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THE ANALYTICAL LIMITS OF CLUSTERING APPROACHES AND THE NECESSITY OF A MACRO PERSPECTIVE

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ABSTRACT

This article re-evaluates the historical evolution and primary theoretical expansions of cluster theory within a systematic literature debate. The theoretical accumulation-spanning from Marshallian externalities to industrial districts, Porterian clusters to new economic geography, and from learning regions to national innovation systems, including related variety, smart specialisation, global value chains, and economic complexity-is addressed through a common analytical framework. The study's central finding suggests that while the existing literature provides robust explanations at the firm, sectoral, and regional scales, it remains constrained regarding the strategic organisation of national production systems, cross-sectoral integration, supply chain coordination, institutional alignment, resilience, and supply security in essential sectors. By combining a selective and interpretative literature review with conceptual synthesis, the article discusses why these limitations necessitate a higher-scale framework. In this context, the study clarifies the constitutive dimensions of a macro-perspective in cluster research and establishes a systematic groundwork for subsequent theoretical and empirical inquiries.

Keywords: Clustering, Security of Supply, Macro-Clustering

JEL Classification: D24, I31, L52, O11, O14, O25, R11, R58

I. INTRODUCTION

The concentration of economic activities within specific geographical areas remains one of the most enduring domains of debate in economic literature. Marshall's (1920) seminal observations demonstrated that the clustering of industries in the same space is far from coincidental; rather, such concentration generates sustained productivity advantages through knowledge spillovers, specialised labour pools, and the provision of intermediate inputs. Subsequently, Krugman (1991), Fujita, Krugman, and Venables (1999), and Audretsch and Feldman (2004) established that this phenomenon of spatial concentration is more than a historical observation, it serves as a central explanatory axis for both economic geography and innovation processes.

The theoretical trajectory extending from the Marshallian framework to the Italian industrial districts approach, and from Porter's discourse on competitive advantage to the literature on learning regions and innovation systems has conceptualized clustering not merely as a firm-level cost advantage, but as a capacity for knowledge production, institutional learning, and specialised coordination. While Becattini (1990) and Piore and Sabel (1984) highlighted the dimensions of social embeddedness and flexible specialisation, Porter (1990, 1998) redefined clustering through the interplay between competition, innovation, and policy design. Subsequently, Lundvall (1992), Nelson (1993), and Cooke (2001) transcended firm boundaries to emphasize the systemic nature of innovation.

Nevertheless, the accelerating technological and geo-economic transformations of recent years have necessitated a re-evaluation of the clustering literature at a higher scale. As Baldwin (2016) posits, the global fragmentation of production processes, the increasingly multi-layered nature of value chains, and the reorganisation of coordination costs through digital technologies have complicated the explanation of competitiveness solely through local agglomeration dynamics. The OECD's (2023) science, technology, and innovation outlook emphasizes that resilience and preparedness have become paramount in the face of climate transitions, geopolitical pressures, and supply chain disruptions. Furthermore, the OECD's (2025) more recent assessment reveals that research security, strategic competition, policy complementarities, and administrative agility have further deepened this debate. Juhász, Lane, and Rodrik (2024) further observe that the expanding empirical and theoretical literature on industrial policy has once again placed coordination, learning, and technological directionality at the centre of the agenda.

While a significant portion of the existing clustering literature has addressed certain dimensions of these transformations, the primary scale of explanation has often remained at the micro, sectoral, or regional levels. As Martin and Sunley (2003) emphasize, the concept of the cluster has occasionally become overstretched within policy discourse; conversely, the functional integrity of disparate clusters within the national production system, their alignment with strategic sectoral priorities, and the mechanisms for their coordination through public policy instruments have not been sufficiently elucidated. In this context, it has become an essential academic imperative to move beyond merely explaining the success of existing clusters and instead clarify how new fields of activity are to be identified, how they should be interconnected, and through which institutional architecture they can be sustained.

The objective of this study is to theoretically demonstrate why a macro perspective is needed in cluster research by re-examining the historical development and main theoretical ramifications of cluster theory. Within this framework, the original contribution of the article is not to summarize cluster theories chronologically, but rather to highlight the shortcomings of these theories in terms of the strategic organisation of national production systems.

