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Review Article

Regional Governance Challenges in Implementing EU Smart Specialization Policy: A Critical Review

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Abstract: This review paper has three main objectives: first, to examine the governance challenges associated with the implementation of smart specialization policies in different EU regions; second, to examine the governance challenges faced by weaker regions; and third, to explore specific governance approaches to address these challenges. A systematic literature review was conducted to analyze the most relevant studies, extract critical findings, and derive lessons and practical policy recommendations. The review identified two key challenges in the governance of smart specialization policies, namely stakeholder engagement and institutional readiness. These challenges are common in most EU regions and are more critical in weaker regions. Further analysis reveals specific governance approaches that can address these challenges, with some literature explicitly linking these approaches to multilevel governance. Given the gaps identified in the existing literature, this paper aims to lay the groundwork for future research to explore these governance approaches in the context of smart specialization policies in EU regions and, more specifically, in weaker regions.

Keywords: Regional Governance, Challenges, Innovation Policy, Smart Specialization, European Union

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Highlights:

- Implementing smart specialization in EU regions remains challenging.
- Stakeholder engagement and institutional readiness are crucial for S3 governance.
- A more specific approach to S3 governance is highly encouraged.

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1. Introduction

This paper examines the challenges and complex phenomena related to smart specialization strategies (S3) governance and the state-of-the-art innovation policy implemented in different European Union (EU) countries and regions. The existing literature on smart specialization emphasizes the need to adhere to the S3 framework set by the European Commission. However, in practice, implementing S3 in different regions has encountered many obstacles (Di Cataldo et al., 2022). The implementation of S3 in different countries has shown the potential of S3 to drive significant changes in regional development, which is primarily influenced by reforms in research, technology, and innovation policies. Some EU member states organize their strategies at the national level (Cvijanović et al., 2020; Ranga, 2018), while others take a more decentralized or regional approach (Foray et al., 2015; Wibisono, 2022b). While S3 has been successfully implemented in all EU member states, there are still significant gaps in its implementation and governance at the regional level. Many regions have experienced more advanced economic development by implementing S3 based on strong regional innovation policies, a trend observed in many capital cities or advanced industrial regions (Asheim, 2019; Grillitsch & Asheim, 2018). However, there are significant differences in weaker, less developed, or lagging regions. Previous research has indicated that geographical characteristics, such as peripheral, border, and sparsely populated areas, are among the factors contributing to this challenge (Švarc & Dabić, 2021).

The challenges faced by many regions have been examined in previous studies. In general, they start with the challenge of implementing S3 within the framework set by the European Commission, such as the prioritization process and the entrepreneurial discovery process (EDP). As S3 is a bottom-up policy that starts with the participation of more stakeholders at the local level, increasing their participation and mobilizing and facilitating different interests are challenges that occur in almost all regions (Roman & Fellnhofer, 2022). In addition, institutional readiness is a factor that is widely discussed in the literature. One of the challenges is how the existing institutional conditions can quickly adapt to the various changes required to implement S3 (Carayannis & Grigoroudis, 2023). These two factors are interrelated and have been widely studied in smart specialization literature. Innovation policy experts emphasize that effective cooperation, coordination, and communication are vital to increasing stakeholder participation and institutional strengthening (Benner, 2019; Fonseca et al., 2021). Regions that are generally more advanced may have focused on these suggestions. However, weaker regions still face more fundamental problems, such as weak innovation and entrepreneurship networks, difficulties in economic diversification, or being locked into path dependency (Hassink & Gong, 2019; Morgan, 2013; Papamichail et al., 2023).

This paper has three research objectives. First, it examines the main governance phenomena and challenges in implementing smart specialization in different EU regions. Second, it examines governance challenges specific to weaker regions. Third, it identifies specific governance approaches that can address these challenges. To achieve these objectives, the author used a systematic literature review method to collect relevant articles and to summarize and review the critical findings of the selected articles. The review of the selected articles related to the first two objectives highlighted two main challenges in the governance of smart specialization policies in EU regions: stakeholder engagement and institutional readiness. The review showed that these challenges mainly arise at the lower levels of government (regional or subnational) where these policies are implemented and that weaker regions often face more significant challenges. Further investigation led to identifying specific governance approaches that can address these challenges. In some of the literature, scholars often emphasize the importance of improving coordination and participation and creating cooperation and collaboration between institutions in different regions and levels of government, while others explicitly identify these issues as critical elements of regional policy in the context of multilevel governance. This paper provides valuable insights into the challenges associated with the governance of smart specialization policies in the EU region and specific governance approaches, such as multilevel governance, that can address these challenges. The paper also encourages scholars and policymakers to investigate further the compatibility between specific governance frameworks and the principles of smart specialization policies.

The remainder of the paper is organized as follows. The second section outlines the methodological framework used to conduct the review, particularly the selection of relevant articles and the review process. The third section presents the critical findings from the selected articles, with a focus on what critical insights, suggestions, and recommendations the articles provide regarding the governance challenges of smart specialization in the EU region, as well as what governance approaches can be adapted or implemented to improve the effectiveness of smart specialization policy implementation. The fourth section discusses the results of the review, highlights lessons learned, and provides recommendations for policy practice. Finally, the fifth section concludes the review and discussion, highlights implications and contributions, and identifies opportunities for future research.

2. Materials and Methods

In the first stage of the systematic literature review, the author conducted a process to determine the scope of the review (*protocol 1*) to identify potentially relevant papers using the PICOC framework (population, intervention, comparison, outcome, and context) to outline the factors that would fall under the scoping categories. The research population (P) consisted of scholarly articles on implementing smart specialization policies in the EU published in leading scholarly journals. In this case, the author used the quality standard that the article was published in a journal indexed in *Scopus* and included in the *Scimago Journal & Country Rank (SJR)*. The intervention (I) focused on relevant studies that addressed governance challenges in developing or implementing smart specialization policies in the EU. Next, the two contexts of smart specialization and governance were compared (C) to identify challenges in the implementation of smart specialization policies in the EU. The expected outcome (O) of this process was the identification of phenomena and challenges in the governance of smart specialization policies, as well as the identification of suggestions and recommendations provided by previous research to address the current and future challenges of smart specialization policy governance in the EU. The critical review, which is in line with the second general objective of this study, aimed to provide more specific suggestions or recommendations to address the current challenges of S3 governance and to improve its successful implementation in different EU regions (practical contribution) and to provide directions for future research exploring related issues (theoretical contribution). This second general objective is expected to be the main contribution of the author's current study.

