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SOCIAL FIELDS – A FRAMEWORK FOR REGIONAL COMPARATIVE ASSESSMENT OF THE PERFORMANCE OF INNOVATION IN EUROPE

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Abstract: In light of new global trends and economic realities, regions are gaining increasing importance in politics, economics, and the social landscape. As Dodescu and Chirila (2012, 1178) highlight, the regional level plays a critical role in establishing a socio-economic foundation for innovation, a key driver of development. A crucial component of this foundation is the intra- and inter-regional knowledge flow, underscoring the significance of the regional level within Innovation Systems, which extends beyond localized learning processes. This paper examines innovation gradation from a regional perspective, treating regions as units of analysis. The study explores not only innovation but also the three social forces within a complementary framework to explain a region's classification as a specific type of innovator. The research investigates the impact of innovation, institutions, networks, and cognitive frames, which represent varying innovation levels and statistical classifications. The findings underscore the complexity of innovation processes and highlight the central role of networks, although they are neither exclusively sufficient nor necessary. The interplay of institutions, cognitive frames, and innovation adds further complexity, warranting deeper investigation.

Key-words: Innovation, Regional Development, Social Forces, Qualitative Comparative Analysis

1. Introduction

In the context of new global trends and economic realities, regions are gaining greater influence in politics, economics, and the social landscape. As Dodescu and Chirila pinpoint (2012, 1178), the regional level plays a critical role in establishing a socio-economic foundation for innovation, which is a key driver of development. A crucial aspect of this foundation is both intra- and inter-regional knowledge flows, highlighting the regional level's significance within Innovation Systems—extending beyond localized learning processes. At the same time, as with any interaction among agents, facilitating effective action requires a defined mechanism linking the regional level and innovation processes. In this regard, local clusters, research institutions, and regional innovation networks play a pivotal role through their synergistic contributions (Lundvall and Borras 1997).

Uncertainty often challenges innovation processes (Beckert 1999, 25). Since the nature of innovation and its processes is typically surrounded by ambiguity, it paradoxically underscores the need for innovation itself. The starting point is identifying the optimal level of R&D investment, as there is a positive correlation between innovation levels and real GDP growth. However, determining the best allocation of resources is difficult due to the lack of knowledge regarding potential returns. Furthermore, without clear innovation objectives, understanding the

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innovation process itself becomes challenging (Beckert 1999, 25). Due to the complexity and uncertainty of this process, the topic attracts scholars from diverse fields, bridging interest in innovation systems across national, regional, and sectoral frameworks (Kastelle, Potts, and Dodgson 2009, 3).

Continents, countries, nations, and regions vary in terms of innovation capacity. This variation results in distinctions such as center versus periphery, north versus south, or urban versus rural. As such, the state plays a key role in stimulating and promoting innovation, particularly in areas with weak innovation activity and capacity (Khiari and Ben Rejeb 2015, 598). Additionally, as these authors highlight, beyond individual corporate characteristics, sector- and region-specific factors influence the innovation process as external determinants. Furthermore, literature suggests that within National Innovation Systems (NIS), Regional Innovation Systems (RIS) are considered integral components. Building a robust NIS and achieving national economic growth depends on strengthening RIS through the collaboration of multiple stakeholders (Herliana 2015, 152).

There are two key perspectives on innovation systems—one from a national research standpoint and the other from a regional research perspective. The national perspective focuses on the institutional role, emphasizing the importance of institutions in enabling or constraining innovation processes through factors such as education levels, research output, and patents. The regional perspective, however, centers on firms as the primary drivers of innovation, with trust and collaboration within firm networks playing a crucial role in fostering innovation (Kastelle, Potts, and Dodgson 2009, 6).

As Lundvall (1998) highlights, this approach is characterized by its connection to tacit knowledge, such as "learning-by-doing." Additionally, industrial clustering, human resources, and institutional linkages are at the forefront of the discussion (OECD 1997, 9). This paper addresses innovation systems from a regional perspective, where regions serve as the units of analysis. Furthermore, Regional Innovation Systems (RIS) are seen as specific social fields embedded within a larger context, functioning as social arenas or local orders where different actors interact. This article aims to gain a better understanding of the factors determining a region's ranking in the Regional Innovation Scoreboard. This ranking is influenced not only by innovation but also by three social forces that provide a complementary framework for explaining a region's classification as a particular type of innovator. In line with this argument, the research question is:

1. Can innovation levels and social forces determine a region's classification?

Additionally, the hypothesis for this research is:

H1. Innovation and social forces are considered both sufficient and necessary conditions for a region to be classified as an innovation leader.