The main research questions of this study are categorised under three main headings. The first inquiry identifies the primary theoretical approaches that have emerged within the historical trajectory of clustering literature and examines the mechanisms through which these approaches explain production systems. The second question explores the fundamental analytical limitations of these perspectives regarding the strategic organisation of national production systems. Finally, the third question investigates the underlying reasons that necessitate a macro-level reconsideration of the clustering phenomenon in the face of contemporary economic transformations.

This study is theoretical in nature. Methodologically, it combines a selective and interpretative literature review with conceptual synthesis. Within a trajectory extending from Marshall to Boschma, Porter to Gereffi, and Lundvall to Juhász and Rodrik, foundational texts and contemporary contributions are evaluated in tandem. The objective is not so much to describe these approaches individually, but rather to discuss their collective explanatory power, their interconnections, and their scalar limitations. In this framework, the study theoretically addresses the necessity of a macro-perspective in cluster research. Following the introduction, the second section examines the historical evolution and primary approaches of cluster theory; the third section discusses the limitations of the existing literature; and the fourth section sets out the theoretical justifications for the need for a macro-perspective.

2. THE EVOLUTION OF CLUSTER THEORY AND PRIMARY APPROACHES

In this section, the clustering literature is addressed within a framework of analytical continuity. This approach enables a clearer understanding of the mechanisms through which each perspective explains clustering and the specific limitations each carries regarding a macro-perspective..

2.1. Marshallian Origins and Agglomeration Economies

The fundamental starting point of the clustering concept is Alfred Marshall. Marshall (1920) argued that the concentration of specific industries within the same geographical area generates sustained productivity advantages, explaining these benefits through knowledge spillovers, specialised labour markets, and the deepening of intermediate goods suppliers. Marshall's concept of "industrial atmosphere" demonstrates that the production environment consists of more than mere physical proximity; it shows that knowledge, skills, and business habits also interact by virtue of spatial closeness.

This approach was subsequently systematised within the literature on agglomeration economies. Audretsch and Feldman (2004) demonstrated that knowledge spillovers are reinforced by geograph-

ical proximity, while Duranton and Puga (2004) showed that agglomeration operates through the mechanisms of sharing, matching, and learning. These contributions reveal that productivity growth cannot be explained solely by the internal organisation of the firm; rather, the spatial environment serves as an active component of production. These findings, which align with Jacobs' (1969) early observations that inter-industry knowledge spillovers in cities depend on diversity, confirm that the spatial environment constitutes an active production infrastructure. Consequently, place or space has ceased to be a passive backdrop for cost reduction and has instead become a productive infrastructure that generates knowledge, skills, and coordination.

The enduring significance of the Marshallian approach can be consolidated into two key points. Firstly, it demonstrates that competitive advantage cannot be explained solely through prices and economies of scale, recognising instead that learning and the circulation of knowledge are also decisive factors. Secondly, it reveals that geography is not an external element added post hoc to economic analysis, but rather an intrinsic component of the production system. Nevertheless, the primary limitation of the Marshallian framework lies in its concentration on the functioning of the local production environment, failing to discuss in detail the state's capacity for determining sectoral priorities, establishing infrastructure, and strategically organising the national production system.

2.2. Industrial Districts, Flexible Specialisation and Social Embeddedness

The debate on industrial districts in Italy was instrumental in the revival of Marshallian literature. While Becattini (1990) integrated Marshallian externalities with local social structures, Piore and Sabel (1984) demonstrated how flexible specialisation generates competitive advantage in regions characterised by a high density of small and medium-sized enterprises. What is decisive in this approach is not merely the co-location of firms. Consequently, it is argued that the historical, cultural, and institutional bonds established between the local community and the production structure are of equal importance.

Trust-based relationships, recurrent interactions, shared norms, and vocational traditions facilitate production coordination and reduce transaction costs through the mechanism conceptualised by Granovetter (1985) as the "social embeddedness of economic action". Consequently, the industrial districts literature does not automatically interpret scale in favour of large firms. It is recognised that a multitude of vertically disintegrated, yet horizontally interconnected small firms can also generate collective production capacity. Here, the region is conceptualised as a social production sphere possessing a coordination and adaptation capacity superior to the sum of individual firms. Similarly, in Storper's (1997) "regional world" approach, local dependencies and interpretative frameworks are highlighted as inseparable components of the production system.