In the scoping process, the author defined two key terms to explore in the literature sources: governance and smart specialization. Potentially relevant literature was searched through the *Scopus* database, which was chosen because it is one of the primary databases where high-quality or reputable international journals have undergone thorough and rigorous peer review (Singh et al., 2021). These two terms were used consistently throughout the literature search (*protocol 2*) and the critical review process (*protocol 3*). Some technical procedures were applied, such as the usage of special punctuation (e.g., an asterisk '*' to distinguish *'specialization'* and *'specialisation'*). Some inclusion criteria were also applied in the database search, namely restrictions on the language of writing (English), year of publication (2017–2023), document type (research articles and review articles), and field of study (economics, business, environmental, and social sciences). In other words, exclusion criteria were also applied, such as the exclusion of articles outside the scoping year, the exclusion of articles in the form of proceedings or book reviews, and the exclusion of articles not related to the issues this study sought to explore, such as articles in the fields of public health, medicine, science, and engineering. This process identified 34 potentially relevant articles that fit the scope and objectives of the study. These potentially relevant articles were screened by carefully reading the abstracts to determine whether they discussed smart specialization and its governance. From this initial assessment, 16 articles were found to be less relevant to this study's specific focus and general objectives. For example, some articles discussed university–industry collaboration (UIC), identifying priority economic sectors (prioritization), the entrepreneurial discovery process (EDP), and analyzing industrial cluster policies. These article topics generally aligned with smart specialization policies but did not specifically address the governance issue. At the end of the abstract screening process, the author selected 18 articles considered most relevant to the current study's specific issues and general objectives and included them in the critical review process (*protocol 3*). The search process in the database is shown in the PRISMA diagram in Figure 1.

The articles selected for review in this study are listed in Table 1, and their distribution by publication source is shown in Table 2. The review of the selected articles is divided into three sections: Section 3.1 focuses on articles that address the main challenges of smart specialization governance in EU regions in general, Section 3.2 focuses on articles that address these governance challenges specifically in weaker regions, and Section 3.3 focuses on articles that highlight governance approaches specifically designed to address the governance challenges related to smart specialization in different EU regions. The review of the selected articles includes a summary of general and specific information. The general information includes the article's main content (*i.e.,* purpose, research focus, and study methods) while the specific information highlights issues related to smart specialization governance (i.e., governance phenomena and challenges and recommendations for overcoming these challenges). The results of this review are further elaborated in the discussion section, which aims to extract key insights and offer more specific and pragmatic recommendations to address future smart specialization governance challenges.

3. Review of critical findings from selected articles

3.1. Navigating key governance challenges

The review of critical findings from selected articles in this first section focuses on papers that discuss the implementation of S3 in general in the EU. Most of the selected articles discuss the implementation of S3 in its context as a regional innovation policy, where it is implemented at the regional or local level. While a majority of EU member states have integrated S3 into their national innovation policies, the execution of these strategies at the local and regional tiers presents significant challenges. The following eight studies focus on the central issues and challenges they face.
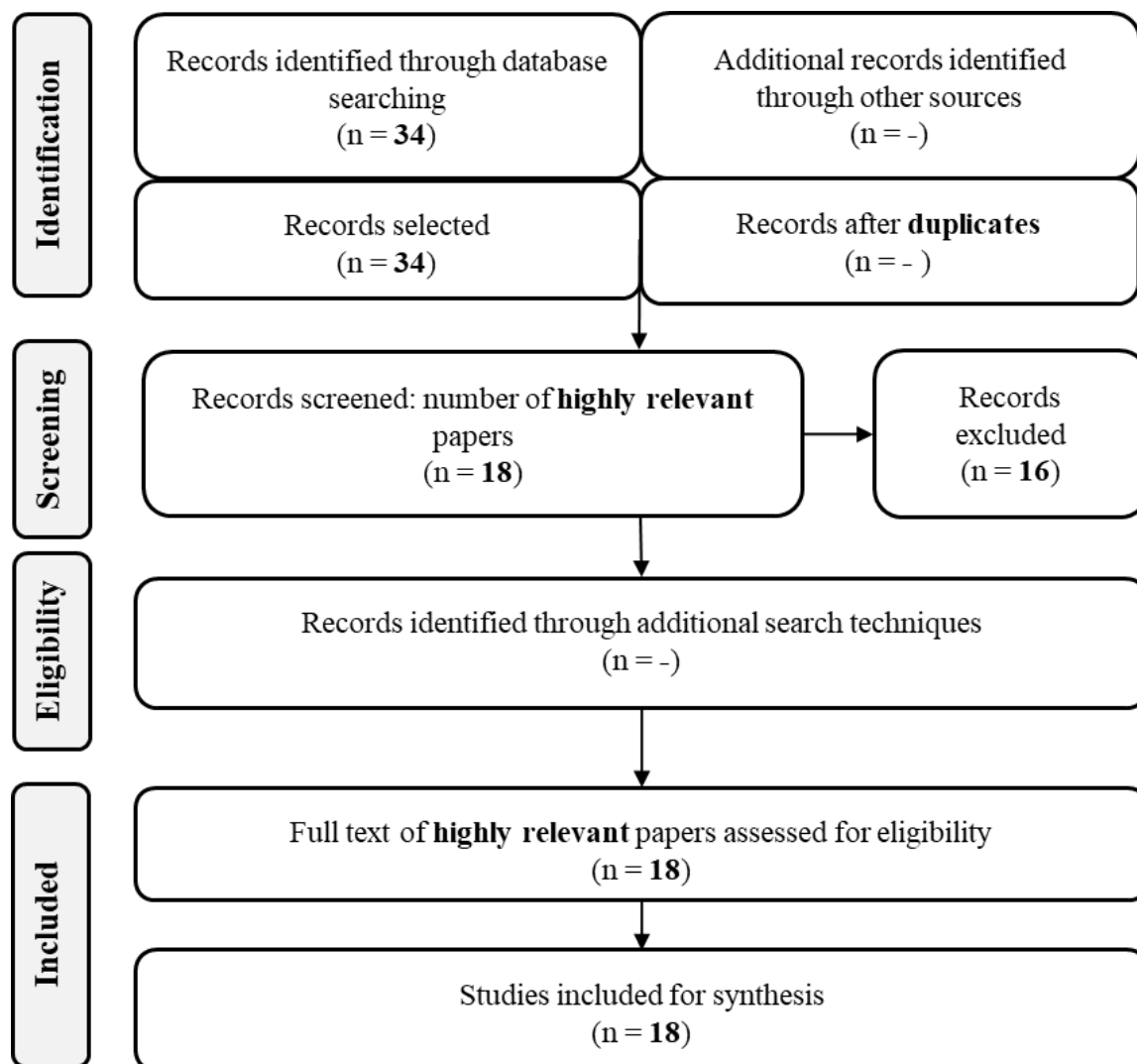

Figure 1. PRISMA flow diagram. Source: Authors' elaboration.

