

Investigaciones Regionales - Journal of Regional Research

ISSN: 1695-7253 ISSN: 2340-2717

investig.regionales@aecr.org

Asociación Española de Ciencia Regional

España

Yépez Muñoz, Francisco; Palma Martos, Luis; Pulido Pavón, Noemí Rethinking Andalusian RIS3 Strategy Design through Regional Benchmarking Investigaciones Regionales - Journal of Regional Research, núm. 51, 2021, Octubre, pp. 5-30 Asociación Española de Ciencia Regional Madrid, España

Disponible en: https://www.redalyc.org/articulo.oa?id=28969606001



Número completo

Más información del artículo

Página de la revista en redalyc.org



abierto

Sistema de Información Científica Redalyc

Red de Revistas Científicas de América Latina y el Caribe, España y Portugal Proyecto académico sin fines de lucro, desarrollado bajo la iniciativa de acceso



European Regional Policy

Rethinking Andalusian RIS3 Strategy Design through Regional Benchmarking

Francisco Yépez Muñoz*, Luis Palma Martos**, Noemí Pulido Pavón***

Received: 05 May 2021 Accepted: 08 October 2021

ISSN: 1695-7253 e-ISSN: 2340-2717

ABSTRACT:

Research and innovation strategies for smart specialisation (RIS3) has played a key role in the European Union regional policy in the 2014-2020 programing period.

Regional benchmarking exercises are encouraged by the European Commission to provide a better vision of the position of the region and detect its strengths and weaknesses.

In our work we intend to reinforce the SWOT analysis included in the RIS3 strategy of Andalusia 2014-2020 using the benchmarking methodology proposed by the European Commission. This exercise allows us to outline new proposals for action and a cualitative methodology that could be useful in the design of RIS3 strategies in the period 2021-2027.

KEYWORDS: European Union regional policy; smart specialisation; regional research and innovation strategies for smart specialisation (RIS3); SWOT Analysis.

JEL classification: R10; O18; O21; O38; R58.

Análisis del Diseño de la Estrategia RIS3 de Andalucía a través del Benchmarking Regional

RESUMEN:

Las estrategias de investigación e innovación para la especialización inteligente (RIS3) han jugado un papel clave en la política regional de la Unión Europea en el período de programación 2014-2020.

La Comisión Europea fomenta los análisis regionales comparativos para proporcionar una mejor visión de la posición de las regiones europeas y detectar sus fortalezas y debilidades.

En nuestro trabajo pretendemos reforzar el análisis DAFO incluido en la estrategia RIS3 de Andalucía 2014-2020 utilizando la metodología propuesta por la Comisión Europea. Este ejercicio nos permite esbozar nuevas propuestas de actuación y una metodología cualitativa que puede ser útil en el diseño de las estrategias RIS3 del período 2021-2027.

PALABRAS CLAVE: Política regional de la Unión Europea; especialización inteligente; estrategias de investigación e innovación para la especialización inteligente (RIS3); análisis DAFO.

CLASIFICACIÓN JEL: R10; O18; O21; O38; R58.

Autor para correspondencia: francisco.yepez@uca.es

^{*} Universidad de Cádiz. España. francisco.yepez@uca.es

^{**} Departamento de Economía e Historia Éconómica. Universidad de Sevilla. lpalma@us.es

^{***} Departamento de Economía Aplicada. Universidad de Sevilla. npulido@us.es

1. Introduction

1.1. RIS3 strategies 2014-2020, priorities of specialisation and benchmarking

Research and Innovation Strategies for Smart Specialisation (RIS3), promoted by the European Commission in the 2014-2020 programming period, try to boost the contribution of the European Union (EU) regional policy to the priority of smart growth established in the Europe 2020 strategy, through the improvement of the performance of regional innovation systems (European Commission, 2010, 2011).