Thus, this research investigates the impact of innovation, institutions, networks, and cognitive frames, which collectively represent a range of innovation levels and statistical classifications. Moreover, the aim is to assess the necessary and sufficient conditions for innovation leadership using Qualitative Comparative Analysis. This method will facilitate an examination of these regions both in terms of their innovation levels and their membership within specific statistical regions in Europe.

2. Theoretical Background

2.1. Social Fields

At the forefront of the success or failure of strategic steering among actors and social environments is the analysis of social fields, which serves as a framework for examining Regional Innovation Systems (Fligstein and McAdam, 2012). Fligstein (1997, 11) highlights that "interactions between more and less powerful collective groups according to rules and shared meanings take place," which leads to the interpretation of social fields as local orders. Furthermore, Fligstein and McAdam (2012, 3) state that "in a broader environment consisting of countless proximate or distant fields, as well as states, which are themselves organized as intricate systems of strategic action fields," each field is embedded within a larger system. Since traditional economic approaches cannot adequately explain the changes brought about by rapid technological advancements, a new perspective is needed to understand innovation processes. It is crucial to focus on novel approaches, as these processes are key drivers of economic development worldwide (Scoville and Fligstein 2020).

As previously mentioned, new economic realities emphasize the need for alternative approaches to development. In any given social field, interactions between three social forces—institutional rules, cognitive frames, and network structures—shape the relationship between actors and their social settings, forming complex structures (Beckert 2010). Following this line of argument, Beckert asserts that, on the one hand, social network structures are shaped by institutions, thereby creating culturally relevant meanings. On the other hand, institutions are influenced by social networks, while cognitive frames play a legitimizing role in reinforcing certain institutions.

The notion of "field" is used as a guiding framework across various disciplines, including the study of interactional communities (Wilkinson 1970). Specifically, it never refers to an object in isolation but rather to a formation that includes both the context and the object itself. Additionally, it encompasses both structure and process, representing the broader context that surrounds the subject of study. As Wilkinson explains, a field has three distinct characteristics:

- Individuals and their environment form an indivisible unity.
- Each field is dynamic, functioning and evolving over time.
- Novelty, whether creative or random, is an inherent part of the field.

As Granovetter (1992) highlights, once innovation processes take root in modern societies, they foster diverse actions and imaginaries. This underscores the understanding that economic institutions do not simply emerge to meet economic needs but are instead shaped by the social networks in which they are embedded. At the same time, these networks, along with resource access, are either constrained or facilitated by individual actions.

The integration of innovation and social field frameworks is relatively recent, though several studies have already explored the interaction of social forces with innovation processes. These studies have primarily focused on the influence of institutions, social networks, and cognitive frames on technological innovation while also empirically verifying the impact of these three social forces on innovation at both national and regional levels (Roncevic and Modic 2011; Cepoi and Golob 2016, 2017; Modic and Roncevic 2018; Gangaliuc 2022).

2.2. Institutions

Institutions are considered to be at the forefront of driving innovation processes and regional development. North (1981) defines institutions as "a set of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals in the interests of maximizing the wealth or utility of principals." Additionally, Jakobsen and Aarset (2010) expand on North's definition by also considering actions that guide economic actors, such as political-administrative regulations, including laws and policies.

The importance of institutions is particularly evident in the early stages of innovation processes, as these phases are often high-risk and costly. Institutions play a protective role by positively influencing innovation. For example, regulatory protections for certain research and development (R&D) activities can encourage investment and support innovation (Jakobsen and Aarset, 2010, p. 930). However, as the authors point out, the regulatory framework can also hinder innovation, especially when restrictive measures limit fair competition and affect business strategies. Following this line of argument, once a fair competitive framework is restored through the removal of regulatory obstacles, innovation processes can thrive, and business strategies will no longer be adversely affected (Sign, Dhir, Das, and Sharma, 2024).