Chrysomallidis and Tsakanikas (2017) investigated the implementation of S3 in Greece, with a particular focus on the governance dynamics between central and local or regional governments in the area of research, technology, and innovation (RTI) development. This paper employs theoretical analysis using a historical institutionalism approach to investigate the occurrence of policy layering, which introduces new elements into existing institutions without changing their core. The study examines RTI factors across regions, including the composition of business and public RTI budgets and the structure of operational programs (OPs) in each region. The results show that the principles embedded in S3 triggered a process of decentralization of RTI governance in Greece, which allowed local governments to play a more significant role in the decision-making process related to RTI. One such initiative is the EDP, which involves strong collaboration between public and private entities and even community representatives in identifying the comparative advantages of a region, thus providing a solid basis for regional development. Although the S3 policy has made progress, empirical evidence still shows the persistence of RTI centralization in Greece, where RTI budgets and OPs are mainly concentrated in the capital region of Attiki. This indicates significant regional disparities between Greece's developed and less developed or remote areas. The study also shows that the underdevelopment of small and weak regions is exacerbated by the limited contribution of the business sector to RTI due to administrative governance issues at the regional level, which often do not consider the interests of the business sector in the regions. To address this gap, this paper recommends improving the decentralized RTI governance system in Greece through effective coordination between the central government, represented by the General Secretariat for Research and Technology (GSRT), and local RTI authorities. This is because the S3 framework allows each region to significantly influence RTI policy at the national level by leveraging local capital resources that are expected to support the success of S3 at the national level. The paper also recommends the implementation of RTI incentives to promote the role of the business sector in developing RTI in various regions through close cooperation with the business sector, government, and universities.

Table 1. List of selected articles. Source: Authors' elaboration.

No.	Year of publication	Number of articles	Author(s)
1	2017	2	Chrysomallidis & Tsakanikas, 2017; Morgan, 2017
2	2018	2	Foray, 2018; Pugh, 2018
3	2019	6	Aranguren et al., 2019; González-López, 2019; Kroll, 2019; Morgan & Marques, 2019; Rehfeld & Terstriep, 2019; Sörvik et al., 2019
4	2020	3	Barzotto et al., 2020; Cvijanović et al., 2020; Knudsen et al., 2020
5	2021	1	Ghinoi, Steiner, Makkonen, et al., 2021
6	2022	3	Laranja, 2022; Ruhrmann et al., 2022; Wibisono, 2022a
7	2023	1	Estensoro & Larrea, 2023

Table 2. Sources of publications. Source: Authors' elaboration.

No.	Source of publication – Publisher	No. of articles	Best quartile (Scimago Journal & Country Rank 2023)
1	Regional Studies (Routledge)	5	Q1 – Social Sciences (miscellaneous)
2	Environment and Planning C: Politics and Space (SAGE Publications Ltd)	2	Q1 – Geography, Planning, and Development
3	Innovation: The European Journal of Social Science Research (Routledge)	2	Q1 – Cultural Studies
4	European Planning Studies (Routledge)	1	Q1 – Geography, Planning, and Development
5	Industrial and Corporate Change (Oxford University Press)	1	Q1 – Management of Technology and Innovation
6	Cambridge Journal of Regions, Economy and Society (Oxford University Press)	1	Q1 – Geography, Planning, and Development
7	Regional Studies, Regional Science (Taylor and Francis Ltd.)	1	Q2 – Geography, Planning, and Development
8	Journal of the Knowledge Economy (Springer Verlag)	2	Q2 – Economics and Econometrics
9	Cogent Social Sciences (Cogent OA)	1	Q2 – Social Sciences
10	Regional Science Policy and Practice (Elsevier)	1	Q2 – Geography, Planning, and Development
11	European Journal of Government and Economics (University of Coruna, Faculty of Economics and Business)	1	Q4 – Public Administration

Countries or regions transitioning from a centralized policy process, but with a strong drive for policy decentralization, can learn from countries that have implemented a decentralized research and innovation policy process, such as Germany. Ruhrmann et al. (2022) discuss the challenges of implementing the Regional Innovation Strategy for Smart Specialization (RIS3) at the regional level in Germany and examine synergies in the innovation system across national, regional, and local levels of government. The research identifies differences in innovation characteristics between East and West Germany as well as differences in innovation synergies across sectors. The research adopted a quantitative approach using triple helix indicators and utilized the Orbis database, which covers more than three million firms in Germany, distributed geographically and sectorally across different regions. Several important facts about the governance of RIS3 in Germany were identified, including the highly decentralized nature of innovation synergies, where more than 95% of innovation synergies occur at the local and regional levels (NUTS2 and NUTS3), while only a small proportion of innovation synergies occur at the national level. Conversely, the study identified remaining gaps in innovation synergies between West and East German regions. The transformation of the innovation system in the long-term process of German unification has not fully addressed the gap between the two regions. This research shows that innovation at the regional level in Germany tends to be more concentrated in high-tech sectors, while other knowledge-intensive sectors tend to be more diffuse and less concentrated. To address regional disparities, the research suggests that the German government should seek to strengthen innovation governance capacity or RIS3 at the local level, tailored to the specific regional context. The focus of capacity building should be to improve systemic links between less developed or lagging

regions and regional innovation hubs, for example, around eastern Germany. This can be done by involving more local stakeholders and improving vertical coordination with higher levels of government. In this context, cooperation is not only between institutions or levels of government but also between sectors and regions.

In the context of the regionalization of regional innovation policy (RIS3) in Germany, the study by Rehfeld and Terstriep (2019) presents a comprehensive assessment of RIS3 governance in North Rhine-Westphalia (NRW) and its potential to provide valuable insights for the S3 agenda in Europe. The study highlights the importance of understanding the regional context and stakeholder engagement in formulating and implementing effective innovation policies. The study analyzed the governance structure of innovation policy in NRW, the interactions between key actors, and the collaborative mechanisms that support innovation. The study highlights NRW's challenges in implementing S3, including stakeholder engagement, regional policy integration, and adapting to global economic dynamics. Rehfeld and Terstriep (2019) found that weak collaboration due to a lack of stakeholder engagement can hinder policy effectiveness. This phenomenon also leads to policy uncertainty and further creates regional innovation capacity gaps. Germany is known as a country with a high technological capacity that has the potential to influence global economic conditions. However, a lack of stakeholder participation in policymaking can hinder adaptation to these global economic challenges. In support of S3, Rehfeld and Terstriep (2019) provided several suggestions for strengthening regional innovation policy governance in NRW. They emphasized the importance of strengthening stakeholder engagement (public sector, private sector, and civil society) by creating collaborative platforms and making the S3 framework a way for regions to respond to changing global economic conditions. The authors also emphasized that flexible policy frameworks should be developed to adapt to changing global market conditions and to be utilized according to local conditions and needs. Furthermore, they underscored the need to increase the number of innovation networks or clusters to facilitate better knowledge dissemination, including strengthening support for small and medium-sized enterprises (SMEs) and early innovation education.

