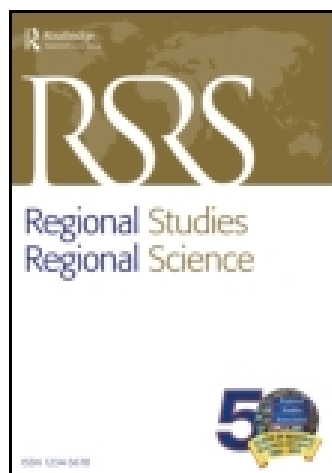


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Regional innovation systems in peripheral regions: insights from western Greece

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EARLY CAREER ARTICLE

Regional innovation systems in peripheral regions: insights from western Greece

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Despite the widespread popularity of the regional innovation system (RIS) concept, its details remain relatively underspecified, while most studies focus on the attributes of a handful of ‘ideal type regions’. This makes it difficult to explore how economically weak regions are succeeding in developing their potentially missing RIS elements. By investigating a peripheral region in Greece, this paper argues for deeper interaction among innovation actors and develops a five-dimension conceptual framework useful in analysing bottlenecks to regional innovation.

Keywords: regional innovation system; peripheral regions; Dytiki Ellada; Greece

Introduction

Regional innovation systems (RISs) conceptualize territorially rooted innovation-based regional development processes. Any systems approach regards innovation as an interactive process requiring continual cooperation between firms and other innovating actors. Several RIS archetypes have been proposed – often based on analyses of core regions with higher densities of innovation actors (*inter alia* D’Allura, Galvagno, & Mocciaro, 2012). A key assumption in all these ‘ideal-type’ heuristics is that the existence of different elements (structure) encourages interaction (activity), and therefore the RIS structure will function effectively as long as the necessary elements are present.

However, the overly ‘structural focus’ in RIS analyses (Uyarra & Flanagan, 2010, p. 683) has diverted attention from understanding situations where actors fail to interact and these structures fail to form, and in particular what discourages those actors from interaction. Concurrently, some regions have improved their innovative capacity via building weak interactions between specific RIS elements, as studies highlighting ‘path dependency’ and ‘(political) lock-ins’ suggest (e.g. Hassink, 2007). As most studies focus on industries in complex (metropolitan) regions obfuscating the ways that peripheral regions are considered (Doloreux & Dionne, 2008), our understanding of less successful systems is weak (Asheim, Smith, & Oughton, 2011, p. 881), and particularly the barriers that inhibit interactions, thereby keeping them weak.

Consequently, policy conclusions drawn from success stories are of limited use for less-favoured regions (Tödting & Trippel, 2005, p. 1204). To address this lacuna, I explore the dynamics of innovation interactions in less successful peripheral regions,

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focusing upon Dytiki Ellada in western Greece. I define regions as ‘peripheral’ within a country if located outside the main metropolitan areas, as well as being economically marginal with a low innovation base, since geographical peripherality is not necessarily co-terminus with economic weakness (e.g. Jauhiainen & Suorsa, 2008). I seek to widen the view of RIS heuristics to account for all those factors inhibiting or facilitating interactions in non-ideal-type regions. As local agents do not act in isolation, but are linked to other regional, national and global systems, I also consider the dynamic roles that these actors can play at different spatial levels within and beyond the region.

I continue by arguing that existing work on RISs and their comprising elements tends to overlook substantial relationships between innovation actors. I then set out the case study, Dytiki Ellada, its methodology and the challenges it faces in promoting innovation activities. I then demonstrate how barriers inhibiting innovation-related regional interactions are tied to particular RIS elements, arguing that weakness derives from four interconnected elements interacting in a multilevel environment. I then present a five-dimension framework for better conceptualizing and ‘operationalizing’ RISs. I conclude by arguing for more attention to be paid to a deeper interaction among innovation actors and their multidimensional roles.