The importance of RIS3 strategies in the EU programming period 2014-2020 is highlighted by the fact that Regulation (EU) 1303/2013, laying down common provisions concerning the ESIF funds (European Parliament and Council of the European Union, 2013), established the design of these strategies as a condition required prior to receiving investments in the field of R&D&i from the EU Regional Development Fund, which is the main investment instrument of EU regional policy.

Smart specialisation strategies are framed within the theoretical framework of innovation systems (Freeman, 1987; Lundvall, 1988, 1992) in which the regional level has been gaining increasing relevance (Cooke, 1992) (Hong, Oxley, McCann, & P., 2012), due to the assumption of increasing powers by regional authorities in innovation policies and the rise of theories of the industrial economy that emphasize the relevance of the regional level, such as industrial districts (Becattini, 1990), clusters (Porter, 1990) and the *New Economic Geography* (Krugman, 1991, 1995; Fujita, Krugman & Venables, 1999). Innovation systems studies focus on relations between public and private agents that perform R&D&i activities in a given country or region, considering these agents as part of a system in whose coordination the public sector plays an essential role. This approach is a natural consequence of the predominant trend in the study of innovation economics since the end of the 20th century, which gives increasing relevance to the historical evolution and the institutional, economic and legal framework in the innovative performance of organizations in a given society (Nelson & Winter, 1977, 1982; Rosenberg, 1976; Dosi, 1982; Pérez, 1983; Freeman & Pérez, 1988; Malerba & Orsenigo, 1990).

One of the key assumptions of smart specialisation is that regions at an intermediate or low level in terms of innovation should focus their efforts on promoting applied technology activities in specific strategic areas, since their possibilities of competing in the development of inventions of technologies of general application are very limited. Therefore, these regions should try to identify those areas in which they have a greater competitive capacity and focus efforts on applied research in these fields (Foray, David, & Hall, 2009; McCann & Ortega-Argilés, 2013a).

It should be noted that the approach proposed is a specialisation in broad strategic priorities, which is not limited to economic sectors in a strict sense, but to areas of specialisation. Therefore, these priorities are open to innovative actors from many different economic sectors and, likewise, it is intended that specialisation in these areas can lead to new specialisations in adjacent areas through the principle of "related variety" (Frenken, Van Oort, & Verburg, 2007).

When identifying the most convenient specialisation priorities for a region, a key aspect is to have all the relevant public and private actors of the regional innovation system involved in the identification process, through the so-called "entrepreneurial process of discovery" (McCann & Ortega-Argilés, 2013b; European Commission, 2012). Thus, the European Commission recommend the performance of regional benchmarking exercises (Navarro et al., 2014), in order to detect good practices that may be applicable in different regions as well as to analyze the comparative position of the region with respect to others, since competition and the position in the international value chain is a key aspect in the performance of regional innovation systems (Rakhmatullin et al., 2020). Benchmarking analysis, which has its origins in the field of business strategy, is gaining increasingly relevance as a practical tool in the field of regional innovation systems (Huggins, 2010), and have been proven useful to make comparisons of regional innovation systems and public policies applied to them (Groenendijk, 2010).

1.2. Andalusian RIS3 strategy 2014-2020 and regional benchmarking

Andalusia is a peripheral region of the EU located in southern Spain that has almost 8.5 million inhabitants. Its population, together with its 87,597 square kilometers of territory, makes Andalusia one of the largest regions in Europe in population and size, superior in these magnitudes to several EU countries. In 1985, one year before Spain entered the European Economic Community, Andalusia had a GDP per capita equivalent to 52.92% of the average GDP per capita of the Europe of Fifteen. This situation of disadvantage in the economic sphere, together with its large population, has caused that Andalusia has been one of the regions most benefited by the reception of EU funds in the field of EU regional Policy over the last thirty years.