The urgency of increasing stakeholder engagement is one of the S3 governance challenges highlighted by Morgan (2017). This paper focuses on the interaction dynamics among key stakeholders in developing regional innovation policies. The study used qualitative analysis with a case study approach that examined the development of innovation policies in two different regions, namely the Basque Country (Spain) and Wales (UK). Through a comparative study between the two regions, Morgan found that there is real complexity in the governance of S3 in Europe, especially when it comes to building collaboration between stakeholders. In the Basque region, local entrepreneurship tends to be more advanced, but the role of universities in innovation is not optimal. In Wales, local entrepreneurship is somewhat behind, but the role of universities in developing innovation ecosystems is significant. In this regard, local governments need to proactively partner with universities or the business sector so that each party can maximize its role as a driver of the knowledge economy and the local economy. As this phenomenon in two regions in different countries shows, involving local actors in S3 governance is challenging. Morgan concluded that there is an urgent need to find the most inclusive forms of governance to create synergies and the active participation of all stakeholders. The more significant the synergies are, the greater the potential for building solid cooperation and collaboration among all stakeholders.

Stakeholder engagement is essential in the EDP, but facilitating and mobilizing the diverse interests of innovation actors is a complex task. This issue was addressed in a study by Estensoro and Larrea (2023), which examined the critical role of policymakers in developing EDPs that fit within the S3 framework. The study adopted a qualitative research approach, using in-depth interviews with key stakeholders such as policymakers, academics, and industry experts. Through a thorough thematic analysis of the data collected, the authors identified the different roles of policymakers and the specific challenges they face in developing EDPs. The study highlights the complexity of policymakers' roles in the EDP and found that their understanding of their roles needs improvement. The study also found that policymakers have difficulty fostering effective collaboration with the private sector and academia or research institutions, and there are significant challenges in managing different local innovation resources to support the implementation of S3. The authors suggest that policymakers should be clearly defined in their crucial role in facilitating the EDP and ensuring that all parties understand the S3 framework to be adopted. In addition, the study emphasizes the need to create a more collaborative policy design mechanism and develop policymakers' capacity and competence through specialized training. The authors also underscored the need to develop relevant indicators to monitor and evaluate the results of each step in each policy process.

Laranja (2022) examined the translation process of S3 and the EDP in different EU regions through a process-oriented policy approach. The study investigated how entrepreneurial experience can be effectively integrated into regional innovation policies. Based on qualitative analysis and case studies, this study uncovers best practices in S3 implementation using a theoretical framework (U-Theory) that highlights collective and participatory transformation in policy development. By analyzing the processes and challenges associated with S3 implementation, the study provides practical guidance for policymakers and stakeholders seeking to develop innovation ecosystems that support S3 processes. The study's findings highlight the complexity of translating the S3 concept into policy practice and reveal the difficulties that regions face in integrating the idea of EDP into their policy frameworks. Other key challenges include weak collaboration between stakeholders, uncertainty about their respective roles, and barriers to measuring policy impact. The study highlights the need for a more process-oriented approach to S3 policy design. This aims to facilitate the dynamics that occur during the adaptation of S3 approaches and to make stakeholder engagement more effective during the process. The study emphasizes the importance of enhancing collaboration among all stakeholders to create a vibrant innovation ecosystem and suggests enhancing the effectiveness of the EDP through training programs. In addition, Laranja (2022) recommended the establishment of a dedicated evaluation mechanism to better assess the impact of this policy.

In a conceptual and case study, Foray (2018) argues that critical challenges in the EU can be addressed through mission-oriented policy design. The principles of mission-oriented policy are aligned with the principles of smart specialization. Mission-oriented, in the context of smart specialization policy, is interpreted as a policy approach based on local challenges. Foray's paper focuses on a conceptual description that can enhance understanding of the opportunities for S3 policies in creating new mission-oriented policy practices to address region-specific problems. This paper emphasizes that the innovation policy framework for S3 should be agile enough to adapt to local economic realities and potential global challenges. By examining the implementation of S3 in different European regions, Foray showed that S3 policies require the active involvement of local stakeholders to produce innovative policies that are sustainable and appropriate to local challenges. The involvement of local stakeholders is aimed at creating cross-sectoral cooperation, namely government, private sector, and academics or researchers who share the same mission, and at finding new fields that are entrepreneurial and unique to the region. Engaging stakeholders and creating collaboration are often challenges in implementing S3. The challenge is even more significant when a region has less established innovation capacity or economic resources. Because critical processes in S3, such as EDP or the prioritization process, involve multiple parties, regions with weaker institutions or less flexible institutional structures tend to experience bureaucratic bottlenecks, making adapting S3 in these regions more challenging. Foray suggests that S3 policies should consider flexibility and institutional rigidity. Policy flexibility refers to new policy adaptations that are often faced with dynamic local

and global socioeconomic conditions. Institutional flexibility is needed to adapt new policies quickly without being hampered by rigid institutional conditions or rules.

The institutional preconditions for adopting or adapting S3 are also the focus of the study by Knudsen et al. (2020). This research focuses on implementing S3 in Norway, which can provide important lessons for other European countries. This research used a qualitative approach with in-depth interviews and an analysis of policy documents to explore the dynamics of S3 policy governance in decentralized regions in Norway. The S3 policy has been implemented in Norway, with critical considerations related to the readiness of institutional capacity and the ease of mobilizing different local innovation actors and creating collaboration between them. The main challenge in implementing S3 in Norway is the complexity of coordination between local and national innovation actors due to the need to keep local policy strategies in line with national policy strategies. In addition, some regions were found to have organizational rigidities and problems with the quality of the human resources needed to support the implementation of S3 policies. The incompatibility of strategies in the regions with strategies at the central level and the weak competence of human resources in managing regional policies are obstacles to implementing S3 in Norway. The common knowledge of innovation actors in the regions about the mission and vision of regional development is necessary to create strong cooperation and to develop sound innovation policies. Therefore, this research emphasizes the need to develop institutional capacity and strengthen human resource competencies to implement effective S3. Strong collaboration among stakeholders can be created through coordination and communication mechanisms that are specifically designed so that each actor can engage in continuous dialogue and knowledge sharing to ensure that each party has the same understanding of the vision and mission set. In addition, throughout the policy process, monitoring and evaluation are essential to ensure that each step is relevant to the plan and decision.

3.2. Governance challenges in weaker regions

If regions that are generally ready to adopt and adapt to new innovation policies such as smart specialization still face challenges in some way, then it can be assumed that weaker regions will face even more of these challenges. The critical analysis of the selected articles in this second part focuses on studies that deal with implementing S3 in specific regions. While some of the articles in the previous section dealt with the main challenges of S3 in EU regions in general, the following studies examine the implementation of S3 in EU regions that are weaker, less developed, or related to other similar terms. The following five articles reveal significant governance phenomena in these regions using the same critical review approach as in the previous section.

