Journal of Policy Options · RESDO

Examining the Cluster Life Cycle in the Process of Economic Development

Rahman Aydemir[a]

Abstract
Economic development has long been recognized as a dynamic and multifaceted endeavor, with governments at both national and local levels continually striving to craft effective policies and programs to optimize resource utilization and foster sustainable growth. In recent years, a novel approach gaining traction in this domain is cluster-based economic analysis and strategy development. This study endeavors to delve into the evolving landscape of economic policy and explore the role of clusters therein. Central to our analysis is the conceptualization of "the cluster life cycle" as a pivotal determinant in shaping the support requirements of economic clusters. By conceptualizing clusters as dynamic entities traversing distinct stages of development, ranging from nascent formation to maturity and beyond, we posit that tailored interventions and support mechanisms can be devised to address the evolving needs and challenges encountered at each phase of the cluster life cycle. Our research underscores the imperative of fostering synergistic collaborations among key stakeholders, including government agencies, industry associations, academic institutions, and businesses, to nurture vibrant and resilient economic ecosystems. By cultivating conducive environments for innovation, knowledge exchange, and collective action, governments can catalyze the emergence of thriving clusters capable of driving sustainable economic growth and enhancing regional competitiveness. Our study aspires to contribute to the ongoing discourse surrounding cluster-based economic development and inform evidence-based policymaking practices aimed at fostering inclusive and equitable prosperity. By embracing the dynamic nature of clusters and adopting a holistic approach to policy formulation, governments can unlock new pathways for realizing their economic development objectives and empowering communities to flourish in an ever-evolving global landscape.
Keywords: Economic Development, Clusters, Cluster Life Cycle
JEL Codes: O18, R11, R58

1. INTRODUCTION

Clusters have emerged as a focal point of interest among policymakers and researchers in recent years. The concept of clusters, popularized by Porter (2003), has gained prominence as a key factor contributing to regional prosperity. Policymakers have increasingly recognized the significance of regional clusters and have endeavored to promote their development as a means of driving economic growth and competitiveness (Swords, 2013; Martin and Sunley 2011; Bröckeret al., 2012). Since the late 1980s, governments at both national and local levels in various countries, including Germany, Brazil, Japan, South Korea, the Spanish Basque country, and France, among others, have implemented initiatives to nurture and support the growth of clusters within their respective regions. These efforts have been aimed at leveraging the inherent synergies and interdependencies among firms, suppliers, and related institutions within specific industries or geographic areas to stimulate innovation, productivity, and economic development (Russell and Smorodinskaya, 2018; Feser, 1998; Bolumole et al., 2015; Bergman and Feser, 2020). By fostering collaboration, knowledge sharing, and specialization, clusters are seen as catalysts for driving regional economic growth, attracting investment, and creating employment opportunities. Governments have implemented various policies and initiatives to support the development of clusters, ranging from investment in infrastructure and technology to providing incentives for research and development, entrepreneurship, and workforce development.

Cluster policies are often advocated on the premise that they yield economic benefits and thus warrant public support. Clusters are typically defined as "geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Porter, 1998). This definition underscores the interconnectedness and synergies among firms, suppliers, and supporting institutions within a specific industry or geographic area. Proponents of cluster policies argue that clusters facilitate knowledge sharing, collaboration, and innovation, leading to increased productivity, competitiveness, and economic growth. By concentrating related industries and resources in close proximity, clusters enable firms to access specialized suppliers, skilled labor, and support services more efficiently (Andersen, 2006; Karaev et al., 2007; Doeringer and Terkla, 1996). This proximity fosters the exchange of ideas, best practices, and technological advancements, fueling innovation and entrepreneurship within the cluster.

[a] Okan University, Business Administration Programme, Istanbul, Turkey
Received: 30-12-2023 **Revised: 01-02-2024** **Online Published: 01-03-2024**

Furthermore, clusters often serve as focal points for research and development activities, with academic institutions, research centers, and government agencies collaborating with industry players to drive innovation and commercialization. This collaborative ecosystem enhances the region's capacity for innovation and technological advancement, positioning it as a hub of expertise and excellence in its respective field (Viitanen, 2016; Bramwell et al., 2012; Reichert, 2019). Supporters of cluster policies argue that public investments in infrastructure, education, research, and workforce development can yield significant returns by strengthening the competitiveness and resilience of clusters. By fostering a conducive environment for business growth and innovation, governments can attract investment, create jobs, and stimulate economic development within cluster regions.