The contribution of these approaches lies in their treatment of clustering alongside social embeddedness and the institutional environment. However, their primary limitation emerges precisely at this juncture. While the industrial districts literature provides robust explanations as to why specific local ecosystems succeed, it offers more limited answers regarding how these successes can be

systematically linked to national industrial policy. The question of how to establish the connection between regional social embeddedness and national strategic coordination is often left underspecified within the literature.

2.3. Porter, Competitive Advantage and the Cluster Approach

Michael Porter established the contemporary policy framework of the cluster approach most distinctly. Porter (1990) argued that nations and firms compete not merely through natural resources or low costs, but through productivity growth, innovation capacity, product quality, and differentiation strategies. The Diamond Model evaluates factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry as interconnected components.

Porter's subsequently developed cluster approach directly linked spatial concentration to competitive pressure and innovation dynamism. According to Porter (1998), the proximity of firms nurtures intense rivalry alongside cooperation. Universities, research institutions, suppliers, financial organisations, and specialised service firms constitute the institutional ecosystem of this competitive environment. Thus, clustering is addressed as a strategic form of organisation that enhances both production efficiency and entrepreneurial capacity.

Porter's approach holds particular significance due to its alignment of local production advantages with national competitive strategies. Nevertheless, this framework frequently focuses on the characteristics of successful clusters, thereby relegating questions of how to select nascent fields, which policy instruments to employ for their support, and how to interconnect disparate clusters within the national production architecture to a secondary status. Particularly when evaluated from the perspective of late-industrialising economies, it is of great importance to move beyond merely supporting existing clusters and instead focus on constructing new fields of activity and deepening them within a long-term framework of institutional coordination.

2.4. New Economic Geography and Spatial Concentration

The new economic geography approach, which evolved with Krugman (1991), explains through formal models why economic activities concentrate in specific regions. According to Krugman, the interplay between increasing returns, transport costs, and market size leads to the agglomeration of production activities in certain centres. Fujita, Krugman, and Venables (1999) extended this approach into a broader spatial equilibrium framework, demonstrating the conditions under which core-periphery relationships emerge.

The fundamental contribution of the new economic geography is that it does not regard spatial concentration as merely a matter of historical coincidence. Instead, concentration is explained as an endogenous outcome arising from the mutual interaction between market access and cost structures. Consequently, the approach provides a significant analytical tool for understanding why specific centres become points of attraction and why certain regions remain in the periphery.

Nevertheless, the limitation of the new economic geography has been its relegation of institutional design and governance capacity to a secondary status. Explaining the spatial concentration of production networks solely through market size while disregarding other factors such as educational infrastructure, public coordination, technology policies, standards, venture capital, and skill regimes has constituted a significant constraint. Consequently, because the spatial insights of the new economic geography were not complemented by institutional and strategic dimensions, they have remained insufficient in fully explaining the transformation of national production systems.

2.5. Learning Regions, Innovation Systems and the Triple Helix

A significant area of the clustering literature comprises approaches that place learning and innovation processes at the centre. Florida (1995) introduced the concept of the "learning region" into academic debate, suggesting that knowledge production is now concentrated in specific geographical spaces and that these spaces should be defined not only by their production infrastructure but also by their capacity for continuous learning. Morgan (1997) deepened this concept within the framework of institutional networks and regional governance, asserting that economic success depends on institutionalised learning capacity alongside capital accumulation. In this approach, it is stated that economic superiority emerges through dense networks of interaction established among firms, universities, research organisations, and public actors within a particular region.

On the other hand, the national innovation systems approach has elevated this debate to a broader scale. Drawing on the Japanese experience, Freeman (1987) emphasised the role of technology policy in national performance, while Lundvall (1992) and Nelson (1993) asserted that innovation arises from interactive learning processes rather than the disconnected activities of dispersed actors. Cooke (2001) deepened this approach through regional innovation systems, employing the concepts of spatial networks and institutional thickness. Furthermore, Asheim and Isaksen (2002) clarified the distinction between locally grounded and inter-regional innovation systems, demonstrating that the balance between local "sticky" knowledge and global "ubiquitous" knowledge is decisive for regional innovation performance.