TABLE 1. Priorities of specialisation of Andalusian RIS3 Strategy 2014-2020

Priorities of specialisation	Lines of action	Priorities of specialisation	Lines of action
P1. Mobility and logistics	L 1.1. Research and Innovation in integral logistics: Intermodality L 1.2. Innovative business development in international value chains L 1.3. New models of sustainable mobility and distribution L 1.4. Incorporation of logistics not linked to productive activity	P5. Health and social welfare	L 5.1. Development of the biosanitary business sector L 5.2. Creation of applications and technologies for new health and social welfare services L 5.3. Advanced therapies and regenerative medicine L 5.4. Population-based social health research L 5.5. Research and Innovation in healthy life and active aging,
P2. Advanced industry linked to transportation	L 2.1. Advanced manufacturing in the transportation industry L 2.2. Research and Innovation in new materials L 2.3. Development of innovative products for the transport industries L 2.4. Transfer of technology and manufacturing processes	P6. Agribusiness and healthy food	L 6.1. Advances in quality, traceability and food safety L 6.2. Functional and personalized food L 6.3. Take advantage of new opportunities in the blue economy and green economy L 6.4. Innovation in processes and products of the food industries
P3. Territorially based endogenous resources	L 3.1. Research and Innovation on the management of natural resources and cultural heritage L 3.2. New processes and products for the use of agricultural resources L 3.3. Mining Integrated in the territory L 3.4. Innovation for the adaptation of the territories to climate change L 3.5. Optimization of ecosystem services	P7. Renewable energy, energy efficiency and sustainable construction	L 7.1. Development of renewable land and marine energy L 7.2. Smart energy networks L 7.3. High capacity energy storage systems L 7.4. Energy efficiency in companies, homes and institutions L 7.5. Energy sustainability of rural areas L 7.6. New designs and materials for sustainable construction and processes
P4. Tourism, culture and leisure	L 4.1. Research and innovation in innovative tourism products L 4.2. Development of new tourism models L 4.3. Research and innovation on accessibility for tourism L 4.4. Innovation in the cultural and creative industries	P8. ICT and digital economy	L 8.1. New ICT developments L 8.2. ICT for business development L 8.3. Development of new instruments for E-Government L 8.4. Innovation in digital content

ISSN: 1695-7253 e-ISSN: 2340-2717

Source: Junta de Andalucía (2015, pp. 122-123).

Following the steps of the Guide on Research and Innovation Strategies for Smart Specialisation (European Commission, 2012), the actors involved in the design of the Andalusian RIS3 Strategy 2014-2020 (Junta de Andalucía, 2015) proceeded to perform a SWOT analysis of the Andalusian innovation system, and to identify the specialisation priorities most relevant to its development.

Table 1 shows the main priorities of specialisation selected, as well as the lines of action defined to improve the competitiveness of the region in each of them.

Once the priorities of specialisation and lines of action detected in the so-called "entrepreneurial process of discovery" (European Commission, 2012) had been selected, Andalusian RIS3 Strategy 2014-2020 defined the axes and political measures through which it was intended to implement the strategy, as we can see in table 2.

The main objective of our work is to rethink the design of the Andalusian RIS3 Strategy 2014-2020 using the Regional Benchmarking Tool promoted by the European Commission (Navarro et al., 2014), with the data that regional authorities had at their disposal in 2015. While the SWOT analysis contained in the Andalusian RIS3 strategy lacked a comparative perspective, the use of this tool allow us to perform a detailed qualitative analysis of the situation of the region in relation to a selection of regions at the time of the design of the srategy, focusing our analysis on structural dimensions considered crucial for innovative performance.

This exercise allows us to enrich the SWOT analysis performed in the Andalusian RIS3 Strategy 2014-2020 and, therefore, analyse the relevance of the priorities of specialisation and axes of action included on it and propose new lines of action and political measures that could have been taken into account. Likewise, we verify that this kind of tools can be useful for the design of the RIS3 strategies in the period 2021-2027, whose preparatory work is starting in 2021 and should be developed based on the improvement of the previous RIS3 strategies.

