

# Smart specialization and entrepreneurial discovery: Theory and reality

## Especialização Inteligente e Descoberta Empreendedora: Teoria e Realidade

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### Abstract/Resumo

Smart specialization appears as key element not only in relation to the programming of EU funds for 2014-2020, but as an opportunity to generate wealth and jobs through the phenomenon known as entrepreneurial discovery. Therefore, it is essential for regions identifying and supporting entrepreneurial discovery processes and initiatives. Thus, the aim of this paper is twofold. First, making advance in clarifying the concept of entrepreneurial discovery both in theoretical and practical terms. Secondly, establishing a set of recommendations on the role of entrepreneurial discoveries within a smart specialization strategy and more specifically, the requirements for policies in order to be able to identify and support initiatives and processes of this nature.

**Keywords:** smart specialization, entrepreneurial discovery, RIS3

**JEL Codes:** O31

A especialização inteligente aparece como elemento fundamental não só em relação à programação dos fundos da UE para 2014-2020, mas também, como uma oportunidade para gerar riqueza e emprego através do fenómeno conhecido como descoberta empreendedora. Portanto, é essencial para as regiões identificar e apoiar processos e iniciativas de descoberta empreendedora. Assim, o objetivo deste artigo é duplo. Em primeiro lugar, contribuir para o esclarecimento do conceito de descoberta empreendedora, tanto em termos teóricos como práticos. Em segundo lugar, estabelecer um conjunto de recomendações sobre o papel das descobertas empreendedoras dentro de uma estratégia de especialização inteligente e, mais especificamente, sobre os requisitos das políticas adequadas, capazes de identificar e incentivar os processos desta natureza.

**Palavras Chave:** especialização inteligente, descoberta empreendedora, RIS3

**Códigos JEL:** O31

## 1. INTRODUCTION

In the new competitive context, the key to compete in the market is based on finding a differentiated competitive position. In other words, to find those niches of activity and knowledge where not only things are better, but better compared to others. In addition, as a result of the increasing technological changes, these niches must evolve over time in a continuous search for the competitive advantage.

Innovation, from the combination of different ideas, experiences etc. generates new solutions to meet market needs (determined usually at an international level). Being able to systematize and generalize this phenomenon at regional level, will lead to a continuous process of economic renewal. And thus, this entrepreneurial phenomenon will make the regional economy more dynamic and competitive.

Recently a territorial development model has been extended focused on territorial search of specialized diversification. This model, known as smart specialization, is achieving remarkable relevance in the current postulates of European Regional Policy to the point of becoming, through the development of a strategy for smart specialization, an ex-ante condition for the Structural Funds in the period 2014-2020.

Although there are many opportunities behind the model and its strategies, there is also a significant number of risks to be considered. First, despite the lengthy theoretical literature on smart specialization, this fact has generated a lack of guidelines to carry out process of this kind.

Second, the latter statement is even more obvious when referring to entrepreneurial discovery, a fuzzy concept with a lack of real examples. However this kind of discovery appears as a key element to achieve specialized diversification processes, wealth generation and job creation in a framework of sustainable competitiveness in the medium and long term.

Third and finally, the link among the strategies and the ex ante conditionalities of the Structural Funds is putting high pressure on the deadlines to have them defined and launched. But this pressure does not correspond to what in theory would be required for an effective and appropriate definition of the strategies regarding the entrepreneurial discovery.

Nevertheless, given the opportunity that these strategies represent for the territorial develop-

ment, and especially for wealth generation of and job creation, it is essential that regions seek ways to identify, support and systematize the efforts on entrepreneurial discovery processes in their respective territories.

Thus, the aim of this paper is twofold. On the one hand, the **first objective** of the paper is to **clarify the concept of entrepreneurial discovery** both theoretically and operationally. On the other hand, the **second objective** is to **obtain a set of recommendations about the role of entrepreneurial discovery in smart specialization strategies** that enable policy makers identifying and supporting initiatives and processes of this nature.

The first section introduces the theoretical and practical framework of smart specialization as a model of territorial development. It also included the reflection on current smart specialization strategies.

The second section examines from a theoretical perspective the phenomenon of entrepreneurial discovery by establishing a series of defining and characterizing elements, as well as the differences between their processes and initiatives. This section also includes a reflection on the implications of entrepreneurial discovery processes and initiatives as part of a smart specialization strategy, and how to maximize their contribution to economic diversification.

The third section includes a number of case studies in different Spanish regions. The analysis of the examples allows the translation of the concept to each territory reality.

Finally, a fifth section summarizes a number of conclusions and recommendations to be considered in terms of the opportunities that the smart specialization strategies represent regarding the implementation of the entrepreneurial discovery phenomenon.

## 2. SMART SPECIALIZATION AND TERRITORY

The smart specialization concept has recently gained importance as a basis for European regional policy in the framework of the "Europe 2020" strategy and its "Innovation Union" initiative (Del Castillo et al. 2012a).

The concept comes from the strategic reflection carried out between 2006 and 2009 by a panel of experts at European level supported from DG Research entitled "*Knowledge for Growth*" (Pontikakis, Kyriakou and Van Bavel

2009). The mission of this group was to study the increasing gap between EU and U.S. in terms of R&D effort and its contribution to economic growth.

It was concluded that, in addition to labour market imperfections, the different composition of the economic structure (medium and low technology sectors in Europe) makes difficult for European businesses to translate R&D into commercial results, as well as increase productivity levels similar to those in the U.S. (Pontikakis et al. 2009). This is thought to be problem of scale and of regional economic activity integration limiting Europe's ability to compete at international level (K4G 2008).

The European market, unlike the U.S., is much less integrated. On one hand, U.S. regional innovation systems work as a more consistent set than the European ones. Both elements lead, according to the group of experts, to fragmentation and duplication of efforts, and what is worse, to inefficient transmission of knowledge within the regional systems (K4G 2007). In short, Europe faces serious difficulties in achieving the necessary critical mass that would achieve such a level of excellence and adequate adaptation to the demands of enterprises (especially SMEs).

In response to this situation, the expert group emphasized the concept of smart specialization based on the idea that regions must identify a number of technological and knowledge domains through entrepreneurial discovery processes in order to build competitive advantages. This will also allow regional policy makers to define and adjust their policies to promote innovation in these domains (Foray et al. 2009). The prioritization of the efforts pursued by this approach is intended to achieve a more consistent distribution of European innovation, in order to get a sufficient critical mass of the research effort as well as in terms of medium and high technology companies.

As a consequence of the importance acquired by these reflections on the new strategic framework of the Europe 2020, DG Regional Policy of the European Commission includes smart specialization in the Common Strategic Framework as a structural element for the Cohesion Policy. Specifically, it is one of the requirements for accessing the ERDF in the next programming period (EC 2010a and EC 2011a).

But smart specialization is still a concept in development, mainly referenced to authors advising the Commission (Foray and Van Ark.