The triple helix approach, developed by Etzkowitz and Leydesdorff (2000), identifies university-industry-government relations as the governance core of the innovation system. Within this framework, the state ceases to be merely a regulatory actor, the university more than an educational institution, and the firm more than a producer; instead, each is evaluated as an actor that partially permeates other domains to produce hybrid spheres of cooperation. Science parks, technology transfer offices, and joint research centres constitute the tangible examples of these hybrid spaces.

The approach of Bathelt, Malmberg, and Maskell (2004) regarding "local buzz and global pipelines" is of equal significance along this axis. This framework conceptualises the informal dissemination of knowledge within a cluster as local buzz, while the selective and formal channels through which the cluster connects to external knowledge sources are defined as global pipelines. Boschma (2005), on the other hand, asserts that geographical proximity alone is insufficient and must be considered

alongside organisational, institutional, cognitive, and social forms of proximity. This literature reveals that cluster success cannot be explained by spatial proximity alone, but that the learning architecture across all dimensions is of critical importance. Nevertheless, the question of how disparate knowledge pools is to be coordinated on a national scale remains largely underspecified.

2.6. Related Variety, Regional Branching and Smart Specialisation

A relatively recent strand of the clustering and regional development literature seeks to explain the conditions under which regions can transition into new fields of activity. The primary analytical distinction in this debate was established in the study conducted by Frenken, Van Oort, and Verburg (2007). According to the study, related variety refers to diversification between sectors with high cognitive proximity, whereas unrelated variety defines a leap into areas lacking such proximity; these two types generate distinct regional growth dynamics. Boschma and Frenken (2011) deepened this framework from an evolutionary perspective, asserting that the process of regional branching often proceeds through activities related to the existing knowledge base. Accordingly, rather than leaping into entirely foreign fields, regions tend to diversify in sectors associated with their pre-existing competencies.

Boschma (2017) emphasises that regional diversification often proceeds via knowledge and skill bases related to existing activities. The smart specialisation approach, conceptualised by Foray, David, and Hall (2011) within the context of European research and innovation policy, suggests that regions should deepen their competitive advantages through focused investments and build upon unique knowledge bases rather than imitation. On the other hand, Balland, Boschma, Crespo, and Rigby (2019) link smart specialisation policy with related diversification and knowledge complexity, asserting that the transition of regions into more complex fields requires strategies aligned with the local skill base. This debate generates a significant body of literature that brings clustering and industrial policy closer together.

Nevertheless, the literature on related variety and smart specialisation also frequently prioritises the regional scale. This approach explains which activities a region is more likely to pivot towards. However, it remains limited in addressing issues such as strategic sectoral selection at the national level, the inter-regional division of labour, the production security of essential needs, or the reduction of external dependency on critical intermediate inputs.

2.7. Global Value Chains, Economic Complexity and Approaches to Competitiveness

The global value chains approach represents a significant turning point in terms of transcending the scale limitations of the clustering literature. Drawing on the global production networks perspective, Coe, Dicken, and Hess (2008) emphasised that global coordination is not purely economic; rather, institutional, social, and regional contexts directly shape the structure and operation of these networks. Furthermore, Gereffi, Humphrey, and Sturgeon (2005) explained how governance forms emerge within global production networks and how production is coordinated across disparate firms

and geographies. Within this framework, competitiveness has become dependent not only on what is produced, but also on which link of the value chain one occupies and within which governance relationships one operates. The debates on upgrading were systematised particularly by Humphrey and Schmitz (2002) through types of process, product, functional, and inter-chain transitions.

In his "great convergence" statement, Baldwin (2016) argued that the decline in information and communication technologies and coordination costs has radically altered the global organisation of production. This transformation has necessitated the evaluation of local clusters no longer as isolated islands of production, but as nodes within global production networks. Similarly, Fischer, Meissner, Boschma, and Vonortas (2024) emphasised that the relationship between global value chains and regional innovation systems has reached a new critical threshold, necessitating a concurrent reading of local-proximate and global-connected dynamics.

The economic complexity approach has deepened this debate through the knowledge compositions and production competencies of nations. Hidalgo and Hausmann (2009) assert that the capacity of countries to produce more diverse and sophisticated products reflects the intensity of their implicit (tacit) knowledge sets. Furthermore, Hausmann and Hidalgo (2011) state that the structure of the economic output network determines the opportunities for transitioning into new fields of activity. This literature adds the dimensions of skill intensity and product complexity to the clustering debate, moving beyond mere spatial proximity.

