
PhD THESIS

Assessing the determinants of clusters' competitiveness: A focus on Romania's agri-food sector

(SUMMARY OF PhD THESIS)

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1. INTRODUCTION

Over the last decade, Europe has seen the emergence of a diversified society focused on cluster-driven economic development. The European Union (EU) provides several types of financial support to clusters and incorporates them into numerous key programs. Several EU Member States have launched specialized cluster initiatives.

This thesis presents an instrument to analyze cluster competitiveness by considering a complete collection of associated dimensions. Rather than focusing on particular variables like innovation or information sharing, it is essential to consider the numerous factors influencing cluster growth.

The research was driven by a compelling need to nurture competitive and sustainable clusters that can catalyze economic expansion and progress in Romania. Clusters are premised on stimulating innovation, drawing in investments, and generating well-paying employment opportunities. However, harnessing this potential requires a deep understanding of the factors contributing to their competitiveness. By focusing on Romania, this research aims to fill a significant void in the current body of knowledge and provide valuable insights that can shape policy and implementation strategies.

Romania's journey towards resilient and competitive industrial ecosystems involves collaboration, evidence-based decision-making, strong policies, strategic investments in technology and innovation. Embracing these principles, Romania can continue its path towards sustainable growth and the competitiveness of solid ecosystems.

The proposed approaches provide an appropriate means of comprehensively assessing the variables influencing cluster competitiveness. Through the implementation of this framework in the Romanian national context, followed by an analysis of its regional implications and a final concentration on the particular domain of the agri-food industry, an in-depth knowledge of cluster dynamics in Romania is acquired. The method not only encourages academic engagement but also offers national and regional policymakers' insightful information. An exhaustive examination of cluster effect is made possible by the investigation of the economic, innovative, networking, and environmental aspects.

This methodological framework serves as a valuable tool for advancing academic understanding and informing evidence-based policymaking concerning cluster dynamics in Romania. Its application facilitates interdisciplinary collaboration, fosters knowledge exchange, and contributes to the cultivation of resilient and competitive industrial ecosystems within the national and regional landscapes.

2. THESIS STRUCTURE

The thesis is structured into two primary sections: "State of the art of cluster concept" and "Personal insights."

The "State of the art of cluster concept" section comprises two main chapters: "Overview of the cluster concept and features" and "Future directions of clusters: policy implications and relevance." This section delves into the cluster concept using insights from specialized literature, covering everything from its characterization and conceptualization to its relevance and implications for policy implementation.

The second part, known as "Personal insights," consists of six chapters and a bibliography. These chapters provide detailed information about the particularities of the thesis, the materials and methodologies used in this study, the results and subsequent discussions, and the conclusions drawn from the research. The final chapter specifically emphasizes the originality and contribution of this research endeavor.

3. STATE OF THE ART OF CLUSTER CONCEPT

From academics to policymakers, they have all accepted the argument that clusters may play an essential role in enhancing an environment that is both competitive and sustainable for businesses (CHIFOR & ARION 2023). When it comes to outlining his beginnings there are numerous assumptions that attempt to express and define the industrial cluster concept. Numerous academic work demonstrated that "the cluster concept" had been in use before Porter formally introduced it in the 1990's (ABDELILLA, 2008, CHIFOR et al. 2023). The "industrial districts," a concept placed out by Alfred Marshall, was Porter's guidance he freely admits (PORTER, 1998). Alfred Marshall's definition of an industrial district will serve as the starting point for the etymology of the cluster concept, which will then move on to Porter's definition and other definitions that cover the notion up to nowadays day.

Table 1.

The evolution of cluster concept from Marshall theory until nowadays

AUTHORS/ YEAR	THEORY	KEY CHARACTERISTIC S	KEY FEATURES ACCORDING TO THE THEORY
Marshall 1890 (GASHAWBEZA & RANDALL, 2006)	Industrial districts	Industrial approach: a focus on knowledge transfer in the manufacturing sector	Agglomeration advantages arise from three sets of localization economies, namely a pooled market for workers with specialized skills, the availability of specialized inputs and services, and technological spillovers.