TABLE 2.
Political axes of Andalusian RIS3 Strategy 2014-2020

Axes	Measures
1. Eficient and Competitive Industry	 1.1. Support for business R&D&i projects 1.2. Incorporation of technologists and researchers 1.3. Support for participation in international calls 1.4. Integration of tractor companies 1.5. Support for the incorporation of enabling technologies 1.6. Implementation of ICT in industry
2. Enabling Technologies	2.1. Support for the generation of KET knowledge2.2. Collaboration boost2.3. Internationalization of KET knowledge generation2.4. New ICT developments
3. Innovative and job creating SMEs	3.1. Innovative entrepreneurs 3.2. Protection of Industrial and Intellectual Property 3.3. Integration into global value systems 3.4. Collaborative R&D 3.5. ICT implementation in SMEs

TABLE 2. CONT. Political axes of Andalusian RIS3 Strategy 2014-2020

Axes	Measures
4. Internationalization	 4.1. Immersion in innovative environments 4.2. Internationalization of the generation of knowledge 4.3. Internationalization of companies 4.4. International cooperation projects 4.5. Attracting innovative companies
5. Education, Talent and Creative Environments	5.1. Technology transfer 5.2. Support for excellent research 5.3. Support for the generation of knowledge 5.4. Entrepreneurial culture 5.5. Training for innovation 5.6. Support for creating a creative environment 5.7. Culture of creativity
6. Social Innovation	 6.1. E-Administration and E-Government 6.2. Support for knowledge management 6.3. Innovative public procurement 6.4. Promotion of new models of public-private cooperation 6.5. Support for new proposals for social organization 6.6. Pilot projects 6.7. Digital Strategy
7. Networking	7.1. Support for the development of new collaborative approaches7.2. Deepening participation in networks7.3. Information and awareness systems for innovation7.4. Support for the maturation of business projects
8. Infraestructures	8.1. Research Infrastructures8.2. Innovation spaces8.3. Communication infrastructures8.4. ICT infrastructures

Source: Junta de Andalucía (2015, p. 169).

In section 2 of the article we will describe the methodology used in our work. Next, in section 3 we will describe the results of our benchmarking analysis, while in section 4 we explain how these results are policy relevant and directly applicable to the political measures introduced in the Andalusian RIS3 strategy. Finally, we will dedicate section 5 to the general conclusions of our work.

METHODOLOGY

The most widespread methodologies at the European level to evaluate the innovative performance of the territories are based on the elaboration of synthetic indexes, built on variables related to innovation. Some of the most prominent examples of these indices are the Global Competitiveness Index (World Economic Forum, 2020), the European Innovation Scoreboard (European Commission, 2020) and the Regional Innovation Scoreboard (European Commission, 2019).

Following a similar approach, the European Commission commissioned a group of researchers to develop a tool to help regional authorities to perform benchmarking exercises, useful in the design and implementation of their respectives RIS3 strategies (Navarro et al., 2014).

This tool allows us to have data from 205 regions of the EU in a wide range of variables, related to seven key dimensions determining the innovative potential of the regions according to the specialised literature: geodemography, educational level of human resources, technological structure, sectoral structure, company size, economic openness and institutions and values.

From these data, Navarro et al. built a distance matrix of 205 European regions in relation to the performance in these seven dimensions. As regards the selection of the regions with which performing benchmarking exercises, the authors propose to make comparisons with regions that have similar structural characteristics, based on the idea that these conditions cannot be changed in the short term and determine the innovative capacity of the regions and the suitability of the policies to be implemented. These authors based their approach to the selection of reference regions in abundant literature of the evolutionary approach, which defends the uselessness of the replication exercises of good practices in regional policy without attending to the peculiar structural characteristics of the regions, determined by their historical evolution (Tomlinson & Lundvall, 2001; Balzat, 2006; Nauwelaers, Veugelers, & Van Looy, 2003).

