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AROs and Territorial Fragility

The case for applied research organisations as tools to address territorial fragility in the European Union

ABSTRACT

The persistence of territorial fragility and the “innovation divide” within the European Union remains a critical challenge for cohesion policy. This paper investigates the role of Applied Research Organisations (AROs), also known as Research and Technology Organisations (RTOs), in mitigating these disparities. By synthesising recent literature on regional innovation systems, Smart Specialisation Strategies (RIS3), and proximity dynamics, we argue that AROs function as vital intermediaries that compensate for institutional voids in lagging regions. The analysis highlights their specific contribution to the Entrepreneurial Discovery Process (EDP), their capacity to facilitate industrial modernisation through knowledge transfer, and the nuance of their geographical versus cognitive proximity to local actors. We conclude that strengthening AROs in peripheral territories is a necessary condition for successful place-based innovation policies.

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1 Introduction

The European Union's cohesion policy has long grappled with the challenge of territorial fragility—a condition where regions suffer from structural economic weaknesses, demographic decline, and disconnectedness from global innovation networks. Despite significant investment, an “innovation divide” persists between the core technological hubs and the peripheral or “lagging” regions [1]. In this context, the role of intermediary institutions has gained increasing scholarly attention. Applied Research Organisations (AROs), often referred to as Research and Technology Organisations (RTOs), have emerged as critical actors capable of bridging the gap between basic science and industrial application [2].

Territorial fragility is not merely a lack of funding; it is often characterised by “institutional voids”—the absence of effective organisations that can facilitate collective action and knowledge exchange [3]. While universities generate knowledge and firms exploit it, lagging regions frequently lack the translation mechanisms required to turn inventions into regional growth. This paper argues that AROs are uniquely positioned to address these voids. Unlike universities, whose primary mission is education and fundamental research, AROs have a specific mandate to support industry through applied R&D, acting as “innovation intermediaries” that can de-risk technology adoption for local SMEs [4].

Furthermore, the current policy landscape, dominated by Smart Specialisation Strategies (RIS3), places a premium on the “Entrepreneurial Discovery Process” (EDP)—a bottom-up approach to identifying regional competitive advantages. The effectiveness of RIS3 in peripheral regions, however, is often hampered by weak local institutional capacity [5]. This paper explores how AROs can serve as the backbone of the EDP, ensuring that innovation strategies are grounded in technical reality rather than political wishful thinking. By examining the interplay of geographical and cognitive proximity, we provide a comprehensive case for AROs as essential tools for EU territorial resilience [6].

2 Theoretical Framework: Innovation Systems in the Periphery

2.1 The Challenge of Left-Behind Places

The concept of “left-behind places” has moved to the forefront of economic geography, describing territories that have failed to transition from old industrial paradigms to the knowledge economy [7]. These regions are often characterised by a “low-development trap,” where low productivity, low skill levels, and poor connectivity reinforce one another. Innovation policy in these contexts cannot simply replicate the models of successful metropolitan hubs (e.g., Silicon Valley or Bavaria). Instead, it requires “place-based” approaches that acknowledge specific local constraints [8].

A key theoretical constraint in these regions is the “regional innovation paradox”: the regions with the greatest need for innovation support are often those with the lowest absorptive capacity to utilise public funds effectively. [1] notes that while EU research policy drives growth, its impact is uneven, often favouring regions with pre-existing strong institutional fabrics. This suggests that without dedicated intermediary structures, funding flows may fail to “stick” in fragile territories.

2.2 AROs as Intermediaries and Void Fillers

In robust Regional Innovation Systems (RIS), interaction between knowledge producers (universities) and knowledge users (firms) is fluid. In fragile regions, this interaction is often broken or non-existent. AROs function as “system builders” in these contexts. [3] argues that in peripheral regions, innovation intermediaries can generate “small wins”—incremental improvements in collaboration that build trust and capacity over time.

By providing shared infrastructure and specialised expertise, AROs compensate for the lack of private R&D investment. They act as “institutional anchors” that can withstand short-term economic shocks better than individual firms. [4] highlights that RTOs operate effectively in “old tech places,” helping traditional industries upgrade rather than demanding a complete (and often unrealistic) shift to high-tech sectors. This

evolutionary approach is crucial for resilience, as it builds on existing industrial heritage rather than ignoring it.

3 AROs and Industrial Modernisation

3.1 Facilitating Industry 4.0 in Lagging Regions

The transition to Industry 4.0 presents both a threat and an opportunity for lagging regions. Without intervention, the digital gap may widen. However, AROs can facilitate the adoption of advanced manufacturing technologies by lowering the entry barriers for SMEs. [9] argues that for lagging regions, the focus should not necessarily be on inventing the newest technologies, but on the diffusion and adoption of existing ones.

AROs serve as demonstration sites or “living labs” where local firms can test new technologies before investing. This function is particularly vital in regions where firms are risk-averse due to economic stagnation. By aggregating demand and knowledge, AROs reduce the uncertainty associated with modernisation. [2] describes RTOs as “entrepreneurship instruments,” suggesting they do not just support existing firms but can also spin off new ventures that catalyse regional diversification.