RIS elements and gaps

The RIS approach has its origins in the National Innovation System approach that transcends ‘linear’ approaches to technological progress, instead focusing on ‘interactive’ learning. For some scholars, the flexible character of the innovation system is seen as an ‘advantage’ for an open-ended research strategy (Lundvall, 2003), while others regard the approach as ‘undertheorized’ demanding more conceptual clarity around system components, functions and inter-element relations (Edquist, 2005, p. 202). RIS approaches also lack a common definition or theory (D’Allura et al., 2012). Nevertheless, the key rationale underpinning RISs is that they consist of subsystems that interact in an architecture to produce ‘outputs’ – that is, to generate, exploit and diffuse innovation within regions. Thus, successful RISs typically include (Autio, 1998):

- the ‘knowledge application and exploitation subsystem’ (KAES): innovative industries/businesses;
- the ‘knowledge generation and diffusion subsystem’ (KGDS): higher education institutes (HEIs), research centres and other ‘intermediaries’ (e.g., Howells, 2006);
- intensive interactions between subsystems in terms of scientific/applied knowledge and human resources flows, including links with other (inter)regional and (inter) national institutions;
- high-quality infrastructures and institutional setting, including sufficient ‘regional autonomy’ (Cooke, Uranga, & Etzebarria, 1998);
- ‘regional policy actors’ (Tödtling & Trippel, 2005) (Figure 1).

RISs studies assume that an ideal-type structure and architecture is enough to generate outputs, and base their analyses and recommendations on what is missing from the structural arrangement. This corresponds with what Uyarra and Flanagan (2010, p. 683) consider as ‘a static snapshot of “usual suspect” actors and institutions’ that ignores actors’ roles, relationships and performance, precisely those interactions vital to any system producing its output and that reveal its ‘systemness’. Indeed, there is a growing recognition of more attention for both ‘local’ and ‘non-local’ relationships (Lagendijk & Oinas, 2005) as well

as ‘place-based leadership’ (Sotarauta, 2014) based on the ways local leaders mobilize other actors and create new interactions, in understanding local/regional development.

This relative neglect of RIS interactions is limiting, in terms of the fluidity of relationships between actors, particularly in peripheral regions. This risks negatively impacting public policy, as complex and dynamic issues of ‘interactivity’ reduce to a rather technocratic idea that having the right pieces of the jigsaw will all fit together well. Alongside, the conceptual slipperiness of definitions of ‘institutions’ or ‘infrastructure’ (Figure 1), it is difficult to operationalize the RIS concept. I therefore examine how different RIS elements interact and factors influencing and inhibiting those interactions. This fits with recent shifts in policy paradigms emphasizing region-specific strengths, a bottom-up approach to innovation policy encompassing concepts such as ‘constructed regional advantage’ (Asheim, Boschma, & Cooke, 2011) and ‘smart specialisation’ (McCann & Ortega-Argilés, 2013). These concepts emphasize that local actors such as universities, authorities and companies should improve their interactions’ quality to enhance collective innovation capability and, hence, strengthen the weak RIS. My analysis addresses two questions:

- What are the components of the RIS, and what are the main obstacles to innovation activities?
- To what extent do interactions among the different ‘players’ infrastructural and institutional factors influence RIS dynamics?

The case study: Dytiki Ellada

Dytiki Ellada (Figure 2) consists of three prefectures presenting intra-regional differences between the capital of the region (Patras) and the other areas (Region Western Greece (RWG), 2014). The region is considered geographically ‘peripheral’ outside Greece’s metropolitan areas; economically ‘peripheral’; in 2009 ranked 12th of 13 Greek regions and 213th of 264 EU-27 regions; and innovation performance is weak with firms’ patenting activities almost absent (Reid, Komninou, Sanchez-P, &

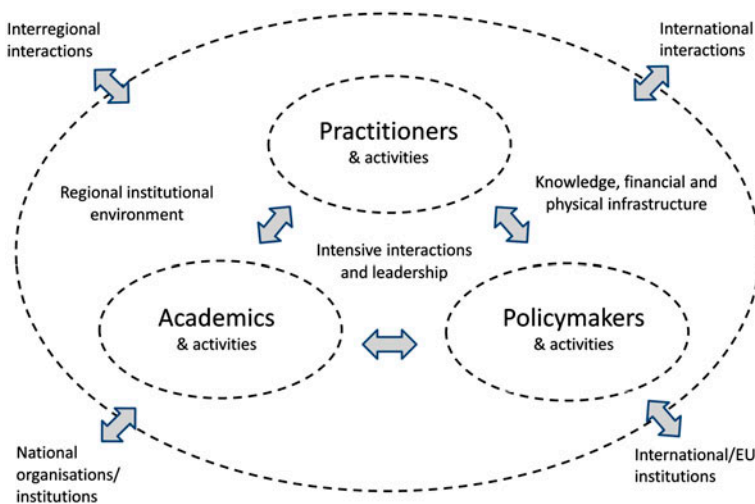


Figure 1. Main RIS elements. Source: inspired by Autio (1998) and Tödtling and Trippl (2005).