In our work we perform a comparative SWOT analysis of the Andalusian innovation system in relation to the innovation systems of the European regions considered more similar to Andalusia according to the methodology proposed by Navarro et al. (2014). The ten selected regions, ordered from least to greatest similarity with Andalusia, are Murcia, Valencian Community, Catalonia, Canary Islands, Sardinia, Campania, Sicily, Castilla la Mancha, Galicia and Castilla y León.

To implement our analysis, we take the data from the variables used by Navarro et al., which provide us with an idea of the comparative situation of the regions with the most recent data available at the time of preparation of the RIS3 strategy of Andalusia, in 2015.

This allows us to introduce a comparative perspective, trying to enrich the SWOT analysis of the Andalusian innovation system contained in the RIS3 strategy of Andalusia 2014-2020 and make new proposals for action that would have been relevant in it, as well as establish a work methodology that could be useful in designing smart specialisation strategies in the period 2021-2027.

3. BENCHMARKING SWOT ANALYSIS

In this section we resume the data used and the main conclusions obtained in our comparative SWOT analysis of the Andalusian innovation system, divided in each of the seven dimensions taken into account.

3.1. GEODEMOGRAPHY

TABLE 3. Population structure and accessibility

Region	% Population >= 65 (2011)	% Population <15 (2011)	% Pop. in urban and comm. areas (2006)	Multimodal accessibility (2006)
Galicia	23,98%	11,97%	65,57%	39,97
Castilla y León	24,02%	12,17%	64,72%	32,24
Castilla-la Mancha	18,31%	15,51%	42,80%	32,76
Catalonia	18,41%	15,97%	76,93%	68,63
Valencian Community	18,53%	15,29%	69,69%	51,33
Andalusia	16,24%	16,43%	68,55%	40,43
Murcia	15,17%	17,67%	71,53%	32,84
Canary Islands	14,98%	14,24%	72,39%	24,32
Campania	17,56%	15,48%	77,72%	62,98
Sicily	19,89%	14,46%	49,35%	41,61
Sardinia	21,58%	11,94%	45,98%	44,16

Source: Navarro et al. (2014).

In table 3 we can observe the data of the regions in the variables related to this dimension.

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 1.

3.2. Educational level of Human Resources

In table 4 we can observe the data of the regions in the variables related to this dimension.

TABLE 4. Population with upper secondary and tertiary education

Region	2012	2013	2014	2015
Galicia	51,40%	51,20%	53,00%	55,30%
Castilla y León	56,80%	57,30%	57,70%	57,50%
Castilla-la Mancha	45,80%	46,90%	48,80%	49,50%
Catalonia	54,40%	56,10%	57,40%	58,80%
Valencian Community	52,30%	52,60%	55,30%	56,30%
Andalusia	45,80%	47,10%	47,60%	48,60%
Murcia	46,60%	47,90%	48,90%	49,40%
Canary Islands	48,90%	49,80%	49,40%	50,70%
Campania	49,70%	50,80%	51,20%	51,30%
Sicily	48,20%	48,10%	49,20%	49,80%
Sardinia	47,70%	47,80%	47,20%	49,60%

Source: Navarro et al. (2014) and Eurostat.

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 2.

FIGURE 1.

Comparative SWOT analysis Geodemography

STRENGTHS

- 1) Second highest percentage between reference regions of population aged between 15-65 and third lower percentage of population older than 65 years.
- 2) Powerful network of medium-sized cities with access to a multitude of services and high quality of life.
- 3) Significant improvement of the situation in Andalusia with respect to previous periods in potential multimodal accessibility.

WEAKNESSES

- 1) Intermediate degree of urbanization, lower economies of scale and attractiveness of the potential market of the region in relation to regions as Catalonia or Campania.
- 2) Intermediate-low performance in the variable referring to multimodal accessibility.
- 3) The high unemployment rate among the active population in Andalusia significantly distorts the benefit of having more population in active age.