According to the OECD (2010), creating a supportive environment for fostering innovation is one of the key roles of institutions. This is achieved through various activities such as facilitating knowledge diffusion, encouraging entrepreneurship in technology, conducting fundamental and applied research, and developing policies. Additionally, regional innovation policies and stakeholders in science and technology play a crucial role in establishing the necessary conditions for knowledge transfer (Huggins and Kitagawa, 2012).

However, it is important to recognize the differences between developed Western institutions and those in transitional economies. The primary distinction lies in institutional priorities: transitional economies focus on spillovers and productivity, whereas Western economies prioritize attracting foreign direct investment (FDI) and technology (Kramer, 2016). Furthermore, Western economies tend to have higher levels of institutional quality, which enables smoother coordination between regulatory rules and economic processes. This coordination is essential, as it ensures that economic agents apply these rules uniformly. As Kastelle (2009, p. 15) highlights, the competitive diversity of rules within innovation systems can lead to phases of de-coordination and re-coordination.

The behavior of economic actors is shaped by public authorities through administrative and political regulations. The complex web of laws and provisions has historically evolved (Jakobsen and Aarset, 2010, p. 928). However, as the authors note, regulations do not always facilitate innovation; instead, they sometimes conflict with innovation processes, making their removal a prerequisite for progress. That said, while certain regulations may negatively impact innovation, not all regulations should be considered harmful. On the contrary, some regulatory measures can support and enhance innovation outcomes. Proponents of regulatory frameworks argue that such measures are designed to maintain fair competition. Nonetheless, as previously discussed, these regulations may unintentionally limit firms' strategies by burdening the market. By eliminating such constraints, innovation processes can flourish.

From this perspective, regulatory frameworks can offer several benefits, particularly for high-risk, emerging, and high-cost innovations—for example, by providing legal protection and incentives (Jakobsen and Aarset, 2010, p. 930).

As previously discussed, the relationship between innovation processes and the institutional framework can be both obstructive and constructive. Jakobsen and Aarset further highlight that the influence of the legal framework on innovation extends over long periods and impacts different stages of the innovation process. Although there is no definitive answer regarding the direction of causality between economic development and institutions, scholars generally agree on a bidirectional relationship.

Law, Lim, and Ismail (2013) argue that in high-income countries, institutions play a crucial role in driving economic development and improving institutional quality. Conversely, in lower-income societies, economic progress fosters institutional growth, although priority may be given to other policy areas. Despite this, institutions remain essential, particularly in the early stages of economic development.

Furthermore, Siddiqui and Ahmed (2013) emphasize that institutions generally have a significant and positive impact on economic growth. Economic expansion is not only accelerated by the improvement of political institutions but also by structural and legal advancements. As the authors highlight, human capital and international trade also contribute to economic growth. To promote sustainable growth, they recommend several key actions, including reducing corruption and bureaucratic inefficiencies, fostering competitive markets, and strengthening institutions in all forms (Siddiqui and Ahmed, 2013, p. 28).

2.3. Networks

Social networks are considered another social force that influences the development and understanding of economic interactions (Hua, Yang, and Shao, 2022). According to Bullinger et al. (2004), networks create connections between different stakeholders at various levels, such as linkages between small and medium-sized enterprises (SMEs). These connections establish favorable conditions for profit generation and knowledge sharing by leveraging complementary competencies (Bullinger et al., 2004). As a result, these connections are used to enhance the market significance of SMEs through innovative processes and products.

Following this line of argument, Zeng et al. (2010) point out that networked relationships can be key drivers of economic growth and technological progress. However, it is also important to consider regulatory intermediaries, which serve as links between material providers and value chain leaders. Their influence on relationships can be either positive or negative (Lund-Thomsen et al., 2021). Additionally, Wincert (2005) emphasizes that company size plays a role in aspects such as behavior, performance, and networking capabilities, with smaller firms uniquely benefiting from these connections.

In recent decades, globalization has facilitated the sharing of information and knowledge by reducing barriers, leading to increased interest in a new paradigm within innovation literature—open innovation. According to Chesbrough (2006), open innovation is defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation.” Initially, scholars used this concept to explain the relationship between two enterprises. In a closed innovation model, innovation remains confined within a company, whereas in an open innovation model, collaboration between companies allows them to share their innovation processes (Chesbrough, 2012).

Over time, the concept of open innovation has evolved to emphasize three key pillars:

- Recognizing that innovative ideas often originate outside a company.
- Highlighting the necessity of different frameworks for firms to capture returns on their innovative efforts.
- Developing a business model that enables firms to create and capture value from the market, acting as an intermediary between economic return and technical inputs (West, Salter, Vanhaverbeke, and Chesbrough, 2014).