2007, Foray et al. 2009, Foray 2009a, Foray 2009b, David et al. 2011 and McCann and Ortega-Argilés 2011). Considering the literature (Barca 2009, EC 2010a and Del Castillo et al. 2012a), smart specialization can be defined as *"the prioritization carried out at territorial level compared to that of other territories in a series of economic activities, scientific areas and technological domains potentially competitive and able to generate new market opportunities in a global context"*. According to these authors, the concept can be broken down into three main elements, namely:

1. The prioritization in a limited number of areas (technological, scientific and economic areas) regarding the choices of other regions.
2. The search for opportunities through the exploitation of the territorial related variety, maximizing externalities and generating new business activities.
3. The coherence of the whole process in the global context, where territorial specialization is part of a global value chain.

The prioritization of a territorial specialization pattern is based on the methodological foundations of business strategy (Del Castillo et al 2013a). In fact, as Porter notes (1996) the foundations of territorial competitive advantage arises from specific territorial asset combination, from the type of agents located there, and from the level of connectivity within the region.

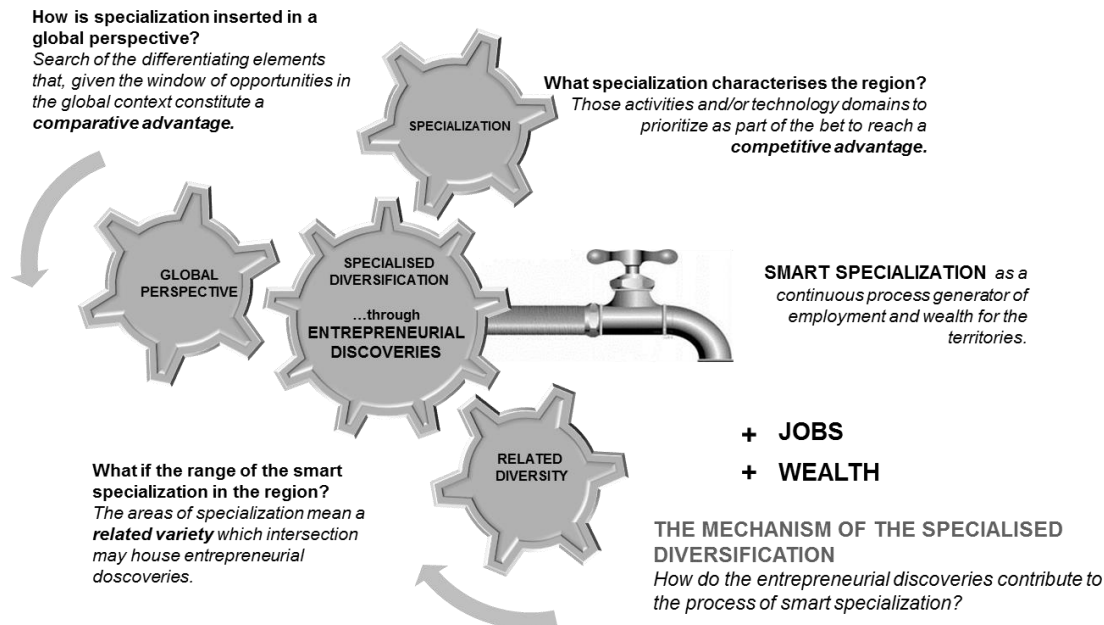
Nevertheless, smart specialization goes beyond the mere prioritization of specialization patterns: in the medium/long term the determinants of a territorial competitive advantage may vary, making necessary a change in the specialization pattern accordingly. Basically, it is the traditional dilemma about what kind of agglomeration economies should be exploited in a given territory (Frenken et al. 2007): location economies (sectoral specialization); urbanization economies (sectoral diversification); or related variety exploitation (a balance between the two above).

The smart specialization approach, influenced by the recent academic literature in the field (Boschma e Immarrino 2009 and Boschma et al. 2012), seems to support the idea that the exploitation of territorial related variety gives optimal economic results in the long term. Therefore, a strategy for smart specialization

should be focused on seeking specialized diversification through the exploitation of the territorial related variety. Going further, these possi-

bilities are identified and materialized through the phenomenon of entrepreneurial discovery (Del Castillo and Paton 2012).

**Figure 1. The specialized diversification mechanism: how do entrepreneurial discoveries contribute to the process of regional smart specialization?**



Source: Own elaboration from Del Castillo et al. (2012a) y (2012b)

Finally, neither the specialization pattern nor the exploitation of territorial related variety may happen isolated from the international context. Firstly, the progressive implementation of global production networks makes impossible to find complete value chains at regional level, only parts of them (Paton and Garatea 2012). Secondly, the “global” dimension of smart specialization seek to overcome the limitations that authors such as Kaufmann and Tödtling (2000) note regarding the inefficiency and risk related to the lock-in effect that “autarky” may lead.

In short, smart specialization is interpreted not as the search for a pure specialization that exploits localization economies, but as an exercise to diversify from the possibilities of related variety exploitation (McCann and Ortega-Arquiles 2011). In addition, these fundamentals must find their roots in a dynamic framework that takes into account the territorial assets (tangible and intangible) in a global context, and where governance contribute to achieve a competitive and comparative advantage throughout “waves of innovation” (Del Castillo et al. 2012b).

In policy terms, the Commission urges the regions to develop smart specialization strategies (RIS3) focusing on pursuing a diversified

portfolio of related activities. This strategy must find equilibrium between specialization and diversification, trying to avoid an exposition of the region to the risks of changes in market conditions or other unpredictable external factors (EC 2010a).

Thus, according to McCann (2011) the smart specialization strategy is a case of policy linked to territory (a place-based policy). That is the reason why it is so important to analyse which are the productive and knowledge bases of the region (economic and knowledge specialization pattern according to Del Castillo et al. 2013b), where it has not only competitive but comparative advantages.

This approach is in fact an important matter regarding those advocating for more political neutrality regardless of temporal and spatial factors (World Bank 2008). In line with authors such as Rodríguez-Pose (2011), there is significant room for territorial differentiation in strategic approaches, and therefore it should be reflected accordingly.

It can be clearly appreciated that these new approaches of smart specialization and RIS3 are not completely new. As some authors note (Del Castillo et al. 2013b), smart specialization is the result of a reflection carried out since 90s, with

the first exercises of regional innovation strategies. It is however a response to the deficiencies of the previous strategies where there was less availability of conceptual and applied developments (Navarro et al. 2012). In fact, concreteness given by the entrepreneurial discovery concept is probably one of the most representatives of those deficiencies.

### 3. THE ENTREPRENEURIAL DISCOVERY (I): A THEORETICAL APPROACH

#### 3.1. The concept of entrepreneurial discovery: processes and initiatives

Following the origin of the concept (Foray et al. 2009 y Foray 2009b), the entrepreneurial discovery can be defined as a learning process by which a region gradually discovers which should be their priorities in R&D and innovation linked these to the ability to transform the current economic structure orientated to maintaining a path of growth and employment. According to the thesis of their authors, these processes (or should be) led by entrepreneurs.

