Research and Innovation for Smart Specialization Strategy

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Research and Innovation for
Smart Specialization Strategy

Concept, Implementation Challenges and Implications

by

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Summary

The prioritization of selected economic activities through a broad consultative process is often considered a central aspect of research and innovation policies aiming at promoting smart specialization (RIS3). This is seen as an effort to reduce fragmentation and a way to increase the impact of research and innovation investments on regional and national development. This note argues that targeting research and innovation policies may not be always recommendable due to inherent problems of incomplete information and the inevitable representation bias towards incumbent interests. When the economic specialization of a region is not evident from observation of market dynamics, policies should aim at enabling the process of market selection, allowing such specialization to emerge as a result of entry, exit and experimentation. Such an approach would have two immediate implications for the development of RIS3: (i) replacing the emphasis on ex ante definition of activities with a focus on a results-based approach for research and innovation investments; and (ii) fully integrating monitoring and evaluating mechanisms in the development of the strategy, allowing for policy experimentation, structured learning and systematic adjustment of programs and policies towards the pre-defined objectives.
Introduction

A balanced regional development has always been a priority for social cohesion in the European Union (EU) and resources were consistently made available by the European Commission (EC) to Member States’ catching up with leading economies. Resources concentrated mainly in the EU Structural Funds are supposed to help, in particular, the convergence of lagging regions within Member States. Structural funds are disbursed within the framework of “Operational Programs” and have been used to finance innovation policies, among other investments. In this sense, innovation policies have been an important component of the EU regional development strategies.

Research and innovation policies also became one of the main tools available to promote economic recovery and sustain growth in recent years. The Lisbon Agenda established a target for R&D expenditures (3% of GDP) that was subsequently confirmed by the Europe 2020 Strategy. In 2010, the European Commission announced the availability of € 6.4 billion for research and innovation -- the largest budget ever made available -- while urging Member States to strengthen their policies and programs to reduce the innovation gap between the EU and other world leading economies (The European Commission Europe 2020 Flagship Initiative Innovation Union (Innovation Union) -- COM(2010)546).

The adoption of a “smart specialization strategy” was one of the recommendations put forward by the Innovation Union flagship initiative to increase the impact of research and innovation policies of Member States on economic growth. It builds on the ideas developed in David, Foray and Hall (2009), which include ‘increasing the correlation between R&D and training specialization and the structures of the economy’; and facilitating economic “self-discovery” through a broad governance driven and fact based consultative process. Member States have therefore encouraged to define research and innovation policies for smart specialization strategies (or simply RIS3).

The Commission proposed that the submission of a Smart Specialization Strategy be an *ex ante* conditionality for access to Structural Funds in the 2014-20 period. The Partnership Agreement of each Member State with the Commission, to be signed in 2013, will determine the thematic objectives and the monitoring and results framework to trace the performance of each. In this context, a number of client countries as well as the European Commission (EC) have expressed interest in cooperating with the World Bank to foster the policy dialogue, practitioner exchange and peer networks to support the design, implementation and evaluation of Smart Specialization Strategies.

This paper focuses on a rather specific aspect of the smart specialization agenda, as it concentrates on understanding research and innovation policies for smart specialization (RIS3) and discusses some key challenges entailed to their design and implementation. This study does not attempt to provide a comprehensive analysis of the concept, nor does it lay out a full set of indicators that can be used to measure smart specialization. These issues are tackled in a number of documents produced by the EC, IPTS and the OECD which complement this report.

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3 See [Error! Reference source not found.](#) for further detail on the EU Cohesion Policy instruments.


This paper does not address the overall set of policies possibly needed for the implementation of smart specialization. It reviews a series of documents issued by the EC to guide its Member States, and builds on a number of recent efforts to inform this process, especially two similar initiatives prepared by the JRC-IPTS (Research and Innovation Strategies for Smart Specialization (RIS3) Guide) and the OECD (TIP Project on Smart Specialization, DSTI/STP/TIP/AH(2012)1).

The RIS3 Guide, in particular, presents a general definition of the concept and outlines six steps to establish a national or regional strategy, starting with an analysis of the economic specialization of the country or the region; continuing with the establishment of priority areas and of the consultative process through which these priorities should be determined; concluding with the set of monitoring and evaluation mechanisms necessary for implementation. This paper fully supports the emphasis of the RIS3 Guide on governance, transparency and accountability and its proposal that monitoring and evaluation be fully integrated into the design and implementation of the strategy.

This paper explores circumstances in which targeted research and innovation policies may be useful, namely, when information on the economic specialization of the region or the country is fully or partially available, through some sort of “market test”. In such cases, research and innovation policies may help sound companies to keep a competitive edge in international markets or to cope with growing international competition (shaping comparative advantages) or simply support potentially high growth companies to realize their potential (unleashing latent comparative advantages).

When the economic specialization of a region is not immediately evident from observation of market dynamics, policies could aim to enable the process of market selection, allowing such specialization to emerge as a result of entry, exit and experimentation. This paper therefore proposes that research and innovation policies targeting few activities may not be always recommendable in the first instance due to the nature of information available to policy-makers (incomplete and asymmetric).

The informational asymmetry mentioned here refers to the nature of the decision-making process that is inevitably biased towards “incumbents” (and thus against new entrants or potentially successful entrepreneurs) despite the quality of the consultative process. As a result, policy-makers should be encouraged to enable innovation (including new business models) and efficient market selection – a process through which successful companies will define a new specialization pattern for the country or the region. Such policies then go beyond standard boundaries of research and innovation to include improving regulations to facilitate firm entry; firm innovation and exports. In a nutshell, these are policies that promote “high growth potential entrepreneurship”. This paper therefore underlines the importance of the entrepreneurial environment, which includes (but is not limited to), entry and exit conditions, access to

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7 Most recent version published in May 2012.

8 The OECD has launched a discussion space for smart specialization with the European Commission and the IPTS also to elaborate on the ‘how to’ of smart specialization. This project aims to guide the design and evaluation of smart specialization strategies at both the national and the regional levels, through the formulation of indicator-based strategy profiles. Background documents from these activities are mostly available online https://community.oecd.org/community/smartspecialisation
finance (especially early stage financing), product market regulation, and access to inputs in the smart specialization agenda.

In such cases, the role of smart specialization should be flexible and should endorse iterative learning by emphasizing the integration of monitoring and evaluation mechanisms in the development of the strategy, replacing the emphasis on targeting certain activities. This should allow for policy experimentation, structured learning and systematic adjustment of programs and policies towards the pre-defined objectives. The strategy may consist of two steps: first, to identify bottlenecks and market failures; then, to experiment with pilot instruments based on hypotheses. Impact evaluation of tested policies should lead to the learning and adaptation processes which address the bottlenecks that were identified in the first stage.