The competitiveness literature has similarly rendered national and international linkages visible. Rugman and D'Cruz (1993) and Moon, Rugman, and Verbeke (1998) argued that national competitiveness cannot be explained solely by domestic factor conditions but must be evaluated alongside external linkages and multinational enterprise networks. While Cho (1994) and Cho and Moon (2000) brought the human element and policy environment into sharper focus, Aiginger (1998, 2006) linked competitiveness to the capacity for wealth creation, moving beyond export performance or market share. However, despite all these contributions, questions regarding the internal integrity of the national production system, how disparate regional foci are to be interconnected, and what depth of production should be targeted in fundamental sectors continue to be addressed in a limited manner.

Table 1. A Comparative Synthesis of Clustering Approaches

Approach	Primary Contribution	Analytical Scale	Primary Limitation
Marshallian Approach	Agglomeration externalities, specialised labour, and knowledge spillovers	Local / Industrial	Weak dimension of national coordination and strategic sectoral selection
Industrial District	Flexible specialisation, trust, and social embeddedness	Regional	Explains regional success; limited capacity for integration at the national scale
Porter-type Clusters	Interaction between competition, innovation, and related-supporting industries	Regional / National	Explains successful clusters; limited discussion on the construction of new strategic fields

New Economic Geography	Endogenous approach to concentration derived from market size and cost structures	Regional / National	Institutional design, skill regimes, and public coordination are of secondary status
Innovation Systems and Triple Helix	Institutional learning, university-industry-government interaction	Regional / National	Demonstrates the need for governance; strategic design of national production architecture remains limited
Related Variety and Smart Specialisation	Skill proximity and complexity in transitioning to new fields of activity	Regional	Explains regional diversification; weak dimension of national strategic prioritisation
Global Value Chains and Economic Complexity	International positioning, upgrading, and skill intensity	Global / National	Limited discussion on the internal integrity of the national production system and supply security in fundamental sectors

3. LIMITATIONS IN CURRENT LITERATURE AND THE ANALYTICAL GAP

The clustering literature has generated a robust theoretical foundation in terms of explaining how production environment's function. The lineage extending from Marshall to Porter, and from Lundvall to Gereffi, details the mechanisms of knowledge spillovers, specialisation, innovation, and institutional interaction in meticulous detail. However, considering the complex structure of contemporary production systems, the limitations of this literature are becoming as visible as its explanatory power. Addressing these limitations in a systematic manner is of paramount importance for understanding the necessity of a higher-scale analytical framework.

The first limitation is the issue of scale. A significant portion of the literature concentrates on the firm, industry, or regional level, thereby relegating the holistic architecture of the national production system to a secondary status. However, matters such as strategic sectoral selection, skill formation, technology acquisition, financing regimes, and deepening in critical intermediate inputs require national coordination to an extent that cannot be reduced to the sum of regional clusters. The conceptual critique of Martin and Sunley (2003) and Markusen's (1999) views regarding the blurry content, inadequate empirical foundation, and detachment of the cluster concept from policy applications can be evaluated as approaches that beyond conceptual and definitional objections, emphasise that the question of scale has not been sufficiently clarified.

The second limitation is the lack of sectoral integrity. Many clustering policies remain limited to supporting specific sectors in specific regions, failing to sufficiently account for the linkages of these sectors within the national production structure, their intermediate goods dependencies, technological depth, and long-term upgrading potentials. While Boschma's (2017) related diversification approach and the smart specialisation framework of Balland et al. (2019) render the skill proximity between activities more visible, the question of which activities hold strategic priority on a national scale and how they are to complement one another remains largely unanswered.

The third limitation is the issue of institutional coordination. The innovation systems and triple helix literature strongly emphasises the need for cooperation. Freeman (1987), Lundvall (1992), Nelson

(1993), and Etzkowitz and Leydesdorff (2000) clearly demonstrate that innovation relies on systemic linkages between actors. Nevertheless, the insights provided by these studies do not produce a sufficient answer to the question of how the governance architecture is to function. In particular, questions concerning the establishment of the division of tasks, data flow, performance evaluation, and policy feedback between the central and regional levels are not sufficiently addressed, despite being one of the fundamental areas determining the implementation capacity of clustering policies.