Thus, as RIS3 Guide notes (IPTS 2012), the concept of entrepreneur within the framework of these discovery processes must be understood in a broad sense (companies, higher education institutions, public research institutes, researchers and independent innovators, etc.) and includes anyone who is in the best position to combine, on a creative basis, different approaches for new market opportunities.

However, beyond all these references, the study of what is in practice the entrepreneurial discovery within the framework of smart specialization model is nearly nonexistent (Paton y Barroeta 2012). Even the developments carried out by scholars in the field of entrepreneurship show the lack of clarity and consensus on the concept (Ven and Engleman 2004, and Gordon 2011). That inevitably generates an important difficulty on defining RIS3, as well as on what choices and how to prioritize them during the strategic implementation period (Navarro et al. 2012).

From the scarce work still carried out by the authors in terms of regional cases, as well as papers on the concept (Del Castillo et al. 2011, Del

Castillo y Paton 2012 and Paton et al. 2013), it can be noted that entrepreneurial discoveries can be found throughout the whole economic structure. In other words, these discoveries be found in any type of economic sector and area of knowledge and therefore, in any type of region (IPTS 2012 and Del Castillo et al. 2013). And this has an interesting implication to regional policy.

At this point it should be stressed that, although the great majority of available documentation makes reference to research and innovation from a technological perspective mainly if the nature of entrepreneurial discovery implies to consider equally the non-technological innovation. This is in fact more relevant in traditional sectors (non-technological ones), services and specialization patterns in less advanced regions in general (Del Castillo et al. 2012d).

As referenced by Navarro et al. (2012), regarding the studies of Corrado et al. (2005), the productivity increases as far as a territory considers also other type of factors (organizational improvements, creativity and design, etc.) in addition to more R&D effort. Therefore, such factors should not be ignored when planning a smart specialization strategy. Moreover, the above statement is more evident in less developed regions and in traditional sectors, in which R&D capabilities are lower and competitive advantages frequently lay on factors others than science and technology (McCann and Ortega-Argilés 2011).

As figure 2 shows, considering the entrepreneurial discovery approach it is necessary to differentiate between the process and the initiative<sup>1</sup>. The first one refers to the set of mechanisms by which the entrepreneur identifies the possibility of combining knowledge and economic activities in the framework of existing market opportunities and develops the idea. On the contrary, the second one refers to the concretion of the idea in a product/service through a business model, and commercialized by a new company.

Besides, some authors also suggest that both the process and initiatives are subprocesses of the entrepreneurial discovery (Zahra et al. 2006, Davidsson 2008). As Davidsson (2008) notes, the discovery is referred to the process of shaping an idea to reach a business concept, while

<sup>1</sup> This distinction is reinforced by the fact that the phenomenon of specialized diversification is a process, and therefore also the entrepreneurial discovery. Depending on the degree of maturation of

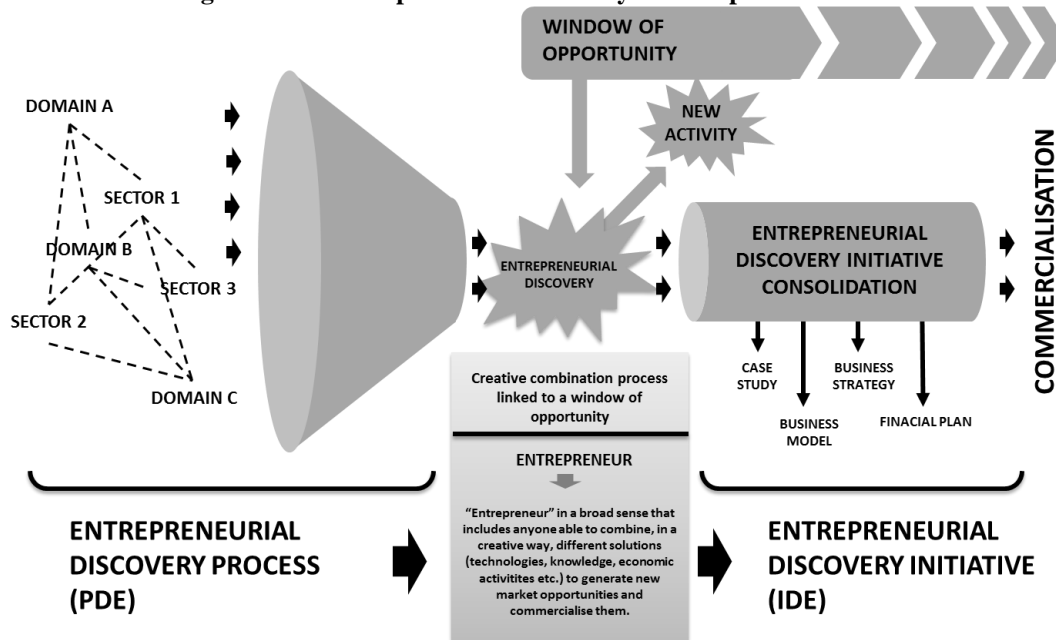
this discovery, this may be a latent process or an initiative at the time of identification.

the undertake action (initiative) refers to implement the concept in the market.

Even though the entrepreneurial discovery is related to a micro level (individual initiatives that may result in new business projects), the approach of smart specialization model seeks to

overcome it to reach a macro level. In other words, it is not about focusing on individual processes or initiatives, but a large set of them that allows obtaining systematic results in terms of regional development.

**Figure 2. The entrepreneurial discovery: from a process to an initiative**



Source: Own elaboration.

As Foray (2009) notes, the key is to systematize multiple decentralized experiments that lead in regional discoveries that allow, in the context of a smart specialization strategy, to identify fields of opportunity to be prioritized. As Navarro et al (2012) note, it is about changing from the "microscopic" framework to the "macroscopic" one where smart specialization strategies have their foundations.

In terms of strategic definition and implementation, the entrepreneurial discovery processes, due to their more incipient level, are more difficult to identify and it is usually necessary to consider broad economic areas where they can be found and generated. The RIS3 aims, in this case, to boost discovery processes and support them to become concrete initiatives. The participatory governance of RIS3 facilitates the identification of these processes, as well as the raising of wills and commitments to transform them into formal initiatives (Del Castillo et al. 2013a).

Regarding entrepreneurial discovery initiatives, due to their further level of development (at this stage an entrepreneurial activity has already been launched), are easier to identify, and

here the RIS3 aims to contribute to their consolidation and anchoring to the region. An example of both (identification and support) can be seen in Del Castillo et al. (2011) and Del Castillo and Paton (2012) respectively.

As shown in the later papers, the difficulty of integrating the entrepreneurial discovery in a smart specialization strategy comes from the scale and scope of the concept as well as from the number of potential entrepreneurial sources. In short, two barriers must be taken into account (Del Castillo et al. 2013b):

1. Identification and prioritization of existing (initiatives) and potential (processes) on agreed criteria and objectives.

2. Support (instrumentation) included on the strategy for both existing and potential discoveries (and in the latter case the process itself).