This paper is composed of four other sections. The next section defines the key concepts and relationships drawn from the existing documents, and it identifies the relevance of targeted research and innovation policies and a broad-based consultative process for RIS3. The third section discusses the challenges related to incomplete information and consultative processes. The fourth section addresses those challenges at the operational level. The fifth section focuses on the public policy implications. The final section summarizes the main conclusions.
Research and Innovation for Smart Specialization Strategies (RIS3): Definitions

The RIS3 Guide defines national or regional research and innovation strategies for smart specialization (RIS3) as:

“integrated, place-based economic transformation agendas that [...]: focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development, including ICT-related measures; build on each country's/region’s strengths, competitive advantages and potential for excellence; support technological as well as practice-based innovation and aim to stimulate private sector investment; get stakeholders fully involved and encourage innovation and experimentation; are evidence-based and include sound monitoring and evaluation systems”. (RIS3 Guide, p. 8)

Smart Specialization. The idea of smart specialization was put forward as an instrument in the Europe 2020 Agenda. It builds on the concepts developed in Foray and van Ark (2007) and David, Foray & Hall (2009). As a first approximation, smart specialization strategies can be understood as development strategies that, building on existing comparative advantages, promote a larger contribution of the knowledge factor to economic growth. At the enterprise level, the knowledge used by firms translates into better processes and products, new business models or simply innovations; raising productivity, exports and, in some cases, more and better jobs. In a nutshell, smart specialization strategies could be understood as knowledge-driven growth strategies.

Knowledge and other productive assets. In order to increase the effectiveness of research and innovation policies, David, Foray & Hall (2011) propose the general idea that policy makers should increase ‘the correlation between R&D and training specialization and the structures of the economy’, where “the structures” refers to the local economic activity in different sectors. By focusing on certain sectors, policy makers would avoid the dispersion of R&D funding and increase the probability of matching research results with market demand. The approach is further developed in the RIS3 Guide, which proposed a specific framework for concentrating the vast amount of resources that are allocated to R&D, innovation and technology policies in member countries.

Regional development and economic transformation. RIS3 is expected to be applicable at the regional level, as the cornerstone of regional development strategies. The objective is to trigger structural transformation in the regional economy supposedly to generate a ‘cluster of firms’ with enough spillover effects and economies of agglomeration to transform the region from ‘periphery’ to a ‘center’. According to the RIS3 Guide, R&D, innovation and technology policy should target certain activities with the potential to generate

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10 European Commission Europe 2020 Flagship Initiative Innovation Union.
11 Measuring Smart Specialisation: The Concept and the Need for Indicators, David, Foray, & Hall, (2011); p.1.
clusters of firms and thus the expected transformational effect as opposed to simply promoting scattered innovation. **Prioritization** of sectors then becomes a core element of RIS3.

The focus of research and innovation policy on smart specialization is even endorsed as a criterion for well-performing innovation systems by the Innovation Union Flagship (Box 1).

### Box 1: Features of well performing national and regional research and innovation systems:

“[…] Design and implementation of research and innovation policies is steered at the highest political level and based on a multi-annual strategy. Policies and instruments are targeted at exploiting current or emerging national/regional strengths within an EU context ('smart specialisation')

- An effective and stable centre-of-government structure, typically steered by the top political level, defines broad policy orientations on a multi-annual basis and ensures sustained and properly coordinated implementation. This structure is backed up by networks involving all relevant stakeholders, such as industry, regional and local authorities, parliaments and citizens, thereby stimulating an innovation culture and building mutual trust between science and society.

- A multi-annual strategy defines a limited number of priorities, preceded by an international analysis of strengths and weaknesses at national and regional level and of emerging opportunities ('smart specialisation') and market developments, and provides a predictable policy and budgetary framework. The strategy duly reflects EU priorities, avoiding unnecessary duplication and fragmentation of efforts, and actively seeks to exploit opportunities for joint programming, cross-border co-operation and exploiting the leverage effects of EU instruments. Bilateral co-operation with non-EU countries is based on a clear strategy and, where possible, is coordinated with the other EU Member States.

- An effective monitoring and review system is in place, which makes full use of output indicators, international benchmarking and ex-post evaluation tools. […]”

*Source: Innovation Union, Annex I: Self assessment tool: Features of well performing national and regional research and innovation systems*

**Selecting (targeting) sectors.** David, Foray & Hall (2009) argue that target activities should be those resulting from the entrepreneurial self-discovery process, as defined in Hausmann and Rodrik (2003). This is the decision process where entrepreneurs discover the markets in which to operate from a set of “modern sectors”. This concept specifically rules out the use of top-down foresight exercises and similar instruments in selecting the target-sectors, emphasizing the importance of a "bottom-up" approach.

**Definition of a “priority area”.** Smart specialization aims to target few priority areas which are neither broad sectors nor a single firm, but new or existing activities with high market potential. The proponents of the smart specialization concept support that this is one of the distinctive features of smart specialization in comparison to traditional industrial policy.

**The role of broad-based consultations.** The notion of a “top-down approach” is further developed in the RIS3 Guide. The document suggests that research and innovation policies should aim to prioritize certain areas based on **evidence, consultation and analysis**. It is also highlighted that in this process, initial stakeholder consultation should involve all the key players in innovative sectors: public and private sector actors, academia, the civil society, peer networks and the users of innovation. Research and innovation policy should thus target sectors that result from this process.

OECD (2012) summarizes the differences between traditional industrial policy and smart specialization as the emphasis of the latter on knowledge and technology-led growth, the presence of a consultation process in
which policy makers are open to market signals and the use of market-based tools such as public private partnerships, surveys and SWOT analyses by the policy makers. There seems to be some ambiguity in the role of the self-selection process and broad based consultations in deciding on the activities to be targeted. The process of self-discovery is sometimes presented as both a market and an “off-market” process, as for example in the following statement: “It is of crucial importance that RIS3 governance bodies focus on a limited number of innovation and research priorities in line with the potential for smart specialization detected in the analysis phase that is anchored in entrepreneurial discoveries” (RIS3 Guide, p.22).

Reconciling sectoral growth policy with regional development and research and innovation policies. Designing and implementing smart specialization at the regional level is a challenging task due to the strong forces of agglomeration that arise from fundamental differences between the core and the periphery. Regional boundaries are much more open to accommodating these forces than national boundaries, and this constitutes a challenge for the implementation of RIS3 (McCann & Ortega-Argiles, 2011).

Relocation of entrepreneurs. In the presence of both a diversified core and a specialized periphery, new firms may find it more profitable to locate in the cities during the learning and search process for their ideal domain (Duranton & Puga, 2004). Although costly, this may allow firms to easily employ the different kinds of inputs needed when an experimented domain fails and a new one needs to be tried. Such relocation may curb the emergence of new activities in the periphery.

Relocation of the labor force which is skilled in different domains than the one prioritized in the region. Such labor will be more geographically mobile, and is likely to relocate to the diversified cities or to other regions with demand for their existing skills. Generation of local human capital fit for the local specialization will be costly and may require time to build up. Local training programs which reinforce the formation of general as well as specialized skills may further induce the emigration of locally-produced human capital (McCann & Ortega-Argilés, 2011). The question here is whether countries are ready to accommodate these effects.