Porter 1998 (PORTER, 1998)	Clusters	Industrial approach: focuses on competitiveness	Geographically proximate group of interconnected companies and associated institutions in a specific field based on commonalities and complementarities.
Krugman 1991 (KRUGMAN, 1991, VENABLES, 1996)	New Economic Geography	Agglomeration of economic activity: Agglomeration forces, which typically result in the concentration of economic activities	Clusters are not seen as fixed flows of goods and services, but rather as dynamic arrangements based on knowledge creation, increasing returns and innovation in a broad-sense.
Malmberg and Maskell 2002 (ASHEIM et al. 2005, SMORODINSKA Y & KATUKOV, 2019, MALMBERG & MASKELL, 2002)	Knowledge Spillovers and Regional Innovation Systems	Innovation approach: innovation and economic growth are fostered within specific geographical areas	Regional knowledge spillovers and innovation systems are deeply interconnected. A robust and homogeneous regional knowledge base, geographical proximity, and effective regional cooperation are critical for fostering innovation.
Morosini 2004 (MOROSINI, 2004)	Social entities	Social approach: industrial clusters include a close-knit community and various economic agents, not just firms.	A socioeconomic entity characterized by a cohesive social community and a concentrated population of economic agents situated within a specific geographic region.

Source: Authors own contribution

In overall terms, the development of the cluster idea can be traced back to Marshall's groundbreaking theories on industrial districts in the early 20th century. From then, it evolved into a complex model that incorporates concepts such as innovation dynamics, collective learning, and global economic interdependencies. Porter's groundbreaking work has been essential in forming the current conversation about cluster theory, which now includes wide variety of considerations that impact the evolutionary paths and competitiveness of local clusters.

The way clusters are conceptualized now synthesizes past perspectives with modern economic complexities, highlighting the essential function of adaptability and external connections serve in deciding the survival and prosperity of clustered industries.

4. RESEARCH AIM AND OBJECTIVES

The research aim was to provide a comprehensive framework for looking into the determinants underpinning clusters competitiveness. Subsequently, the research proceeded to assess these characteristics within the specific context of cluster landscape in Romania, thereby enriching our understanding of the competitive dynamics present in Romanian clusters.

To accomplish the study goal, four approaches have been introduced with the purpose of achieving a multidisciplinary analysis as presented in figure 1.

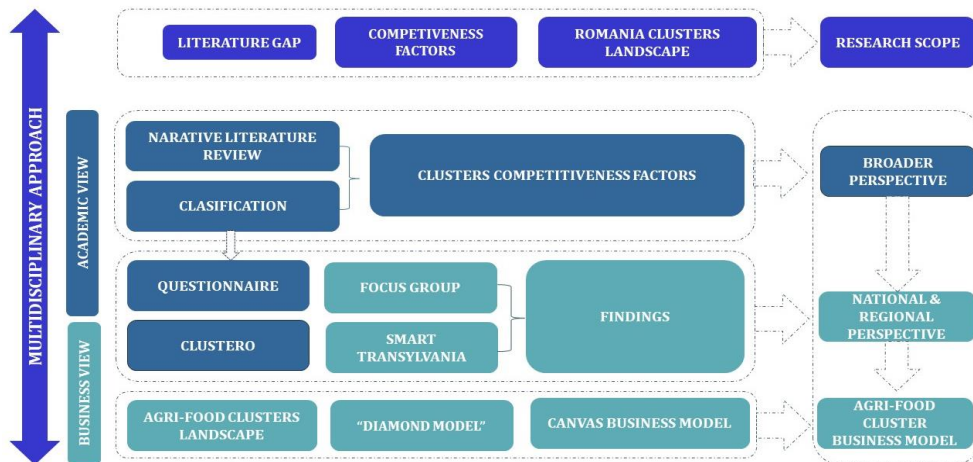


Fig. 1 Research objectives

Source: Authors own development

5. RESEARCH MATERIALS AND METHODS

The materials and methods section is designed to give a thorough overview of the specific techniques employed in this study, ensuring transparency and reproducibility. Additionally, it strives to offer a detailed description of the methods, data collection approaches, and analytical techniques utilized to accomplish the research objectives and goals.

