European Commission

THE ROLE OF SMART SPECIALISATION IN THE EU RESEARCH AND INNOVATION POLICY LANDSCAPE[1]

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INTRODUCTION

This paper explores the role of regional policy in strengthening the EU's research and innovation (R&I) policy paradigm with a particular focus on smart specialisation. Smart Specialisation Strategies (RIS3) play a major role in stimulating R&I at the regional level in less-developed EU regions and Member States. It can also play an important role in the industrial transition of other regions. Given such an impact, as well as the mobilisation of public and private actors at the regional level, there is now an urgent need to consider what has been achieved and what remains to be done in the future. We will do this in the context of the overall EU R&I policy and will focus on five themes. First, we outline the different principles and types of innovation policies and position regional policy in that context. Second, we re-evaluate the *raison d'etre* and novelty of smart specialisation. Third, we address its achievements to date. Fourth, we discuss the challenges of RIS3 design and implementation. Lastly, we suggest how regional and R&I policies might be better integrated.

1. THE LANDSCAPE OF INNOVATION-RELATED POLICIES IN THE EU

In 2020, regional innovation policy will be 30 years old but before that anniversary it needs to be fully coordinated with other types of EU innovation-related policies. Innovation-related policies are broadly defined policy areas which seek to enhance knowledge generation, absorption and diffusion in the economy (and society) so as to support an innovation-driven economy and to solve major societal problems. For our purposes, it is useful to differentiate five main policy areas:

- Research and development (R&D)-driven innovation policy
- Industrial policy
- Cohesion or regional policy
- Sectoral policies or mission-oriented policies for grand challenges, and
- Policies supporting knowledge transfer and co-generation via various types of innovation-based value and supply chains (see Figure 1).

(1) R&D-driven innovation policy is traditonally focused on the generation of new technology and frontier knowledge with a view to the commercialisation of R&D-based knowledge. This is the major policy area for generating technology-based growth, and represents the key focus of most EU countries and regions, be they laggards or technology leaders. The EU Framework Programme for R&D (Horizon 2020) also follows this approach.

In the EU, the specific types of R&D-driven innovation policy focus either on science and collaborative R&D, or on the commercialisation of public R&D, or on business R&D (Izsak et al., 2014). However, they all assume that the R&D is the major source of knowledge for innovation and that science and technology (S&T) opportunities are the main drivers of technological change.

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(2) Industrial policy is innovation-oriented and focused on the economic impact of innovation activities in a specific industrial context. Hence, its focus is on a variety of factors that jointly generate productivity growth, employment or competitiveness of specific industries. Recent technological, industrial and social changes show that innovation alone does not necessarily lead to job generation or income equality. Hence, innovation policy is not sufficient to address economic and social challenges that emerge from the generation of new innovation activities. In addition, the systems-nature of manufacturing and the challenges posed by the increasingly complex interdependencies across a range of industries call for a new industry perspective in promoting growth and the implementation of innovation.

(3) Regional policy is concerned with developing the potential for sustainable development in all EU regions, in a way that fosters a high level of social, economic and territorial cohesion. Its focus on innovation will vary depending on the economic structure, types of resources and level of income. This calls for place-based approaches "which build on local capabilities and promote innovative ideas through the interaction of local and general knowledge and of endogenous and exogenous actors in the design and delivery of public policies" (Barca, McCann and Rodriguez-Pose, 2012:149).

(4) Although the development of new technologies alone will not solve any of the new grand societal challenges, for some at least the creation and adoption of more effective and appropriate technologies is a necessary part of any solution. Grand societal challenges do not lend themselves to a 'technology-fix' approach as they are multidimensional issues. Rather, they require "system-wide transformation across different types of sectors, and involve partnerships between different actors (private, public, third sector, civil society)" (Mazzucato, 2017: 3). In that respect, "almost all of today's challenges are broader in nature and require efforts that are structured for the long run" (Foray, Mowery and Nelson, 2012:1698). Nevertheless, **mission-oriented R&D programmes and policies** can be of great value "if they are well designed to fit the particular challenge and the context" (ibid: 1697).

(5) With the increasing interdependence of countries, firms and regions in global knowledge flows and global value chains (GVCs), the scope of R&I, industrial, cohesion and mission-oriented policies is expanding by including mechanisms and tools to address the issues of open innovation, trade-in-tasks and increased inter-regional dependence. This has led to the gradual emergence of a new policy area which is specifically focused on the **promotion of innovation value chains**. New initiatives, like Vanguard[3] or INNOSUP[4], are designed to establish inter-regional innovation value chains with a view to aligning regional specialisations and capabilities to expedite technology deployment. The aim is not to recreate entire supply chains within a country/region, but to utilise extraterritorial linkages to enhance a region/country's position in global or regional value chains. This is part of a broader international trend towards GVC-oriented industrial and innovation policies (Gereffi, 2014).

It is important to recognise that none of the five policy areas above is sufficient to maintain a flourishing innovation-based economy. Only when they are mutually compatible and complementary can we expect to see positive outcomes regarding sustainable economic activity and social welfare.

Achieving compatibility and complementarity, however, are not trivial tasks as these areas represent autonomous policy domains, each of which has its dedicated constituency, stakeholders, objectives and criteria for assessment. Their autonomy is reinforced by silo-thinking and governance arrangements which make it difficult to forge synergies between different policy areas. Understanding the limits and potential of each of these areas and how they can mutually reinforce each other is a challenge for public policy. Hence, it is critical to spell out the different principles on which they are based and explore whether there is scope for reconciling these principles in a new and more integrated policy paradigm. Although this does not resolve the issue of how to translate such policy principles into specific policy instruments, it does help us to search for appropriate policy tools[5].

3 http://www.s3vanguardinitiative.eu/

4 INNOSUP-01-2016-2017 Cluster facilitated projects for new industrial value chains; INNOSUP-08-2017: A better access to industrial technologies developed overseas.

5 For specific proposals in this direction see the final section (5) of the paper.

1.1 TOWARDS CLOSER COORDINATION OF THE FIVE POLICY AREAS

In a nutshell, five innovation-related policy domains in the EU are driven by different principles and governance structures and technology-based growth requires closer cooperation among them. From a regional development perspective, closer coordination would require a reframing of the five policy areas so that they can respond to new challenges – the following principles could provide the basis for doing so:

1. *Mainstream R&I policy in peripheral regions needs to promote excellent international research, but only as long as it remains locally relevant research*

A policy of supporting R&D in less-developed regions has created 'pockets of excellence' which are not connected to the local environment. Most regional policymaking is premised on the notion that the knowledge produced in regional R&D systems by universities and public research organisations PRO is relevant to regional industry (Bonaccorsi, 2016). However, very often pockets of excellence have insufficient potential for knowledge spillovers to the regional economy (Reid et al., 2015). Research excellence is necessary but in no way sufficient for regional development, which calls for the differentiation of the role of R&I in peripheral regions. From a regional perspective, the aim is to increase the industrial relevance of the regional science base by linking centres of excellence in science to areas of industrial strength (EC, 2009; Radosevic and Lepori, 2009).

2. *Addressing societal challenges requires 'mission-oriented innovation eco-systems'*

Societal challenges are very different to the challenges faced by historically successful examples of mission-oriented programmes like the Manhattan and Apollo projects. "These programs were aimed to develop a particular technological capability, and the achievement of their technological objective signalled the end of the program" (Foray, Mowery and Nelson, 2012: 1698). Also, societal challenges require the actions of many parties, private as well as governmental, "many of whom may provide little if any R&D funding, yet who will decide whether or not to deploy new technologies created by such initiatives" (ibid). Public funding for societal challenges is only one of several required sources of funding. Also, decisions to deploy new technologies which are competing with existing ones are in the hands of numerous stakeholders with their own interests (ibid).