3.2 Knowledge Transfer Mechanisms

The mechanism of transfer in fragile regions differs from core regions. In the core, transfer might happen through formal licensing or high-velocity labour mobility. In the periphery, transfer is often more relational and requires long-term engagement. [4] examines the network of Italian RTOs, finding that they create “tech spaces” that allow firms to access knowledge that is not available locally. This external connectivity is crucial; AROs act as pipelines to global knowledge networks, preventing the “lock-in” effect where regions become trapped in obsolete technologies.

4 The Role of AROs in Smart Specialisation (RIS3)

4.1 Anchoring the Entrepreneurial Discovery Process (EDP)

Smart Specialisation Strategies (RIS3) are the cornerstone of current EU cohesion policy. The central methodology of RIS3 is the Entrepreneurial Discovery Process (EDP), which demands that priorities be identified through a bottom-up dialogue between government, academia, business, and civil society. However, [5] warns that in territories with weak institutions, the EDP can be captured by rent-seeking incumbents or fail due to a lack of articulation.

AROs play a stabilizing role in this process. [10] provides evidence that scientific and research units are indispensable in the EDP because they possess the “entrepreneurial knowledge” required to identify viable technological domains. They provide the evidence base that validates or challenges the claims of other stakeholders. By offering technical foresight, AROs help policymakers distinguish between genuine regional potential and mere aspiration.

4.2 Translating Strategy into Practice

Moving from the design of RIS3 to its implementation is a major hurdle for fragile regions. [11] emphasises the need for process-oriented policies that translate high-level strategies into concrete actions. AROs are often the implementing bodies for these strategies. They manage the specific projects—whether in bio-economy, advanced materials, or digitalization—that the RIS3 documents prioritise.

Moreover, [10] notes that these units operate at multiple levels (macro, meso, micro), linking high-level EU policy objectives with the day-to-day operational problems of local firms. This multi-level alignment is essential for the coherence of EU regional development policy. Without AROs, RIS3 strategies in lagging regions risk remaining “paper tigers”—well-written documents with no mechanism for execution.

5 Proximity and Regional Ecosystems

5.1 Geographical vs. Cognitive Proximity

A critical question for policy is whether AROs need to be physically present in every lagging region. [6] investigates this through the lens of proximity dimensions. While geographical proximity facilitates initial contact and trust-building, it is not sufficient for innovation. Cognitive proximity—sharing a common knowledge base and technical language—is often more important for complex problem solving.

However, for peripheral regions, the lack of geographical proximity to knowledge providers is a barrier. [6] finds that “social proximity” (personal relationships) can sometimes substitute for geographical closeness, but having a local ARO significantly lowers the threshold for interaction. Local AROs understand the specific cultural and institutional context of the region, which remote experts might miss.

5.2 Retaining Human Capital

One of the most debilitating aspects of territorial fragility is the “brain drain.” Talented researchers and engineers leave for the core regions. AROs provide high-quality employment opportunities within the periphery, acting as talent magnets. By creating a local demand for high-level skills, they help to retain human capital that is essential for long-term resilience [7].

Furthermore, [3] suggests that intermediaries help combinatorially knowledge bases. They bring together actors who would not otherwise interact (e.g., a traditional textile firm and a materials science researcher). This recombination is the essence of innovation and is difficult to orchestrate from a distance.

6 Discussion and Policy Implications

The evidence synthesized suggests that AROs are not merely “nice-to-have” institutions but structural necessities for addressing territorial fragility. However, their effectiveness is contingent on specific policy designs.

1. Long-term Funding Stability: AROs in lagging regions cannot rely solely on competitive industry contracts, as the local industrial base is too weak. They require sustained "core funding" from the state or EU to maintain their capabilities [8].
2. Autonomy and Governance: To be effective in the EDP, AROs must maintain operational autonomy from local political cycles. They must serve the long-term strategic interests of the region, not short-term electoral goals [5].
3. Networked Mandate: Isolated AROs in the periphery will struggle. They must be incentivized to network with stronger RTOs in core regions (e.g., Fraunhofer, TNO) to ensure they are conduits for state-of-the-art knowledge [4].

7 Conclusion

To what extent do AROs function as effective instruments for mitigating territorial fragility? The literature indicates that they are effective primarily because they address the root causes of fragility: institutional voids, lack of absorptive capacity, and fragmentation of the innovation system. Through their role in the RIS3 Entrepreneurial Discovery Process [10], and their ability to mediate industrial modernisation [9], AROs provide the "institutional infrastructure" necessary for place-based development.

Future EU cohesion policy should explicitly prioritise the creation and strengthening of AROs in lagging regions. This is not a call for duplicating the exact models of the core, but for establishing adapted, responsive research units that can navigate the specific proximity and capability challenges of the periphery [6]. By doing so, the EU can move beyond simple resource transfer to building the genuine structural resilience required to close the innovation divide.

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