5.1. Materials

To proceed with the analysis of clusters in Romania, preliminary data was gathered on the national cluster landscape registered with the Ministry of Economy.

Subsequently, due to its strategic relevance, the study scrutinized ClusteRO (Romania’s representative body of clusters), a nationally representative association of clusters. The research advanced to the regional level with the SMART Transylvania (The SMART Transylvania Association is a formal organization of clusters from the North-West region of Romania), a structure considered an example of best practice.

The study then took a turn, shifting its focus to the agri-food sector. It specifically selected the national network that encompasses agri-food clusters,

thereby enhancing its comprehensiveness.

Figure 2 summarizes all the materials used to reach the thesis objective.

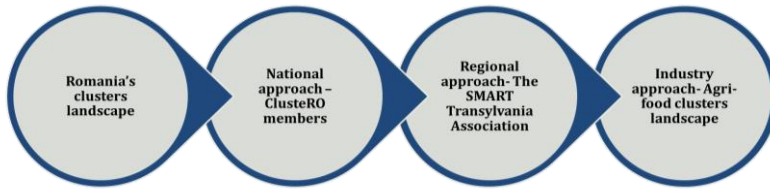


Fig. 2 Research materials engaged

Source: Authors own development

5.2. Methods

The scientific approach focused on identifying the factors that determine the clusters competitiveness combining the secondary data collected with the perception of the cluster management and operation team from different fields of activity in Romania.

The findings of this research were gathered through a multifaceted data collection methodology. Initially, an extensive review of relevant academic literature was conducted to ascertain the defining attributes influencing cluster competitiveness.

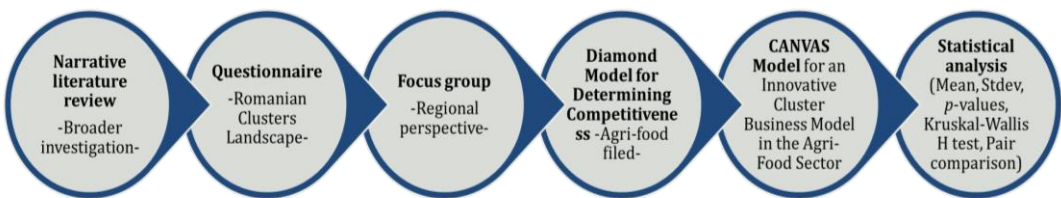
Following, applying the insights gained from the literature analysis, a structured questionnaire was developed and distributed to ClusteRO members.

Furthermore, adopting a regional perspective, a focus group session was organized, engaging key stakeholders from Romanian clusters, particularly members affiliated with SMART Transylvania.

For the best use of the insights gained, a thorough investigation of competitiveness variables within Romanian agri-food clusters was conducted.

Figure 3 summarizes all the methods used to reach the thesis objective.

Fig. 3 Research methods implemented



Source: Authors own development

In essence, the investigation of the factors shaping cluster competitiveness entailed an integrated and comprehensive approach in the current study. This required multidisciplinary study that drew on a range of finds and approaches, allowing for a more elaborate examination of the multiple processes that exist in these complex ecosystems.

Considering their dynamic character and interaction with larger economic, social, and environmental settings, clusters require a thorough knowledge of the specific circumstances they face. Using this comprehensive methodology, the thesis was able to acquire deeper insights into the factors of cluster's competitiveness.