The open innovation paradigm also implies fostering collaboration between various stakeholders throughout the innovation process (Chesbrough, 2012, p. 26). Zeng et al. (2010) highlight that networks play a crucial role in facilitating these interactions. These networks enable SMEs to benefit from shared knowledge and profits within connected systems. SMEs, in turn, serve as engines of economic growth and technological progress through these interactions.

Markusen (2003) notes that innovation-driven interactions with industrial districts and regional networks are central to theories on regional industry clustering. Furthermore, SMEs’ engagement in innovation partnerships within regional networks and industrial districts is closely linked to the growth of regional clusters (Zeng et al., 2010, p. 182). Regional innovation systems benefit significantly from synergies and cooperative mechanisms fostered by these clusters. Additionally, industrial clusters receive support from various stakeholders, including regional governments, universities, institutions, and other economic actors, who interact either directly or indirectly (Su and Chen, 2015, p. 80). According to Su and Chen, the institutional framework plays a fundamental role in fostering regional innovation systems. Moreover, the integration of regional innovation stakeholders into the region’s socio-cultural environment enables private and public actors to form networks through which feedback is exchanged.

Yam et al. (2011) highlight that networks functioning within a specific region facilitate innovation, knowledge creation, and adaptation, contributing to the sustainability and long-term viability of regional innovation systems. Economic, internal, and external social forces shape the conditions necessary for sustainability, while also influencing the dynamics of economic and social subsystems (Gaziulusoy and Brezet, 2015, p. 558).

The interconnected behaviors and decisions of network actors influence the adoption of specific practices and innovations within these networks (Sun, Liu, and Zhao, 2022). This interconnected nature is reinforced by the fact that the decision to adopt a new practice or product often depends on the belief that others will do the same (Aarikka-Stenroos, Sandberg, and Lehtimäki, 2014, p. 366). As a result, the active participation of network actors is crucial in research and development efforts, as well as in the commercialization of innovations within a collaborative framework.

2.4. Cognitive Frames

Until now, the focus has been on two of the three social forces proposed by Beckert. The third social force, which is crucial in explaining various processes, is **Cognitive Frames**. In previous chapters, the influence of globalization on the expansion of innovation and knowledge sources was discussed. In line with this argument, the literature on R&D performance emphasizes the impact and role of national culture and globalization.

As Jones and Davis (2000) illustrate, consider the case of a company aiming to innovate. Before proceeding with innovation, several factors must be considered—particularly the regional and national environment. For innovation to succeed, a favorable cultural environment is necessary. Innovation may be rejected if local culture is disregarded or undermined, even if substantial resources are invested (Jones and Davis, 2000).

One of the challenges in studying this relationship is the absence of a universally accepted definition of culture, making it difficult to examine the connection between innovation and cultural influences (McGrath and MacMillan, 1992). At the same time, as DiMaggio (1997, p. 263) points out, culture—through social movements, networks, and institutions—plays several key roles: **activating, selecting, and diffusing representations**. In other words, culture can be understood as an interaction between cultural phenomena (e.g., material culture, media, conversations, etc.) and cognitive structures that trigger cognitive processes (DiMaggio, 1997, p. 264).

Beckert (2010, p. 612) highlights that the perceptions of networks are shaped by cognitive frames, and these networks, in turn, influence and spread cognitive frames. Alongside institutions, these three social forces shape the **stratification of fields** within different contexts (e.g., state, region, etc.). Furthermore, they position different actors at varying levels of power, who then employ resources through **structural coupling** and their strategic positions (Luhmann, 1999), thereby impacting both networks and institutions.

Economic processes do not rely solely on economic factors; they are also shaped by **societal values and cultural backgrounds** (Uhlaner and Thurik, 2010, p. 162). While studies on the effect of cognition on economic outcomes remain limited, existing research indicates that a company's motivation to innovate—as well as society's influence on R&D—is closely linked to cultural aspects. Thus, as Jones and Davis (2000) emphasize, companies should assess whether the national or regional environment supports innovation before initiating the innovation process. If companies or other actors ignore cultural and contextual factors, innovation may be rejected—regardless of the level of investment (McGrath et al., 1992).