Porter (1998) argues that clusters often defy conventional industrial classification systems, as they encompass a broader array of actors and relationships than traditional industry boundaries suggest. Indeed, clusters comprise not only firms within a specific sector but also a wide range of supporting institutions, suppliers, service providers, research organizations, and other stakeholders that contribute to the cluster's competitive advantage. Given the unique characteristics of clusters, Porter (1998) suggests that support mechanisms for cluster development should be tailored to address the specific dynamics and needs of these interconnected ecosystems. Unlike traditional industrial policies, which focus primarily on promoting individual industries or sectors, cluster-based support mechanisms should adopt a more holistic approach that recognizes the interdependencies and synergies within and across cluster networks. Instead of targeting specific industries or sectors in isolation, cluster-based policies should aim to strengthen the overall competitiveness and resilience of cluster ecosystems (Smorodinskaya and Kalukoy, 2019; Kiese and Hundt, 2014; Audretsch et al., 2019). This may involve investments in infrastructure, innovation, workforce development, and institutional capacity-building to enhance the cluster's capacity for collaboration, innovation, and value creation. Furthermore, cluster-based policies should prioritize initiatives that foster collaboration and knowledge sharing among cluster participants, facilitate technology transfer and commercialization, and promote entrepreneurship and innovation within the cluster ecosystem. By nurturing an environment conducive to collaboration, learning, and innovation, policymakers can help clusters leverage their collective strengths and capabilities to drive sustainable economic growth and competitiveness.

Menzel et al. (2009) suggest that clusters typically undergo a lifecycle characterized by distinct phases such as emergence, growth, and decline. Each phase of the cluster lifecycle is associated with unique characteristics, challenges, and opportunities. As clusters evolve over time, the needs and concerns of cluster participants may vary, necessitating adjustments in cluster policies and interventions. For instance, during the emergence phase, clusters may be characterized by the initial formation of linkages among firms, research institutions, and other stakeholders. At this stage, policymakers may focus on fostering collaboration, building critical mass, and attracting investments to support the nascent cluster's development. In the growth phase, clusters experience rapid expansion, increased specialization, and the emergence of cluster-specific infrastructure and support services (Smorodinskaya and Katukoy, 2019; Belussi, 2021; Pronestì, 2019). Policymakers may prioritize initiatives aimed at enhancing innovation, upgrading skills, and facilitating access to markets and financing to sustain the cluster's growth momentum. However, clusters may also face challenges such as resource constraints, competition from other regions, or technological disruptions that could lead to stagnation or decline. During the decline phase, policymakers may need to adopt strategies to revitalize the cluster, diversify its economic base, or facilitate the transition to new industries or technologies.

Arthurs et al. (2009) emphasize the importance of aligning cluster policies with the stage of development of the cluster. They argue that cluster policies must be flexible and adaptive to respond to the evolving needs and dynamics of clusters at different stages of their lifecycle. This may require policymakers to periodically reassess the effectiveness of existing policies, identify emerging challenges or opportunities, and adjust policy interventions accordingly.

2. LITERATURE REVIEW

Porter (1998) defines clusters as geographic concentrations of interconnected companies and institutions within a specific industry or field. These clusters encompass a variety of linked industries and entities that are crucial for fostering competition and innovation. One of the key advantages of clusters is their shared proximity, both in terms of geography and activities, which enables them to benefit from various positive externalities that are specific to their location. These location-specific externalities include access to specialized human resources and suppliers, which can enhance efficiency and facilitate collaboration within the cluster. Additionally, clusters benefit from knowledge spillovers, where ideas and innovations generated by one company or institution can diffuse rapidly within the cluster, stimulating further innovation and creativity. Moreover, the intense competition within clusters fosters pressure for higher performance among participating firms, driving them to innovate and improve their products and services to maintain competitiveness. Furthermore, the close interaction with specialized customers and suppliers within the cluster provides opportunities for learning and knowledge exchange, leading to continuous improvement and adaptation to market demands. Porter (1998) highlights several advantages that companies in clusters can enjoy, leading to higher levels of efficiency, innovation, and business formation. Firstly, companies within clusters can operate with greater efficiency by leveraging specialized assets and suppliers, as well as benefiting from shorter reaction times compared to operating in isolation. Secondly, clusters facilitate higher levels of innovation by fostering knowledge spillovers and facilitating close interactions between companies and research institutions. This environment of collaboration and exchange of ideas encourages the generation of new ideas and

innovations, while the proximity to customers and other companies provides valuable feedback and opportunities for improvement. Moreover, the cluster environment lowers the cost of experimenting for companies, enabling them to innovate more freely and rapidly without incurring excessive costs. Additionally, the intense pressure to innovate within clusters encourages companies to continuously strive for improvement and stay ahead of the competition.

Furthermore, clusters tend to attract a higher level of business formations, particularly start-ups, due to the availability of external suppliers, partners, and a supportive ecosystem. Start-ups benefit from the network of resources and expertise available within the cluster, facilitating their growth and success.