### 3.2. Identification of entrepreneurial discovery: discovering the discovery

To identify at first instance entrepreneurial discoveries in a territory it is necessary an ex-

tensive knowledge about their characteristics. Following the definition of entrepreneurial discovery given at the beginning of the section,

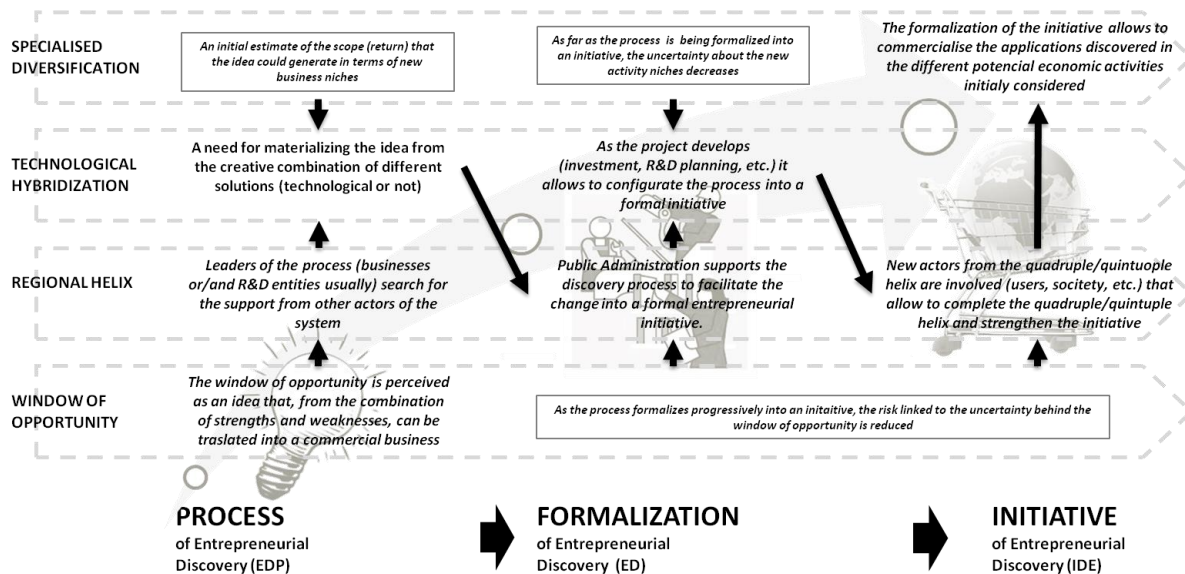
Table 1 shows the elements of potential discovery cases:

**Table 1. Main characteristics of entrepreneurial discovery**

| <i>CHARACTERISTICS</i>             | <i>CHECKLIST</i>   | <i>ASPECTS TO CONSIDER</i>  |
|------------------------------------|--|---|
| <b>Window of opportunity</b>       | <i>Does it have a clear market orientation at international level?</i>                           | <ul style="list-style-type: none"> <li>• Marketing period at short, medium or long term</li> <li>• Geographic scope: national, European and international</li> </ul>                      |
| <b>Regional helix</b>              | <i>Does the "entrepreneur" arises and / or is supported by the quadruple helix?</i>              | <ul style="list-style-type: none"> <li>• Companies</li> <li>• R&amp;D and innovation agents</li> <li>• Government</li> <li>• Users/clients</li> </ul>                                     |
| <b>Technological hybridization</b> | <i>Are different knowledge/technology domains combined?</i>                                      | <ul style="list-style-type: none"> <li>• Sector-Sector (non technological innovation)</li> <li>• Sector-Technology</li> <li>• Technology-Technology (technological innovation)</li> </ul> |
| <b>Specialized diversification</b> | <i>Does it contribute to the diversification of the current regional specialization pattern?</i> | <ul style="list-style-type: none"> <li>• Incremental improvement</li> <li>• New product/service generator of new activities</li> </ul>  |

Source: Own elaboration

**Figure 3. The dynamic nature of entrepreneurial discovery: the lifecycle and its stages**



Source: Own elaboration

The search for these features in a participatory process like the one the Commission proposes (EC 2011b), to boost the identification of entrepreneurial discoveries (IPTS 2012). Moreover, it is important to appreciate the different categories that the Commission states (EC 2010a), and which imply a number of mechanisms for the instrumentation of structural change through specialized diversification (see Table 3).

These features are also useful when discriminating potential cases and to establish priorities in phases such as those indicated by EURADA (2012) in which entrepreneurs and the business tissue in general, should be involved as a part of the RIS3 definition. Here it is important to consider the differences established between processes and initiatives linked to the dynamic nature of the phenomenon, and the "life cycle" of any entrepreneurial experience.

Following the case study methodology presented by some authors (Del Castillo et al. 2012d, Ortega-Argilés 2012, DATAR 2012, and Navarro et al. 2011), we have searched for the features of Table 1 in a number of Spanish regions with the aim to propose a translation of the phenomenon of entrepreneurial discovery

with in the current RIS3 exercises. Following the proposal by Del Castillo et al. (2011) and Del Castillo and Paton (2012) we propose an overall index for the case (Table 2). The results from the case studies analyzed are included in section 3

**Table 2. Identification of entrepreneurial discoveries: the case study approach**

| CONTENTS                      | DESCRIPTION  | CHARACTERISTICS  |
|-------------------------------|--|--|
| Territorial context           | <i>A description of the overall context (economic, social and environmental) of the region where the discovery is located. It is desirable to emphasize the economic and R&amp;D and innovation dimensions, but also others (social and environmental ones) to understand the determinants from which the discovery arises.</i>  | <ul style="list-style-type: none"> <li>• Window of opportunity</li> </ul>  |
| Description of the discovery  | <i>To describe clearly the nature of the discovery including the aspects that define it but especially the distinctive nature of the hybridization. In this section, complementary to the above, the role that entrepreneurial discovery plays in strategy of the region should be highlighted to specialized diversification.</i>   | <ul style="list-style-type: none"> <li>• Technological hybridization</li> <li>• Specialized diversification</li> </ul> |
| Business model                | <i>To identify those agents involved in the discovery and their roles, and more specifically the expected return of its implementation and consolidation. Complementing the previous section, the business model should specify mechanisms to achieve it, or in other words the strategy (as a set of actions and commitments) for launching the entrepreneurial discovery initiative.</i> | <ul style="list-style-type: none"> <li>• Regional helix</li> <li>• Window of opportunity</li> </ul>                    |
| Contribution to the territory | <i>Finally, the last section allows linking the entrepreneurial discovery with the set of determinants that made possible the discovery. This section provides the "learning process" for policies for RIS3 and policy implementation.</i>   | <ul style="list-style-type: none"> <li>• Regional helix</li> <li>• Specialized diversification</li> </ul>              |

Source: Own elaboration

### 3.3. RIS3 and entrepreneurial discovery: the instrumentalization of structural change

Despite the emphasis that literature on smart specialization places on the importance of the definition regional strategies, the progress made on how to implement this kind of processes is relatively low. They are mostly limited to general assumptions without deepen paradoxically on elements such as governance (Del Castillo et al. 2013a), social capital or leadership (Navarro et al. 2012). However, as the Commission notes (2010a), understanding the entrepreneurial discovery phenomenon as a facilitating mechanism of the specialized diversification, leads to four pathways for structural change:

1. The redesign actions (or "retooling") would be based on modernization of existing

traditional sector applying enabling technologies<sup>2</sup> or innovations to reach international trends and higher competitive levels.