Emphasis on ICT. Another component of the RIS3 agenda is to implement policies which aim to increase the ICT use. Since mid-1990s, the EU has remained in a catching-up position lagging behind the US and Japan, especially in the field of investments in innovation and technology while China and the rest of the developing world have been progressing fast. One of the eleven thematic objectives of the 2014-2020 programming period is therefore identified by the Commission as “enhancing access to and use and quality of information and communication technologies”.

Smart Specialization Strategy as an “ex ante conditionality”. The Commission proposed the acceptance of a Smart Specialization Strategy as an ex ante conditionality for access to Structural Funds in the 2014-2020

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13 See Annex II.
period. The Partnership Agreement of each Member State with the Commission, to be signed in 2013, will determine the thematic objectives and the monitoring and results framework to trace the performance of each. ANNEX II presents the ex ante conditionalities for the use of Structural Funds in 2014-2020 including a roadmap for increasing the ICT use in Member States.

The proposed approach to regional development is justifiable. Inter-regional income disparities across EU regions have not substantially narrowed despite large amounts allocated through previous regional policies (Puga, 2002). The main cause for regional disparities between the core and the periphery in the EU relate to agglomeration effects, strengthened by rapid innovation and technological advancement in the core (Farole, Rodriguez-Pose, & Storper, 2009). The transformational effect aims to address precisely this structural problem and, ideally, targeted research and innovation policies would promote it. Yet this note will argue that it may be not always feasible.

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15 By some measures, distribution of per capita income across regions in the EU is more unequal than across the US states, contrary to what one would have expected given the higher spatial concentration of production in the US (Puga, 2002).
Incomplete information and the political economy of lobbying

In this section we argue that, due to incomplete and asymmetric information, a public sector governance structure that discourages efficient risk management and the collective decision making processes that are inevitably biased towards incumbents’ interests may hinder the government’s capacity to properly select sectors or products that may induce an economic transformation.

Competitive rent-seeking, a concept whose roots date back to the 1970s when targeted policies were widespread (Krueger, 1974; 1997), explains the incumbent bias arising from the asymmetric information problem. Despite the rigor in the consultation process between the government and the incumbents, the information resources available to the policy maker are limited. This is partly due to a demand side coordination problem: in a typical setting, there exist a very large number of consumers, who consume a relatively small amount each, and a few producers who serve all these consumers. There is a strong incentive for the producers to lobby, disclose only limited information and compete for the scarce government resources to reduce their costs and stay in the market. On the other hand, it is much more difficult for the large number of consumers coordinate and lobby to enable a demand-driven specialization strategy.

The capacity to obtain and process information related to supply and demand conditions is a classical problem of economic policy making. Information-related problems are larger when the products or services will only exist in the future – as in the case of targeted innovation policy. The task becomes overly difficult when those products need to generate a “transformational” effect – as expected in the present context. The trickier part here is identifying the sufficient conditions – for example, relevant economies of scale, and spillover effects based on existing comparative advantages. In the 1990s, the difficulty to identify sectors with the attributes that would render targeted support justifiable was one of the reasons why the “strategic trade policies” did not develop much as a practical option.

The problem of collecting and processing information about supply and demand, even when the market conditions are known, is a classical challenge for economic planning. The best known instrument to collect and process information about cost and preferences, supply and demand, is the market - despite the well-established case of market failures. In the case of innovations or entrepreneurial activities that could potentially lead to a transformation in the economy by generating a cluster of specialization, the problem is even more severe. The reason is because these activities, by definition, suffer from the inexistence of a price and, more generally, from missing markets. Since the product is ex ante unknown, the market cannot be created either.

Collective decision making, even when based on a broad consultative process, does not help much in this context for two reasons. The first is asymmetric information. Self-motivated sector or project advocates naturally possess more information about their own sector or project than policy-makers. The quality and relevance of information provided or generated in this context has inevitably limited use for decision making. The second reason is that representation in the collective decision-making process will be biased towards incumbent political and economic interests. Incumbents have more incentive to voice or lobby (more to win, clear goals, and defined coalition) as opposed to new entrants, particularly future entrepreneurs, simply because these entrepreneurs do not exist at the time of targeted policymaking and hence have no lobbying power.

The critical factors are the inexistence of market generated information and any alternative source of reliable information for decision making. This is precisely the reason why Hausmann and Rodrik (2003) argue in favor of subsidizing entry into new markets: the information generated by the first-comer is a non-
proprietary good and can be quickly utilized by followers (imitators). This in turn reduces significantly the returns to investments in the “discovery” process, which makes private investment levels inferior to the socially optimal (as in the case of R&D investments for example).  

When reliable market information is not available, should governments bet public money in targeting specific sectors? One argument often heard is that private sector investors, including venture capitalists and serial entrepreneurs also have incomplete information, face high uncertainty and still profit from those investments. Could the public sector not achieve the same results? This is very unlikely given the different incentive regimes under which the public and the private sectors operate.

Private investors invest their own resources (or they are the agents of indirect investors), profit from success and bear the financial losses associated to failure, facing an incentive structure that is more conducive to better risk management and thus entrepreneurial success. For instance, private investors are quick in selecting a project and bringing the financial and non-financial resources (such as mentoring and networking) required for its development (to exit and thus cash in the expected returns). Yet, they are also fast in assessing the odds of project success and are eager to exit as soon as failure is perceived as the likely outcome so that investors’ losses are contained.

Public servants invest tax payers’ money, they do not profit from its success, and do not bear the costs of bad decisions. Under these circumstances, favoritism becomes more frequent than usual. Instead of a quick exit, support to unlikely successful deals will be unnecessarily extended. Indeed, as argued more broadly by Rodrík (2004), identifying credible exit strategies is one of the critical challenges for the industrial policy of the 21st Century.

The EU has tried to address the challenges above before, as for example, in the case of state aid regulations for restructuring sectors. In order to receive support to restructuring activities, firms or countries are asked to provide a detailed plan with measurable and monitorable milestones demonstrating long term financial sustainability once the support has ended. An amount of subsidy is defined ex ante, and responds to the criteria of minimum necessary. Based on these, a clear time frame is set with a defined date for the suspension of the subsidy, after which the firm is not allowed to use similar support for a long period. The US approach to the firms in the automotive sector is another example of direct support (with a very different governance structure). In most cases, however, such approaches are the exception and not the rule of policy-making.

There are circumstances when the lack of information poses no serious risk to policy makers. We argue that, depending on the amount of market generated information, it may not be desirable to target R&D and innovation policies to specific sectors. The argument does not exclude the possibility of targeting sectors when market driven information is sufficiently available. In these cases, focusing R&D policies in sectors in which the economy is specialized and globally competitive is possible and may help to increase the impact of R&D and innovation investments. A schematic view is presented in Figure 1. In the next section we develop a tentative typology based on the existence of evidence about the economic specialization of a region.