Rosenthal et al. (2004) reported in a survey that empirical studies on agglomeration consistently show a positive relationship between the size of a cluster and productivity gains. Specifically, the doubling of the size of a cluster, measured either by employment in a specific sector within a region or by the local density of employment, is associated with productivity gains ranging between 3% and 8%. This suggests that larger clusters tend to exhibit higher levels of productivity, likely due to the concentration of resources, knowledge spillovers, and other agglomeration effects that enhance efficiency and innovation within the cluster. The 2006 Innobarometer, conducted by The European Commission, focused on examining the unique characteristics of companies operating within a cluster-like environment. The study involved interviews with 3,528 companies situated in such environments across the 25 member states of the European Union. The findings of this survey were then compared with the general data collected in the 2004 Innobarometer. This comparative analysis aimed to provide insights into how companies within cluster-like settings differed from those operating outside of such environments, shedding light on the potential advantages and challenges associated with clustering for innovation and business development. The significance of clusters and their role in regional development is widely acknowledged in the existing literature. However, despite this recognition, there remains a notable absence of a proven model or formula for either supporting existing clusters or initiating new ones. While investing in the necessary assets to facilitate the emergence of a cluster is crucial, there is no one-size-fits-all solution or magic formula for success. Instead, the development of clusters relies on various factors such as the availability of technological infrastructure, a skilled workforce, and a conducive environment for entrepreneurial activity. Building the foundation for a cluster involves making long-term investments in key assets at the national or regional level. These investments may take time to yield tangible results and may initially appear to offer low returns. However, they are essential for nurturing the conditions conducive to cluster growth. This process can involve fostering technology innovation, cultivating a pool of educated and skilled labor, and creating avenues for entrepreneurial talent to thrive. Each cluster may follow a different trajectory and require tailored approaches based on its specific context and industry focus. Therefore, while there is no one definitive pathway to cluster development, strategic investments and supportive policies play a crucial role in laying the groundwork for cluster success.

This perspective is echoed by Bresnahan et al. (2001), who emphasize the complexity of cluster development and the absence of a universal blueprint for success. They highlight the importance of long-term investments in national or regional capabilities, acknowledging that these investments may not yield immediate returns but are essential for fostering an environment conducive to cluster growth. The Research Institute of the Finnish Economy (ETLA) and the Finnish National Fund for Research and Development (SITRA) embarked on a comprehensive research initiative in line with Porter's (2000) cluster approach to analyze the competitive advantage of Finnish industries. This initiative culminated in a groundbreaking mega cluster mapping project, which was unveiled in 1995. The study meticulously identified nine distinct clusters, drawing from insights gleaned from approximately 60 smaller-scale studies conducted across various sectors. The findings of this ambitious undertaking provided a solid foundation for policymakers and stakeholders, informing strategic decisions aimed at fostering the development of national industrial clusters. Leveraging the insights from the mega cluster mapping, the Finnish government initiated the National Cluster Programme, which aimed to bolster the competitiveness and sustainability of key industry clusters within the country. Ultimately, this collaborative effort resulted in the implementation of targeted measures to support the growth and innovation within eight identified clusters, as part of the broader framework outlined by the European Commission Enterprise Directorate-General (2007). Through this initiative, Finland demonstrated its commitment to nurturing strategic industries and enhancing its overall economic competitiveness on the global stage. Despite the widespread adoption of cluster policies in numerous countries, there remains a notable gap in their comprehensive evaluation. Significant financial resources are often allocated to cluster initiatives, exemplified by substantial investments such as the 1.5 billion euros earmarked for the French Competitiveness Clusters from 2006 to 2008, and the staggering 45 billion euros allocated for the Northwest Regional Economic Strategy in the UK from 2006 to 2026. However, despite these substantial investments, there exists a surprising dearth of macro or micro-level empirical analyses assessing their impact on firm performance.

Indeed, the efficacy of cluster-oriented policies has yet to be scientifically substantiated (Bergman, and Feser, 2020). This lacuna in empirical evidence underscores the need for rigorous evaluation and assessment of the outcomes and effectiveness of cluster initiatives. Without comprehensive empirical analysis, policymakers and stakeholders are left without a clear understanding of the tangible benefits and potential drawbacks associated with cluster policies. Addressing this knowledge gap is imperative to inform evidence-based decision-making and optimize the allocation of resources towards initiatives that yield the greatest economic and societal returns (Martin et al., 2010). Given the complex and multifaceted nature of cluster initiatives, identifying a universal model that accommodates all variations may prove challenging. However, one common denominator that could serve as a foundational principle for designing cluster support programs is recognizing the life cycle dynamics inherent in

cluster development. As highlighted by Menzel et al. (2009), clusters typically undergo distinct phases or stages, including emergence, growth, and decline. Each phase is characterized by unique challenges, opportunities, and developmental trajectories. By understanding and acknowledging these life cycle dynamics, policymakers and stakeholders can tailor cluster support programs to align with the specific needs and priorities of clusters at different stages of development. For instance, initiatives aimed at fostering cluster emergence may focus on creating conducive environments for collaboration, knowledge exchange, and resource mobilization among cluster participants. In contrast, programs targeting cluster growth may emphasize enhancing innovation capacity, expanding market reach, and attracting external investments. Meanwhile, efforts to mitigate decline may involve revitalization strategies, capacity-building interventions, and diversification initiatives. By incorporating the concept of the cluster life cycle into the design and implementation of support programs, policymakers can adopt a more nuanced and context-sensitive approach that addresses the evolving needs and challenges faced by clusters over time. This adaptive framework can enhance the effectiveness and sustainability of cluster initiatives, ultimately contributing to the long-term competitiveness and resilience of regional economies.