Figure 2. Dytiki Ellada, Greece.

Source: Based on http://en.wikipedia.org/wiki/File:Periferia_Dytikis_Elladas.png/.

Tsanakas, 2012). The post-2008 recession already inhibited low levels of both private and public research and development (R&D) investment (Table 1), driving up increased unemployment and ‘brain-drain’ (RWG, 2014).

Developing a strong RIS is a regional priority, but there are few innovation actors, and little knowledge about how they cooperate, making policy development hard. Dytiki Ellada’s KGDS includes three HEIs (about 40 000 students); three public research institutes (150 research staff); and two publicly funded ‘intermediaries’ (science park, incubator unit): their main R&D activities include information and communication technology, chemical, energy, life sciences and pharmaceuticals. Likewise, the KAES comprises fewer than 300 firms (mainly small and medium-sized enterprises – SMEs) in medium-/low-technology segments (e.g. food/distilling, agriculture), and just 30 high-technology businesses. The local/regional policy actors, hereafter, ‘knowledge support subsystem’ (KSS) include the regional government and its relevant agencies, 19 local governments and three chambers of commerce.

I chose a case study approach to examine closely the relationships and bottlenecks within an RIS, analysing the data via social network analysis. I undertook 11 face-to-face semi-structured interviews with senior-level representatives in key organizations in Dytiki Ellada. The interviews covered HEIs, public research centres and local/regional authorities, with the ‘business’ dimension covered through the business associations; chambers of commerce; incubator units; and technology transfer departments.

Table 1. Research and development (R&D) expenditures compared: total intramural R&D expenditure (GERD) by NUTS-2 regions and sectors of performance, 2011 (€, millions).

Region	Business enterprise sector	Higher education sector	Government sector	Private non-profit sector	Total R&D expenditure	Percentage of GDP (all sectors)
Dytiki Ellada	11.32	56.58	4.24	0	72.15	0.75
EU-28 average	163.99	60.85	32.38	2.34	259.55	1.97
Attiki (Athens metropolitan region)	363.33	225.72	174.16	11.99	775.19	0.77
Kentriki Makedonia (Thessaloniki metropolitan region)	44.42	103.98	40.63	1.24	190.27	0.68
Greece (all 13 regions)	485.86	559.53	331.73	14.04	1391.20	0.67

Note: NUTS, Nomenclature of Territorial Units for Statistics.

Source: EUROSTAT (2014).

RIS constituents and obstacles

In terms of *organizations*, Dytiki Ellada has a (relatively) dynamic KGDS; however, weak KAES indicate limited firm demand knowledge-providers' services: some respondents felt a number of potentially 'commercializable' activities were not yet fully exploited. Likewise, there were some overlaps between the two subsystems: some research institutes conducted 'knowledge application' activities through spin-off companies, and some firms undertake 'knowledge generation' within their R&D departments. Simply mapping the key system elements is insufficient to explain how RIS performance, even where indicators for these activities may exist, includes the number/variety of patents, R&D projects or bibliometrics (Bergek, Jacobsson, Carlsson, Lindmark, & Rickne, 2008). Public bodies (KSS) contribute to RIS governance by offering support mechanisms linking up R&D actors to drive regional development. Most interviewees stated a great dependence on national financial streams, suggesting that increased budgetary autonomy may facilitate regional policy action to dynamize their RIS.

In relation to *interaction*, social network analysis revealed a fragmented RIS where substantive links – especially between actors outside Patras – are either missing or of low quality. Poor quality included lacking a technology transfer dimension, strong connections between traditional/non-innovative industry and with primarily *ad hominem* linkages. Little evidence was found of institutionalization of temporary connections between actors, and certainly not the development of shared territorial innovation assets. Although beyond this paper's scope, the social network analysis confirms also limited 'connectedness' of the KAES with other local/regional actors, and international organizations. Interestingly, interviewees reported difficulties in cooperating with national policy-makers, who tended to support innovation activities more in 'metropolitan' regions to increase national R&D performance. Nonetheless, that some government officials and politicians were active in national and European Union networks shaping local (R&D) investments for Dytiki Ellada indicates that local agents were potentially acting beyond their 'authority boundaries' to create new RIS opportunities.