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16 Haussmann and Rodrík (2003) justify policy intervention in the case where entrepreneurs are searching for their ideal domain of operation under uncertainty about costs, which depend on some unobserved productivity parameter for each good in the ‘modern’ sector (p.608). They solve for the general equilibrium investment in the modern sector, and show that the decentralized equilibrium results in underinvestment, coupled with too high product diversification.

17 An example is the shipbuilding sector in the 1980s.
Figure 1. Access to information, risk level and policy making

- Enabling specialization
- Discovery through experimentation
- Unleash latent comparative advantage
- Modernization

Risk level for policy makers:
- HIGH
- MED
- LOW

Access to information:
- NO INFO
- PARTIAL INFO
- FULL INFO

Risk level:
- HIGH
- MED
- LOW
- NO INFO
- PARTIAL INFO
- FULL INFO

Unleash latent comparative advantage
Modernization
Enabling specialization
Discovery through experimentation
Operationalization of RIS3: Access to Information

In developing RIS3, policy-makers will have to address the type of economic specialization of the region and its determinants or binding constraints. Based on the nature of the economic specialization and its underlying causes or “binding constraints”, policy makers can decide whether research and innovation policy is a relevant instrument to foster development and if so whether targeted instruments are recommendable or not. There is little that research and innovation policies can do to help regions overcome problems related to “distance” or lack of economic resources or poor institutional framework but there is probably a large contribution in helping companies move their products up on the quality ladder. In this section we assume research and innovation are potentially relevant to focus on issues of sector targeting.

In what follows, we present a simplified typology relating availability of information on the economic specialization of a region to the degree of convenience of adopting targeted policies. We argued in the previous section that the absence of reliable information about supply and demand is one of the reasons why the government often avoids targeting sectors and products. The level of information available on the specialization of the country or the region is a crucial factor for the future success of targeted policies. We propose three cases in which different degrees of information about economic specialization imply different chances of success with sector targeting and provide some practical examples: regions with apparent comparative advantages; regions with latent comparative advantage or regions with unclear specialization. The argument is pictured in Figure 1.

Regions with apparent comparative advantage. These are the regions where a few globally competitive industries are already installed. For such regions, the key indicators and consultative processes should lead to similar conclusions with regard to the region’s comparative advantages. Yet regions of this type may be experiencing growth or decline and, consequently, the pattern of specialization may or may not be sustainable. Targeted R&D and innovation policies will “complement existing productive assets”, helping firms to maintain a competitive edge in the sector by investing in R&D or regain competitive advantage lost to new players in the global market. The RIS3 guide presents the case of the Finnish pulp and paper industry, which is increasing its R&D efforts in nanotechnology to improve the efficiency and quality of production. Spanish CITES, public private laboratories providing a number of technology related services to the private sector, were instrumental in improving product design and quality in the local shoe industry thereby helping the sector to refocus exports to high end markets (particularly Japan).

Box 2: How public private partnerships can help to avoid inadequate investments in R&D facilities: The case of CITES

How can public private partnerships help to avoid inadequate investments in R&D facilities? One way of assessing the private sector’s demand for knowledge services in a specific domain is through “public-private partnerships (PPP)”, which allow the policy maker to co-invest in high-return projects. An example of this kind of set up is Spain’s program for Technology Centers (CITEs). These centers are co-financed by the private sector and the government, in an arrangement where the government financing is envisaged to phase out gradually. They have a very specialized sector or even product focus. CITEs carry out the following functions:

‘(i) facilitate the transfer of knowledge and existing technologies (off-the-shelf) to enterprises; (ii) address missing links in sectoral value chains and quality issues; (iii) identify bottlenecks and opportunities for further innovation of
products and processes at the sectoral level; (iv) facilitate the commercialization of new products; (v) provide value added services not reasonably available; and (vii) provide specialized training.’
These functions respond to the technological needs, as well as skill formation or adaptation, for the specific area of specialization in the region.
More broadly, in this type of regions, the key is to foster backward and forward linkages and product differentiation to move up in the value chain by exploiting existing scientific potential, fostering academic entrepreneurship, research commercialization and collaboration between public and private sectors.

Regions with latent comparative advantage. In this second category of regions, there is no substantial economic activity in the potential area of specialization, but the required knowledge ‘partially’ exists typically, but not only, due to (i) availability of a non-tradable, location-specific input, such as a natural resource, or an immovable asset (land and climate for example); or (ii) local common knowledge about the economic activity, a tradition prevalent in the region that indicate potential for specialization. Again, assuming that the bottleneck is related to lack of knowledge with local content, R&D and innovation policies (and probably investments in skills-formation and other business development services) may be useful to ‘unleash’ existing comparative advantages. The cases of the soybeans industry in Brazil and of wine in Chile are good illustrations of how technology oriented policies may enable the development of entire sectors, triggering structural change.

Box 3 : The case of soybean exports in Brazil
Trade orientation, entrepreneurship and technology policy were the key factors in Brazil’s transformation from a net importer into the world’s second-largest exporter of soybeans in the span of three decades.
In the early 1970s, the Brazilian government encouraged the cultivation of soybeans in the Southern region of the country, where a temperate climate and fertile soil seemed to provide adequate conditions. By the mid-1980s, however, fertile land in that area had become scarce and rental prices had risen. Agricultural entrepreneurs began looking for alternatives in the then-cheap and virtually unexplored “Cerrado” – the Brazilian prairies – an area about the size of France but with completely different soil and climatic conditions. At that time, Embrapa, a government agricultural research institute, was instrumental in rebalancing soil acidity and cultivating crops suited to the country’s tropical climate, thereby expanding the area effectively available for cultivation of soybeans. Embrapa now grows more than 200 varieties of soybeans to suit the country’s diverse soil and climatic conditions.
High agricultural productivity rates and the effective utilization of land enabled entrepreneurs to explore new export opportunities. Access to better and cheaper agricultural inputs, stemming from broad trade liberalization, were also pivotal in raising agricultural productivity, and soybean exports in particular, after the 1990s.

Regions with unclear specializations. When there is no obvious local asset that induces an economic specialization in a region, information from direct observation of market dynamics is not available and sector targeting becomes less recommendable for the reasons discussed in the previous section. Under these circumstances, we recommend that policy-makers focus on creating an enabling environment for efficient
market selection (from which an economic specialization should emerge over the years, as a result). This means combining measures that promote firm entry and startups—possibly high growth potential firms—and allowing firm exit. Research and innovation policies play a central role in promoting entry but other policies such as facilitating access to credit, skills and information; and improving the business environment (such as adopting pro-competition regulation in the service sectors) will be equally important. When economic specialization is not evident, promoting entrepreneurship across the board seems to be the dominant strategy for policy makers.