On the other hand, it is recognised that societal challenges require a redirection in technical change which will not be fashioned entirely by market forces. This requires a reframing of the 'mission' and the nurturing of 'innovation eco-systems'. Demand and technical solutions are to be 'discovered' through interactions by private firms, government bodies and researchers rather than through a clearly defined series of individual projects.

3. *Generic (horizontal) innovation policy needs to be complemented by 'industrial innovation policy' which is sector- and technology-specific, with a view to generating 'micro-innovation systems'*[6]

The dominant approach in EU innovation policy has been the generic (horizontal) type of innovation policy that has been prevalent in the last 30 years. In that respect, smart specialisation represents a departure as it is not about the horizontal approach – but nor is it about the old type of sector-focused industrial policy. Rather, it can be described as a *de facto* 'industrial innovation policy' as it highlights the fact that the area of innovation application (domain) is context-dependent (such as industry, technology and sector) rather than generic. For example, instead of information and communications technology (ICT) as a generic area, industrial innovation policy focuses on the fields of ICT application (e.g. ICT in the fishery industry). In that respect, its level of aggregation could be best described as the 'micro-innovation systems'.

4. *Place-based policies need to link up with GVC policy with a view to building external links as leverage for enhancing endogenous capabilities*

The challenge of place-based policies is that they are too often inward-oriented. Given the dominance of global value chains in the growth and modernisation of less-developed regions, it is of the utmost importance to take this dimension onboard much more explicitly because one of the major tensions we can see today is between place-based activities, such as clusters, and GVCs as levers of modernisation.

The particular difficulty here is how to turn the local production stage of a GVC into a developmental building block (Radosevic and Stancova, 2015). One view is that GVCs are the key to technology upgrading. The argument is that in a globalised context it does not make much sense to build local clusters; instead, being plugged into a GVC is sufficient (Baldwin, 2016). An alternative view is that a country or region should link up only when it can benefit from the linkages. Therefore, regions should first build endogenous technological capability and only then link up. These are mutually exclusive views, both with significant trade-offs.

6 For more on this see Foray (2015) and Radosevic (2017).

The new challenge is how to link clusters internationally/inter-regionally both upstream and downstream. This calls for a new principle that place-based activities need to do more to embrace GVCs as levers of place-based growth. In this way, the diversity of EU regional ecosystems could be turned into an advantage, like the successful German-Central European manufacturing cluster (IMF, 2013). The EU is the appropriate context for such value-chain-oriented industrial and innovation policy.

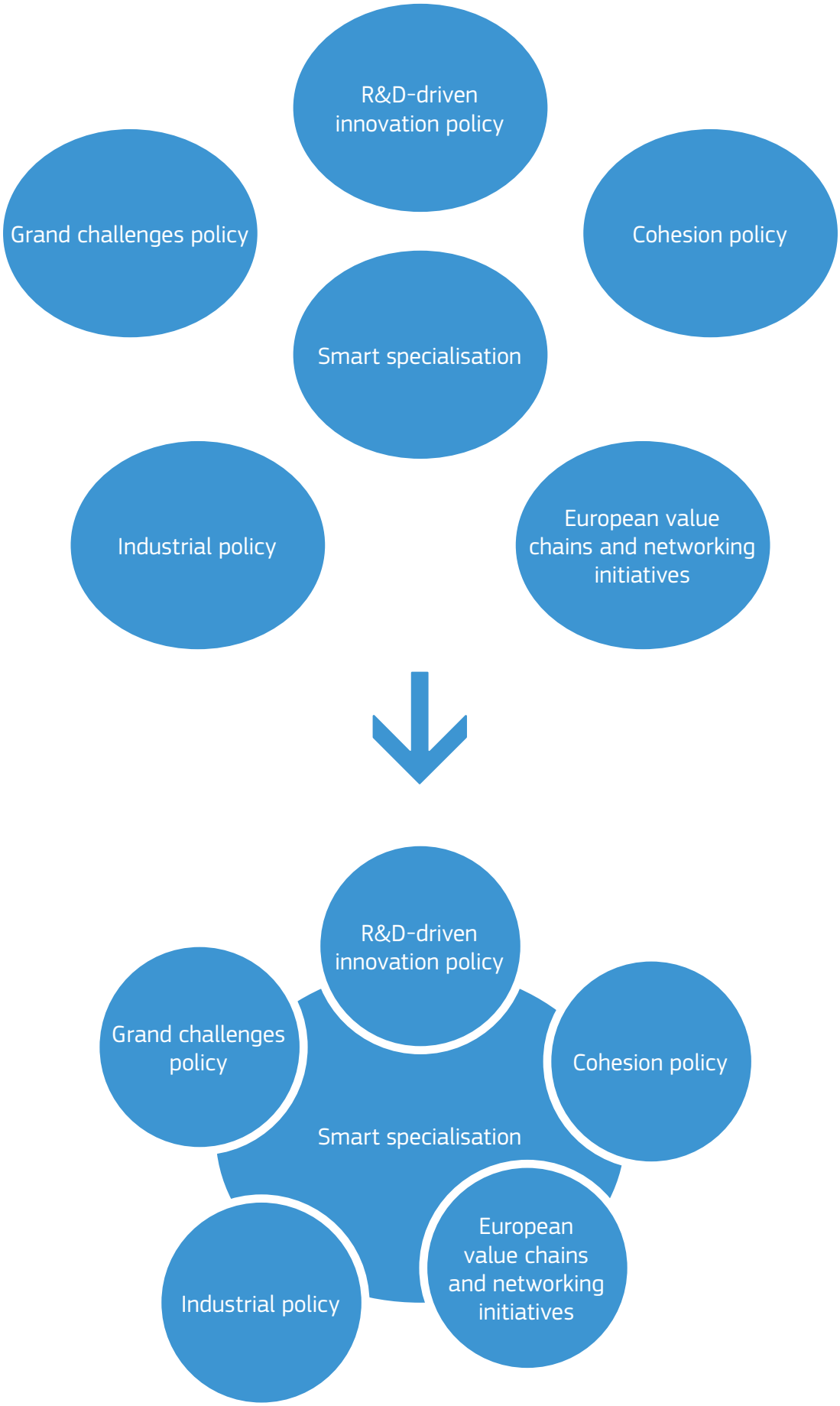
1.2 SMART SPECIALISATION IN THE CONTEXT OF EU INNOVATION-RELATED POLICIES

Strictly speaking, RIS3 should be understood as a policy approach and a policy process rather than an innovation policy in its own right. In other words, it would be more appropriate to define it as a policy process focused on technology and innovation deployment in EU regions which is being realised through other policies (See Figure 1 for details).

As we show below, Cohesion Policy is already an integral part of the smart specialisation process. Some regions and Member States implement RIS3 with national support measures outside their Operational Programmes. Also, RIS3 includes elements of R&I policy, but these are implemented, harmonised and integrated into national/regional R&I policies. Finally, RIS3 has coordinating bodies, but its implementation is distributed across different agencies and ministries which manage RIS3-framed programmes as their 'sector' specific programmes.

This 'meta role' of RIS3 is both its weakness and its strength. Its strength is that it can redefine and reshape other policies by impacting on specific criteria or priorities which these policies need to consider at the regional level. Its weakness is that it may sometimes have quite limited opportunities to reshape and integrate cohesion, R&I, industrial and GVC/networking policies. So, the key challenge is whether RIS3 can play an integrative role among different policy domains. Figure 1 shows illustrates the relationship between RIS3 and five policy domains. The desirable relationship of closely coordinated policy domains stems from the crucial fact that the innovation deployment cannot be effective if left to the uncoordinated and unfocused collections of all these policy domains.