SWOT

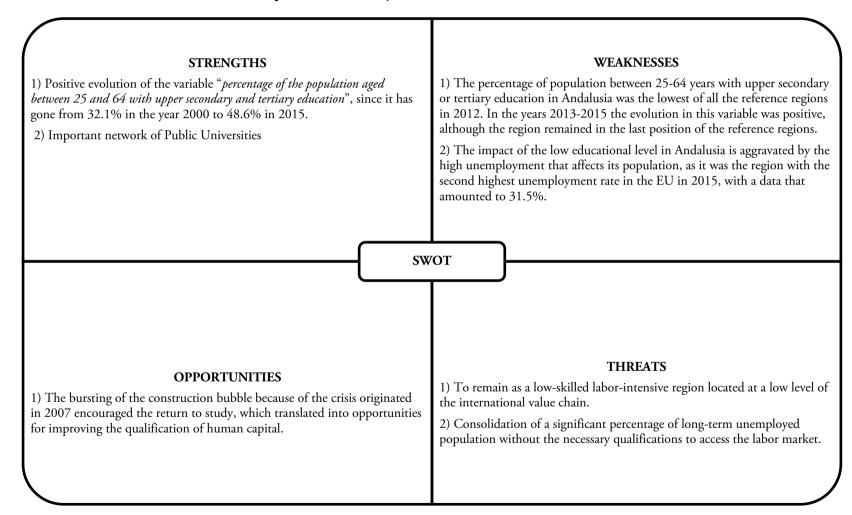
OPPORTUNITIES

- 1) Increase in business and cooperation with Africa, the neighboring Mediterranean regions and the Center and the South of Portugal.
- 2) The importance of its rural population makes Andalusia an important recipient of European funds from the European Rural Development Policy. This, together with the importance of the Andalusian agricultural sector, which makes it a key region for Common Agricultural Policy, represents an important development opportunity through the modernization of the agricultural sector and the rural economy.

THREATS

- 1) The gradual aging of the population, together with the chronic nature of the problem of unemployment in Andalusia, can keep the percentage of employed population at a very low level with respect to the total population.
- 2) Reduction of investments in infrastructures can cause the increase in the potential multimodal accessibility differential with respect to the less peripheral European regions.

Figure 2.
Comparative SWOT analysis educational level of Human Resources



3.3. TECHNOLOGICAL SPECIALISATION

In the table 5 we can observe the data of the regions in the variables related to this dimension.

TABLE 5. Percentage of patents by technological fields (2006-2010)

Region	% patents PCT electrical engineering	% patents PCT instruments	% patents PCT chemistry	% patents PCT mechanic engineering	% patents PCT other fields	Technological concentration (Gini Index of distribution of patents by subtechnological fields)
Galicia	7,60%	8,97%	35,60%	33,87%	13,97%	0,50
Castilla y León	12,93%	13,23%	33,32%	30,48%	10,04%	0,44
Castilla-la Mancha	12,67%	10,59%	36,72%	21,47%	18,54%	0,57
Catalonia	12,99%	12,61%	38,51%	23,44%	12,46%	0,43
Valencian Community	12,57%	14,97%	32,37%	19,98%	20,10%	0,37
Andalusia	9,34%	16,36%	39,20%	23,18%	11,93%	0,43
Murcia	7,52%	15,40%	34,47%	24,96%	17,64%	0,47
Canary Islands	12,01%	14,93%	24,21%	27,85%	21,01%	0,54
Campania	18,55%	15,21%	33,86%	24,45%	7,93%	0,44
Sicily	21,25%	21,18%	33,70%	15,08%	8,79%	0,52
Sardinia	9,71%	15,15%	35,62%	27,55%	11,97%	0,47

Source: Navarro et al. (2014).

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 3.