2. The synergistic diversification (or "extending") would be based on accessing new activities for the region (but not in terms of international markets/ trends) through economies of scope (e.g. from vehicle manufacturing to satellite positioning).

3. The transition to a new sector (or "emerging") would be based on accessing new activities for the region (but not in terms of international markets and trends) through front line technology and knowledge application in a given sector (e.g. application of ICT to historical heritage).

<sup>2</sup> In smart specialization terms the concept of "Key Enabling Technology –KET" has become significantly important (EC 2012)



4. Radical foundation actions ("cross-sectoral" or from related variety exploitation into radical innovations) understood as new combinations of technology domains and for economic activities that help to generate innovative

ideas for new products and services (such as hybridization opportunities resulting from the intercluster collaboration leading to completely new activities).

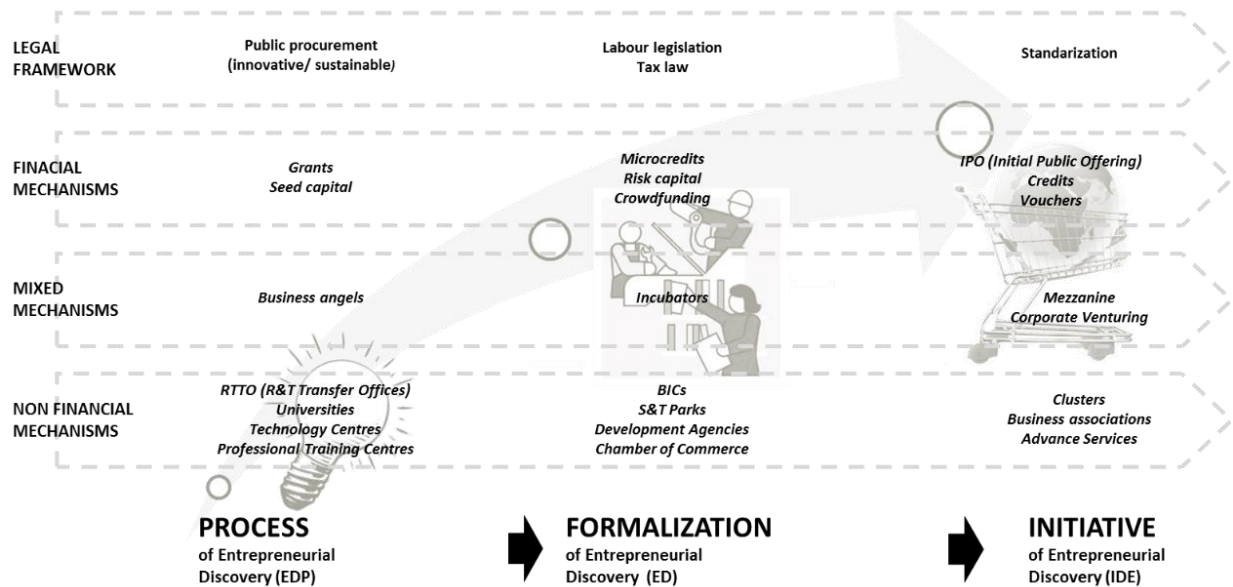
**Table 3. Entrepreneurial discovery typologies required by structural change**

| Typologies of the discovery* | Entrepreneurial discovery typologies |           |           |                    |
|------------------------------|--------------------------------------|-----------|-----------|--------------------|
|                              | Redesign                             | Extension | Emergence | Radical foundation |
| Specialized diversification  | Low                                  | Medium    | High      | High               |
| Technological hybridization  | Low                                  | Medium    | Medium    | High               |
| Quadruple helix              | Medium                               | Medium    | Medium    | High               |
| Window of opportunity        | Low                                  | Medium    | High      | High               |

Thus, the combined analysis of the entrepreneurial discovery typologies regarding ways of structural change allows considering a first set

of policies to be undertaken to support the emergence and consolidation of these discoveries (Figure 4):

**Figure 4. Phases of an entrepreneurial discovery and supporting policies.**



Source: Own elaboration.

Besides, these policies would vary (qualitatively and quantitatively) according to:

1. The stage from which the entrepreneurial discovery is (process, formalization of entrepreneurial discovery initiative).
2. The characteristics of the discovery itself (in relation to the potential level for diversification, hybridization, regional helix, and the opportunity window).
3. The paths chosen for structural change (Table 3).

As McCann and Ortega Argilés note (2011), at the beginning the theory of smart specialization was linked to "laissez faire" approaches. This implies an inherent danger in regions with a lack of the necessary conditions to be developed by entrepreneurs (Paton and Barroeta, 2012). This danger has led to clarify the role of different actors of the quadruple helix, especially with regard to the involvement of the government.

Navarro et al. (2012) specify that the policies used in the framework of smart specialization and entrepreneurial discovery would be based on "finding the line that separates the macroscopic framework (in which the election of the

Government would be justified) from the microscopic one (in which the agents make their choices in a decentralized way)". This debate arises because, as these authors note, "it is more likely to conceive a greater commitment of the economic actors in more developed regions than in less developed ones, since one of the features of less developed regions is the absence of those facilitators to whom Foray assigns the leadership in the process".

Foray et al. (2009) propose leaving the leading role to entrepreneurs and therefore, the role of government should not consist on selecting bureaucratically the chosen specialization areas and boosting them, but facilitating the conditions for it:

1. To provide incentives to entrepreneurs to get involved in the discovery.
2. To assess and evaluate the effectiveness of such support so that the support is focused in economic sectors with a significant competitive and impact potential.
3. To provide complementary investments for emerging activities.
4. To provide information and facilitate coordination and linkages.

Nevertheless, it is important to generate positive expectations for the whole spectrum actors of the quadruple helix regarding the prioritization of economic activities, technology and of knowledge domains, but not trying to impose predefined fields (Foray 2009a), limiting what in Foray's sense should consist on "boosting a

large number of experiments in a decentralized way". Again, this author specifies more the role of the government when stating that "it is crucial to be non-neutral when identifying a very broad agenda of priorities, while neutral in relation to specific applications of the priorities".

In line with these claims is the OECD (2011) stating that "regional governments play a key role in the recognition of opportunities for change, in the mobilization of resources towards diversification and in the identification of new economic frontiers".

Thus, it could be concluded that the government should identify opportunities, enable and mobilize resources and guide those choices that best contribute to regional wealth and employment generation. On the contrary, it should not focus its policies in a "mission oriented", "enfant industries" or "picking winners" way, which ignore the existing or potential capabilities of the territory (Foray 2009a). As Avnimelech and Teubal note (2008), make it possible to enable natural and spontaneous processes that characterized advance regions, but because of market imperfections do not happen in less developed areas.