Following this line of argument, we observe a pattern in which the three social forces—**institutions, networks, and cognitive frames**—interact to create a favorable environment for innovation. This approach offers a fresh perspective for understanding development processes and economic realities. Additionally, Beckert (2010, p. 620) highlights that changes in cognitive frames reshape **institutional and network perceptions**, further contributing to our understanding of economic success through cognitive and cultural dimensions.

New approaches and ideas for economic restructuring often emerge in response to **economic crises** (Efrat, 2014, p. 12). In the **information age**—and particularly in the **knowledge era**—value creation, creativity, and innovation play leading roles in business. While guiding strategies are crucial for business development and growth, other factors—such as **investment in human capital, infrastructure, and technology**—are also essential (Andersson, Dasí, Mudambi, and Pedersen, 2016, p. 153).

Globalization shapes the market for innovation, fostering a **favorable environment** for knowledge exchange and innovation drivers. Within organizations, cognitive structures can **both**

assist and constrain innovation. As a result, tensions arise within institutional frameworks. As Campbell (1998, p. 382) highlights, stakeholders' **perceptions and interpretations of the world** influence decision-making, **limiting potential actions and creating constraints**. Moreover, cognitive biases may cause some options to go unrecognized.
However, Campbell (1998, p. 382) also emphasizes that **cognitive structures guide actions,** shaping legitimate paths forward through **cues, frameworks, and scripts**. At the forefront of this process is **bricolage**—the practice of crafting solutions by recombining **socially accepted and available scripts, concepts, cultural artifacts, and models**. These elements are embedded within the institutional environment, and when traditional institutional components are **reconfigured in novel and socially acceptable ways,** they drive **innovation**.

Meanwhile, actors develop strategies and construct their perspectives **through culture,** which serves as a **toolkit** for navigating complex environments (Cepoi, 2021).

3. Methodology and Data

In this study, to test the hypothesis, Qualitative Comparative Analysis (QCA) is employed as the primary methodology due to its several advantages over classical methods of data analysis. Firstly, as Seawright (2005) highlights, QCA is a powerful tool for causal inference, with fewer restrictive assumptions regarding causal processes compared to traditional methods. In regression analysis, for instance, assumptions are often homogenized and simplified, but QCA avoids such constraints. Furthermore, as Braumoeller (2004) notes, QCA facilitates the identification of combinations of multiple causes more effectively than regression analysis.
This research involves a small-N comparative case analysis, which is not well-suited for meaningful statistical approaches. In contrast, QCA is ideal for such analyses as it accommodates causal complexity (Schneider, 2008). Additionally, QCA is particularly suited for comparative studies that are limited, either by design or necessity, in the number of cases (Rihoux, 2006; Rek et al., 2015), as is the case with the countries included in this analysis. In QCA, each case's uniqueness is preserved and emphasized, adopting a case-sensitive approach that treats each case as a complex entity. However, as scholars like Rihoux (2006, p. 352) point out, this sensitivity can be both a strength and a limitation, as results can be affected by the inclusion or exclusion of specific cases.
As Ragin (2008) explains, QCA identifies necessary and sufficient conditions—or combinations of conditions—for specific outcomes. QCA operates using set membership values, assigning set anchors through a calibration process. Each set is attributed a fuzzy membership value based on empirical and theoretical considerations (Schneider and Wagemann, 2012). During calibration, sets receive values ranging from 0 (indicating non-membership) to 1 (indicating full membership). For example, a value of 0.3 indicates the set is "more out than in," whereas a value of 0.7 indicates it is "more in than out" (Ragin, 2008).
In the literature, there is no universal standard for determining thresholds for consistency and coverage. As Schneider and Wagemann (2010) note, these thresholds depend on various aspects of the research design, such as the number and characteristics of cases, the quality of the data, and other contextual factors. Typically, the consistency threshold for a condition to be deemed sufficient or necessary is set at 0.75, while the coverage threshold is set at 0.5. These benchmarks are flexible, enabling a nuanced understanding of causality through the closeness of approximation. Consistency takes precedence, as assessing coverage is only logical when a condition is consistently identified as sufficient or necessary (Schneider and Wagemann, 2012, p. 41).
This research relies on third-party data, including questions designed to assess levels of Innovation, Institutions, Networks, and Cognitive Frames. Each indicator is measured through a set of four labeled questions (see Table 1). For each question, participants—representatives from academia, small and medium enterprises, and stakeholders from state institutions—had to select a single label scored from 1 to 4.
The data collection was carried out in 17 regions across 17 European countries. During the project, semi-structured, expert focus group interviews were conducted in multiple European