**The challenge, therefore, is to define the right policy mix and the programs that better fit the economic and institutional circumstances of each region or country within a given pre-defined objective.** Yet predefined entrepreneurship policies do not exist as such; rather, existing economic policies constitute (or not) an eco-system that is more or less favorable to entrepreneurship (Acs, 2012). Overall, an eco-system that promotes entrepreneurship should allow for the identification of business opportunities, provide the right incentives and access to inputs required for their development by entrepreneurs. For instance, the inadequate regulation of the telecom or logistics sectors may preclude the development of e-commerce; in other cases, the lack of early stage financing may hinder the development of science-based startups. More broadly, countries and regions vary according to their entrepreneurial strengths and weaknesses.

![Figure 2. Understanding economic specialization](image)

In order to identify the type of a region, the availability of information can be assessed during the design of its smart specialization strategy. Analytical exercises that aim to uncover local comparative advantages may provide consistent and reliable signals to the policy maker, revealing to the policy maker the risks of targeting
specific activities, and if such risks are low, the areas of specialization which may be considered\(^\text{18}\). The emphasis here is on the opposite scenario, where the policy maker does not obtain reliable information from the analytical exercise and should draw the strategy on uncovering the latent comparative advantages through enabling policies, which are briefly discussed in the next section.

\(^{18}\) Diagnostic activities may include, but are not limited to, analyses of trade competitiveness, transport infrastructure and connectivity with markets, economic geography aspects, productivity and research and technological development infrastructure. Some general tools for this purpose are outlined in Annex I.
Implications

*Ex ante* targeting is more likely to achieve its desired goals if the region’s comparative advantage is known to the policy maker. This is the case for regions with apparent or latent comparative advantage, where information is available about the specializations of the region and the risk of moral hazard and opportunistiuc lobbying is low. In these regions, specialization can be welfare-improving as it facilitates the efficient use of the available resources.

On the other hand, peripheral regions with less clear emerging or existing trends need their future specializations to be revealed through a flexible strategy which encompasses enabling policies for entrepreneurship and market selection, rather than *ex ante* targeting. While forces of agglomeration stimulate the creation of a diversified core and a rather specialized periphery, the challenge for the periphery is to create a suitable environment for entrepreneurship. This is difficult because entrepreneurship is more likely to flourish in regions where: (i) a diverse set of sectors exists, (ii) many multinational companies operate, (iii) markets are competitive, (iv) population is dense, and (v) market potential is high (McCann & Ortega-Argiles, 2011).

In these typically less developed regions, the prime goals of the policy maker may include facilitating firms’ access to information, improving market entry and exit conditions, building the infrastructure for innovation financing and helping the buildup of knowledge assets (such as a large research university with commercialization potential). Research and innovation policy may focus on commercialization of research through university-industry collaboration, research startups and spin offs, improvement of the intellectual property regime, development of the early stage financing infrastructure, strengthening knowledge networks and facilitating spillovers.

**Achieving structural transformation of the region is a challenge that extends beyond research and innovation policies.** Trade policy, technology absorption and adoption, business environment and the regulations that govern the human capital input are directly related to the entrepreneurial environment. Policy setting in these areas naturally involves a more complex institutional framework than the boundaries of research and innovation policy. To be more specific, the entrepreneurial environment is shaped by a whole host of policies including labor market regulation, education policy (strong primary, secondary, tertiary, vocational and higher education); health policy (which helps provide security for the entrepreneur); the regulatory environment; business taxation and the judicial system (Acs, 2012). Rigid business regulation may deteriorate entry conditions, hindering the entrepreneurial capacity of the region.

“Self discovery” is heavily dependent on entry conditions, with fewer discoveries occurring in systems burdened by barriers to entry. Klinger and Lederman (2011) document the strong correlation between government regulation and self discovery. The higher the regulatory burden, the fewer export discoveries are made, despite the threat of allowing imitators in the newly discovered sectors. In fact, imitation tends to increase welfare in many new sectors as it increases the scope for social returns from these activities. The government, which has an incentive to support such discoveries should then consider addressing entry barriers.

**Is knowledge the binding constraint against the structural transformation of the region?** This is a key question that needs to be answered by the region while designing its smart specialization roadmap. If the binding constraint relates to a more fundamental structural bottleneck, such as the regulatory environment or physical infrastructure, then the region should prioritize addressing such constraint, while taking into consideration the next steps in research and innovation in its medium or long term agenda. For instance if
the business regulatory framework for establishing a company is heavily complicated by red tape, then taking measures to generate university spin offs may prove to be insufficient in stimulating the desired structural transformation of the local economy.

**Identification of regional bottlenecks against structural transformation.** Having established whether or not knowledge is a binding constraint, the strategy should then sketch more specifically what the binding constraints are, and which ones to address in the short, medium and long terms. Knowledge bottleneck(s) may relate to a number of institutional factors, mainly arising in one or more of the following aspects: (i) constraints to increasing private R&D and innovation investment (access to finance, intellectual property protection, incentive schemes), (ii) constraints to improving technology adoption by SMEs (skill mismatches, ease of access to technology, awareness), (iii) constraints to research excellence (skilled labor, partnerships).

The right policy mix is not necessarily related to research and innovation policy, but it is one that enables the “self discovery” process. The nature of entrepreneurial activity is to experiment with new product niches, discovering the cost of these activities and abandoning those that cannot be undertaken at a sufficiently low cost to prove profitable. As Rodrik (2004) elaborates, the discovery of such cost does not necessarily arise from inventing a product or process that is new to the world, although it may well be. Such discovery may even arise from adopting a technology to produce a traditional product or undertake a well-known process at a lower cost. Another route is to adapt the product or process to local conditions in a more efficient way than the competition.

The smart specialization strategy can be designed as a long term plan to install and continually review the policy framework through integrated impact evaluation and iterative learning. This long term strategy is envisaged to: (i) determine the overall objective and relevant measurable goals, (ii) identify bottlenecks and market failures, and (iii) experiment, learn from these experiments, and then adapt the policies accordingly. The “identification stage” consists of the tasks (i) and (ii), after which the “experimentation and adaptation stage” follows. Each stage can be guided by a checklist of questions as listed later.

Importantly, the strategy identifies channels through which measurable development objectives can be achieved via flexible policy interventions. The monitoring and evaluation framework should therefore be embedded in all stages of the smart specialization strategy. Progress towards these measurable development objectives can be monitored through intermediate outcomes and influenced by means of flexible interventions. In other words, the policy maker works backwards from the desired final outcomes, identifying the main channels through which these outcomes could be achieved via proposed interventions.

Understanding the incentives for lobbying for all key stakeholders, both public and private, may help to mitigate (but not completely eliminate) some issues concerning the political economy of lobbying. Several private and public actors, or different levels of government may compete or collaborate while defending the interests of a large set of related parties. In regions where limited or no information is available to the policy maker, the problem is particularly severe and more difficult to alleviate by such examination. It would be expected in these regions that the benefits to related parties are less obvious, and hence more difficult to analyze.
The following checklist provides a set of questions that may guide the characterization of a region prior to designing a smart specialization strategy.