Figure 1: Towards the integration of EU research and industrial innovation policies



2. *RAISON D'ÊTRE* OF SMART SPECIALISATION

One question asked repeatedly over the last 20 years in regional policy discussions is whether there is a better alternative to a policy that spreads R&D investments thinly across several frontier technology and research fields, and as a consequence fails to make much of an impact in any one area. A more promising strategy appears to be to encourage investment in programmes that will complement the country's other productive assets to create future domestic capability and inter-regional competitive advantage. We refer to this strategy as 'smart specialisation' (Foray et al., 2009). Smart specialisation is expected to create more diversity among regions than a regime in which each region tries to create more or less the same by imitation. The latter would almost certainly result in excessive duplication of R&D and educational investment programmes, which in turn would diminish the potential for complementarities within the European knowledge base (ibid.).

In designing a smart specialisation strategy, regions can address a dual problem – that of differentiation and specialisation of their innovation capacities – which is generally poorly dealt with by standard R&I policies.

Differentiation: each region is different with regard to its history, relative specialisations and socio-economic, geographic, demographic conditions, etc. These differences imply that each region can be characterised by specific capacities, potential and opportunities concerning R&I – that cannot be fully fulfilled within the framework of undifferentiated policies, which are limited to the provision of aggregate and generic capacities (education, public research infrastructure and finance). Therefore, each region was invited to particularise itself by identifying these new combinations between regional-specific capacities and regional-specific opportunities that should be explored and developed further.

Specialisation: once such combinations have been identified, there is a need for some kind of 'specialisation', which means nothing other than trying to concentrate resources, agglomerate actors, encourage related projects and provide the new specific public goods in order to advance knowledge and innovation in the selected domains. Essential determinants of the productivity of activities dedicated to innovation are scale, critical mass, and a sufficient agglomeration of actors. It is problems of R&D infrastructure indivisibility, markets for specialised inputs (such as skills or services) and methods of circulating and recombining ideas and knowledge that give large-scale systems – for example urban centres – an indisputable comparative advantage when it comes to innovation. Thus, although each region is well advised to possess this critical mass of innovation actors, medium-sized region will be unable to obtain them everywhere. So, choices must be made, and the specialisation process should be guided by the logic of differentiation and identification of new combinations between specific capacities and specific opportunities.

Differentiation and specialisation are complementary, meaning that each of the two policy objectives reinforces the positive effect of the other which means they need to be pursued together. This will avoid spending resources unproductively on policies which pursue one of the objectives while ignoring the other.

This is the case of the so-called 'another biotech cluster' policy which corresponds to a policy of specialisation without differentiation. Regions want to specialise in the same 'good thing' even if there is nothing in the region in terms of assets and capacities that could justify such a choice. Such sheep-like behaviour creates a situation whereby poorly differentiated regions compete for the same resources. As a result, very few regions will be able to build critical mass in the considered domain and compete successfully at the global level. It might also happen that no winner emerges at all because the potential agglomeration economies will become dissipated when too many regions compete for the same factors.

The mirror of this 'specialisation without differentiation' policy is 'differentiation without specialisation'. In this case, the policy supports isolated and unrelated R&D projects – that is, projects which are quite disconnected from the regional product space and, as such, will not benefit from positive locational effects (such as intra-regional spillovers and synergies, thick specialised factor markets and specific R&D infrastructures). In these cases, isolated projects are likely to fail or at least to be relocated towards other places where similar projects are being undertaken and complementary capabilities are available.

A logical consequence of a policy aiming at both differentiation and specialisation is that choice matters. It is not true to say that because of globalisation and digitalisation most regions have no choice. In fact, it is quite the opposite. For regions wishing to engage in international competition based on innovation, there are always many entry points. This means that a RIS3 is characterised by a higher degree of intentionality and prioritisation compared to more horizontal policies which take care of the most aggregate capabilities and infrastructures.

Where should region X focus? It is not enough to say, "we are good in ICTs". To a certain extent, most regions and countries are "good in ICTs". But such a statement provides insufficient guidance for the prioritisation and selection of potential domains for specialisation. ICTs correspond to a very large domain – including both the complex dynamics of a key enabling technology and the development of a great number of applications in a variety of sector-specific contexts. Thus, the next set of questions should be: "what are the specific ICT capacities and potentials in region X; what are the specific ICT opportunities in terms of sector modernisation and transformation in this region, etc.?". With more specialisation and differentiation comes the need for more granular forms of knowledge and information about capacities, potential and opportunities. One main challenge is to find the right level of granularity to put a smart specialisation strategy into operation. RIS3 provides a collection of tools and concepts to help regions to identify relevant domains at the right level of granularity and implement an action plan within each of these domains.

Thus, the starting point of RIS3 is to recognise that every region is facing challenges and opportunities in terms of innovation that are specific – based on history, existing relative specialisations, economic and social structures. In helping regions to recognise and take advantage of their differences and heterogeneities and translate them into future competitive advantages, the RIS3 approach can yield results that will be superior to past tendencies produced by undifferentiated recommendations of undifferentiated best policy practices – encouraging local authorities to set their sights on doing the same 'good things' to foster the same forms of innovation.

This policy is neither purely bottom-up (because at some point, priorities are chosen by the government) nor totally top-down (because the way priorities are identified and developed in the entrepreneurial discovery process introduces a strong bottom-up component). Rather, it is an intermediate process which aims to enhance entrepreneurial coordination within a framework structured by the government.

We must immediately present three qualifications to avoid certain incorrect interpretations of this approach.

First, this logic of specialisation does not mean that 'all the rest' should be neglected. The most generic and horizontal policies – addressing the general education and R&D infrastructure as well as the key economic institutions related to labour, capital and product markets – naturally remain essential. Furthermore, smart specialisation becomes an additional option that regions are well advised to activate if they are capable of setting up an intelligent process of identifying strategic domains and developing them.

Secondly, the logic of differentiation of innovation capacities, needs and opportunities at regional level necessarily implies that the reality of innovation is not reduced to high-tech and cutting-edge research. Innovation is widely distributed over the whole spectrum of sectors (not just high-tech) and invention processes (not only formal R&D). In most regional economies, this means incremental, cumulative and perhaps informal (without R&D) innovation, as well as the formation of new engineering competences and management capacities – all these being developed mainly in traditional sectors.

Thirdly, the identification of strategic domains and the constitution of strong innovation capacities within each domain do not mean that the aim is a closed economy or regional autarky. The strategy is open. It must take into account and be based on existing potential, part of which, in each region, is composed of international investments and segments of internationalised value chains. It must also seek critical resources and knowledge outside the region that are not available at home.

Of course, specialisation can become a dangerous game – which is likely to generate lock-in effects, monoculture and a tendency towards uniformity that can reduce the range of options and opportunities for future development. Therefore, it has to be smart! The risk of transforming this approach into some kind of central planning exercise based on the usual principal-agent governance model (in which the state decides priorities and the firms execute the plan) is high. This is why the specialisation process needs to be carefully designed to make it compatible with crucial governance principles of decentralisation and experimentalism.

The 'smartness' of the policy is based on the concepts of granularity, entrepreneurial discovery and flexibility (see Annex 1 on the "design principles" which are critical to shift from a specialisation strategy to a smart specialisation strategy).