regions, ranging from less developed to more developed areas. The selected regions include:North-West, Romania; Nord Region, Republic of Moldova; Zakarpatya, Ukraine; Lazio Region, Italy; North Region, Portugal; East Region, Austria; North-East, Finland; East Region, Netherlands; Central and Western, Lithuania; Nord-Norge, Norway; Vidzeme, Latvia; Vojvodina, Serbia; Southern Ireland; Nordjylland, Denmark; Sofia Region, Bulgaria; Continental Region, Croatia; and the Moravian-Silesian Region, Czech Republic[2].

Table 1. Components for Regional Innovation Systems

Condition	Measurement
Innovation	Innovation Level Information Circulation Enterprises' R&D InvolvementOpen Innovation
Institutions	Institutional Support for Innovation Attraction of Talented People Retention of Talented People Innovation Policy Status
Networks	Network Contribution to Innovation Regional Actor's Cooperation Cooperation with Outsiders Trust
Cognitive Frames	Entrepreneurship and Creativity Importance of Education and Learning Competition Globalisation

Table 2. Regional Innovation Scoreboard

Region	Type of Innovator
North-West (Romania)	Emerging
Nord (Moldova)[3]	Emerging
Zakarpatya (Ukraine)	Emerging
Lazio Region (Italy)	Moderate
North region (Portugal)	Moderate
East Austria Region (Austira)	Leader
North-East (Finland)	Strong
East Netherlands Region	Strong
Klaipeda (Central and Western Lithuania Region)	Strong
Nord-Norge (Norway)	Strong
Vidzeme (Latvia)	Emerging
Vojvodina (Serbia)	Emerging
Southern (Ireland)	Strong
Nordjylland (Denmark)	Leader

[2] To access this data, interested parties must contact Professor Borut Rončević (borut.roncevic@fis.unm.si), the coordinator of the Jean Monnet TIR 2020 project, as data access is governed by the project's agreement with the European Education and Culture Executive Agency. Additionally, parties can register on the TIR 2020 website here to gain access to the data repository. The data collection was conducted under the Jean Monnet Center of Excellence project "Technology and Innovations in Regional Development for Europe 2020" (TIR2020). Additionally, the data was also collected from the Regional Innovation Scoreboard (2023)

[3] For Moldova even if RIS 2023 does not provide data, Moldova is considered as a young and emerging economy, pinpointing that it cannot be considered a leader, strong or moderate innovator.

SofiaRegion (Bulgaira)	Emerging
Continental Croatia	Emerging
Moravian-Silesian Region (Czechia)	Moderate

Source: Regional Innovation Scoreboard 2023

4. Analysis

As mentioned at the beginning of the paper, the aim is to see whether alongside Innovation, the three Social Forces (institutions, networks and cognitive frames) can be considered as necessary or sufficient conditions for the Innovator Outcome. In order to do that, we considered both the presence and absence of certain condition.

Table 3. Necessary Conditions for the Type of Innovator Outcome

	Cons.Nec	*Cov.Nec*	*RoN*
Innovation	0.712	0.622	0.857
Institutions	0.600	0.565	0.853
Networks	0.886	0.588	0.783
Cognitive Frames	0.591	0.422	0.743
~Innovation	0.714	0.276	0.379
~Institutions	0.745	0.279	0.355
~Networks	0.505	0.227	0.466
~Cognitive Frames	0.675	0.289	0.457

Source: Author's own calculation

As we can notice in Table 2 when it comes to the four conditions that determine the outcome, not all of them are relevant in terms of necessity. Following this line of argument, several key findings are at the forefront:

- For Networks, the consistency approaches the typical QCA threshold for necessity, indicating that Networks are consistently present when the outcome occurs. Additionally, the RoN (0.783) coefficient suggests that Networks are not trivial and play a significant role as a necessary condition.
- In the case of Innovation consistency (0.712) falls below the threshold of 0.75, meaning Innovation does not qualify as a necessary condition in strict QCA terms. At the same time, the RoN (0.857) coefficient suggests that Innovation is somewhat relevant but not as critical as Networks.
- For negated conditions (~Innovation, ~Institutions, etc.),
- All cases have low Consistency and low RoN, implying that the absence of these conditions does not qualify as a necessary condition for the outcome.