**Fully integrating monitoring and evaluation to policies and programs is essential to allow systematic learning and improvement.** Rather than ex ante targeting certain areas, research and innovation policies could focus on identifying the intermediate goals, the channels through which these goals are meant to be achieved, and the bottlenecks – market and institutional failures – that reduce the chances of success. Public actions would then tentatively aim at correcting such failures; be monitored and evaluated, as well as adjusted based on lessons acquired through systematic learning. Recognizing that there are no pre-defined policy recipes when economic specialization is not immediately evident implies raising the relevance of results-orientation as well as the integration of proper monitoring and evaluation mechanisms into policy/program implementation.

**In order to raise the impact of research and innovation on regional and national development, governments could focus their interventions around a small number of measurable intermediate objectives** with a clear direct link with the broader development goal of higher growth and job creation, as for instance:

- Accelerating the commercialization of public research and academic entrepreneurship through licensing and spin off companies;
- Increasing the collaboration between public research organizations with the local private sector through organic research collaboration;
- Promoting business expenditure in R&D and innovation, including new business models, and the number of firms engaged in innovation activities;
- Reforming the system of managing public research organizations to favor talented research and performance (excellence and productivity), as well as skills formation, all underlying factors for successful smart specialization.

Enabling faster adoption of updated technologies and organization processes (especially general purpose technologies by small and medium sized companies, ICT by the service sector).
Selected research and innovation policies, programs and investments would therefore directly contribute to one of the previously selected intermediate goals and be evaluated accordingly. They would address identified market and institutional failures, and be designed and implemented in a way consistent with robust evaluation, thus informing subsequent adjustment towards a higher impact. Such approach would help, in particular, to rationalize the relevance of investments in research infrastructure that tend to encompass a large share of research and innovation investments financed by the structural funds.

In the case of commercialization of public research, for instance, regions could experiment with programs addressing the supply of ideas originating from public research organizations -- from supporting better intellectual property management practices by technology transfer offices to the provision of small grants for the development of proof of concepts; and/or with programs promoting the demand for such ideas, such as supporting angel investments (for example, accelerator programs), according to their specific circumstances.

In the case of adoption of ICT, the lower usage levels of European firms as compared to their US peers derives from relatively lower returns from ICT investments in Europe due to the adoption of less efficient management (organizational) practices and higher product market regulation – which prevent local firms from reaping the same level of benefits as their US counterparts.\(^\text{19}\) Hence, there is no obvious indication of whether and which type of policies could help increase the productivity of ICT and increase its use in Europe.

Experimentation may also be related to the design of support mechanism. For instance, in promoting collaboration between public research organizations and the private sector, one of the important variables may be the targeted population. Under certain conditions, which are difficult to identify upfront, eliminating

\(^\text{19}\) (Bloom, Sadun, & van Reenen, 2012). The Europe 2020 Flagship Initiative Innovation Union (COM(2010)546) argues that another reason for the gap is the low level of investment in ICT equipment which remain below the threshold ICT that could potentially allow the private sector to reap the benefits of ICT investments; and modest progress in innovative activity by European businesses and inadequate research infrastructure which unleash the productivity gains from ICT investment. If the underlying reason is the level of ICT investment that remains below a potential efficiency threshold, then the reinforcement suggested by the EU could help

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Table 1. Identification stage, examples

<table>
<thead>
<tr>
<th>Goal</th>
<th>Bottleneck</th>
<th>Instruments</th>
<th>Measure of success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentivizing R&amp;D expenditure</td>
<td>Financing</td>
<td>Alternative credit lines</td>
<td># firms engaged in innovation; proportion of spending on R&amp;D</td>
</tr>
<tr>
<td></td>
<td>Incentives</td>
<td>Matching grants</td>
<td></td>
</tr>
<tr>
<td>Accelerate R&amp;D commercialization</td>
<td>Business skills (academia)</td>
<td>Entrepreneurial training</td>
<td>Licensing of spin off companies; patents</td>
</tr>
<tr>
<td></td>
<td>Early Stage Financing</td>
<td>Angel investors</td>
<td></td>
</tr>
<tr>
<td>Improve technology adoption by SMEs</td>
<td>Awareness</td>
<td>Information campaigns</td>
<td>Take up rates of targeted technologies</td>
</tr>
<tr>
<td></td>
<td>Skills</td>
<td>Training Programs</td>
<td></td>
</tr>
<tr>
<td>Research Excellence</td>
<td>Retention of skilled labor force</td>
<td>Non-financial incentive schemes</td>
<td>Academic qualifications; Quality of publication output; Publication collaborations</td>
</tr>
<tr>
<td></td>
<td>Coordination / collaboration</td>
<td>Workshops / international conferences</td>
<td></td>
</tr>
</tbody>
</table>

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the possibility of the private sector sponsoring project applications may result in a large share of the funds being unused (especially when other standard sources of public financing for public research are generously available).

The assessment of innovation policies is still in its initial stages, especially in new member countries and despite the significant emphasis placed by the EC. Yet, motivated by the Lisbon Agenda and more recently the Europe 2020 Strategy, new member countries are encouraged to commit more resources to research and innovation (for example, 1.5 and 2 percent of GDP in Bulgaria and Romania respectively). The proposed results-based framework could help governments better deploy additional resources to promote research, development and innovation. It may also help government to establish a clear strategy to achieve related goals established under their innovation strategies (such as 1 percent of GDP invested by the private sector, as in the case of Romania). Finally, it will help governments of New Member States to identify remaining areas of critical institutional reforms to complete the transition of their innovation systems.
Smart Specialization Proposed Checklist

- Identification Stage -

Is there any obvious comparative advantage of the region based on existing economic activity?
Is there a latent comparative advantage based on an immovable asset that could be a source of wealth creation?
Is knowledge a binding constraint hindering the structural transformation of the region?

If knowledge is a binding constraint:

- Will research and innovation policy help in addressing these bottlenecks?
- Does the bottleneck relate to research and development infrastructure?
- Does the bottleneck relate to technology adoption and absorption?
- Does the bottleneck relate to the entrepreneurship environment?
- What are the alternatives for the appropriate policy mix to address the identified market failure?

If there are other fundamental binding constraints that relate to the success of a cluster in achieving structural transformation, are these related to:

- Inadequate infrastructure service delivery?
- Financial market imperfections that limit financing to firms?
- Weak state capacity (adverse regulatory framework/poor implementation of regulations)?
- Weak private investor capacity (SMEs: inadequate technical or market knowledge)?
- State coordination failure (different ministries, municipalities, etc)?
- Private coordination failure (first mover costs)?
- Availability of land, land tenure systems and mechanisms to access land, pricing mechanisms, etc. (in all agribusiness growth poles the issue of land and the determinants of accessing it should be given a central role)?
- Lack of critical mass?
- Inadequate learning mechanisms?

Which are the areas of high risk? Identify specific, potential sources of risks based on existing data.
External risks (such as monetary shocks, economic recession, price fall), country risks (such as political instability, land tenure/property rights), and regional risks (such as drought, natural disasters) directly affect the likelihood of success. Some of these could be addressed through mitigation actions and integrated into the project design.