In the initial stages of emergence, clusters typically consist of a handful of small companies, often dispersed across a wide geographic area and possessing limited technological capabilities. As highlighted by Arthur (1994), Feldman (2005), and Klepper (2007), the transition from an emerging cluster to a growing one hinges on the attainment of critical mass, wherein the growth rate of cluster-affiliated companies surpasses that of non-clustered entities. Central to this transformation is the creation of synergies around a focal point—a nucleus of activity or innovation that serves as a catalyst for cluster development. This focal point may arise organically from shared expertise, specialized resources, or common interests within the cluster, thereby fostering collaboration, knowledge exchange, and collective learning among participating firms. By leveraging synergies and concentrating efforts around a focal point, emerging clusters can enhance their cohesion, resilience, and competitiveness, laying the groundwork for sustained growth and evolution. Additionally, fostering an enabling environment that encourages entrepreneurship, innovation, and investment can further accelerate the transition from an emerging cluster to a thriving economic ecosystem. As policymakers and stakeholders endeavor to support the development of emerging clusters, they can draw insights from research on cluster dynamics and evolutionary economics to design targeted interventions that facilitate synergies, catalyze innovation, and stimulate growth. Through strategic investments in infrastructure, human capital, and institutional capacity, emerging clusters can realize their potential as engines of regional development and drivers of economic transformation.

The dynamics driving the emergence and sustained growth of a cluster are multifaceted and evolve over time. While increasing returns and external effects play a crucial role in perpetuating cluster vitality, the factors that initially ignite cluster formation are often more elusive and fraught with risk. Research suggests that the genesis of a cluster is often contingent upon several key factors. Chief among these is access to a sizable and expanding market demand, which serves as a catalyst for entrepreneurial activity and investment. Additionally, the presence of a skilled labor pool and access to critical resources such as capital and infrastructure are essential prerequisites for cluster formation. Furthermore, the pioneering firms within a nascent cluster must possess strong organizational and technological capabilities to drive its development forward. These capabilities encompass a range of competencies, including innovation, marketing, supply chain management, and strategic planning. By leveraging their expertise and resources, cluster pioneers can cultivate an environment conducive to business growth, knowledge sharing, and collaborative innovation. However, sustaining cluster growth requires ongoing investments and concerted efforts to enhance the capabilities of firms within the cluster. This entails continuous learning, adaptation, and innovation to remain competitive in an ever-changing market landscape. Moreover, fostering a supportive ecosystem that nurtures entrepreneurship, facilitates knowledge exchange, and promotes collaboration among cluster participants is essential for long-term prosperity. (Bresnahan et al., 2001).

Cluster initiatives require careful consideration and targeted support to maximize their effectiveness in driving regional economic development. According to cluster theory, competitive advantage extends beyond individual firm-level resources and capabilities to encompass the broader business environment within a geographic cluster. Empirical research has demonstrated that clustering can yield substantial benefits, including enhanced rates of new firm creation, increased firm productivity, greater innovation, improved profitability, and accelerated growth. To optimize the impact of cluster initiatives, it is essential to identify and prioritize key areas for support. These may include infrastructure development, education and workforce development, research and innovation, business support services, and networking and collaboration. Investing in physical infrastructure such as transportation networks, telecommunications systems, and utilities can enhance connectivity and accessibility within the cluster, facilitating collaboration, knowledge exchange, and market access. Supporting education and skills development initiatives can help cultivate a highly skilled and adaptable workforce capable of driving innovation and competitiveness within the cluster. Training programs, vocational education, and initiatives to promote lifelong learning can contribute to talent retention and attraction. Fostering a culture of innovation and entrepreneurship is critical for cluster success. Supporting research and development activities, technology transfer programs, and collaborative innovation networks can stimulate knowledge creation, technology adoption, and commercialization of new ideas. Providing targeted assistance to cluster firms through incubators, accelerators, business development centers, and industry associations can help address specific needs such as access to financing, marketing support, regulatory compliance, and export assistance. Facilitating networking opportunities, industry clusters, and business-to-business collaboration can foster knowledge sharing, best practice exchange, and synergistic partnerships among

cluster participants. Platforms for networking events, industry forums, and joint projects can strengthen social capital and trust within the cluster ecosystem (Gordon et al., 2005).

Effective policies to support clusters require a delicate balance between intervention and decentralization. Top-down approaches that dictate specific industries or technologies to be supported are often unsuccessful. Instead, policies should embrace a philosophy of "benign neglect," allowing for decentralized decision-making and focusing on creating enabling conditions for cluster development. Central to these policies is the cultivation of suitable demand and markets, including the establishment of standards and openness to innovation. By fostering an environment conducive to entrepreneurship and competition, policymakers can encourage the organic growth of clusters driven by market forces rather than government intervention. Investments in human capital are also crucial, with policies aimed at developing a skilled workforce through education and training initiatives. By equipping individuals with the knowledge and skills needed to thrive in a dynamic economy, policymakers can empower them to contribute to cluster development and competitiveness. Furthermore, policies should focus on key supply-side factors and institutions that support innovation and entrepreneurship. This may involve investments in research and development infrastructure, access to financing for startups and small businesses, and regulatory frameworks that promote business growth and investment.

Ultimately, successful cluster policies strike a balance between providing necessary support and allowing clusters to evolve organically. By creating a conducive environment for innovation, entrepreneurship, and collaboration, policymakers can foster the emergence of vibrant and sustainable clusters that drive economic growth and prosperity (Bresnahan et al., 2001).