Lastly, for Institutions and Cognitive Frames, consistency of 0.600 and 0.591 is Too low to be considered necessary. Although their RoN (0.853 and 0.743) is relatively high, the low consistency weakens its claim as a necessary condition.

The analysis suggests that Networks are the strongest candidate for a necessary condition, while other conditions (like Innovation, Institutions, and Cognitive Frames) do not meet the consistency threshold typically required for necessity in QCA.

Table 4. Sufficient Conditions for the Type of Innovator Outcome

	Cons.Suf	*Cov.Suf*	*PRI*
Innovation	0.6219	0.7121	0.3625
Institutions	0.5652	0.6000	0.3182

Networks	0.5883	0.8857	0.3719
Cognitive Frames	0.4223	0.5912	0.1965
~Innovation	0.2757	0.7143	0.0738
~Institutions	0.2786	0.7451	0.0854
~Networks	0.2266	0.5055	0.0163
~Cognitive Frames	0.2888	0.6747	0.1064

Source: Author's own calculation

On the other hand, for the sufficiency analysis, the results are less promising, as in the case of the main consistency threshold indicator, it did not achieve the minimum threshold of 0.75 for any of the proposed conditions. Nevertheless, several remarks can be made:

- If Innovation is at the forefront, the consistency value (0.6219) is moderate but below the sufficiency threshold. Additionally, the coverage indicator (0.7121) indicates that Innovation explains a substantial proportion of cases where the outcome is present. Lastly, a low PRI (0.3625) suggests that Innovation might also occur in cases where the outcome is absent, weakening its sufficiency claim.
- For Networks, the consistency is also moderate (0.5883) but below the sufficiency threshold in the case of innovation. The higher score for coverage (0.8857) suggests Networks explain a large portion of the outcome cases. Also, the low PRI value (0.3719) means its sufficiency is weakened due to inconsistency.
- In the case of Cognitive Frames, the low score for consistency (0.4223) indicates that this condition is not sufficient, meanwhile, coverage (0.5912) indicates a moderate relevance of Cognitive Frames for the type of innovator. The low PRI score (0.1965) indicates ambiguousness and weak sufficiency.
- All negated conditions have low consistency, low PRI, and moderate to low coverage, thus suggesting that the absence of these conditions is not a strong or consistent predictor of the outcome.

Thus, summarizing the sufficiency analysis, we can mention that Networks has the highest coverage (0.8857), indicating that it plays an important role in explaining the outcome, even if it is not fully sufficient. At the same time, low PRI values across conditions suggest that the conditions are not unambiguously sufficient for the outcome.

Table 5. Configuration of conditions for Type of Innovator

Innovation	**Institutions**	**Networks**	**Cognitive Frames**	**OUT**	**n**	**incl**	**PRI**	
0	0	0	0	0	7	0.282	0.022	Nord (Moldova), Lazio Region (Italy), Northregion (Portugal), North-East (Finland), Vidzeme (Latvia), Vojvodina(Serbia), Continental Croatia
0	0	0	1	0	1	0.340	0.048	Zakarpatya (Ukraine)
0	0	1	0	1	2	0.562	0.262	Nordjylland (Denmark), Moravian-Silesian Region (Czechia)
1	1	1	1	1	2	0.685	0.455	East Austria Region (Austira), East Netherlands Region

Source: Author's own calculation

This truth table likely represents an analysis within a Qualitative Comparative Analysis (QCA) framework, where different configurations of conditions (Innovation, Institutions, Networks, Cognitive Frames) lead to an outcome - Type of Innovator (OUT). Each column under the conditions (Innovation, Institutions, Networks, Cognitive Frames) indicates whether the presence (1) or absence (0) of a condition is part of the configuration. Meanwhile OUT represents whether the configuration leads to the outcome (1 for presence, 0 for absence). Thus, the table shows how different combinations of conditions relate to the outcome. Configurations like 1111 (all conditions present) strongly lead to the outcome, while others (e.g., 0000) have weak or no association. Following this line of argument, each row can be interpreted in the following way:

- The first row shows that all conditions are absent as in the box for the Outcome is 0, meaning that the outcome does not occur. Additionally, we can notice that there are 7 cases that fit this configuration (e.g., Nord, Lazio Region, etc.). Even more, this configuration does not reliably lead to the absence of the outcome, as we have a low consistency (incl = 0.282) and negligible PRI (0.022)
- In the case of the second row, we can pinpoint that only Cognitive Frames are present, though the outcome is absent. Only one case Zakarpatya) fits, with higher consistency (incl = 0.340) but still weak PRI (0.048)
- The third row denotes that only networks are present and the outcome occurs. Within this row, we can see that two cases (Nordjylland and Moravian-Silesian Region) fit, with with stronger consistency (incl = 0.562) and moderate PRI (0.262) in comparison to other cases. Additionally, these results indicate that this configuration has a moderate association with the outcome.
- Lastly, the fourth row represents only two cases (East Austria and East Netherlands) that fit the configuration where all conditions are present, with a higher consistency (incl = 0.685) and PRI (0.455), suggesting this configuration almost supports the occurrence of the outcome, in comparison to the previous three configurations showed an even weaker score.

5. Conclusion

This study provides critical insights into the interplay of regional innovation processes and the socio-institutional factors represented by the three social forces: Institutions, Networks, and Cognitive Frames. While the findings do not conclusively confirm the proposed hypothesis, they shed light on the centrality of Networks as a critical yet non-exclusive factor in shaping innovation outcomes. This underscores the complexity of the innovation ecosystem, where no single condition—whether Innovation, Institutions, or Cognitive Frames—can singularly determine success. Instead, it is the intricate interplay between these conditions that drives regional innovation dynamics.

The results emphasize the necessity for a holistic approach to understanding innovation processes. The presence of Networks as a potentially necessary condition suggests that fostering connectivity—through collaboration, partnerships, and information flow—is pivotal. However, the absence of sufficient thresholds across the conditions reveals that innovation processes are not linear or deterministic but are instead contingent on specific regional contexts and interactions among multiple factors.

Importantly, the analysis highlights the unique challenges faced by regions not classified as Innovation Leaders. These regions often experience diminished consistency and coverage when two or more conditions are absent, reflecting their structural disadvantages. This finding emphasizes the need for tailored policies and interventions that address specific regional gaps, whether in institutional support, cultural adaptation, or network development.

From the policy and practical implications, the study has several practical implications for policymakers, regional planners, and stakeholders in the innovation ecosystem:

- Strengthening Regional Networks: Policymakers should prioritize fostering robust regional networks that enable knowledge sharing, resource mobilization, and collaboration between academia, industries, and public institutions. Such networks are critical to creating fertile ground for innovation.

- Institutional Support: Strengthening institutional frameworks through investment in R&D policies, regulatory reforms, and innovation-focused funding mechanisms can enable regions to overcome structural barriers.
- Cultural and Cognitive Adaptation: Recognizing the role of culture and cognitive frames in shaping innovation outcomes is essential. Regions must promote a cultural environment conducive to experimentation, creativity, and acceptance of new ideas.
- Context-Sensitive Strategies: Tailored approaches that account for regional variations in capacity, resources, and socio-institutional dynamics are necessary to bridge the gap between Innovation Leaders and other regions.

At the same time, to deepen the understanding of regional innovation processes, future research should address several key areas:

- Larger Sample Size: Expanding the dataset to include more regions and countries will provide greater statistical power and enable broader generalizations.
- Temporal Analysis: Longitudinal studies examining changes in innovation outcomes over time can capture the evolving nature of regional innovation ecosystems.
- Sectoral Focus: Investigating specific industries or sectors could offer insights into how innovation dynamics vary across different economic activities.
- Quantitative-Qualitative Integration: Combining QCA with other methods, such as econometric modeling or case studies, could enrich the analysis and provide a more comprehensive understanding of causality.

Lastly, innovation is inherently a multifaceted phenomenon, deeply rooted in social, cultural, and institutional contexts. While this study contributes valuable insights into the interplay of the three social forces within regional innovation ecosystems, it also highlights the limitations of current methodologies in capturing the full complexity of these processes. Moving forward, a combination of broader datasets, interdisciplinary approaches, and policy-oriented research will be instrumental in advancing both theoretical understanding and practical solutions for fostering innovation across diverse regions.

6. Disclaimer

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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