How is the causal chain between actions, intermediate outcomes and final outcomes characterized?

- What is the development objective of the national smart specialization strategy? In what ways does that concern the region?
- What is the development objective of the regional smart specialization strategy?
- How can the development objective be broken down into one or several intermediate outcomes?
- What types of actions should be taken to address the identified bottlenecks?
- What is the sequence of actions, and through which mechanisms are these actions planned to solve the identified bottlenecks?

What are the key monitoring indicators identified?

Who is accountable for monitoring? Who monitors the relevant variables and in what periodicity?

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20 For the case with other factors than knowledge as the binding constraint and the impact evaluation framework, components are adapted from the World Bank Africa Financial and Private Sector Development Framework for the Design and Implementation of Growth Poles Projects
Are the indicators derived from the development objectives, intermediate outcomes or actions? Are they verifiable and objective?

How is the institutional setting that may affect the political economy of various components of the strategy and individual projects put in place as part of the strategy?

Who are the key stakeholders?

What is their interest in the project? Are there important officials or entities with limited or no interest in the success of the strategy, or in particular project components? For example, local officials may be motivated by the increase in local revenues generated by some effects of the policy, with limited or no interest in, addressing the bottlenecks.

Are there important officials or entities that might want to block or slow down the project, or any particular project component? Are there firms that are likely to benefit from monopoly/oligopoly rents?

Are there important stakeholders that might want to capture the project, or any particular project component?

- Experimentation and Adaptation Stage -

What are the feedback mechanisms available in the given policy mix?

Is the policy mix targeting sectors or instruments? Or is a combination of interventions put in place?

Has the pilot policy mix been successful in achieving the intermediate goals determined in the identification stage?

Have the intermediate goals changed since the pilot policy launch? (If so, revisit the identification stage)

Have the monitoring indicators changed since the pilot policy launch? (If so, revisit the identification stage)

What are the external factors affecting the results?

Are the risks identified in the identification stage likely to be realized? Did additional risks emerge?

Are there any other concerns that may influence the impact such as coordination problems and timing of interventions, or data availability?

Were impact evaluation studies undertaken for the experimented policies?
Conclusions

The prioritization of selected economic sectors through a broad consultative process is often considered a central aspect of research and innovation policies aiming at promoting smart specialization (RIS3). Targeted research and innovation policies are seen as an effort to reduce fragmentation and a way to increase the impact of research and innovation investments on regional and national development. They also relate to the understanding that the strategies of the current Programming Period did not achieve the desired goals.

Targeting research and innovation policies, however, may not be always recommendable due to inherent problems of incomplete information and the inevitable representation bias towards incumbent interests. When the economic specialization of a region is not immediately evident from observation of market dynamics, policy-makers should be encouraged to adopt measures that enable the process of market selection, allowing such specialization to emerge as a result of entry, exit and experimentation.

Research and innovation policies can play a major role in fostering entrance of knowledge–based startups, innovation and technology adoption – i.e. contributing to an eco-system that nurtures the creation of high growth potential firms. Other policies that facilitate entry and encourage technological modernization – e.g. promoting competition, providing access to credit, skills and information, and facilitating market exit – are equally relevant. Their adoption can leverage, in some cases become a pre-condition for, the impact of research and innovation measures on economic development. Because such policies and programs are hard to define upfront, some experimentation (and failure) will be inevitable.

The paper also explored circumstances in which targeted research and innovation policies may be useful, namely, when information on the economic specialization of the region or the country is fully or partially available, through some sort of ‘market test’. In such cases, research and innovation policies may help sound companies to keep a competitive edge in international markets or to cope with growing international competition (shaping comparative advantages) or simply support potentially high growth companies to realize their potential (unleashing latent comparative advantages). For different reasons, these situations are likely to be the exception rather than the rule.

In our view, the above approach would have at least two immediate implications for RIS3 worth taking into account:

- Replacing the emphasis on ex-ante definition of sectors and full commitment of resources up-front with a results-based approach in which some flexibility for policy/program experimentation and ex-post allocation of resources based on results is granted;

- Fully integrating monitoring and evaluating mechanisms in the design and implementation of the research and innovation strategy, allowing for structured learning and systematic adjustment of programs and policies towards the pre-defined objectives.

These recommendations seem not too far from the views conveyed by the Commission on different occasions. It is also consistent with an emphasis placed by the Commission, the OECD and other organizations on the importance of adequate monitoring, evaluation and learning for the adaptation of research and innovation policy for diverse and changing circumstances. A smart specialization strategy would thus be a “living” document, as recommended by the Guidelines and a management tool for better use of public expenditures in research and innovation, as advocated by the Innovation Union Report.
Annexes

ANNEX I

Data analysis: information on the specialization of the economy

Identification of latent comparative advantage in the R&D, innovation and technology context has two components. The first component is an assessment of the existing strengths of the economy, which is an analysis of the institutional setup and the observed comparative advantage. The second component involves an attempt to investigate the latent comparative advantage.

The first component implies a stocktaking exercise of the region’s observed strengths and weaknesses. This involves the review of existing industry trends and of economic specialization in the country or region with a complementary analysis of the potential distortions generated by current economic policies. Examples of distortionary policies include: state protection in the industry; tariffs, subsidies, technical or regulatory barriers to entry; the degree of dominance of state-owned enterprises in the economy; and other monetary or non-monetary subsidies directly available to stimulate the growth of the sector. Benchmarking the region’s intra-industry innovative activity against international comparators is a crucial component of this stocktaking exercise.

The second component involves an analysis of the potential to unlock latent comparative advantages. A survey of emerging global trends in technology and innovation, complemented with an assessment of the region’s potential in advancing in some areas may shed light on the potential avenues for development. David, Foray and Hall (2009) conjecture that the local potential will be related to the already existing sectors in the region or country. As an example to a follower strategy, they suggest an examination of the patenting activity by firms in the same sector located in other regions of the world to measure the prospects for catching up.

Joint work by the Commission and the OECD is underway to compile a general set of indicators to assess the degree of specialization in each region. The project consists of four stages: (i) identification of indicator-based specialization profiles, (ii) preparation of templates for strategic governance profiles of countries involved in the project, (iii) construction of strategic governance profiles, and (iv) preparation of one or two case studies per country.

Indicators used to assess trade competitiveness provide valuable guidance, as the capacity of a region in terms of innovation and technology is part of the ‘trade promotion infrastructure’. A Trade Competitiveness Diagnostic (TCD) (Farole & Reis, 2012) comprises three modules: (1) Trade outcomes

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21 Economic specialization can be measured by the revealed comparative advantage (RCA). The RCA for product \( k \) in country \( i \) is the export of product \( k \) relative to the country’s total exports divided by the world export of product \( k \) relative to total world exports (Farole and Reis, 2012).