Public policies favoring pre-competitive research and cooperative R&D have played a decisive role in the emergence and development of technology centers and technological infrastructures globally (Tassey, 1991). These infrastructures, as defined by Justman et al. (1995), encompass a set of collectively supplied, industry-specific capabilities intended for application in multiple user organizations. Such policies have been instrumental in fostering innovation and technological advancement, particularly in industries where collaboration and shared resources are critical for progress. Public policies supporting pre-competitive research and cooperative R&D have been instrumental in fostering the emergence and growth of technology centers and technological infrastructures worldwide. These infrastructures, characterized as a collective set of industry-specific capabilities, are intended for use by multiple organizations across various sectors. By investing in pre-competitive research and fostering collaboration among stakeholders, policymakers can create an environment conducive to innovation and technological advancement. Technology centers serve as hubs for knowledge exchange, facilitating the transfer of research findings and cutting-edge technologies to multiple user organizations. These initiatives enable organizations to access specialized resources and expertise that may be prohibitively expensive or impractical to develop independently. By pooling resources and sharing risks, organizations can accelerate the pace of innovation and enhance their competitiveness in the global marketplace. Moreover, technology centers play a crucial role in bridging the gap between research and commercialization, facilitating the translation of scientific discoveries into practical applications and marketable products. This not only drives economic growth but also addresses societal challenges by fostering the development of solutions to pressing issues in areas such as healthcare, energy, and the environment. Clustering plays a vital role in accelerating the dissemination of knowledge acquired within a given industry. Local industrial policy, as emphasized by Humphrey et al. (2000), holds significant importance in this regard by facilitating the expansion of infrastructure and enhancing training, testing, and certification facilities. These efforts contribute to the overall growth and competitiveness of industries by fostering an environment conducive to innovation and skill development.

3. METHODOLOGY

Survey techniques are commonly employed in cluster analysis to gather customized data regarding key cluster dynamics. Unlike official statistics, surveys collect data from a sample rather than the entire population, which may limit the comprehensiveness of the data. Additionally, the lack of standardization in survey design makes it challenging to compare results across different studies conducted by various researchers. However, the advantage of custom survey design is that it allows for specific targeting of stakeholders and tailoring of data collection to address specific issues of interest in the cluster analysis (Arthurs et al., 2009). In order to test hypotheses, a non-parametric test was conducted, focusing on the Eskisehir-Bileck and Kutahya regions, which host three cluster initiatives at different stages of maturity in the cluster life cycle. Thirty participants from these initiatives were briefed about the study and engaged in a one-day workshop. Using a Likert scale ranging from 0 to 5, participants evaluated a survey comprising 44 questions categorized into four components. Each participant prioritized support needs for activities within their cluster, and if they identified missing activities, they were invited to add them to the survey. To validate the survey, it was initially conducted with a small controlled group consisting of representatives from different clusters and experts.

4. RESULTS AND DISCUSSIONS

Table 1 offers an exhaustive examination of the Kruskal-Wallis test outcomes, a statistical tool employed to scrutinize the efficacy of diverse strategies concerning the reinforcement of coordination, the augmentation of awareness, and/or the enhancement of efficiency within clusters. Each entry in the table delineates a particular initiative pertinent to cluster development, designated by a distinctive code and accompanied by a concise

explanation of its purpose. These initiatives span a spectrum of endeavors, ranging from the establishment of legal institutions to the identification of cluster strategies and the preparation of financial support program applications. Within the table, every row delineates the mean ranks ascribed by respondents across different cluster types denoted by 1.00, 2.00, and 3.00, signifying the perceived effectiveness or significance of each initiative.