The fourth limitation is that the relationship between clustering and industrial policy remains implicit in many studies. However, Rodrik (2004), Hausmann, Rodrik, and Sabel (2008), Mazzucato (2013, 2018), and lastly Juhász, Lane, and Rodrik (2024), have reframed industrial policy not as a mere collection of individual incentives, but within a broader debate on public capacity involving processes of learning, coordination, direction-setting, and discovery. In this respect, although there is a strong potential affinity between the clustering approach and contemporary industrial policy literature, the two literatures have yet to be fully integrated.

The fifth limitation is that the dimensions of resilience and economic security have remained secondary for a long time. Classical clustering policies have often focused on efficiency, specialisation, and export success. However, the OECD (2023) assessment reveals that, in the post-pandemic era, innovation and production systems must now be considered alongside risk, vulnerability, and preparedness capacity. Similarly, Fischer et al. (2024) emphasise that the relationships between global production networks and local innovation systems are generating new breaking points. Therefore, clustering analyses must explain not only the benefits of specialisation but also the vulnerabilities arising from excessive dependencies.

The sixth and the last limitation is the insufficient treatment of essential needs within a production perspective. The clustering literature often concentrates on exporting, high-technology intensive, or competitive sectors. However, fields such as agriculture and food, healthcare, education, and housing determine continuity, accessibility, quality, and cost stability alongside market success. When supply security, logistics, storage, standards, human resources, and public coordination in these areas are evaluated together, it is considered that the clustering literature needs to focus on a broader framework of social production.

Table 2. Fundamental Gaps in the Clustering Literature and the Need for Research

Gap Area	Focus on Current Literature	Need for Research
Scale	Micro and regional analyses are predominant	Concurrent consideration of global, national, and regional scales
Sectoral Integrity	Local success stories are prominent	Joint discussion of strategic sectoral selection and production network design
Institutional Coordination	The need for cooperation is emphasised; governance design remains weak	Development of multi-level coordination and feedback mechanisms

Industrial Policy Linkage	Policy instruments are often addressed in a fragmented manner	Frameworks integrating learning, investment, and technology policies
Resilience and Economic Security	Emphasis on efficiency and specialisation is prevalent	Analyses encompassing vulnerability, preparedness capacity, and supply security
Essential Needs Areas	Exporting and technology-intensive sectors are more visible	Studies examining production continuity in areas such as food, healthcare, education, and housing

When these gaps are evaluated collectively, it becomes evident that the issue does not merely pertain to aspects missing from individual literatures. The fundamental problem lies in the narrowing of the analytical scale of clustering and the relegation of questions concerning the holistic organisation of the production system to the background.

4. THEORETICAL JUSTIFICATIONS FOR A MACRO PERSPECTIVE

The gaps identified in this study clearly demonstrate why a macro perspective has become essential in clustering research.

At this point, it is useful to clarify what is meant by macro-clustering. Existing cluster approaches have predominantly focused on geographically concentrated networks of firms, institutions, and supporting organisations operating within a particular locality or region. While these perspectives provide valuable insights into agglomeration economies, innovation dynamics, and regional competitiveness, they offer more limited explanations regarding how different production centres are connected within a broader national production structure.

Macro-clustering refers to a higher-order form of production organisation in which regional clusters, sectoral specialisations, innovation infrastructures, and institutional arrangements are linked through a wider system of coordination. Rather than viewing clusters as separate and self-contained units, this perspective emphasises the relationships and complementarities that emerge among different regions, industries, and production activities across the national economy.

In this sense, the focus shifts from the individual cluster to the production ecosystem as a whole. The central concern is not only how particular regions generate competitiveness, but also how different productive capabilities interact, reinforce one another, and contribute to broader development objectives. Macro-clustering therefore highlights the importance of inter-regional linkages, cross-sectoral integration, and institutional coordination in shaping the long-term evolution of national production systems. By doing so, it provides a framework for understanding how local production strengths can be connected to national strategic priorities and changing dynamics within global value chains.