22 TIP Project on Smart Specialization, DSTI/STP/TIP/AH(2012)1, introduced earlier.

23 Indicators identified in stage (i) are divided into categories, according to the data used: (a) data on scientific research: an ‘activity index’ tracing down the importance of a country’s publications relative to its size and field, and specialization based on a classification of scientific disciplines; (b) data on technology, namely, patent-based measures; (c) economic specialization indicators.
(2) Competitiveness diagnostics; and (3) Policy options for competitiveness and case studies. To attain a comprehensive view of the region’s strengths and weaknesses, a full TCD analysis would be highly recommended. A TCD may help identify whether the binding constraint in the region is technology-related or not, thereby increasing the prospects for estimating the potential for smart specialization to trigger growth in the region.

Finally, field work involving interviews, surveys, and tools such as value chain and/or product space analyses can be undertaken to complement the desk work outlined above. The drawback of interviews is that each stakeholder might present their subjective view and may have personal or institutional benefits from supporting a certain standpoint. Farole and Reis (2012) present a set of interview targets and issues for discussion as part of the qualitative analysis of the ‘trade promotion infrastructure’. By the same token, surveys need to be carefully designed to lead to an objective assessment. Value chain analyses provide product-level information with a detailed description of the range of processes from the source of the product to its end-user.

**Box 4: Value chain analysis**

A value chain describes the full range of activities that brings a product or service from its conception to its end use (and disposal), including design, the sourcing and transformation of raw materials, production, packaging, marketing, and distribution. At an industry level, it combines the industry supply chain with the concept of the value that is added in each step of the process.

The value chain analysis framework centers around three major segments that describe each production link in the value chain: source, make, and deliver. Each activity mapped in the value chain diagram can be represented by a cost breakdown. In addition to mapping the value chain, a value chain analysis typically includes measurement of the chain’s performance, establishment of benchmarks (e.g. of cost, time, and quality relative to other countries), and finally, analysis of the performance gaps, and the factors that contribute to them.

**Example: Apparel value chain**

![Value chain diagram]

In a diagnostic focusing on a specific sector (for example, apparel as outlined above), value chain analysis could cover core components of the diagnostic, including all aspects of factor inputs / factory gate “competitiveness”, transport and trade facilitation, standards and certification and parts of the internal and external trade policy environment. This would be supported by other tools (e.g. standard interviews and textual analysis) to analyze aspects of the incentive framework and the trade promotion environment.

Box 5. Product space analysis

[...]The hypothesis is that countries that build up competence in producing a certain good can redeploy their human, physical and institutional capital more easily if they seek to produce goods that are “nearby” those that they are producing already. Proximity between products on a product space is computed from the pair-wise likelihood that a country exports a product given that it also exports another product. Proximity between any two goods (m and n) is the minimum of the pair-wise conditional probabilities of having comparative advantage.

$$\varphi_{m,n} = \min \left\{ P \left( \frac{RCA_m}{RCA_n} \right), P \left( \frac{RCA_n}{RCA_m} \right) \right\}$$

[...]Whether a country’s exports in which it has comparative advantage are located in the denser part of the product space or in the periphery can predict the ease with which that country transforms itself economically. Structural transformations are not smooth movements along a continuum but a messy process beset by market failures. When such market failures are binding, it is harder for firms to hop longer distances without government coordination and support. Because products do not evolve in sequence, i.e., having iron ore deposits does not necessarily make a country an efficient steel producer, lateral-linkages are as or more important than forward-linkages with downstream industries.

Source: Farole and Reis (2012), p.71
ANNEX II

Thematic *ex ante* conditionality for the use of Structural Fund programs


First two of eleven *ex ante* conditionalities:

<table>
<thead>
<tr>
<th>Thematic objectives</th>
<th><em>Ex ante</em> conditionality</th>
<th>Criteria for fulfilment</th>
</tr>
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<tbody>
<tr>
<td>1. Strengthening research, technological development and innovation (R&amp;D target) (referred to in Art.9(1))</td>
<td>1.1. Research and innovation: The existence of a national or regional research and innovation strategy for smart specialisation in line with the National Reform Program, to leverage private research and innovation expenditure, which complies with the features of well-performing national or regional research and innovation systems.</td>
<td>– A national or regional research and innovation strategy for smart specialisation is in place that: is based on a SWOT analysis to concentrate resources on a limited set of research and innovation priorities; outlines measures to stimulate private RTD investment; contains a monitoring and review system. – A Member State has adopted a framework outlining available budgetary resources for research and innovation; – A Member State has adopted a multi-annual plan for budgeting and prioritization of investments linked to EU priorities (European Strategy Forum on Research Infrastructures - ESFRI).</td>
</tr>
<tr>
<td>2. Enhancing access to and use and quality of information and communication technologies (Broadband target) (referred to in Art.9(2))</td>
<td>2.1. Digital growth: The existence within the national or regional innovation strategy for smart specialisation of an explicit chapter for digital growth to stimulate demand for affordable, good quality and interoperable ICT-enabled private and public services and increase uptake by citizens, including vulnerable groups, businesses and public administrations including cross border initiatives.</td>
<td>A chapter for digital growth within the national or regional innovation strategy for smart specialisation is in place that contains: – budgeting and prioritisation of actions through a SWOT analysis carried out in alignment with the Scoreboard of the Digital Agenda for Europe; – analysis of balancing support for demand and supply of ICT should have been conducted; – measurable targets for outcomes of interventions in the field of digital literacy, skills, e-inclusion, e-accessibility, and e-health which are aligned with existing relevant sectoral national or regional strategies. – assessment of needs to reinforce ICT capacity-building.</td>
</tr>
<tr>
<td>2.2. Next Generation Access (NGA) Infrastructure: The existence of national NGA Plans which take account of regional actions in order to reach the EU high-speed Internet access targets, focusing on areas where the market fails to provide an open infrastructure at an affordable cost and to an adequate quality in line with the EU competition and state aid rules, and provide accessible services to vulnerable groups.</td>
<td>A national NGA Plan is in place that contains: – a plan of infrastructure investments through demand aggregation and a mapping of infrastructure and services, regularly updated; – sustainable investment models that enhance competition and provide access to open, affordable, quality and future proof infrastructure and services; – measures to stimulate private investment.</td>
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ANNEX III

Full Decision Tree: A typology for smart specialization and policy implications

**STEP I: Specialization**

- **Yes**
  - Fully: Apparent comparative advantage
  - Sustainable
  - Sector Innovation Policy
  - Reorganization/Technological Modernization
  - Structuring
  - Exit/Diversify
  - Exit policies/Enable self Discovery

- **Partially: Latent Comparative Advantage**
  - Based on natural resources
  - Sector Innovation Policies

- **Linkages/Coordination Failure**
  - S&T/KE/Skills
  - Sector Innovation Policy
  - Technology does not need local knowledge
  - Enable Self Discovery

- **No**
  - Enable Self Discovery

**STEP II: Bottlenecks**

- Sustainable
- Restructuring
- Exit/Diversify
Bibliography


Foray, D., & van Ark, B. (2007). Knowledge Economists' Policy Brief no.1: "Smart specialisation in a truly integrated research area is the key to attracting more R&D to Europe".


