

In conclusion, this study provides useful information that practitioners, policymakers, and academics may use to inform evidence-based choices and develop tactics for improving cluster competitiveness in the fast-paced economic environment of today.

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Conflicts of Interest

The authors declare that they do not have any conflict of interest.

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