#### 4. THE ENTREPRENEURIAL DISCOVERY (II): A PRACTICAL APPROACH

Some entrepreneurial discovery case studies identified in four Spanish regions are presented in this section (Tables 5 to 8). They includes both initiatives and processes covering also the typologies addressed in Table 3. Table 4 shows a brief summary of the analyzed cases:

**Table 4. Some entrepreneurial discovery case studies in Spain**

| Case Study  | Type Region  | Type          | Approach   | Features * |   |   |   | Path**             |
|---|--|---------------|--|------------|---|---|---|--------------------|
|   |  |               |  | 1          | 2 | 3 | 4 |                    |
| <b>CASE 1</b><br>Rural specialization<br>Urdaibai Bird Center   | <b>Basque Country</b><br>More developed -<br>competitiveness | Initiative    | Territorial diversification<br>strategy in rural areas                           | H          | H | H | H | Radical foundation |
| <b>CASE 2</b><br>Related variety:<br>metal + health             | <b>Basque Country</b><br>More developed -<br>competitiveness | Process       | Reinventing a traditional<br>activity towards an emerging<br>technological niche | H          | M | M | H | Emergence          |
| <b>CASE 3</b><br>Sector modernization:<br>Heritage + high tecn. | <b>Castilla y León</b><br>More developed –<br>Phasing-In     | Initiative    | Access to a related niche<br>through enabling technologies                       | M          | M | M | M | Extension          |
| <b>CASE 3</b><br>Export redesign:<br>Food Technology            | <b>Extremadura</b><br>Less developed -<br>Convergence        | Formalization | Modernization of the activity<br>to increase market share                        | L          | L | M | L | Redesign           |

Source: Own elaboration

\*See table 1: H-High; M-Medium; L-Low

\*\* see table 3

**Table 5. Smart specialization in rural areas: the case of Urdaibai Bird Center (UBC)**

| <b>TITLE</b>                        |  | <i>"Urdaibai Bird Center" International (UBC) "Living Lab"</i>  |
|-------------------------------------|--|---|
| <b>REGIONAL CONTEXT</b>             |  | The UBC resort is located in the middle of the Biosphere Reserve of Urdaibai. It is a geographical area with absence of important population centers (lack of critical mass) and, mainly rural (traditional activities). Due to the restrictions imposed by its natural environment, the economic development potential is relatively limited.  |
| <b>BUSINESS MODEL</b>               | <b>Window of opportunity</b>                 | <p>Even though the limitations imposed by the area, the location includes excellent conditions for monitoring birds. This research activity (together with the potential of inclusions of new technologies applications) allows to discover the opportunities that could have impact on social challenges such as:</p> <ol style="list-style-type: none"> <li>1) the monitoring of the ecologic risks and the climate change through migration models,</li> <li>2) applications in the field of traceability and monitoring for a number of sectors (aerospace, logistics, health, tourism etc.) and</li> <li>3) potential as a transferable model for less advanced regions.</li> </ol>  |
|                                     | <b>Participation of the regional helix</b>   | <ul style="list-style-type: none"> <li>• R&amp;D agents (Aranzadi, ESTIA, ESA/Galileo and UPV/EHU etc.) provide technology and knowledge feeding the processes of technological hybridization.</li> <li>• Public Administration (Provincial Council of Bizkaia, Basque Government, Consulate of India etc.), provide credibility, resources and institutional support, as well as the integration of the UBC into a broadest territorial development policy.</li> <li>• Business tissue (GAIA Cluster, Innovatec, Satec, Navteq, Lotek Wireless, Virtualware, Biotrack, etc.) provides the innovation component that allows the commercialization of the results in the markets, contributing to generate wealth and employment.</li> <li>• User and network communities (Obra Social BBK, Global Nature Fundation, EURING, ENOLL etc.), provide the testing in relation to social challenges, as well as the integration into international networks.</li> </ul> |
| <b>DESCRIPTION OF THE DISCOVERY</b> | <b>Nature of specialized diversification</b> | <p>The UBC as a "living lab" generates research activities and economic and social returns:</p> <ul style="list-style-type: none"> <li>• Frontline research activities in the field of ecology, climate change and biodiversity through birds migratory patterns.</li> <li>• Training and education in environmental and biological fields</li> <li>• High level tourism linked to research (European and international visitors).</li> <li>• Testing of technologies for scientific and economic uses linked to TEICs and horizontal applications (security, transport, health, etc.).</li> </ul>  |
|                                     | <b>Nature of technological hybridization</b> | <p>Although the UBC is specialized in activities with high scientific content in the field of biology- ecology, its nature of "living lab" and of "experimentation center of radical innovations of excellence" has allowed it to exploit the related variety inherent to such activities through technological hybridization: ICTs is the main enabling technology, within application possibilities in the environment, education, tourism and third sectors (security, transport and logistics, health, etc.).</p>   |
| <b>CONTRIBUTION TO THE REGION</b>   |  | <ul style="list-style-type: none"> <li>• In environmental terms, the UBC contributes to improving knowledge and scientific areas related to ecology, biology and climate change (risks monitoring).</li> <li>• In social terms, the UBC contributes to connecting the town Arteaga Gautegiz and its surroundings internationally through the attraction of high-level visitors.</li> <li>• In economic terms, the testing of technology solutions is generating commercialisation opportunities both by participating companies and entrepreneurs.</li> </ul>   |

Source: Own elaboration.