6. RESULTS AND DISCUSSIONS

This chapter's findings result from a rigorous analysis of the empirical data. They are presented clearly and concisely, focusing on providing an objective and unbiased assessment of the research results. This section seeks to gain a thorough understanding of the elements that contribute to cluster competitiveness and their interactions.

This part of the work is a visual representation of the different competitiveness factors identified in the conceptual framework. Through the use of tables, charts and graphs, the quantitative and qualitative results are effectively illustrated. By presenting this information in a clear and concise manner, readers can gain a deeper understanding of the factors that contribute to competitiveness.

The work continues by offering a concise overview of the study's significant findings and their significance concerning the research objectives and hypotheses. It then highlights the study's notable contributions to the research on cluster competitiveness, which holds considerable interest for both academic and business communities.

Lastly, it discusses the general validity and reliability of the results and their implications for theory, practice, and future research prospects.

6.1. Broader view on key factors impacting cluster competitiveness

The **concept of competitiveness** has its roots in Adam Smith's "Theory of Trade", which proposed that reaching profit maximization by means of absolute advantage is the key to a country obtaining more advantages, hence making trade the motor of world output development (LOMBANA, 2009, MELARA-GÁLVEZ & MORALES-FERNÁNDEZ, 2022).

In the 1990s, Michael E. Porter proposed the fundamental concepts of what became known as the "Competitiveness Theory" (PORTER, 1991, MELARA-GÁLVEZ & MORALES-FERNÁNDEZ, 2022). This hypothesis inspired the World Economic Forum (WEF) to define competitiveness as "*the combination of institutions, policies, and factors influencing the productivity level of an economy, thereby shaping the potential prosperity attainable by that economy*" (MELARA-GÁLVEZ & MORALES-FERNÁNDEZ, 2022).

To assess the competitiveness of the clusters, a list of important characteristics and indicators must be identified. This investigation delves into the variables that play an essential role in defining a cluster's competitiveness. The data presented earlier has been instrumental in formulating a set of indicators that will undergo experimental validation. These indicators possess the potential to provide valuable insights that can be leveraged to improve the overall efficacy of the thesis.

In order to develop effective strategies that can boost the competitiveness of a cluster, it is essential to understand which factors are influenced by internal cluster dynamics and which by external factors that are beyond the cluster's control. To achieve this, it is important to categorize competitiveness factors. For instance, factors like innovation and human capital are primarily influenced by internal cluster dynamics.

On the other hand, factors such as market access and regulatory environment

are mainly influenced by external factors. By understanding these internal and external factors, a cluster can take the necessary steps to enhance its competitiveness.

Therefore, proper categorization of competitiveness factors is a crucial first step for any cluster looking to improve its overall competitiveness.

Table 2.

Factors affecting clusters' competitiveness

CATEGORY	CLUSTER MANAGEMENT	CLUSTER OPERATIONAL ACTIVITIES	CLUSTER DYNAMISM
FEATURE	<ul style="list-style-type: none"> ▽ Leadership ▽ Strategic vision & drivers to change ▽ Knowledge sharing coordinators ▽ Representativeness 	<ul style="list-style-type: none"> ▽ Human resources ▽ Financial system ▽ Strategy ▽ Services ▽ Internationalisation & Networking 	<ul style="list-style-type: none"> ▽ Competition ▽ Autonomy ▽ Selective replacement ▽ Export focus ▽ Absorptive capacity
CATEGORY	GOVERNMENT	INNOVATION & TECHNOLOGY	CLUSTER LINKS
FEATURE	<ul style="list-style-type: none"> ▽ Policy & regulation ▽ Infrastructure existence ▽ Financial supporting system 	<ul style="list-style-type: none"> ▽ Cluster & cluster members capabilities ▽ Specialised experts ▽ R&D collaboration ▽ Resources sharing ▽ Technology transfer 	<ul style="list-style-type: none"> ▽ Knowledge transfer ▽ Trust building ▽ Cluster members commitment ▽ Complementarity
CATEGORY	SITUATIONAL CONDITIONS		
FEATURE	<ul style="list-style-type: none"> ▽ Cluster dimension & structure ▽ Market opportunity ▽ Industry structure & infrastructure ▽ Cluster specialisation ▽ Location ▽ Complementary industries 		