Table 1: Outcomes of Kruskal-Wallis Test

	Ranks			Test Statistics[a,b]	
	Cluster type	N	Mean Rank		
1 Establishment of a legal institution (union, foundation, cooperative… etc) to represent the cluster.	1.00	8	29,50	Chi-square	12,587
	2.00	9	9,17	Df	2
	3.00	19	14,96	Asymp.Sig	,002
2 Building institutional capacity of the legal institution (union ...etc) to represent the cluster	1.00	8	16,50	Chi-square	0,421
	2.00	9	14,11	Df	2
	3.00	19	15,85	Asymp.Sig	,810
3 Coordination of the cluster initiative (for example forming a team of professional staff)	1.00	8	21,98	Chi-square	8,004
	2.00	9	10,99	Df	2
	3.00	19	15,42	Asymp.Sig	,018
4 Raising awareness of the cluster actors on clustering	1.00	8	25,94	Chi-square	29,192
	2.00	9	17,61	Df	2
	3.00	19	7,62	Asymp.Sig	,000
5 Organizations to encourage the cluster actors to be familiar each other	1.00	8	29,56	Chi-square	19,619
	2.00	9	6,11	Df	2
	3.00	19	17,04	Asymp.Sig	,000
6 Making sectoral organizations for participation of the cluster actors or participation in these kinds of organizations	1.00	8	19,94	Chi-square	9,470
	2.00	9	19,89	Df	2
	3.00	19	19,88	Asymp.Sig	,176
7 Strengthening the common cluster brand and advertising (especially aiming at marketing)	1.00	8	24,19	Chi-square	20,608
	2.00	9	5,94	Df	2
	3.00	19	16,77	Asymp.Sig	0,000
8 Lobbying and advertising activities (rather for looking after the cluster's benefits)	1.00	8	22,98	Chi-square	16,904
	2.00	9	6,78	Df	2
	3.00	19	17,91	Asymp.Sig	,000
9 Investment promotion	1.00	8	22,91	Chi-square	7,999
	2.00	9	19,11	Df	2
	3.00	19	12,96	Asymp.Sig	,018
10 Market (including the local markets) growth activities	1.00	8	26,19	Chi-square	18,794
	2.00	9	14,22	Df	2
	3.00	19	9,85	Asymp.Sig	,000
11 Access to the international business networks and collaboration with the other clusters…etc	1.00	8	29,56	Chi-square	12,572
	2.00	9	9,50	Df	2
	3.00	19	14,69	Asymp.Sig	,002
12 Conducting the basic analyses (competitiveness…etc) related to the cluster	1.00	8	22,19	Chi-square	20,160
	2.00	9	20,94	Df	2
	3.00	19	7,62	Asymp.Sig	,000
13 Conducting the sophisticated analyses (comparing, market analysis, technology survey) related to the cluster	1.00	8	15,50	Chi-square	,545
	2.00	9	14,11	df	2
	3.00	13	16,46	Asymp.Sig	,761
14 Identifying the cluster strategy and preparing a roadmap	1.00	8	26,00	Chi-square	26,544
	2.00	9	18,44	df	2
	3.00	13	7,00	Asymp.Sig	,000
15 Preparing applications for various financial support programmes.	1.00	8	12,44	Chi-square	13,606
	2.00	9	9,39	df	2

Additionally, the table furnishes statistical test outcomes comprising chi-square values, degrees of freedom (df), and asymptotic significance levels (Asymp. Sig) to evaluate the significance of disparities in mean ranks across various cluster types. By scrutinizing the statistical test results, stakeholders can discern whether there exist notable variances in the perceived effectiveness of cluster-related initiatives among diverse cluster types. Notably, initiatives like raising awareness among cluster actors and fortifying the common cluster brand and advertising exhibit conspicuous differences in mean ranks across cluster types, underscored by markedly low asymptotic significance levels (e.g., Asymp. Sig < 0.05). Such insights serve as invaluable guideposts for decision-makers, offering illumination on the efficacy of different strategies tailored to bolster coordination, foster awareness, and amplify efficiency within clusters across disparate contexts. Armed with this understanding, policymakers and industry leaders can adeptly prioritize initiatives poised to yield optimal outcomes, thereby steering cluster development endeavors toward enhanced competitiveness and sustained growth.

Table 2 presents the outcomes of the Kruskal-Wallis test concerning strategies aimed at bolstering factor conditions and/or markets within clusters. Each row in the table delineates a specific initiative intended to strengthen various aspects of factor conditions or market dynamics within clusters, accompanied by a succinct description of its objective. The mean ranks assigned by respondents across different cluster types, denoted by 1.00, 2.00, and 3.00, are depicted for each initiative. These mean ranks offer insights into the perceived effectiveness or importance of each strategy across diverse cluster contexts. Additionally, the table furnishes statistical test results, including chi-square values, degrees of freedom (df), and asymptotic significance levels (Asymp. Sig), to evaluate the significance of disparities in mean ranks among different cluster types for each initiative. Upon closer examination of the statistical test outcomes, certain initiatives exhibit notable differences in mean ranks across cluster types, as evidenced by low asymptotic significance levels (e.g., Asymp. Sig < 0.05). For instance, activities aimed at strengthening the main (low or half qualified) labor market and those geared towards reducing the cost of raw materials and/or intermediate goods show statistically significant disparities in perceived effectiveness across different cluster types. Such findings offer valuable insights for policymakers, industry practitioners, and other stakeholders involved in cluster development initiatives. By discerning the efficacy of various strategies in different cluster contexts, decision-makers can better allocate resources and tailor interventions to optimize outcomes and foster sustainable growth within clusters.

Table 2: Strengthening the Factor Conditions

		Cluster type	Ranks			Test Statistics[a,b]
1	Strengthening the main (low or half qualified) labour market (worker, master … etc)	1.00	8	6,56	Chi-square	12,819
		2.00	9	18,28	df	2
		3.00	19	19,08	Asymp.Sig	,002
2	Strengthening the qualified labour market (technician, basic engineering)	1.00	8	15,50	Chi-square	2.726
		2.00	9	12,61	df	2
		3.00	19	17,50	Asymp.Sig	,256
3	Strengthening the high - qualified labour market (R & D engineering, designer …etc)	1.00	8	19,19	Chi-square	5,421
		2.00	9	10,78	df	2
		3.00	19	16,50	Asymp.Sig	,066
4	Activities for increasing the quality of raw materials and /or intermediate goods.	1.00	8	8,00	Chi-square	18,257
		2.00	9	11,67	df	2
		3.00	19	22,77	Asymp.Sig	,000
5	Activities for reducing the cost of the raw materials and / or intermediate goods.	1.00	8	8,81	Chi-square	19,547
		2.00	9	10,99	df	2
		3.00	19	29,15	Asymp.Sig	,000
6	Activities to strengthen the common physical Infrastructure (incubation, purifying, energy, transport…etc)	1.00	8	6,69	Chi-square	21,915
		2.00	9	12,17	df	2
		3.00	19	29,27	Asymp.Sig	,000
7	University – Industry Collaboration Programmes	1.00	8	12,44	Chi-square	6,599
		2.00	9	21,00	df	2
		3.00	19	19,58	Asymp.Sig	,098
8	Establishing the units to provide information about the market continuously	1.00	8	19,00	Chi-square	5,792
		2.00	9	18,17	df	2
		3.00	19	11,50	Asymp.Sig	,057
9	Access to strategic information sources (settling the tenders, raw material prices, other news about the market)	1.00	8	24,94	Chi-square	15,884
		2.00	9	15,00	df	2
		3.00	19	10,04	Asymp.Sig	,000