**Table 6. Related variety exploitation: the case of the metal and health industry**

| <b>TITLE</b>                        |  | <b>"II COMPITE Bilgunea" (IICB): "Intersectoral processes for economic diversification"</b>  |
|-------------------------------------|--|--|
| <b>REGIONAL CONTEXT</b>             |  | <p>The Basque Country is traditionally characterized by the importance of its industrial tissue, mainly linked to metal-mechanical and processed activities. A great challenge has emerged in terms of how to achieve certain level of diversification, in particular towards the exploitation of Basque related variety to generate a qualitative change (the so called "Great Economic Transformation ").</p> <p>With this goal in mind, in 2012 the Basque Government and SPRI, launched a pilot initiative to promote technological hybridization among different but related activities that could generate new diversification business projects. This initiative, called "<i>II Compite Bilgunea</i>" (IIBC) operated as a pilot among metal-mechanical SMEs and health care companies to share crosscutting technologies.</p>  |
| <b>MODELO DE NEGOCIO</b>            | <b>Window of opportunity</b>                     | <ul style="list-style-type: none"> <li>• The Basque economy is known for its specialization in industrial niches and though certain diversification had been pursued in the past, it had not always been successful.</li> <li>• The growing awareness among the companies about the possibilities of accessing emerging niches without a total breakdown of their activity and know-how.</li> <li>• This initiative had the commitment of the Administration, a need and interest from companies in both sectors, and capabilities both from companies and agents of the innovation system, to support projects defined from the event.</li> </ul>   |
|                                     | <b>Participation of the regional helix</b>       | <ul style="list-style-type: none"> <li>• The intermediate agents such as regional and local development agencies (Bilbao Ekintza, Inguralde, Goieki, DEBEGESA, Fomento de San Sebastián) contributed with their knowledge on the industrial SMEs tissue in the field.</li> <li>• The Public Administration (Basque Government and SPRI) provides resources and programs to promote business competitiveness, and coherence to regional smart specialization.</li> <li>• The business sector provided sectorial, technological and market knowledge, and shared experiences that allowed going into specific projects and business opportunities.</li> </ul>  |
| <b>DESCRIPTION OF THE DISCOVERY</b> | <b>Nature of the specialized diversification</b> | <ul style="list-style-type: none"> <li>• Activities related to medical care: surgery machinery, and health devices.</li> <li>• Experience exchange in diversification processes towards orthopedic and prosthetic industry.</li> <li>• Establishment of cooperation frameworks for potential research projects with clear market orientation.</li> </ul>   |
|                                     | <b>Nature of the technological hybridization</b> | <p>The pilot event IICB was based in two different economic activities but with shared technologies: On the one hand, industrial SMEs of sectors such as machine-tool, automotive, electronic and electrical components, plastics and polymers manufacturers. On the other hand, high tech companies for healthcare sector (high precision components).</p> <p>Previous analysis allowed the definition of the potential behind the bilateral cooperation and the definition of the match making event to boost technological hybridization based on advanced manufacturing and advanced materials (enabling technologies).</p>  |
| <b>CONTRIBUTION TO THE REGION</b>   |  | <p>The process has been of great interest due to the cultural change of exploring the related variety into different activities. Secondly, it has brought benefits to the participants:</p> <ul style="list-style-type: none"> <li>• From the business side, the identification of niches for industrial diversification through cooperation among industrial towards the healthcare sector.</li> <li>• From the government side, getting feedback about how to define and implement better competitiveness support instruments through intersectoral collaboration with SMEs and new promotion activities related to technological hybridization.</li> </ul> <p>The entrepreneurial discovery process initiated with the IICB pilot involved a total of 28 participants (23 companies) that resulted in 20 business contacts, 4 hybridization technology collaborations and a final project focused on specialized diversification.</p> |

Source: Own elaboration

**Table 7. Differentiating traditional sectors: cultural heritage and high-tech**

| <b>TITLE</b>                        |  | Santa María La Real Foundation   |
|-------------------------------------|--|--|
| <b>REGIONAL CONTEXT</b>             |  | <p>The Foundation Santa María La Real is located in Aguilar de Campo (Castilla y León). In a territory with a strong rural profile, the municipality has a wide natural, cultural and social heritage linked to the Romanesque. However, due to the distance from larger urban centers such as Burgos and Palencia, the municipality has traditionally suffered an important emigration of qualified people.</p> <p>The Foundation was created in 1994 to generate economic development from the local heritage. It has focused on managing the local resources through innovation and creativity.</p>   |
| <b>BUSINESS MODEL</b>               | <b>Window of opportunity</b>                     | <p>The reasons for the Foundation were a privileged environment with historical heritage, the proximity of the Santiago's Pathway, and the growing interest in history and culture.</p> <p>The experience gained in the heritage sector applying new technologies and the capacity generation (either internally or derived from collaboration with other agents) has made possible the launch of the initiative.</p>  |
|                                     | <b>Participation of the regional helix</b>       | <p>The Foundation has a patronage in which different actors of the quadruple helix are represented (Regional and Local governments, University, companies and other non-profit foundations). Operationally, the Foundation collaborates heterogeneously depending on the particularities of the project to be developed (e.g. depending on the knowledge requirements, the need of commitment or institutional support, etc.).</p>   |
| <b>DESCRIPTION OF THE DISCOVERY</b> | <b>Nature of the specialized diversification</b> | <p>The specialized diversification pursued by the Foundation comes from ICTs application in each stage of the Historical Heritage life cycle. Although this application has focused mainly on the construction sector, also reaches other areas such as energy efficiency and environment, tourism, or even health and welfare.</p>  |
|                                     | <b>Nature of the technological hybridization</b> | <p>The Foundation is specialized towards high scientific and technological content activities in the field of management, restoration and conservation of heritage. It explores the related variety through technological hybridization in ICTs and its application towards the whole Heritage life cycle (research, recovery and preservation, dissemination and exploitation).</p> <ul style="list-style-type: none"> <li>• From the research perspective, virtual collaboration networks among specialized research centres are developed.</li> <li>• From the preservation perspective, technological applications for humidity, temperature, ground displacements control, etc. are developed.</li> <li>• From the exploitation perspective, applications for security monitoring (access control, presence detection, etc.), energy efficiency (brightness control, etc.), 3D digitalization for communication and diffusion and virtual information for tourists, etc.</li> </ul> |
| <b>CONTRIBUTION TO THE REGION</b>   |  | <ul style="list-style-type: none"> <li>• From the economic perspective, Foundation's activities are resulting in start-ups. It recently launched the Center for Innovation and Entrepreneurship "Girolab" that gives support to entrepreneurs to begin new businesses related to Heritage valorisation.</li> <li>• From the environmental perspective, applications are not restricted to Heritage, but linked to green European challenges, such as energy efficiency and the use of natural resources.</li> <li>• From the social perspective, the Foundation launched the Schools-Workshop Program focused on training and employment promotion for young people.</li> <li>• From the international perspective, the Foundation has achieved a large trajectory in Latin America and more recently in Asia, where it is exporting its heritage management model.</li> </ul>   |