Morgan and Marques (2019) revisited the role of the state in innovation and economic development, focusing on the implementation of S3 in less developed regions (LDRs) of the EU. The method used in the analysis of this paper was theoretical, which links the specificity of smart specialization as a new industrial policy (NIP) with mission-led innovation. This study shows that regions within a country can respond to new policy challenges through governance experiments, including estimating the economic impact of policy implementation. However, implementing new policies such as smart specialization in LDRs often poses a dilemma. While there is an urgent need to promote regional development through innovation, these regions are often constrained in their ability to manage various innovation resources optimally, so overcoming these challenges is not trivial. Despite receiving particular policy interventions, such as increased financial support, LDRs have less expertise in managing financial support. Another challenge LDRs face is their limited capacity to coordinate across scales—horizontally between institutions within a region and vertically between various levels of government (subnational, national, and supranational). This paper found that the quality of governance in LDRs strongly influences the effectiveness of S3 policy implementation. To address governance issues in LDRs, the authors suggested significant improvements in the administrative and technical capacity to implement S3 principles, especially in critical processes such as the EDP or the prioritization process. Technical training and expertise in designing or allocating various local resources are highly needed in LDRs. This will help increase the capacity of regional innovation policy governance more broadly. The study also suggests the need to consider experimental governance that is more tolerant of failure. In implementing new and comprehensive industrial policies such as S3, experimental governance is interpreted as a process of learning from failure in policy implementation, and this means that failure must be evaluated for continuous improvement. The government also needs to create flexible regulations so that failure in this policy experiment cannot potentially cause negative administrative and political consequences.

Studies on implementing S3 in LDRs are also developing in the eastern and central parts of Europe, which are still primarily dominated by less developed or less innovative regions. The paper by Cvijanović et al. (2020) mainly focuses on exploring stakeholder engagement in the EDP in the context of S3 in Central and Eastern Europe (CEE). The study aimed to understand how stakeholder engagement can improve the effectiveness of S3 and foster regional innovation. The authors used qualitative analysis, including case studies and interviews with stakeholders from the government, academia, and the private sector. They analyzed the dynamics of interactions among these stakeholders and their influence on the implementation of S3, emphasizing the importance of collaboration in creating an inclusive innovation ecosystem. The findings highlight that participatory approaches and shared learning among stakeholders are critical to overcoming the challenges of implementing S3 in the region. Alternatively, the analysis also identified several barriers, such as a discrepancy between local policies and practices and inadequate infrastructure to support innovation in many CEE regions. Lack of stakeholder involvement in the EDP was identified as a significant challenge. Insufficient stakeholder involvement hinders the effectiveness of S3 in CEE and creates a gap between policy and practice. Other challenges relate to weak institutional capacity at the local level and the absence of effective coordination and communication mechanisms among stakeholders. These issues underline the need for a more inclusive and collaborative approach to optimizing the innovation process in LDRs. Suggestions and recommendations related to the governance of S3 in CEE emphasize the need for promoting stakeholder engagement in this EDP process and the development of stronger participatory mechanisms of innovation actors (e.g., through discussion forums) to facilitate productive dialogue and enhance the common understanding of S3. In addition, there is a need to strengthen institutional capacity at the regional level to manage and implement S3 more effectively, for example, by developing technical and managerial skills, strengthening collaboration, and ensuring flexibility in institutional structures to allow new policies to adapt to dynamic local needs.

In addition to LDRs, sparsely populated areas (SPAs) face equally challenging obstacles in implementing smart specialization. These challenges were discussed by Sörvik et al. (2019) in their study that evaluated the implementation of S3 in five SPAs in Europe, namely Västerbotten (Sweden), Nordland (Norway), Lapland (Finland), Highlands and Islands (Scotland), and Aragon (Spain). This study investigated how S3 is applied in SPAs amid their specific geographical challenges and area structural conditions. The study applies the comparative study method of the five regions and incorporates several research methods, such as surveys and interviews. Several critical dimensions of S3 are then explored, including relevant visions of regional innovation, EDP, core markets, and governance of extra-local resources. Concerning the latter, SPAs are characterized

by challenges in terms of organizational and institutional thinness. While SPAs still have innovative firms on a small scale, primarily SMEs, they face institutional thinness that can reduce the capacity of these firms to innovate or collaborate. Geographic distance is one of the main barriers to mobilizing regional innovation resources, including increasing local stakeholder engagement, which is essential for implementing S3. In addition, on the one hand, the dependence of SPAs on natural resources is one of the reasons why these regions are vulnerable to global market fluctuations, while on the other hand, they also struggle to diversify their local economies amid the lack of adequate science- and technology-based services, such as public research institutes and specialized universities. The study provides several recommendations to address these challenges. The first is that economic diversification must be pursued on a cross-sectoral basis. One of the objectives is to reduce dependence on a single natural resource and uncertain and risky market conditions. The issues of sustainable bioeconomic diversification and renewable energy are strongly encouraged in SPAs due to their proximity to primary natural resources, as in Nordland (Norway), which has diversified the seafood industry from algae. One of the efforts to promote the diversification of natural resource-based economies is to increase the number of skilled workers and vocational schools according to the local economy's needs. Moreover, SPAs also have the opportunity to establish interregional or even international connections with other countries to build mutually beneficial innovation networks. This can also be supported by strengthening the role of local universities or intermediary institutions that can bridge the entry of new science or technology needed for local interests or by creating cooperation and collaboration between external institutions and local institutions. To this end, SPAs need to improve coordination across levels of government to build local innovation networks by cooperating or collaborating with higher levels of government at the subnational and national levels.

The challenges and phenomena faced by SPAs in implementing S3 are similar to those found by Ghinoi et al. (2021), who studied the implementation of S3 in peripheral areas with a focus on Lapland (Finland), which is also classified as a SPA. The study assessed the role of governance structures and local stakeholder engagement in the S3 process using a data triangulation approach that integrated three primary data sources: interviews, surveys, and policy document analysis. The results of this study highlighted significant challenges related to suboptimal stakeholder engagement due to the limited availability of networks needed in the EDP, as well as the low participation of local entrepreneurs in determining S3 priority domains. Stakeholder networking is crucial to and strategic in the EDP, because it is the most critical process in the formulation of S3 in which the views and experiences of local stakeholders largely determine which strategies are needed for the region that suit local conditions. The reach of networks in peripheral areas such as Lapland to meet this need is still very limited. This lack of stakeholder networks also limits the participation and interaction of public and private actors in prioritizing or discovering new domains. As a result, the policy process results in less diverse specialization and thus less potential for innovation development. As discussed in relation to the LDRs and SPAs, peripheral regions still depend on traditional industries and natural resources, such as mining, forestry, and tourism, resulting in limited economic diversification. This paper provides recommendations for addressing the dependence of peripheral regions on natural resources and traditional industrial characteristics by shifting path dependencies and exploring new specializations in the bioeconomy or digital-based service sectors. The challenges of expanding stakeholder engagement can be addressed through solid collaboration between the public sector, local businesses, and local universities or research institutions. This development can also be achieved through cooperation with external parties across regions or borders and levels of government. Local governments need to provide policies that can stimulate the participation of local entrepreneurs, for example, by providing incentives to contribute to the identification of new priority areas.