5. CONCLUSION

The research conducted in the Eskisehir-Bilecik-Kutahya region highlights the dynamic nature of cluster support requirements, which evolve based on the maturity level of clusters within the cluster life cycle. However, the study does not provide a clear distinction among support types based on cluster maturity level. Therefore, there is a need

for further research to classify the specific support needs corresponding to different stages of the cluster life cycle. This deeper analysis will enable policymakers and stakeholders to tailor support mechanisms more effectively to the evolving needs of clusters at various stages of development. This research aimed at classifying the support needs of clusters according to their maturity level in the cluster life cycle would contribute significantly to our understanding of cluster dynamics and the effectiveness of cluster support policies. By conducting a more comprehensive analysis, policymakers and stakeholders can gain insights into the specific challenges and opportunities faced by clusters at different stages of development. This nuanced understanding can inform the design and implementation of cluster support initiatives, ensuring that resources are allocated efficiently and interventions are targeted appropriately to maximize the impact on cluster growth and competitiveness. Additionally, a deeper understanding of cluster dynamics can help identify potential barriers to cluster development and inform strategies to overcome them, ultimately fostering a more conducive environment for cluster-based economic growth and innovation. Expanding the scope of research beyond the current regional context to include diverse geographical settings and cluster initiatives with varying levels of economic development would enhance the generalizability and robustness of the findings. By examining cluster support requirements in different contexts, researchers can uncover the nuances and complexities of cluster dynamics, shedding light on how factors such as regional characteristics, industrial composition, and institutional frameworks influence the support needs of clusters. Moreover, comparative studies across regions can provide valuable insights into the effectiveness of cluster support policies and initiatives, helping policymakers tailor interventions to suit the specific needs and conditions of different clusters and regions. Therefore, future research endeavors should consider conducting similar studies in other regions, particularly in less economically developed areas, to enrich our understanding of cluster dynamics and support requirements across diverse contexts. Identifying the diverse support requirements of clusters is crucial, considering that regional cluster policies are shaped by various interests and goals. Recognizing that a singular approach may not be suitable for all clusters underscores the need for tailored interventions that address specific needs and challenges. Key stakeholders within the clusters themselves are instrumental in driving the success of support programs, as they possess valuable insights into the unique dynamics and requirements of their respective clusters. By actively involving cluster members in the design and implementation of support initiatives, policymakers can ensure that interventions are relevant, effective, and responsive to the needs of the clusters they aim to assist. This collaborative approach fosters a sense of ownership and commitment among cluster participants, ultimately contributing to the success and sustainability of cluster support programs. Indeed, conducting a follow-up study to delve deeper into the underlying factors driving cluster policies and how they can be effectively provided to clusters would be valuable. Such research could explore the nuanced needs and preferences of cluster participants, as well as the contextual factors shaping cluster development. By identifying the key determinants of successful cluster policies and strategies for delivering them to clusters, policymakers and stakeholders can refine their approach to cluster support initiatives. This deeper understanding can inform the design of targeted interventions that address specific challenges and leverage opportunities for cluster growth and competitiveness. Additionally, investigating the interplay between cluster policies, economic development goals, and regional dynamics can offer valuable insights into the broader impacts of cluster initiatives on regional economies and competitiveness. Ultimately, this research can contribute to the development of more informed and effective cluster policies that foster sustainable economic growth and innovation at the regional level. The growing prevalence of cluster initiatives and related economic policies underscores the importance of systematically assessing their impact. Evaluating the success of these programs and initiatives is crucial for understanding their effectiveness, identifying areas for improvement, and informing future policymaking decisions. By conducting comprehensive assessments that consider both quantitative indicators and qualitative insights from cluster members, policymakers and stakeholders can gain a more holistic understanding of the outcomes and impacts of cluster initiatives. This can help ensure that resources are allocated effectively, strategies are refined based on evidence-based insights, and the needs and priorities of cluster participants are adequately addressed. Ultimately, a rigorous evaluation process can contribute to the development of more targeted, responsive, and impactful cluster policies that support sustainable economic growth and innovation at the regional level.

REFERENCES

Andersen, P. H. (2006). Regional clusters in a global world: Production relocation, innovation, and industrial decline. *California Management Review*, *49*(1), 101-122.