3. CHALLENGES OF DESIGN AND IMPLEMENTATION

The RIS3 approach represents a major step forward in the history of EU (regional) innovation policy. While we need to build further on these positive experiences, we also need to recognise those aspects that are not yet sufficiently developed. The current approach suffers from several deficiencies, which keep it from being an effective mechanism of structural change and technological upgrading, especially in less-developed regions.

In reality, implementation of RIS3 is proving to be a big challenge for all concerned, especially for public and private stakeholders in less-developed regions. Although there are many examples of good practice in the RIS3 implementation process (see Gianelle et al., 2016), it is clear that the results to date have been decidedly uneven (EC, 2017)[7]. In a public consultation exercise designed to gauge the impact of the RIS3 process, respondents were asked about the specific impact on their R&I support systems. Not surprisingly perhaps, respondents from North Western EU countries perceived a bigger impact than those from Mediterranean and Eastern European countries.

Drawing on extensive empirical studies, the evidence to date suggests that the key challenges revolve around the following issues: (i) the role of institutional context and institutional capacities; (ii) the experimental nature of RIS3 and its governance implications; (iii) diversity of innovation modes and regional challenges; (iv) the role of universities and vocational training colleges in regional ecosystems; (v) knowledge networks and the interplay of geographic and network space; and (vi) social innovation and public-sector innovation (Morgan et al., 2016; McCann et al, 2017). However, in this paper we will focus on the two first challenges.

3.1. THE ROLE OF INSTITUTIONAL CONTEXT AND INSTITUTIONAL CAPACITIES

The institutional context and institutional capacities required for the RIS3 process are assumed as given. However, the evidence shows that this is one of the major barriers to effective RIS3 implementation. Although we can observe that RIS3 works much better in developed regions which have dense networks of actors and resources at their disposal, we cannot conclude that failures in less-developed regions are simply due to poor implementation. The issue of implementation cannot be divorced from the issue of design as they are two facets of the same problem.

The evidence shows that the institutional preconditions differ significantly across the EU-28 countries. In cases where there is more scope for institution building for RIS3, new participatory and coordination practices and experimental policy spaces have not been established. Even when a broad set of actors from business and academia were formally engaged, they did so mostly symbolically. This was particularly the case with the business sector, including multinational companies' subsidiaries. So, weakly organised actors in the context of undeveloped interaction mechanisms (private-private and public-private) led to a range of activities where only existing stakeholders with vested interests were really engaged.

The role of the public administrations in animating and curating the RIS3 process is of major importance. This role can be summarised under the three themes of leadership, knowledge and integration.

The **leadership role** has been especially challenging because, in policy design terms, RIS3 entails a decisive break with the state-centric policy repertoires of previous regional innovation policies (Landabaso, 2014; Morgan, 2017a; 2017b; Gianelle et al., 2016). In the most successful cases, the regional administration has recognised the need for a shift from governmental leadership to collaborative leadership, a shift from centralised to distributed leadership. The transition from governmental to collaborative leadership has been well documented in the case of the Basque Country, where the regional government assumed full control of the RIS3 process at the design stage, when the rules of the game were being established, but relinquished control to other stakeholders (such as industry-led business clusters) when the entrepreneurial discovery process began to define priorities in a more granular fashion (Aranguren et al., 2016). However, governmental leadership continues to play an important part in the RIS3 process because the rules of the game – based on trust, transparency and inclusiveness – must retain the confidence of the regional stakeholders or they will become alienated and recoil from the process.

Public administrations have also experienced a **knowledge deficit** in dealing with RIS3 because, with more differentiation and specialisation comes the need for more granular forms of knowledge. With horizontal innovation policies like R&D tax credits, governments have less need to have a granular knowledge of sectors and industries because such policies are thought to be sector-neutral (although they are not in practice, of course). However, the more specialised the innovation strategy, the more granular the knowledge that is required of government and its partners.

7 See EC (2017) 'Strengthening Innovation in Europe's Regions: Towards resilient, inclusive and sustainable growth at territorial level', Commission Staff Working Document, accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 18.7.2017, SWD(2017) 264 final {COM(2017) 376 final} http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017SC0264&from=EN

One dimension of the knowledge deficit involves poor capacities to collect data and generate evidence about innovation, capabilities, entrepreneurial activities and competitiveness at the right level of granularity in regional economies. Such a deficit is an issue since the process of setting up RIS3 priorities is based on matching capacities and potential, on the one hand, and opportunities to transform structures on the other hand. This requires having the right information and knowledge to analyse this potential and opportunities. There is a challenge here for regional public administrations as well as for academic research in the fields of regional innovation systems and regional studies.

One of the ways governments are trying to redress the knowledge deficit is through public-sector innovation labs which allow public bodies to do what they have not been required to do in the past – namely to engage in innovation policy experiments to discover what works, where and why. Although these institutional innovations have been pioneered by the likes of the innovation foundation Nesta in the UK, there are now more than 300 innovation labs around the world and the public sector is a major player in many of them. These innovation policy labs are in the vanguard of a new public policy paradigm based on a shared and iterative model which is both bottom-up and top-down, where learning-by-doing is part of a co-production process of fast experiments, measurement, rapid feedback and scaling what works. In short, innovation policy labs, while not addressing the data deficit mentioned above, can help governments and the public sector to develop more granular forms of knowledge and design and implement policies that have a greater social and economic impact (Mulgan, 2014).

Policy integration is a third area where public administrations can make a big difference, and one of the biggest challenges has been how to integrate public procurement into the RIS3 policy mix. Sub-national public bodies – regions, cities and local municipalities – account for a significant share of the public procurement market in the EU, a market that accounts for nearly 20 % of the Union's total GDP. However, they struggle to use the power of purchase to fashion lead markets for innovative products and services. There are many reasons why public bodies have failed to tap the potential of public procurement, including a lack of whole-life costing skills within public bodies, weak public-sector leadership, risk-averse behaviour in the face of legal challenge, and austerity-era policies that have curtailed public-sector budgets (Morgan, 2017b).

Despite these barriers, public procurement is one of the 'sleeping giants' of regional innovation policy because it has the potential to furnish a powerful demand-side impetus to innovation and growth providing it is integrated with other RIS3 policies, many of which consist of supply-side measures, such as the upgrading of skill sets or the creation of technology support centres, etc.

The institutional base on which RIS3 is predicated is deemed to be lacking or missing in many parts of the EU-13 bloc. For example, the entrepreneurial discovery process implicitly assumes a mature institutional framework, which is hardly realistic in the case of regions with less-developed R&I systems. State-of-the-art regional development theories highlight the important role of informal institutional factors, such as trust, responsibility, professionalism, partnership and shared leadership for regional development. This contrasts sharply with the underdeveloped institutional framework in regions with less-developed R&I systems, which can be described as being over-bureaucratic, over-politicised, non-responsive, non-transparent, lacking strategic vision, with widespread rent-seeking behaviour and, perhaps most important of all, low trust among the key actors. Moreover, the public administrations in less-developed regions tend to have a risk-averse or 'play it safe' mentality, which limits the room for experimentation, manoeuvre and flexibility in decision-making and public initiatives. Also, public servants in regions with less-developed R&I systems tend to frame the interests of public-sector bodies, private firms and the academy in zero-sum terms. Consequently, many regional authorities often lack a unit or department that is responsible for liaison with local businesses and universities. Therefore, they know little or nothing about the needs and challenges of the stakeholders who are most crucial to the entrepreneurial discovery process, confirming the unreality of the triple helix model in many less-developed regions (Blazek and Morgan, 2018).