The challenge of economic diversification in specific regions has also been raised by Barzotto et al. (2020), who focused on the smart specialization strategy in lagging regions in the face of Industry 4.0 disruption. The study assessed the ability of lagging regions to leverage their essential technologies to face the digital industrial revolution and how regions' current technological capabilities can be improved by adopting place-based policies such as smart specialization. Lagging regions often have low basic technology and limited access to the necessary technological infrastructure. In addition, underdeveloped business and social networks limit their cooperation and innovation and affect their ability to foster synergies between sectors or regions. Weak institutional capacity is a significant obstacle to implementing S3. Institutional adequacy is closely related to the innovation governance structure, and its lack can hinder critical S3 processes. In addition, lagging regions tend to have significant limitations in the availability of qualified human resources, especially those with specialized skills in technology-intensive areas. These challenges hinder the integration and expansion of new technologies in the region, which in turn causes lagging regions to fall further behind in the ongoing disruption of Industry 4.0. According to Barzotto et al. (2020), the constraint of weak innovation capacity in lagging regions can be overcome by bridging gaps between local innovation actors and more extensive innovation networks. Solid links with networks outside the region can potentially create cross-border cooperation. The S3 framework can be a medium to expand the relationship between local and external actors through interregional innovation networks to attract new knowledge and technology levels they need. Strengthening the capacity of local administrative resources in lagging regions also needs to be a priority in the S3 program to strengthen the institutional capacity that is important for innovation policy processes. Strong institutions will facilitate the process of involving different stakeholders and can increase the participation of business actors in the formulation and implementation of S3. Lagging regions that are still dependent on traditional industries can shift and diversify into other technology-intensive sectors. For example, in Pomroskie (Poland), dependence on the energy industry shifted to medical technology and interactive technology, which are more globally competitive. They achieved this diversification (through the EDP) by exploiting the potential of local assets without creating entirely new industrial specializations.

3.3. Specific governance approaches to address challenges

This section focuses on studies that focus on the specific governance approaches used to address the governance challenges of S3 in the EU. Some studies relate their work to the relationship between regional governance and governance at higher levels of government, while others explicitly refer to multilevel governance. The last five papers discussed below explore these themes.

The study by Aranguren et al. (2019) focuses on the dynamics of S3 governance, specifically in the EDP in different EU regions. They investigated the territorial governance structure of S3 and examined the role of local stakeholders in implementing the EDP. The study used a qualitative mixed-methods approach with in-depth interviews and analysis of policy documents to determine how these stakeholder roles affect the implementation of EDP. According to this study, there are several critical challenges to EDP governance. The first is the complexity of multilevel governance, involving different stakeholders at different levels of governance: local or regional, national or state, and EU. This complexity often leads to the misalignment of objectives and priorities, making effective implementation more challenging. The second challenge is strengthening regional institutional capacity, where there is still a large gap between administratively strong regions and weaker regions with limited resources and innovation infrastructure. The third challenge is promoting the involvement of local stakeholders other than government and academia—namely,

the private sector and civil society. Inclusive participation of local stakeholders is necessary, as it will significantly impact the EDP's success. However, as stakeholder engagement remains a challenge in many regions, inclusive mechanisms need to be well designed to encourage all parties to participate in any smart specialization process. The fourth challenge relates to entrepreneurial discovery initiatives proposed by regions, which often struggle to align with national innovation strategies. The study suggests that the EDP should be strengthened with a dedicated coordination mechanism that can link different levels of governance and reduce fragmentation between local and national goals and priorities through collaborative decision-making. In addition, institutional capacity issues, especially in resource-constrained regions, could be improved by providing tailored education and training support to enhance stakeholders' awareness of the S3 framework.

To improve understanding of the S3 policy framework, regions can draw on experiences from other regions or higher levels of government as a means of policy learning. The study by González-López (2019) addresses the process of knowledge sharing among stakeholders in the context of multilevel governance in Galicia (Spain). The study used a qualitative methodology through case studies and interviews with key actors in innovation policies that are influenced by higher levels of government. González-López argues that policy learning mechanisms and processes that occur among all innovation actors by involving higher levels of government can lead to better policy outcomes. Active engagement and solid collaboration are essential, as this policy learning process involves many parties. However, one of the significant challenges in this process is the complexity of inter-level coordination to achieve policy understanding at the local level. This study's findings suggest increasing the involvement of local stakeholders at all stages of the policy process, creating mechanisms for good cooperation and coordination between actors at different levels, and supporting this with flexible and adaptable institutional structures. Local governments can use these processes as policy learning channels to experience best practices in innovation policy implementation from other regions or higher levels of government. Additionally, local governments must strengthen the skills and capabilities to translate and adapt these policy learning outcomes to the local context. According to this study, multilevel governance is believed to create coherence among local, national, and supranational innovation policies. This study confirms that multilevel governance can be an essential approach in S3 governance, especially in areas with centralized policy governance. This governance approach also provides a coherent framework in line with the principles of S3, allowing it to address unique challenges, even in regions with specific conditions. In policy learning through multilevel governance, the processes and outcomes of knowledge sharing, as well as the improved communication capabilities that grow during the process, are essential outputs that can create a solid regional innovation ecosystem.

Regarding the challenges of implementing and governing S3 at different regional levels, lessons can be drawn from the study by Pugh (2018), which focuses on the adaptation and governance of regional innovation policies for smart specialization strategies in the context of peripheral and semiautonomous regions in Wales, UK. In this study, Pugh used a case study approach by interviewing stakeholders and decision-makers of an innovation policy that has existed for more than 20 years. The aim was to examine how the concept of smart specialization can be adapted by regions under the current multilevel governance conditions, with the regional innovation approach already established in current governance. Pugh argues that the political and institutional challenges in the long-standing regional innovation policy concept embedded in EU regional policy have not been fully resolved by the new policy concept of smart specialization. This, in turn, poses challenges in aligning S3 with existing regional innovation policies. This study highlights the coordination gap between weak and semiautonomous regions such as Wales regarding managing S3 consistently. In many cases in Europe, innovation cooperation and collaboration often take place across regions and borders. Unfortunately, the concept of smart specialization has not considered this and has not provided clear guidance on interregional coordination mechanisms to support regional policymaking processes. Pugh also argues that the concept of S3 needs to address the definition of regional boundaries, what kinds of interregional relationships are proposed, and within what regional boundaries are permissible. As a result, views on the relationship between these regions overlap. Given this point, this research suggests that S3 uses a multilevel governance approach, which has not been widely studied in prior research. The MLG concept is well established and can provide a better innovation framework for specific regions, such as semiautonomous or underdeveloped regions. As described in other studies, multilevel interactions in S3 governance allow for the exchange of experiences and knowledge so that S3 governance processes can be further developed according to the local context. However, Pugh notes that there are more complex challenges in using the multilevel governance approach in regional innovation policy, as some arrangements also need to be adapted and validated.