In terms of *institutions*, interviewees' main concerns included 'policy-based' innovation obstacles such as the 'slow' investment processes, the (national) public administration system, and an absence of talent and cluster policies evident in more metropolitan regions (such as Attiki). What were also mentioned by interviewees were the lack of an

‘entrepreneurial culture’, ‘trust’ between actors and ‘commitment’ among local leaders in considering strategic issues. One respondent noted: ‘The challenge [in Dytiki Ellada] is about getting individuals, including politicians to commit to a long-term innovation agenda.’

Likewise, several *infrastructural* barriers were reported ranging from inadequate broadband and research laboratories to the lack of venture capital. In human capital terms, the KGDS is underpinned by highly skilled employees, but the KAES’s limited finance to hire skilled workers affects business capacity to exploit/develop new scientific, technological and creative knowledge. A lack of regional scientists/analysts influences the development of effective innovation strategies, implying a need for a stronger ‘knowledge base’ to create good policies.

Managing ‘interconnections’

The findings above indicate that Dytiki Ellada’s RIS’s low performance results from an ‘interplay’ between four elements, namely weak organizations, inefficient institutions, inadequate infrastructure and loose interpersonal interactions at different geographical scales. The challenge, therefore, is to manage these dynamic relationships to improve the region’s innovation environment. One approach is providing a more ‘systematic examination’ of factors determining these interconnections. Firstly, distinguishing organizations between the knowledge application/exploitation subsystem, the knowledge generation/diffusion subsystem and the knowledge support subsystem highlights each agent’s role in shaping local/regional innovation processes. Both HEIs and local authorities in Dytiki Ellada have limited expertise in bridging academic excellence with firms’ needs, and shifting innovation policy from the supply side to the demand side, respectively.

Secondly, institutions seem to play a decisive role on the RIS’s ineffectiveness. Low ‘regional autonomy’ and other policy-related regulations shape Dytiki Ellada’s systemic evolution, and are paralleled by the lack of an innovation culture, poor trust between actors and missing ‘collective’ leadership. This questions the deeper socio-political and cultural regulatory factors in weak RISs’ development. A distinction around *institutional regulations* for innovation could potentially distinguish between: *policy-based institutions* prescribing how a system/individuals should behave (e.g. investment rules; innovation policies/strategies); *social-based institutions* shaping individuals’ behaviour to promote (joint) interests (e.g. trusting relationships); and *cultural-based* determining agents’ mentality (e.g. collective/entrepreneurial spirit).

Thirdly, specific types of infrastructure may affect the RIS’s capacity to generate ‘outputs’. Firms’ limited finance to hire specialized personnel constrains their ability to exploit new knowledge (output); limited knowledge and physical infrastructure may inhibit the overall creation of innovations, etc. To address this problem, and the static way infrastructures are conceived, talking of *input assets* distinguishes between: *knowledge* infrastructures (scientific/technological/creative knowledge and skills, including policy-making and leadership skills); *physical* infrastructures (telecommunication/transport systems, laboratories); and *financial* infrastructures (venture capital, subsidy schemes, national/European Union programmes).

Fourthly, the lack of ‘interactivity’ among agents indicates that systematization is a complex task, dependent on the dynamics of interpersonal interactions. The term *network* (Bergek et al., 2008) captures indicative measures of formal relationships used, while interactions based on personal connections require interviewing and analysis of

co-patenting/publishing. With RISs are not ‘autarkic’ units uninfluenced by outward linkages, an external dynamics dimension provides a perspective of the RIS’ wider ‘multilevel’ governance environment. Although interactions between local–regional actors in Dytiki Ellada were found to be limited, distinguishing between local and regional level (Pike, Rodríguez-Pose, & Tomaney, 2006) allows the sub-regional (governance) dynamics of a system, often neglected in RIS models, to be captured.

Figure 3 summarizes Dytiki Ellada’s RIS’s main components, distinguishing the key subcomponents that determine and shape interactivity processes. Figure 3 highlights that regional innovation is situated within a broader interconnected system where different innovation-related activities are linked with particular actors, decisions, interventions and individuals who may play ‘multiple’ roles within subsystems (e.g. entrepreneurs as knowledge providers). Such interconnections are also revealed when individual action shapes new (or is shaped by past) ‘institutional regulations’ that in turn shape ‘interpersonal interaction’ and ‘input asset’ elements. These cyclical/reciprocal interactions clearly linked to the dynamics of systems of human actors affect the region’s innovation performance.