3.2. THE EXPERIMENTAL NATURE OF SMART SPECIALISATION AND ITS GOVERNANCE IMPLICATIONS

As we saw in section 2, the RIS3 process must be carefully designed to make it compatible with crucial governance principles of decentralisation and experimentalism. In reality, however, the implementation of RIS3 is caught between the experimentalist nature of its policy design and the political requirements of implementing the policy. The actual implementation shows that the experimental nature of RIS3 is stymied by political and administrative requirements of public administration and funding rules. While local and regional administrations are often thought to be unable to manage a complex process of implementation, even though there is a wide array of support mechanisms (including 100+ experts and the S3 Platform), there is still an urgent need for the Commission to redesign its procedures and regulations so that they are better aligned with experimentalist policy paradigms like RIS3. The issue of weak administrative capacity has been recognised and has led to a truly unique degree of Commission support

deployed via 100+ experts, the RIS3 Platform, the World Bank and the Organisation for Economic Co-operation and Development (OECD) to help regions with the RIS3 process and allow them to design the policy mix tailored to their needs and potentials. However, the degree to which this led to a culture of dependency and substitution rather than complementing local efforts remains an open question.

The experimental nature of RIS3 underlines the importance of policy flexibility, which means the ability to revise priorities, discontinue some and integrate new ones as success, failures and surprises that are generated by the entrepreneurial discovery process within each of the RIS3 priorities. It seems that the Commission's current operational and administrative processes formally allow for such flexibility so that the issue is more about an internal reluctance to change the pre-existing policy-support mechanisms as radically as would have been necessary in light of the experimental nature of RIS3[8]. On the other hand, RIS3 is also a microcosm of a much wider problem of over-regulation, provoking urgent calls for simplification because, as the High Level Group on Simplification complained recently:

"*Over the years, to counter the criticism and eliminate mistakes, more rules have been added at European and national levels which, rather than helping, are now undermining the trust in the ability of beneficiaries, regional and national administrations to manage and use the funds in a sound and efficient manner. The volume of rules for Cohesion Policy alone, including more than 600 pages of legislation published in the Official Journal (more than double that in the period 2007-2013) and over 5 000 pages of guidance, has long passed the point of being able to be grasped either by beneficiaries or by the authorities involved*" (High Level Group, 2017:2)[9].

The experimental nature of RIS3 is also stymied by the undeveloped institutional contexts in less-developed EU regions and countries. Those standards and practices seem to be inimical or difficult to adapt to the experimental nature of the new industrial innovation policy process. In that respect, RIS3 still represents a case of 'incomplete' new industrial innovation policy (Morgan, 2017b).

RIS3 projects are usually designed as a series of separate individual projects rather than a portfolio of related and complementary projects. This may lead to a series of successful individual projects which, however, lack critical mass and synergy effects. When taken jointly, they may not result in the emergence of innovation eco-systems or of micro-systems of innovation and will have limited mezzo or macro effects.

The experimental nature of RIS3 requires 'diagnostic monitoring' instead of conventional interim or end-of-project evaluation. Diagnostic monitoring or problem-solving monitoring is "the systematic evaluation of the portfolio of projects to detect errors as each of the specific projects evolves and to correct the problems (including the weeding out of inefficient projects) in light of implementation experience and other new information" (Kuznetsov and Sabel, 2017). While it may be too risky to organise the entire process on the principles of experimentalist governance, it would be reasonable to expect that some portion of funds is devoted to funding new areas based on this principle. In a nutshell, smart specialisation, as it has been applied so far, seems to have reduced experimentation only to the initial priority selection process, while implementation is run as a conventional public funding programme. It seems that "the current ESI Funds' management arrangements remain dominated by a traditional public agency/management authority model that leaves little room for more experimental and strategic initiatives" (Reid and Maroulis, 2017).

Experimental governance raises particular challenges for less-developed regions. First, a concerted effort to address the key bottlenecks that hinder business activities would represent a huge step forward in many of these regions. Such a practical and problem-solving approach would demonstrate – especially to local entrepreneurs – that the commitment of engaged stakeholders signals a new process of engagement rather than a one-off event required to comply with EU rules and regulations. Second, the attention of key stakeholders should focus on identifying key strengths (or comparative advantages) of the region in question, which should form the basis for a more focused discovery process in the next phase. Third, as regards the priorities of economic specialisation, it should be emphasised that there is a fundamental difference between the very broad vertical priorities that have been selected in regions with less-developed R&I systems and the more granular domains of economic specialisation advocated by the RIS3 guidelines (Blazek and Morgan, 2018).

In other words, even though vertical priorities have been selected in the less-developed countries and regions, this should be considered as a point of departure for a much more focused and granular entrepreneurial discovery process rather than a final result. The main argument here is that the challenging process of searching for new domains of economic specialisation will depend on the specificity of the regional context. In regions with less-developed R&I systems, the entrepreneurial discovery process cannot assume the mature collaborative working arrangements that have evolved over many years in more advanced regions. In less-developed regions, therefore, the initial effort should aim to address major deficiencies of a systemic nature, like the relative absence of mutual understanding and system trust among the regional stakeholders (Blazek and Morgan, 2018).

8 We are grateful to Katja Reppel for drawing our attention to this issue.

9 However, it should be noted that other areas of policy, including H2020, are equally loaded with rules and regulations.

4. TOWARDS BETTER COORDINATION OF SMART SPECIALISATION AND MAINSTREAM R&I POLICY

Section 3 explored some of the 'internal' challenges of RIS3 as a policy framework. However, given that it is not a policy instrument per se but a policy approach and process, its success depends not only on its 'internal' improvements but equally on its coordination with four policy areas that serve as its implementation instruments.

As we have seen, our current knowledge of RIS3 suggests that it works quite well in advanced EU regions, where 'thick networks' of implementing organisations already exist. Its real challenges are in its application in the so-called 'periphery' of the EU (for comparative evidence see chapters in Radosevic, 2017). To address these challenges, we need much better coordination and linkages between smart specialisation, cohesion, industrial and value chain policies. The imperative of innovation deployment which is the main rationale of smart specialisation as a policy framework requires both the breaking down of excessive isolation of different policy areas, as well as closer coordination. Each of the four policy domains needs to consider how links and synergies can be created with other policies as the way to address new challenges. The links should lead to new types of instruments which go beyond the existing administrative and organisational boundaries. This is of paramount importance as the systemic nature of new challenges requires policy responses which cannot be framed within the existing policy areas or without straddling the current policy boundaries.

Stakeholders' expectations and our understanding of the challenges have moved faster than the policy instruments. These challenges include the rapidly changing nature of innovation which is currently driven much more by open innovation processes; the spread of user-driven innovation and the diversification of innovation modes; and the broadening of types of knowledge that matter for growth and productivity beyond purely scientific knowledge etc.

These developments have already been recognised, and responses are emerging, although not in a strategic or coordinated fashion. For example, RIS3 policy and practice need to embrace open models of innovation by R&I policies as a way of capturing gains that can be generated only in inter-regional and international innovation chains. It must also be recognised that industrial policies need to be more specific in addressing the binding constraints to growth and innovation which cannot be addressed through the horizontal and regulatory type of industrial policies alone.

Although RIS3 is still seen as an instrument of Cohesion Policy – to enhance the capacity of regions to deploy R&I funds and alleviate the regional innovation paradox – RIS3 should rather be seen as a place-based innovation process that is multi-scalar in character in that it embraces supra-national, national and sub-national governance levels. When RIS3 is framed in these larger and more capacious terms, it is easier to appreciate how it might contribute to other innovation-related policies and not just to Cohesion Policy.