The consideration of multilevel governance in the implementation of smart specialization is also the focus of the study by Wibisono (2022). This study used a critical analysis approach of relevant literature to support and encourage the adoption of the multilevel governance approach in addressing the governance challenges of smart specialization in different regions of the EU. One of the main issues raised in this study is the importance of coordination between regional and national policymakers in developing S3. The implementation of S3 in different regions faces the problem of weak capacity to evaluate the progress of the policy. Lack of experience in LDRs also leads to fragmentation of policy objectives and outcomes. In LDRs, governance becomes more challenging due to rigid institutional conditions and conflicts of interest among local actors. Wibisono argues that the success of S3 governance in regions can be enhanced by improving coordination with all local stakeholders and by using multilevel governance networks to address region-specific issues and challenges. Multilevel governance supports participatory and coordinating mechanisms for local policy development. The multilevel governance approach helps to ensure that policies formulated and implemented at the local level are appropriate to local conditions, that all local interests are promoted, and that critical local actors are directly involved in solving problems. In principle, multilevel governance promotes multi-stakeholder participation, aligning with smart specialization principles. This study confirmed that regions with various constraints, such as peripheral, lagging, and sparsely populated areas, can overcome their governance challenges by aligning their strategic policies with national strategic projects while adapting to local conditions. For example, S3 policies related to developing tourist forests or nature reserves in peripheral regions can be aligned with national strategic environmental policies. In this case, coordination across levels of government is needed to align local policies with national strategies.

Lastly, Kroll (2019) investigated the complexity of S3 governance amid the innovation paradox, where LDRs need strong innovation policy support but face certain limitations. Through an in-depth review of relevant literature and policy documents, the paper critiques the basic idea of S3, which aims to reduce the gap between developed and underdeveloped regions. The study provides an in-depth perspective on the limitations of the S3 concept as a "one-size-fits-all" solution. Kroll argues that LDRs often face problems with weak institutional capacity and insufficient availability of innovation resources. These conditions challenge LDRs in developing the innovation ecosystem needed to apply the principles of S3 effectively. The study also mentions that LDRs are characterized by institutional rigidity or inflexible policy governance structures that may hinder cooperation among stakeholders within or across levels of government. As a result, the decision-making process becomes more dynamic. The current governance system often makes it difficult for LDRs to unite the various stakeholders crucial to the policymaking process. LDRs are also faced with the need to align regional policy strategies with national policy strategies, whereas S3 encourages regional innovation policy strategies to emerge from local challenges and problems, which can also be solved by leveraging different local potentials. The study recommends that LDRs

build solid institutional capacity but with a flexible and adaptive governance structure that can respond to different dynamics of change at the local, national, and global levels. Finally, Kroll suggested increasing stakeholder engagement and collaboration to solve local problems while considering regional policy strategies aligned with national interests—an alignment that requires good coordination among different levels of government.

4. Lessons learned and practical policy recommendations

Based on the results of a review of critical findings from the selected articles, there are several points that need to be considered when discussing the governance challenges of innovation policies such as smart specialization. In Section 3.1, the first important issue identified in the review that remains a challenge in many regions is the issue of increasing stakeholder involvement in policy planning, design, and implementation. As Laranja (2022) mentioned, the first step is for local governments to identify potential stakeholders with a track record of local innovation. Practical ways to identify these potential stakeholders include technical meetings, seminars or workshops, and focused discussions. In this way, policymakers can prepare the ground for these stakeholders to be further involved in innovation policymaking processes. In these processes, several benefits can also be gained, such as the collection of different perspectives from these stakeholders on the problems and challenges in the context of their region, which can then become the basis for building a shared vision that is targeted and realized through the implementation of innovation policies. According to Carayannis et al. (2017), bringing stakeholders together for joint policy development requires strong trust. Trust is needed to increase participation and involvement so that in joint policy processes, everyone will be open to each other, provide mutual learning, and ultimately facilitate coordination and decision-making. Rehfeld and Terstriep (2019) argue that a shared vision reflects the aspirations of all stakeholders, and that the formulation of a shared vision is essential to create a common perception in the planning and implementation of innovation policy. Engaging stakeholders is not easy. Positive incentives may be needed to encourage each party to become more involved. Estensoro and Larrea (2016a) proposed a scheme to incentivize this stakeholder engagement process, which could be in the form of monetary support (i.e., providing collaborative projects) or non-monetary support (i.e., facilitating the process of finding innovative ideas for future projects).

The second challenge discussed in the selected articles is the condition or readiness of institutions to adopt smart specialization. As Foray (2018) states, considering the condition or readiness of institutions to adopt smart specialization requires the cooperation of all parties, namely the government, universities, and industry. Institutions also need to coordinate different parties during the policy process, including as a platform for knowledge sharing and information exchange. Certain regions that have had innovation institutions for a long time tend to have their own institutional culture. According to Knudsen et al. (2020), if a region has an established innovation institution, it will adapt more quickly to new concepts such as smart specialization. Their study of the implementation of smart specialization in Norwegian regions shows that formal institutions with particular bureaucratic structures can support or hinder the adoption and development of new policies. However, a framework that can analyze the conditions and dynamics of institutional culture would help determine whether adopting new policies such as smart specialization would be more beneficial for development. They also argue that such a framework could be replicated by other regions in Europe. Policymakers' perspectives and actions in adopting new innovation policies can be influenced by the type of diversity embedded in institutions (AlMalki & Durugbo, 2023). This means that policymakers must thoroughly understand the local institutional context and diversity and consider this diversity in their policies. In line with Glückler and Bathelt (2017), understanding the institutional context enables policymaking to occur in a supportive environment. It can also help improve inclusive stakeholder engagement and coordinate and mobilize relevant interests. Lessons can also be drawn from the differences in institutional diversity between the business and academic sectors in Basque Country (Spain) and Wales (UK). Morgan (2017) argues that the level of public trust in these institutions can reflect institutional capacity and quality. This can be attributed to the institutions' transparency and accountability in managing resources used for local advantage.

Section 3.2 outlined these governance challenges in the context of the EU's weaker regions. Some of those mentioned in this paper are less developed regions, lagging regions, peripheral regions, and sparsely populated areas. The implementation of S3 in these regions faces significant challenges. Morgan (2017) urges scholars to rethink the state's role in understanding smart specialization in the context of regional policy. Regions adopt S3 to access structural funds for regional development. However, managing these funds requires adequate administrative capacity or financial governance, since the accountability for using these funds is also subject to the EU level (D'Adda et al., 2022). According to Morgan and Marques (2019), regions need to conduct innovation policy governance experiments. Several related studies have shown that governance experiments can be an essential learning channel when regions adopt and adapt to new types of policies (Braunschweiger & Pütz, 2021; Kivimaa et al., 2017; Ulnicane et al., 2021). The next challenge relates to stakeholder engagement. Inclusive stakeholder engagement is essential in critical S3 processes such as the EDP, but these regions face limited innovation networks. Cvijanović et al. (2020) stated that LDRs in CEE need a stakeholder engagement model tailored to local socioeconomic and cultural characteristics that can accommodate all the expertise and interests of local innovation actors. As mentioned in the study by Sherman and Ford (2014), stakeholder engagement models should be flexible and adaptable enough to local innovation infrastructure and institutional capacity limitations. Weak regions mostly struggle with geographical conditions and path dependency on the primary sector, making it difficult for them to diversify their economies. The S3 framework can facilitate regions such as SPAs and peripheral regions to shift this path dependency across sectors (such as the bioeconomy and digital services) by expanding collaborative networks between institutions, regions, and levels of government (Tödtling & Trippl, 2018). According to Asheim (2019), these processes are an essential way to acquire external knowledge and improve the level of technology, which ultimately helps regions transition out of path dependency.