Arthur, W.B. (1994). Increasing Returns and Path Dependence in the Economy. University of Michigan Press, Ann Arbor.

Arthurs, D., Cassidy, E., Davis, C., Wolfe, D. (2009). Indicators to support innovation cluster policy. *International Journal of Technology Management*, 46(3/4), 263-279.

Audretsch, D. B., Lehmann, E. E., Menter, M., & Seitz, N. (2019). Public cluster policy and firm performance: Evaluating spillover effects across industries. *Entrepreneurship & Regional Development*, *31*(1-2), 150-165.

Belussi, F. (2021). New perspectives on the evolution of clusters. *Dislocation: Awkward Spatial Transitions*, 96-114.

Bergman, E. M., & Feser, E. J. (2020). Industrial and regional clusters: concepts and comparative applications.

Bolumole, Y. A., Closs, D. J., & Rodammer, F. A. (2015). The economic development role of regional logistics hubs: a cross-country study of interorganizational governance models. *Journal of Business Logistics*, *36*(2), 182-198.

Bramwell, A., Hepburn, N., & Wolfe, D. A. (2012). Growing innovation ecosystems: University-industry knowledge transfer and regional economic development in Canada. *Final Report to the Social Sciences and Humanities Research Council of Canada*, *62*.

Bresnahan, T., Gambardella, A., Saxenian, A. (2001). Old Economy Inputs for 'New Economy' Outcomes: Cluster Formation in the New Silicon Valleys. *Oxford Journals, Social Sciences, Industrial and Corporate Change*, 10(4), 835-860.

Bröcker, J., Dohse, D., & Soltwedel, R. (Eds.). (2012). *Innovation clusters and interregional competition*. Springer Science & Business Media.

Doeringer, P. B., & Terkla, D. G. (1996). Why do industries cluster. *Business networks: Prospects for regional development*, 175-189.

Feldman, M.P., Francis, J., Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, 39, 129-141.

Feser, E. J. (1998). Old and new theories of industry clusters. *Clusters and regional specialisation*, *18*, 40.

Gordon,I., McCann, P.(2005). Innovation, agglomeration, and regional development. *Oxford Journals Social Sciences-Journal of Economic Geography*, 5(5), 523-543.

Humphrey, J., Schmitz, H. (2000). Governance and Upgrading: Linking Industrial Cluster and global value chain research. Institute of Development Studies, University of Sussex.

Justman, M., Teubal, M. (1995). Technological infrastructure policy (TIP): Creating capabilities and building markets. *Research Policy*, 24(2), 259-281.

Karaev, A., Lenny Koh, S. C., & Szamosi, L. T. (2007). The cluster approach and SME competitiveness: a review. *Journal of Manufacturing Technology Management*, *18*(7), 818-835.

Kiese, M., & Hundt, C. (2014). Cluster policies, organising capacity and regional resilience: Evidence from German case studies. *Raumforschung und Raumordnung*, *72*(2), 117-131.

Klepper S. (2007). The evolution of geographic structures in new industries. Applied evolutionary economics and economic geography, K. Frenken, Edward Elgar Publishing, Cheltenham.

Martin, P., Mayer T., Mayneris, F. (2010). Public support to clusters- A Firm level study of French Local productive systems. *Regional Science and Urban Economics*.

Martin, R., & Sunley, P. (2011). Regional competitiveness: clusters or dynamic comparative advantage?. *Competition, competitive advantage and clusters: The ideas of Michael Porter*, 211-238.

Menzel, M., Fornahl, D. (2009**)**. Cluster Life Cycles -Dimensions and Rationales of Cluster Evolution. *Oxford Journals Economics & Social Sciences, Industrial and Corporate Change*, 19(1), 205-238.

Porter, M. (1998). Clusters and the new Economics of Competition. Harvard Business Review.

Porter, M. (2000). Location, competition, and Economic Development: Local clusters in a Global Economy. *Economic Development Quarterly.*

Porter, M. (2003). The Economic Performance of Regions. *Regional Studies*, 37(6&7), 549–578.

Pronestì, G. (2019). *Life cycle of clusters in designing smart specialization policies*. Berlin: Springer International Publishing.

Reichert, S. (2019). The role of universities in regional innovation ecosystems. *EUA study, European University Association, Brussels, Belgium*.

Rosenthal, S., Strange, W, C., (2001). The Determinants of Agglomeration. *Journal of Urban Economics*, 50(2), 191-229.

Russell, M. G., & Smorodinskaya, N. V. (2018). Leveraging complexity for ecosystemic innovation. *Technological Forecasting and Social Change*, *136*, 114-131.

Smorodinskaya, N. V., & Katukov, D. D. (2019). When and why regional clusters become basic building blocks of modern economy. *Baltic region*, *11*(3), 61-91.

Swords, J. (2013). Michael Porter's cluster theory as a local and regional development tool: The rise and fall of cluster policy in the UK. *Local Economy*, *28*(4), 369-383.

Viitanen, J. (2016). Profiling regional innovation ecosystems as functional collaborative systems: The case of Cambridge. *Technology Innovation Management Review*, *6*(12).