Equally, Figure 3 indicates via its arrows that local actors may also play ‘multiple’ roles at different spatial scales, such as when politicians successfully lobby nationally via party structures to win new regional investments. Likewise they may be influenced

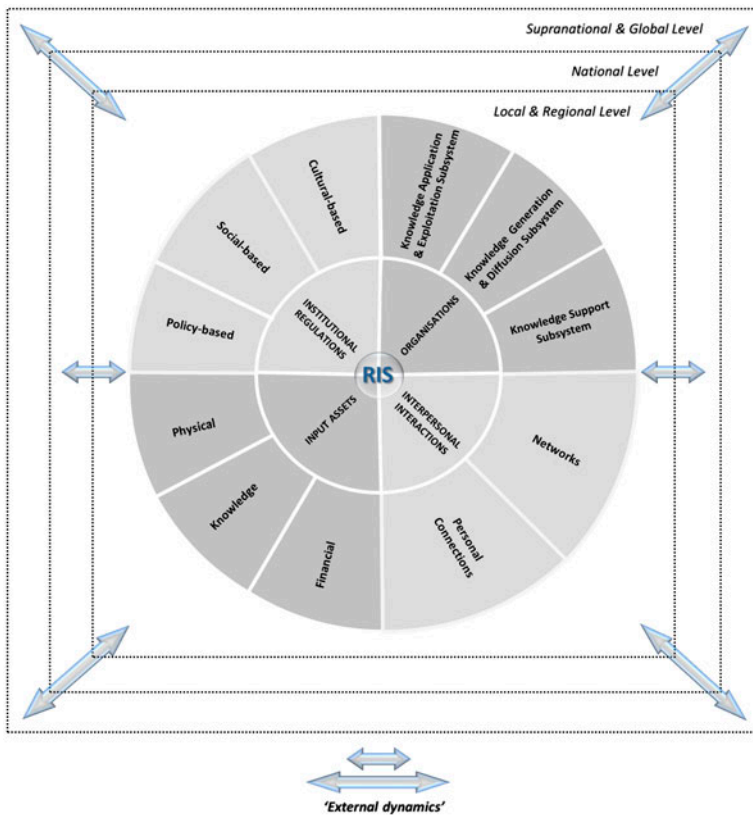


Figure 3. Regional innovation system wheel.

by ‘external’ actors when national policy-makers seek to improve national R&D performance by concentrating scarce investments in metropolitan regions. Interactions mediated through individuals need not necessarily be local, but their local footprint is influenced by their external characteristics. Such ‘external’ networks and other ‘non-local’ relationships (Lagendijk & Oinas, 2005) provide actors with local capacities that allow them partly to reshape wider level networks and systems, and hence to improve the overall RIS.

Conclusions

This paper substantiates the need to address a tendency on focusing attention on what is missing from the innovation system’s structural arrangement typically found in core regions, if less dynamic systems are to be strengthened (Uyarra & Flanagan, 2010). Certainly, acknowledging structural perspectives on RISs is important, but Dytiki Ellada’s case demonstrates that the presence of specific elements alone (such as many HEIs and research institutes) does not automatically encourage innovation activity. Research in weak innovation systems should therefore take into account the interplay between organizations, interpersonal interactions, institutional regulations and input assets, with greater consideration for external dynamics, since agents’ action generates reaction in a number of different geographical scales. Linking back to the constructing regional advantage and smart specialization concepts, the findings reinforce the view that there are no ‘one size fits all’ innovation policies.

A better understanding of less successful RISs requires making a distinction between the different players’ multidimensional roles emphasized in this paper. By adding the ‘knowledge support subsystem’ as a separate RIS component, highlighting its main activity and role (whose ‘value’ is difficult to evaluate without referring systematically to them), this approach invites policy-makers, academics and practitioners to commit towards an innovation-driven regional economy. Perceiving RISs as analogous to organisms being nourished from agents’ choices could improve our understanding about why the subsystems do not ‘automatically’ interact. Nevertheless, my proposed conceptual model (represented in Figure 3) may aid scholars and policy-makers in drawing more specific conclusions and better designing policy responses tailored to the particular innovation obstacles faced by particular RISs (institutional based, interaction based or asset based).

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