As outlined in Section 3.3, the implementation of smart specialization, both in the EU as a whole and in weaker regions, implies that each region operates within a multilevel governance system consisting of regional (and subregional), national (and subnational), and supranational (EU) governments (Hooghe & Marks, 2021). Regions that need to align their regional strategies with national strategies or policies face complexities and challenges. In the governance of smart specialization, many regions are still faced with finding the best way to coordinate and mobilize different interests to have a shared vision in their regional development; weaker regions face even more complex challenges. As Pugh (2018) mentioned, the problem of policy governance and institutional capacity building in underdeveloped, peripheral, or semiautonomous regions with multilevel governance has not been solved since the concept of regional innovation policy was introduced in Europe. Meanwhile, smart specialization offers a new framework that many regions may find difficult to understand. Because each region has its own characteristics and diversity, regional innovation actors need to better understand local, regional, and national socioeconomic and political conditions according to their respective priorities. As the policy authority, local governments need to facilitate this process, mobilize different views, harmonize perceptions, and then leverage them together for the region's advantage. In addition, multilevel coordination needs to be considered when joint decisions agreed upon

at the local level are aligned with national strategies or policies (Hanssen et al., 2013; Hovik & Hanssen, 2015). Effective communication strategies between stakeholders should be developed to promote the inclusiveness and participation of different parties. Specific coordination mechanisms need to be designed to facilitate linkages between local governments or higher levels of government. In this case, the state or central government also plays a vital role as a facilitator or supervisor. As argued by González-López (2019), relationships between regions or between levels of government can be a medium for policy learning that is beneficial to the implementation of S3. Synergies and cooperation will be easier to manage if there is an understanding between parties. Another critical factor in managing interregional or intergovernmental coordination, communication, and cooperation is the presence of a collaborative leader who can unite many parties and has extensive experience in organizing various institutions (Foray, 2018; Ranga & Etzkowitz, 2015).

Previous studies have raised concerns about the feasibility of involving different stakeholders in the development of S3 (Di Cataldo et al., 2020; Iacobucci, 2021; Mascarenhas et al., 2021). In a recent study, Ganzaroli (2024) noted that many regions may struggle to effectively involve different local actors or communities, especially in the development of the EDP. The EDP requires specific expertise, and it is not just a matter of how many stakeholders are involved. Thus, the challenge is to increase stakeholder engagement on the one hand and to ensure that they have the innovative skills needed for the EDP on the other. Ganzaroli pointed out that another problem in managing EDPs is that collaborating institutions seem less willing to apply the S3 framework strictly. In line with Laranja (2022), institutions at the local level tend to be less inclusive, favoring more powerful and dominant actors so that few voices can be heard and reducing the diversity of innovative collaboration. However, according to Kopczynska and Ferreira (2020), the S3 framework is flexible enough to adapt to local conditions and needs. Increasing trust between innovation actors and improving teamwork at the local level, especially in weaker regions, has the potential to strengthen local capacity. As noted by Ghinoi et al. (2021), the success of S3 depends heavily on the ability of local institutions to develop mechanisms that can foster increased cooperation and collaboration among stakeholders at the local level. Therefore, rather than seeing institutions as a problem, S3 represents an opportunity to improve good governance practices at the local level. The critique of smart specialization emphasizes the need for governance mechanisms capable of coordinating different actors (stakeholders) with different types of competencies (according to local needs) and at different levels of governance. There may be structural deficiencies at the local or regional level, but coordination mechanisms between levels of governance will help make the policy process more effective and inclusive. It is important to note that "multilevel governance" has its complexities, and the challenges are more significant in weaker regions. Therefore, the design of innovation policy strategies require flexibility and adaptability (Carayannis & Grigoroudis, 2023; Nijkamp et al., 2024).

5. Conclusion

This review paper examined the governance challenges related to smart specialization policies in the EU region. The study evaluated the critical findings of selected articles that identified these challenges and proposed potential solutions and recommendations to improve the successful implementation of smart specialization policies. The first two sections of the review of the selected articles (Sections 3.1 and 3.2) highlight two key governance challenges—*stakeholder engagement* and *institutional readiness*—and illustrate how these challenges arise in different EU regions in general, especially at the subnational level, and more significantly in weaker regions. The third part of the review (Section 3.3) highlights the need for specific governance approaches to address these challenges. Some articles implicitly underline the importance of interagency, interregional, and interlevel linkages, while others explicitly advocate a multilevel governance approach to address these challenges. Unfortunately, there is a lack of in-depth discussion of this governance approach in the available literature. For example, the urgency of multilevel governance approaches and their compatibility with smart specialization policies in different regional conditions need to be discussed more thoroughly.

This paper seeks to contribute to the literature on smart specialization in two ways. First, it focuses, integrates, and presents critical findings related to the challenges of smart specialization governance more systematically. This has shown that many of the suggestions and recommendations from the selected articles have approached specific governance concepts in a limited way, requiring a more specialized or in-depth discussion of potential governance approaches. Second, a review of the critical findings from the selected articles suggests that adopting more specific governance approaches—for example, multilevel governance—is essential, especially given the multiregional context of the EU. This type of governance approach has yet to be widely explored in smart specialization literature. Although some scholars have initiated discussions on multilevel governance in the context of smart specialization policies, the adaptation of this concept requires some attention, mainly due to the complexity of the concept, its compatibility with the S3 concept, or the specific regional conditions where it could potentially be applied. Therefore, this paper emphasizes the need for specialized expertise to address this issue in future research.

Exploring smart specialization studies from a cross-disciplinary perspective can be challenging. For example, multilevel governance has been widely discussed in public policy literature (e.g., environmental, anti-poverty, and climate policies) and political science literature (especially the literature on European integration). However, the discussion is still limited to regional innovation studies and economic geography. Fundamental questions that might need to be explored in future research include the following: *How does the concept of multilevel governance fit with smart specialization? What should be considered when using this concept in innovation policies such as smart specialization? What are the potential economic impacts of this approach?* These questions have yet to be explored in previous research and can therefore pave the way for future research on smart specialization-related studies.

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