In this perspective, RIS3 lies at the intersection of research and innovation, industry and cohesion policies in the EU. It is important to recognise its place in the spectrum of these policies, and to explore how can we improve and integrate these policies. Figure 1 illustrates that these policies are currently largely independent of each other, so much so that there is an urgent need for better coordination.

Addressing the RIS3 challenges outlined here should generate greater impact regarding innovation capacity and growth. The proposed approach is to build on what has been achieved to reinforce the approach post-2020, as well as addressing the implementation weaknesses and the potential mismatch between policy ambition and policy capacity to delivery.

By itself, however, this will not suffice unless RIS3 is better integrated with other EU and Member State policies. This would require spotting existing and missing linkages and identifying potential synergies among R&I, cohesion, industrial and value chain policies and their better integration with the RIS3 approach.

Furthermore, the sources of competitive advantages are inextricably linked to how regions link up or how they can use linkages to leverage their growth. This has led to various new initiatives like inter-regional networks or bottom-up initiatives (such as Vanguard) which are responses to the challenges of globalisation and the need to generate synergies and complementarities among actors and regions at scale. In short, this calls for the much better integration of value chain policies with place-based innovation policies. It also requires a finer appreciation of the role of MNCs as drivers of innovation (Crescenzi et al., 2014).

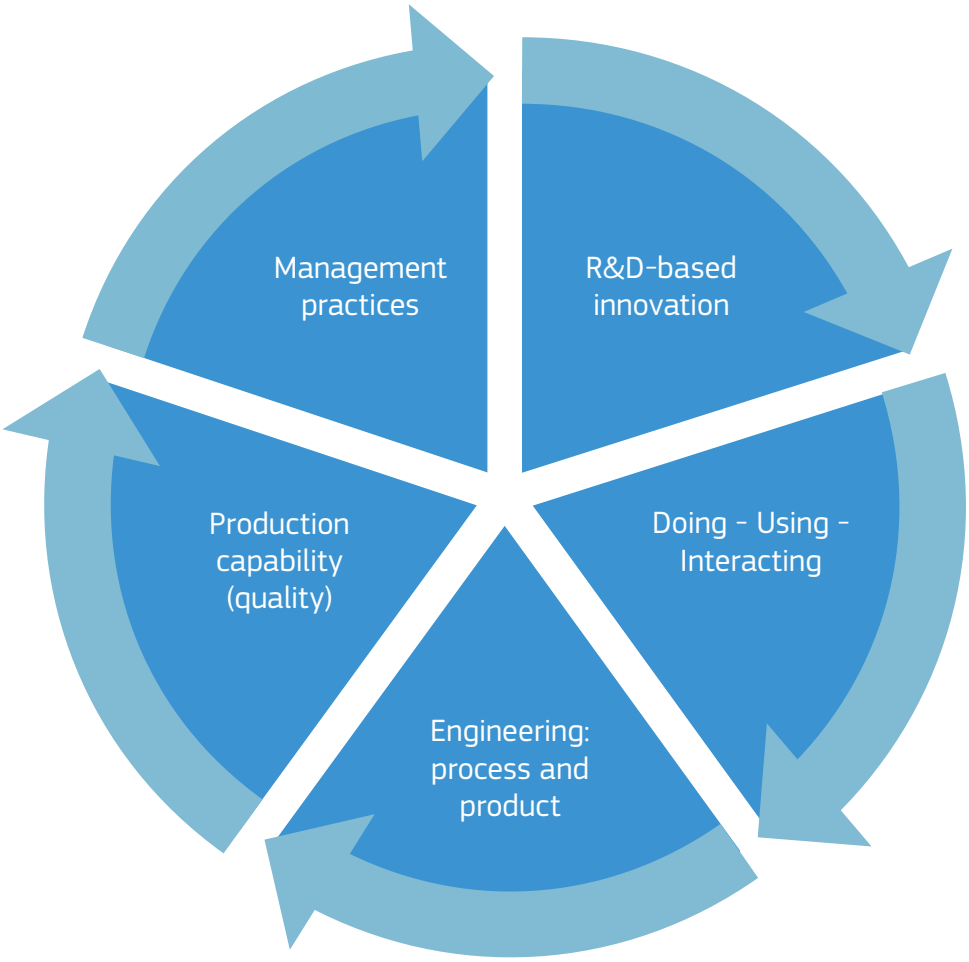
Smart specialisation should continue to occupy a prominent place in the European innovation policy landscape. Its central role in Figure 1 should be seen from the perspective of its principal role in the deployment and diffusion of new technologies. Although the generation of new technology tends to command most attention, the challenge of diffusion and deployment is equally if not

more important and should not be underestimated. New technology does not arrive in a 'technology box' which simply needs to be unpacked. On the contrary, diffusion and deployment involve the development of applications, the reconfiguration of tools and artefacts to new socio-technical contexts and industrial environments, as well as the formation of new competences, skills and management capacities to handle the new technologies. The diffusion and deployment of new technologies need complementary investments which are often major bottlenecks, especially for complex modern technology that requires reorganisation of the process that will use it. Furthermore, the diffusion process enhances an innovation via the feedback of knowledge about its operation under varying conditions and across different users, knowledge that is often used to improve it (Hall, 2004). The most obvious example is extensive user-driven innovation activities like user-driven software development.

RIS3 is *de facto* the most important policy framework in the EU to support the place-based deployment and diffusion of new technologies, especially in the less-developed countries and regions. The deployment and diffusion of new technologies usually take place in a specific regional context in which several modes of innovation operate. Figure 2 below depicts the region as the locus of multiple modes of innovation broadly defined.

A region is a place not only of R&D-based innovation but also a variety of 'doing-using-interacting' type of innovations which are experience-based (Lorenz and Lundvall, 2006). The growth and productivity of EU periphery regions rest on a variety of other activities which are not innovation activities in the narrow sense or are incremental innovations (product and process engineering improvements). Regions are also places where a variety of productivity-enhancing activities take place, such as quality-related activities, and other like management practices focused on production capabilities (Bloom and Van Reenen, 2010). However, these activities are often much more important for productivity growth, competitiveness and employment in less-advanced regions.

Figure 2: Regions as the locus of multiple modes of innovation



- By and large, EU regional innovation policy is focused on R&D-based innovation and does not address alternative modes of innovation and productivity-enhancing activities[10]. The doing – using – interacting mode of innovation is important both in developed and less-developed regions, yet it is a much-neglected mode. The productivity of EU peripheral regions is driven much more by a variety of non-R&D activities. The three most important are: engineering, production capability and management practises. However, it is important to recognise that these activities are mutually complementary and cumulative. Successful firms are those that couple R&D-based and DUI modes of innovation. Developed production capabilities and engineering improvements (incremental innovations) are prerequisites for more ambitious innovation efforts. Improved management practices are also strongly correlated to firms' and economies' level of productivity. So, regional innovation policy cannot be reduced to R&D-based innovation but needs to recognise and address the diversity of innovation modes and productivity-enhancing activities in the region. Hence, the links between RIS3 and research policy in peripheral regions need to be complemented by a variety of other equally important sources of innovation and productivity growth (e.g. user-based innovation, process and product engineering, organisational productivity enhancing improvements, etc.).

Below, we focus on the relationship between R&I policy in the EU from a regional policy perspective, drawing on the lessons learnt over the last five years of designing and implementing RIS3 strategies.

Table 1 summarises the major challenges in integrating RIS3 and R&I policies. The core of the so-called 'European paradox' concerns the implementation gap. This stems from the inability of H2020 to close the implementation gap without closer coordination with innovation deployment and diffusion activities.