The need for a macro perspective does not imply a rejection of local and regional clusterings. On the contrary, the aim is a multi-scale analytical framework that evaluates these structures alongside the national production system, industrial policy, global production networks, and domains of social

reproduction. In other words, the issue is not to abandon the clustering approach, but rather to reposition it within a cross-scale synthesis.

The first justification is the issue of scale. Local and regional clusters are of critical importance regarding knowledge concentration and institutional learning. However, national competitiveness can no longer be evaluated merely as the mechanical sum of successful regional clusters. Questions concerning how disparate regional production areas are articulated with one another, in which critical inputs national depth will be established, and which sectors hold long-term priority, necessitate thinking at a higher scale. Therefore, rather than locking clustering into the regional level, the macro perspective brings global, national, and regional scales together on a single analytical plane.

The second justification is the increasing complexity of production systems. The global value chain governance discussed by Gereffi, Humphrey, and Sturgeon (2005), along with the upgrading issue emphasised by Humphrey and Schmitz (2002), demonstrates that production is not confined within a single space but is fragmented across numerous nodes. The coordination revolution pointed out by Baldwin (2016) and the critical threshold highlighted by Fischer et al. (2024) emerge precisely at this juncture. Indeed, the balance between local innovation capacity and global linkages is becoming increasingly fragile and more strategic.

The third justification stems from the insights provided by the developmental state and contemporary industrial policy literature. Wade (1990), Evans (1995), Amsden (2001), and Chang (2002) have emphasised that in successful examples of industrialisation, the state is an actor that does not merely correct market failures but also steers the production structure. While Rodrik (2004) and Hausmann, Rodrik, and Sabel (2008) associate this steering role with processes of learning and discovery, Mazzucato (2013, 2018) places the market-shaping function of the state at the heart of innovation policies. Furthermore, Juhász, Lane, and Rodrik (2024) state that the new empirical literature presents a more positive and nuanced picture regarding industrial policy. Within this framework, the macro perspective evaluates clustering as a process requiring strategic direction and institutional coordination.

The fourth justification is the issue of strategic sectoral selection and structural transformation. The “self-discovery” approach of Hausmann and Rodrik (2003) and the coordination framework of Hausmann, Rodrik, and Sabel (2008) suggest the joint discovery of new production possibilities rather than merely following existing market signals. Similarly, Boschma (2017) and Balland et al. (2019) have discussed diversification areas compatible with the existing capabilities of regions. However, the question of what depth of production should be targeted at the national level in fields such as defence, energy, healthcare, agriculture, and critical digital technologies necessitates a broader strategic framework.

The fifth justification is the issue of resilience and economic security. The crises, pandemic, energy shocks, and geopolitical tensions witnessed in the first quarter of the 21st century have clearly demonstrated that production systems must be evaluated not only through criteria of cost and efficiency, but also through their capacity for continuity and adaptation. The OECD (2023) emphasis-

es that science and innovation policies are under pressure to simultaneously observe targets for transformation and resilience. In this context, the macro perspective makes it possible to evaluate clustering within the framework of vulnerability management and supply continuity, alongside the benefits brought by specialisation.

The sixth justification is the rethinking of essential needs through the logic of production. Fields such as agriculture and food, healthcare, education, and housing should not be evaluated merely as the provision of final services. The balance between market efficiency and social accessibility which must be maintained in these areas through the integrated establishment of production, procurement, logistics, storage, quality standards, human resources, and public coordination, requires an analytical focus distinct from the success of exporting clusters. Consequently, the macro perspective makes it possible to apply the clustering approach not only to competitive sectors but also to the fundamental production ecosystems that sustain the national foundational infrastructure.

A significant benefit of the macro perspective is its ability to bring disparate literatures together on a common ground. The Marshallian and Porterian lineages explain local externalities and competitive pressures; innovation systems address institutional learning; the related variety literature explores diversification paths; global value chains examine international positioning; and the industrial policy literature focuses on issues of direction-setting and coordination. While each of these approaches is of importance, when it comes to the strategic organisation of national production systems, micro-scale explanations must be synthesised within a higher analytical framework. Therefore, the macro perspective should be evaluated as an expression of the need for a cross-scale synthesis of the existing theoretical foundation.