Source: Own elaboration

**Table 8. The redesign for excellence export: the case of SIPA-CAEX Centre**

| <i>TITLE</i>                        |  | Exportation Support Centre for Meat Sector SIPA-CAEX  |
|-------------------------------------|--|---|
| <b>REGIONAL CONTEXT</b>             |  | <p>Extremadura is a convergence region with particular characteristics that keep it away from the Spanish development level average (in both economic and technological terms). Within the framework of smart specialization, Extremadura is characterized by a lack of critical mass (around 1 million population), a traditional economic structure (with a very important presence of agro food and farming) and historical dynamics which places it as a less advanced region in the context of European average.</p> <p>The SIPA-CAEX Centre is an example of an entrepreneurial discovery that combines different advanced technologies to introduce improvements in agro food industry competitiveness and generate new business opportunities.</p>  |
| <b>BUSINESS MODEL</b>               | <b>Window of opportunity</b>                     | <p>Extremadura is one of the main producers of ham meat. This production is commercialized outside the region, with a significant share of total production going to Europe (France, Germany, UK etc.), to countries outside the EU (USA, Japan, Australia) and increasingly to emerging countries (China, Brazil, Russia etc.). Despite the opportunity for internationalization, regional companies have problems to adapt their products to foreign legal requirements as well to foreign market preferences.</p> <p>To tackle this challenge, the SIPA-CAEX facilitates the adaptability and product improvement through the development of applied and technological research activities. The experience and knowledge in the region has made possible the configuration of a pole of "expertise" around the Centre with an international focus. The pole is also experiencing interesting initiatives of related variety exploitation through entrepreneurial activities.</p> |
|                                     | <b>Participation of the regional helix</b>       | <p>The initiative comes from the Servicio de Innovación a Productos de Origen Animal (SIPA) of the University of Extremadura, but due to the opportunity that it supposes for the regional business tissue, companies and business associations (19-50 companies) as well as the regional government, have been involved in this initiative.</p> <p>The Government of Extremadura has participated in the creation of the new pole of excellence, (with European co-funding through the ERDF) as well as the former Spanish Ministry of Innovation (current MINECO) through support programs for technological projects. The pole includes also the University Institute IPROCAR, the Science and Technology Park of Extremadura and the Surgery R&amp;D Centre of Excellence.</p>  |
| <b>DESCRIPTION OF THE DISCOVERY</b> | <b>Nature of the specialized diversification</b> | <p>Although the Centre is currently mainly focused on ham product, the use and development of technologies with applicability to other food niches, leaves open the possibility for diversification. Besides the Centre is also focusing on the field of food innovation for tourism and frontline restaurants.</p> <p>Finally, technological hybridization between ICTs, biotechnology and health is also generating applications for other related sectors (healthcare, logistics, farming, tourism etc.), which are likely to be commercialized by the incipient entrepreneurial activity of the Center in short and medium term.</p>  |
|                                     | <b>Nature of the technological hybridization</b> | <p>The SIPA-CAEX Centre is highly specialized in food innovation, specifically in food technology, food safety and quality. It is integrating technologies that come from very different fields of knowledge, such ICTs (software development for sensory characterization, analysis and nutritional trials, etc.), biotechnology and health (health care residues, toxins and mycotoxins, pathologies, genomics, etc.) or agro-farming technologies (growth and feeding, processing and distribution, etc.).</p>   |
| <b>CONTRIBUTION TO THE REGION</b>   |  | <p>The Centre is currently a reference in food innovation, at national and international level. The Centre gives support to a group of about 50 companies and generates positive externalities to a wider one. Besides, its transfer activities are generating a "snow ball effect" showing such measures of the beneficiary companies of about 12%.</p> <p>The Centre is contributing to generate in Caceres an innovation pole of about 60-70 acres, with more 30 researchers.</p>  |

Source: Own elaboration

## 5. CONCLUSIONS AND RECOMMENDATIONS

At the beginning of the article, despite the great opportunity that supposes the smart specialization model and its strategic reflection, a series of limits were exposed. The existence of important methodological gaps, particularly referred to the entrepreneurial discovery, and the short deadlines because of linking the RIS3 to requirements, can affect to the performance and achievement of the strategy. Anyhow, the opportunity behind these strategies for the region is remarkably high, particularly in adopting the concept of entrepreneurial discovery. Thus, the paper tried to solve these gaps achieving the two objectives established at the beginning: to **clarify the concept** of entrepreneurial discovery and **obtaining a set of recommendations** regarding RIS3 strategies.

Regarding the **first objective**, entrepreneurial discovery is in fact the key to attract new activities that are supposed to continuously reinvent the specialization model, diversify the economy and generate wealth and employment. As the second section shows, an entrepreneurial discovery can be structured into four elements: technological hybridization, specialised diversification nature, joint collaboration among regional helix, and the market opportunity. In addition to this, it can be clearly detailed following the case study method (section 2), where real regional examples (section 3) can in fact help to translate the conceptual approach into RIS3 definition and support.

However, overcoming the conceptual approaches that have enriched the smart specialisation model and its strategies, the truly interest behind them is to understand how to identify, promote and support what Foray calls “decentralized experiments”.

In these sense, answering to the **second objective** of the paper, the entrepreneurial discovery is thought to make clear the policy question about how and what to prioritize within a smart specialization strategy, especially when a chosen domain may be a choice for two or more regions. That is because the identification of specific cases of entrepreneurial discoveries shows, with a clearer precision, the real differences between regional priorities that cannot be identified with a microanalysis.

Section 3 also shows that those responsible for RIS3 definition and elaboration (quadruple helix actors involved in the participatory gover-

nance process) may consider how the strengths and weaknesses of their territory, against the threats and opportunities of the general context, may facilitate the identification and consolidation of these initiatives of radical innovation. These radical innovations, materialized by entrepreneurial discovery initiatives and processes, must be the focus of any RIS3 from a triple policy approach:

1. Considering how the territorial assets enable, foster and consolidate them;
2. Taking into account how to identify/discover them across time; and
3. Being aware of how to support these processes and initiatives to turn them into real economic sectors with international competitive focus.

This approach to smart specialisation raises two important implications regarding the consideration of entrepreneurial discovery as a core element of the strategy:

- a) The key to RIS3 does not reside in the choices/prioritizations in a certain moment but in the (participatory) process by which the “discoveries” can be reached, and
- b) A RIS3 must be an endless process, not just a document neither a list of optimal choices at a particular time.

Therefore, the research in section 2 and 3 allows obtaining a set of recommendations for policy making regarding the process of RIS3 definition and implementation. Related to the second objective, a number of recommendations are included in Table 9:

Finally, in practice, government in the context of a RIS3 may favour the involvement of the different agents within the governance process, must provide an analysis about the regional competitive situation (both internal and external), may help to identify entrepreneurial discovery initiatives and processes, and must implement agree actions and instruments for supporting them. Moreover, the most important, it must guarantee that not all these channels are specific issues linked to the elaboration of a strategic document, but part of a larger process that includes implementation and monitoring.



**Table 9. Recommendations for RIS3 based on the entrepreneurial discovery**

|    |   |
|----|---|
| 1. | The smart specialization is not a list of technologies/ sectors where the region has an advantage, but a process of discovery within a life cycle (process-formalization-initiative) and which changes across time according to regional capabilities and trends.                                 |
| 2. | The core of smart specialization lays in the radical innovations that arise from the creative combination of technologies and/or sectors. Within them, the region has a high level of specialization/ competitiveness and which are generating new business, employment and wealth opportunities. |
| 3. | All regions, whatever their dominant sectors and technologies are, able to host this kind of radical innovations, resulting in entrepreneurial discovery processes. Smart specialization is a transferrable model.  |
| 4. | The entrepreneurial discovery does not respond to specific sectoral or technological model, but on to an random combination (virtually infinite) of creative ways to take advantage of opportunities from the territorial assets.   |
| 5. | The entrepreneurial discovery can be identified taken into account the specialized diversification, the technological hybridization, the role and commitment of the agents of the quadruple helix and the opportunity window to which it is addressed.  |
| 6. | A RIS3 should be able to establish mechanisms to identify/discover those radical innovations that through entrepreneurial discovery processes become initiatives as well as the mechanisms to support them.   |
| 7. | Public Administration is another agent that, within the governance of a smart specialization and RIS3, should act as an enabler of the conditions that generate and systematize the entrepreneurial discoveries. In this sense, it may act as a limiter of market imperfections.                  |

Source: Own elaboration

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