The implementation gap operates with slight differences in each of the H2020 three pillars, and each of these represents a specific challenge as to how the RIS3 approach can address it. Of all these challenges, in the past, the question of 'scientific excellence' posed the biggest challenge to policy integration because it is the paramount criterion in R&I policy. However, this criterion is necessary but not sufficient in the regional context unless it can be coupled with the local relevance. So, 'excellence' in the regional context would either need to give equal weight to local impact or explicitly demonstrate that there is a potential user of newly generated knowledge. From the perspective of innovation deployment, scientific excellence that does not generate local impact becomes irrelevant from the regional stakeholders' perspective, irrespective of how relevant it seems from the EU perspective.

Table 1: The challenges of integrating RIS3 and R&I policy in the context of the innovation implementation gap

	H2020 aims to generate new scientific knowledge, leading-edge industrial technology solutions, and technical and systemic solutions to societal challenges		
Horizon 2020	**Excellent science**	**Industry leadership**	**Societal challenges**
	Implementation gap		
Challenges of implementing H2020 in a local, regional context	Excellent science but not necessarily directly locally relevant, despite possible knowledge spillovers effects. Multiple but disconnected individual projects.	Islands of industrial technology excellence which need to be locally enlarged and networked for more spillover effects and value-chain integration.	Pilot solutions which require further local adaptations to be implemented. Solutions should be better aligned to the demand/ purchasing power on the ground.
	Smart specialisation is about innovation deployment		
	Implementation gap		
Challenges of RIS3 implementation	Supporting world-excellent but locally relevant 'pockets of scientific excellence'; and fostering synergies among projects in the same region. Connecting these pockets with existing science networks.	Enlarging and networking 'islands of innovation excellence' into the local economy. Fostering industrial transition towards sectors with higher added value and other value chains. Improving local innovation eco-systems.	Adapting and implementing pilot solutions to the local context. Mobilising demand-side instruments and strengthening participation of civil society and user groups in the entrepreneurial discovery processes.

10 It is true that more funding goes to TO3 - SMEs competitiveness than to TO1 - Research and innovation. However, technical modernisation of SMEs through sole purchasing of new equipment does not necessarily lead to own innovation activities and higher productivity.

5. FIVE KEY ISSUES FOR THE FUTURE OF R&I POLICY

Drawing on this conceptual thinking, we have identified five key issues that need to be addressed if the EU is to secure the benefits of a more integrated and more effective R&I policy. The following proposals are fully compatible with the joint principles of R&I and regional policy outlined earlier in section 1.

Key issue 1: in what ways can the R&D Framework Programme (currently Horizon 2020) and Cohesion Policy best contribute to strengthening industrial competitiveness?

It is important to recognise that H2020 involves much more than scientific excellence (see Table 1). Equally, it should be recognised that there are inherent limits to the extent to which technology-driven R&D and technology programmes can lead to deployment and diffusion without the active involvement of users. The challenge is not just in 'the holy grail of technology commercialisation' but equally in the unavoidable need for local adaptations, modification and user-driven innovations. This is most obvious in the domain of societal challenges where any pilot solution requires a variety of local system adjustments and changes. Equally, technology deployment and diffusion which is reduced to supporting the purchase of new machinery and equipment or services without acquiring a capability to innovate will not lead to long-term growth and competitiveness. So, the most effective way to improve innovation deployment and diffusion is by extending the current criteria of both H2020 and programmes under the RIS3 umbrella. This would mean that in some programmes H2020 could not only support scientifically excellent projects but also those that need to be locally relevant, i.e. locally deployed. On the other hand, projects approved within the RIS3 would need to move beyond just deployment of new technologies to develop criteria which must include the development of innovation capability, often including R&D capability.

Key issue 2: what are the respective roles of Cohesion Policy/smart specialisation and Horizon 2020 regarding their innovation support?

In simplified terms, H2020 is about supporting the linear R&D push model from research to innovation, where the major actors are scientists and technology entrepreneurs focused on the issues of commercialisation. In spatial terms, the focus is on a critical mass of interactions in high-tech areas driven by knowledge hubs (centres of excellence). Innovation efforts are directed towards breakthroughs and new-to-the-world innovations.

On the other hand, the Cohesion Policy/smart specialisation focus is on systemic issues related to technology absorption. The policy focus is on enhancing cooperative activities among a variety of actors involved in local innovation ecosystems (cf. clusters), where the aim is to generate synergies, interactive learning and incremental innovations.

However, we consider this dichotomous stylised picture to be a somewhat caricatured picture of reality, even though it broadly corresponds to the main orientations of two policy domains. Putting it simply, although scientific research is neither necessary nor sufficient for innovation to take place, it remains very important. As shown by Kline and Rosenberg (1986), the initiating step of most technological transformation processes is typically design rather than research. This perspective has been adopted by H2020 through two pillars: industry leadership and societal challenges, which are not driven by the same logic as a pillar of scientific excellence. The industry leadership pillar *de facto* takes fully onboard the crucial role of exploratory and advanced development for manufacture in generating new advanced technologies. Also, the third pillar recognises the variety of sources of innovation, including social innovation, and the systemic nature of social challenges. In addition, regional innovation policy in the leading regions may be a *de facto* adjusted version of H2020 R&D-driven policy.

On the other hand, in less-developed regions innovation is most often non-R&D-driven and is focused on non-R&D modes of innovation, as depicted in Figure 2. The key difference is not only the nature of innovation but the ***imperative of implementation*** which figures much more strongly at the regional level. This does not mean that this is not an important issue for H2020 policies, but the take-up of new technology and innovation deployment becomes an issue only after new knowledge or technology has been generated. In the regional context, the first policy imperative is technology deployment – if that requires R&D and innovation activities, these are then conducted as one of the activities, but not necessarily as the core activity. While the overall approach of R&I policy is about 'pushing technologies', from a regional perspective the driving motto is 'do whatever it takes to solve the problem'. The tension between these two approaches would need to be recognised and managed. For example, the issues of skills and training, institutional and organisational changes, etc., may often be much more important for effective implementation at the regional level than the R&D.

Key issue 3: should the R&I divide in the EU be overcome through investment, reforms or other actions?

What needs to be recognised here is that differences in economies' R&D and innovation intensity are closely related to their income differences, variations in sectoral structures and policy decisions. Elsewhere (Izsak and Radosevic, 2016) we show that recently R&I policies in the EU have operated as a factor of further divergence between the EU core and southern countries, and as a potential factor of convergence between the core and central-east. However, even if policies are similar, we note differences in R&D intensities due to variations in levels of development and structural differences. On the other hand, differences in frequency of innovation activities are less pronounced, while differences in the nature of them are significant. We show elsewhere (see Radosevic, 2016) that the nature of innovation activities in the EU-south and east is much more about tangible investments and much less about intangible investments. Also, science-industry links are no less important in the EU periphery than in the EU core but are different, being much more downstream in nature. This reflects the different drivers of growth between the EU core and periphery regions. In the latter countries and regions, R&D is much more important with respect to absorptive capacity than as an innovation generator.

The R&I divide cannot be overcome by only targeting increases in R&D spending without considering country- and region-specific drivers of growth. For example, the R&D policy by itself will not suffice to generate positive effects on growth in the absence of widespread technology diffusion and innovation deployment. In addition to a favourable economic climate, this would require much better coordination among the four policy areas depicted in Figure 1. Boosting only public R&D in peripheral regions may exacerbate the so-called European paradox by generating increased R&D outputs alongside weak R&D demand that does not match local needs. A much more helpful policy mix is one that addresses the variety of innovation modes in the regions (Figure 2) and which focuses on innovation deployment and technology diffusion. Regional smart specialisation strategies can help identify these potential (mis)matches between local strengths and market opportunities.