Source: Author owns development based on (CHIFOR et al. 2024)

Various characteristics govern cluster competitiveness, including proximity and information sharing, management techniques, flexibility, collaboration, governance, and the balance of cooperation and rivalry within the cluster. These aspects work together to produce an atmosphere promoting creativity, productivity,

6.2. The competitiveness of clusters in Romania landscape

This section unveils the questionnaire findings from essential stakeholders within the ClusteRO community. The survey aimed to identify and analyse the key factors contributing to the cluster's competitiveness. The aim was to examine the clusters that are members of the Romanian Association of Clusters' viewpoint on the elements that determine the clusters' competitiveness.

Based on the analysis of the Linkert scale evaluation questions, it can be concluded that there are no significant differences in perception among respondents, regardless of their location or field of activity. However, differences in variation were observed, indicating varying degrees of importance. Future research could delve deeper into these dimensions and consider multiple variables for a more comprehensive understanding.

Table 3.

Ranking matrix of cluster competitiveness factors

	1	2	3	4	5	6	7
Cluster management	0	0	0	0	2	5	17
Operational activities	0	2	5	4	7	5	1
Cluster dynamics	0	3	4	5	8	4	0
External political factors	3	8	5	6	0	0	2
Innovation & technology	1	2	6	3	4	5	3
Links within the cluster	3	5	1	6	3	5	1
Situational conditions	17	4	3	0	0	0	0

Source: Authors own development based on questionnaire answers

The findings of the survey revealed that situational conditions were ranked as the most critical factor affecting competitiveness. This was followed by external political factors. It is evident from the data that the respondents strongly believe that the competitiveness of clusters is predominantly influenced by external factors, regardless of the specific activities of the cluster.

The analysis of clusters within ClusteRO has unveiled the complex nature of the factors that impact cluster competitiveness. The findings suggest that these factors are multifaceted and cannot be fully captured through a simple questionnaire.

Qualitative responses from open-ended questions have shed light on the diverse and detailed perspectives regarding the determinants of cluster competitiveness.

Additionally, no significant perceptual differences were observed based on cluster development stage after conducting the statistical analysis, indicating a consistent evaluation of the critical factors for achieving high competitiveness within the universal cluster model. These findings underscore the importance of conducting detailed regional analyses focused on competitiveness factors and highlights the value

of expertise from specialists in the field.

6.3. Regional approach in highlighting the factors impacting clusters competitiveness- Focus group findings

From the discussions it emerged that, larger companies prioritize technology and innovation, whereas smaller firms focus on daily operations. Clusters help SMEs innovate but must ensure the benefits outweigh the costs. Successful clusters continuously pilot new technologies, involving universities and the community to drive adoption. Innovation varies with cluster maturity; large firms innovate slower due to size, while SMEs are motivated by necessity. Financing and government incentives can boost technology uptake, but clear rules are essential to prevent negative impacts on competitiveness.

External factors, especially financing, greatly influence a cluster's competitiveness. In Romania, sustainable cluster success depends on diverse funding sources, including projects and grants. Core financing, essential for stability and growth, often comes from public policies targeting specific sectors. Transparent and accessible public funding ensures alignment with the cluster's vision and practical impact.

Overall, the success of a cluster depends on cooperation between its members and management team, effective communication, and strategic activities tailored to its development stage. Initially, efforts focus on visibility and attracting new members, while mature clusters emphasize innovation management and complex projects. Good communication enhances notoriety and relevance, driving engagement and external partnerships. Key activities include training, securing funds, fostering collaborations, organizing events, and influencing public policy to ensure the cluster remains competitive and well-connected within its industry.