Table 3. Fundamental Deficiencies in the Clustering Literature and the Complementary Role of the Macro Perspective

Fundamental Problem Area	Limitations of the Clustering Literature	Complementary Role of the Macro Perspective
Scale Issue	Analyses predominantly remain at the firm, sector, or regional level.	Global, national, and regional levels are considered together within a single analytical framework.
Sectoral Integrity Issue	Successful local clusters are explained, but strategic inter-sectoral linkages are discussed in a limited manner.	Strategic sectoral selection, inter-sectoral complementarity, and production network design are placed at the centre.
Institutional Coordination Issue	The need for cooperation is emphasised, but the governance arrangement through which this cooperation will be sustained is not clearly demonstrated.	Governance, coordination boards, division of tasks, and data-driven monitoring mechanisms are proposed.

Integration with Industrial Policy Issue	Instruments such as incentives, financing, technology, skills, and public procurement are often addressed in a fragmented manner.	Industrial policy instruments are integrated within a common strategic production framework.
Value Chain Positioning Issue	Articulation into global networks is often evaluated as an external process.	Selective integration, domestic capacity building, and chain upgrading strategies are taken as the basis.
Performance Measurement Issue	Success is often evaluated through narrow indicators such as exports, number of firms, or production volume.	Efficiency, technological depth, economic complexity, resilience, and social welfare indicators are used simultaneously.

Table 3 does not imply that the clustering literature is entirely inadequate. On the contrary, it confirms the significant contributions of the existing literature, while demonstrating the points at which these contributions remain limited regarding the strategic organisation of the national production system. Within this framework, the macro perspective expresses the necessity of re-evaluating clustering at a higher scale and within a strategic production organisation framework, with the aim of transcending these limitations.

Within this framework, it appears beneficial for the literature to advance in at least three directions. Firstly, there is a need for comparative investigations into the relationship between regional clusters and the national production architecture across different country experiences. Secondly, it is of importance to empirically test the relationship between strategic sectoral selection, value chain positioning, related variety, and institutional coordination. Thirdly, it is essential to research which governance structures yield greater success for clustering practices that simultaneously consider production continuity, accessibility, and quality in essential needs areas. Thus, the macro perspective will move beyond being a mere conceptual call and transform into a concrete research programme.

5. CONCLUSION

This article has addressed the historical and conceptual development of clustering theory within a systematic discussion and has evaluated the principal limitations of existing approaches along the axes of scale, sectoral integrity, institutional coordination, industrial policy linkage, resilience, and the production structure of essential needs areas. The extensive theoretical foundation ranging from Marshall's (1920) intuition of agglomeration to Porter's (1998) competitive clusters, and from Lundvall's (1992) innovation systems approach to the global value chain framework of Gereffi, Humphrey, and Sturgeon (2005) offers a robust basis for explaining local competitive advantage and regional learning processes. In contrast, this same body of knowledge remains limited regarding the holistic organisation of the national production system.

The fundamental conclusion of this study is that clustering analyses have not lost their validity, yet they are no longer sufficient on their own. When the new industrial policy debates summarised

by Juhász, Lane, and Rodrik (2024) are considered alongside the emphasis on resilience, complementarity, and agility by the OECD (2023, 2025), it becomes clear that issues such as strategic sectoral selection, supply chain coordination, institutional synergy, and supply security necessitate a higher-scale analytical framework. Therefore, the macro perspective should be evaluated not as a substitute for local clusters, but as a complementary framework that renders their national-scale functions, mutual dependencies, and strategic importance visible.

In this regard, the original contribution of the study lies not in summarising different clustering approaches, but in demonstrating, within a common ground of discussion, where they fall short concerning the strategic organisation of the national production system. Consequently, this study offers a theoretical proposal for reimagining the scales of explanation within the clustering literature and establishing a more integrated research agenda. Boschma's (2017) relatedness-based diversification approach, the smart specialisation framework of Balland et al. (2019), and the local-global critical threshold assessment of Fischer et al. (2024) provide significant starting points for this proposal.

In conclusion, the clustering literature forms one of the most fruitful bridges established between economic geography and industrial policy. Nevertheless, today's complex, fragmented, and fragile production order necessitates that this bridge is not left solely at the regional level but is reimagined in terms of the strategic organisation of national production systems. The need for a macro perspective arises from this historical and theoretical imperative. Therefore, this study should be evaluated as a theoretical preliminary stage for future discussions on macro-clustering that are yet to be developed.

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