Such strategies should embrace not only R&D-intensive sectors but also low-tech or traditional sectors (agri-food, forestry, tourism and textiles) that evolve through incremental innovation. So, the key issue becomes not the R&D gap per se but the capacity of regions to facilitate different modes and types of innovation activities. These require different policy approaches and different combinations of bottom-up and top-down approaches to innovation policy. In that respect, there are no ex-ante recipes, but they would need to be region- and country-specific.

Key issue 4: who is responsible for overcoming the R&I divide?

Regional economies are more porous than ever before. The fact is that regional production systems in many peripheral EU regions have become disintegrated and traditional locally integrated regions have declined. Regional industrial ecosystems have been eroded and we face the challenge of how to rebuild them. However, a consensus is emerging that, in the context of global value chains, place-based policies alone are an insufficient response to this structural issue. On the upstream side, R&D networks, and on the downstream side, supply chains have the potential to be used as leverage mechanisms of regional innovation. However, this challenge is too big for purely regional solutions. So, there is a strong need for multi-level governance policy coordination and deeper inter-regional collaboration (Morgan, 2017a).

In addition to H2020, a variety of tools and the programmes currently support inter-regional collaboration in R&I activity. However, most of these are upstream-oriented, and there is a dearth of downstream initiatives. Similar to the Vanguard Initiative, which is a bottom-up initiative for developed regions, there is a strong requirement to facilitate such networks within less-developed regions. RIS3 should be used to help technology upgrading through and in cooperation with global value chains. This can be done by: (a) facilitating the creation of new value chains suited to regional R&I and manufacturing or service capacities in less-developed regions; (b) by expanding access to existing value chains to marginalised regions; and (c) assisting firms/regions in the existing value chains to 'climb the ladder' or move from process to product and value chain upgrading (Radosevic and Stancova, 2016). All three paths would require support at both the EU and regional levels. In a nutshell, regional value chains should become a new focus for investment planning by the European Investment Bank and the ESI Funds. RIS3 thematic platforms which have been developed to promote collaboration between businesses and researchers along the value chains across the EU should be considered as a necessary but far from sufficient step in this direction[11].

11 A right step in this direction is formation of eight inter-regional partnerships (http://europa.eu/rapid/press-release_IP-17-5108_fr.htm) and structural support action for five regions in industrial transition (https://ec.europa.eu/commission/sites/beta-political/files/support-action-coal-carbon-intensive-regions_en.pdf).

Key issue 5: what are the implications of this analysis for future R&D Framework Programmes, European Structural and Investment Funds and other EU instruments?

Future Framework Programmes would need to evolve further along the path pioneered by H2020. The next logical step would be to open them to funding from a variety of modes and types of innovation activities. This should expand towards funding beyond applied research and exploratory development towards advanced development, i.e. prototype in manufacturing. In short, it should extend its reach towards the issues of implementation and go beyond pilots and prototypes.

European Structural and Investment Funds (ESI Funds) should increasingly focus on a broad range of actions linked to improving the performance of regional innovation ecosystems (both in terms of their institutional strength/governance and insertion in GVCs as well as specialisation/diversification). Thus, RIS3, while maintaining its strong regional innovation focus, should become a structuring mechanism for a broader range of transformational processes, such as the digitisation of the economy, measures to develop SME competitiveness, and entrepreneurship and internationalisation. In particular, the ESI Funds should further embrace the emerging trend towards inter-regional collaboration and go beyond the existing Interreg format. They should expand existing initiatives, like INNOSUP-01-2016-2017 cluster-facilitated projects for new industrial value chains, and INNOSUP-08-2017, providing better access to industrial technologies developed overseas. Based on the experience of the Vanguard Initiative, the ESI Funds should embark on facilitating bottom-up initiatives of a similar nature but focused on downstream parts of the innovation value chain which involve actors from both developed and less-developed regions. The aim would be to create networks of public-private infrastructures (services) oriented towards technology upgrading via value chains in less-developed regions. The experimental nature of this process would require further adjustments of RIS3 methodology which should integrate technology upgrading via GVC into its framework.

Future R&D Framework Programmes should continue to contribute to a more integrated R&I policy paradigm, notably by 'spreading excellence and widening participation' actions. Although specific forms of this capacity-building initiative may need to be modified, core actions like the Horizon 2020 "Teaming" and "Twining" actions should be expanded significantly. Such measures are essential transnational supply-side mechanisms which are required to develop capacities for R&I excellence. However, it would be necessary to extend their scope towards more downstream activities which go beyond scientific excellence and expand to technology (engineering) excellence. This is consistent with our main proposal to extend the scope of future Framework Programmes to enable the EU to tap into the potential of a more integrated R&I policy.

ANNEX 1 – PROCESS DESIGN FOR A RIS3

The selection of priorities is a complex process which must be carried out not at sector level but at the level of activities that transform these sectors or establish new ones. This level – known as transformative activities – is thus one of intermediate granularity, finer grained than sectors but coarser grained than individual entities. For example, a 'correct' priority should not be the footwear industry as a sector but rather the development of flexible manufacturing technologies for the footwear industry. This is the level that best reveals the domains in which a region should position itself. This identification of transformative activities is based on a process of interactions and dialogue between the government, public sector and private sector, backed up by evidence concerning the regional economy and knowledge of the region's entrepreneurial activities and capacities. All of these contribute to the selection of a small number of unique combinations between existing capacities and new opportunities for transforming regional structures. And finally, the specialisation domains thus identified must not be seen as unalterable structures but rather as pioneering ventures and experiments.

Entrepreneurial discovery essentially characterises the concretisation phase of these priorities. Within the framework of each one, it is a question of implementing programmes to stimulate collective actions and foster coordination between innovation actors, thanks to the deployment of fairly standard instruments and mechanisms (subsidies for collaborative projects, setting up of specialised service platforms, launching of training programmes when the specialisation domain requires specific new competences, liaisons with extra-regional resources, etc.). We refer to entrepreneurial discovery as this phase comprises a crucial learning dimension regarding the real possibilities of development and structural effect offered by the transformative activities. There are successes, failures and surprises. The maximisation of informational spillovers created by this discovery phase is a key point that distinguishes entrepreneurial discoveries supported by a public policy, as is the case here, from those made privately within firms that will tend not to diffuse this information.

Finally, ***the flexibility of the strategy*** is of course a requirement. What is learned thanks to the entrepreneurial discovery process must exert an effect on the characteristics of the programmes within each priority as well as on the priorities themselves to modify or possibly discontinue them. Moreover, new combinations can emerge at any time and must be integrated in the form of new priorities. The flexibility of the strategy requires an appropriate system of monitoring in the manner of diagnostic monitoring (Kuznetsov and Sabel, 2017) including change indicators.

Given the RIS3 goals, it becomes clear that priority areas need to be quite narrow, or at least not too broad. In an area that is too broad – one designated as 'energy', for example – the 12 or 15 projects that are selected and supported are scattered and dispersed. Connections, synergies and spillovers will hardly happen and critical mass will not emerge. In a narrower priority area, the same number of projects will be more connected, providing potential scale, scope and spillover effects. Some platforms will be 'general-purpose' and the markets for specialised inputs (skills and services) will become dense. There is, of course, a political rationale underlying the need for broad areas (the so-called 'coffee for all') but this is not the right way to proceed because, at the end of the day, the region will not get what RIS3 is supposed to deliver.

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