6.4. The competitiveness of Romanian's agri-food clusters

In the upcoming section, a comprehensive analysis of the current status of clusters within the agri-food industry will be conducted. The objective is to thoroughly evaluate the contextual framework of clusters in this sector by applying Porter's diamond model, which encompasses the interconnected influences of factor conditions, demand conditions, related and supporting industries, firm strategy and rivalry. Furthermore, in addition to this analysis, detailed proposals will be crafted to address and enhance the factors that hinder the optimal functioning of agri-food clusters.

Additionally, the systematic framework provided by the CANVAS model will be utilized to develop and innovative business model.

A visual representation of the proposed model is highlighted in the figure 4.



Fig. 4 Innovative Cluster Business Model in the Agri-Food Sector

Source: Author owns development

This innovative business model aims to create a resilient, sustainable, and competitive model of agri-food cluster in Romania, driving economic growth and benefiting all stakeholders involved.

The impact of clusters on the agri-food sector in Romania is multifaceted. Firstly, clusters **can drive regional economic development** by creating jobs, attracting investments, and stimulating local economies. Concentrating agribusinesses and supporting institutions into clusters not only leads to more efficient supply chains, reduced costs, and improved product quality but also fosters a spirit of collaboration and shared success.

7. Conclusions and Recommendations

The reflection on the academic literature revealed that the factors influencing competitiveness constitute a complex and multifaceted subject. Gaining a thorough understanding of the interrelationships between different determinants and characteristics necessitates a multidisciplinary approach. Additionally, the existing literature on this topic does not provide comprehensive coverage, highlighting the need for further in-depth research in the future to address the current gaps. While there has been some progress, it is crucial to undertake more thorough and detailed studies to obtain comprehensive insights.

It is also important to note that competitiveness has not been extensively studied in Romania.

Further investigation into the topic has revealed that the classification of competitiveness factors at the national level indicates the existence of numerous additional aspects beyond those identified in the specialized literature. These emergent factors, derived from open-ended questions, strongly suggest that the

subject is evolving and that its analysis necessitates a comprehensive and integrated approach.

The general findings from the meeting with the group of experts revealed a divergence in perception at the regional level regarding the factors that determine competitiveness. While the questionnaire results indicated that external factors are the most significant determinants of competitiveness, discussions with the panel highlighted that the competitiveness of clusters is primarily attributed to internal factors. These internal factors include trust, cluster management, and the management or operational team.

Developing competitive clusters in the agri-food sector requires in-depth academic research into its specific characteristics and practical aspects. Currently, research primarily relies on data collected at the global and EU levels, with minimal information available on the cluster landscape in Romania. A comprehensive analysis of situational factors impacting competitiveness is imperative to develop business models for existing or future clusters.

8. The novelty contribution of the thesis

The exploration of competitive factors within clusters constitutes a dynamic and multifaceted area of research, necessitating the integration of diverse perspectives and methodologies. This section outlines the innovative contributions of the thesis, which delves into the competitiveness of agri-food clusters. The research methodology was centred on an extensive literature review, a structured questionnaire, and focus group, culminating in the creation of a business model utilizing the CANVAS model, rooted in the foundational framework of Porter's Diamond model.

The novel aspect of the thesis is connected to both the business strategy and the viability of the suggested actions.

Although the cluster concept appears to be outdated, EU regulations have given it significance that makes it relevant nowadays.

This work provides a thorough inventory of relevant literature, combining the strategic elements that govern and influence competitiveness. This compilation offers potential for future academic study focused on tackling the issues associated with increasing the efficacy of industrial and agri-food clusters.

This research fills the gap in the Romanian literature by examining the factors determined for the competitiveness of the cluster organization.

This thesis, also provides a detailed examination of factors useful for strategic management practitioners in assessing cluster competitiveness. It also aims to extract key factors for preliminary benchmarking analysis of clusters' competitive advantages. While the inventory is constructed around characteristics specific to cluster competitiveness, the findings can be applied to any industrial cluster configuration.

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