FIGURE 3. Comparative SWOT analysis Technological specialisation

STRENGTHS

- 1) High percentage of PCT international patent applications in chemistry, a field closely linked to sectors in which the region has an important potential such as the agricultural sector and the industrial subsectors of agroindustry and extractive and pharmaceutical industries.
- 2) High percentage of patents on instruments, specialisation that can be used in other relevant economic sectors of the region such as the health sector and the transport and energy industries.
- 3) Good situation in relation to similar regions in terms of international patents applications per inhabitant. Andalusia was the fourth of the eleven reference regions in international patents applied for per million inhabitants in 2013, significantly above other regions with higher GDP per capita such as Castilla León, Castilla La Mancha and the Canary Islands.

WEAKNESSES

- 1) Low percentage of international applications for PCT patents in the field of electrical engineering and mechanical engineering in relation to similar regions.
- 2) High dispersion of international PCT patent applications, Andalusia being the second region with the lowest value in the Gini index of international patent applications, which would reveal low specialisation and a greater difficulty in reaching critical mass in the different technological fields.

SWOT

OPPORTUNITIES

- 1) Taking advantage of the technological specialisation in chemistry and instruments for its exploitation in regional relevant industrial subsectors such as mining, food, beverages and tobacco, basic metals and metal products and transport equipment.
- 2) Use of the public health system to increase R&D activities in the field of medical and pharmaceutical technology, in which the region already has an important technological specialisation.

THREATS

- 1) Consolidation of the disadvantage in international applications for PCT patents in the field of electrical engineering, a technological field with great potential in Andalusia, especially in the field of renewable energy.
- 2) Low participation of the private business sector in the investment in R&D leads to research disconnected from the private part of the regional innovation system, and reduces the potential economic exploitation of the knowledge and patentes developed.

3.4. SECTORAL SPECIALISATION

In tables 6 and 7 we can observe the data of the regions in the variables related to this dimension.

TABLE 6.
Percentage of employment by economic sectors (2012)

		1					1				1
Region	Agriculture, forestry and fishing	Industry (except const.)	Construction	Wholesale and retail trade, transport	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities	Public administration	Arts, entertainment and recreation	Top of 5 subsectors (2 digits) (% total employment) (2011)
Galicia	6,3%	15,7%	7,2%	27,6%	2,1%	1,7%	0,3%	8,3%	22,8%	8,0%	9,47%
Castilla y León	7,2%	16,3%	6,9%	26,6%	1,7%	2,0%	0,2%	7,5%	24,9%	6,6%	8,98%
Castilla-la Mancha	6,8%	15,4%	7,0%	28,1%	1,7%	2,4%	0,3%	7,0%	25,1%	6,1%	7,60%
Catalonia	1,6%	18,9%	5,9%	28,4%	3,2%	2,7%	0,6%	11,4%	19,4%	7,9%	9,23%
Valencian Community	3,7%	17,5%	6,1%	32,4%	1,8%	2,0%	0,8%	9,0%	19,0%	7,9%	9,77%
Andalusia	7,9%	8,3%	5,4%	31,9%	1,6%	1,9%	0,6%	9,6%	24,8%	8,0%	10,01%
Murcia	12,8%	12,8%	5,2%	31,1%	1,4%	1,7%	0,4%	7,9%	19,8%	6,8%	8,71%
Canary Islands	3,0%	4,5%	5,2%	45,6%	1,4%	1,5%	0,9%	9,7%	20,0%	8,1%	10,83%
Campania	4,3%	13,8%	7,4%	28,4%	1,5%	1,8%	0,6%	10,2%	23,5%	8,4%	9,82%
Sicily	7,7%	9,4%	6,7%	27,3%	1,2%	1,6%	0,4%	9,9%	28,9%	6,9%	9,93%
Sardinia	7,3%	9,1%	6,8%	26,3%	1,4%	2,2%	:	10,8%	27,2%	8,8%	9,34%

Source: Navarro et al. (2014).

TABLE 7. Percentage of employment by industrial sectors (2011)

Region	Mining and quarrying	Food, drinks and tobacco	Textiles, apparel and leather	Wood, paper and printing	Chem., pharm., rubber, plastic and refined petroleum	Non-metallic mineral products	Basic metals and metal products	Electric, electronic, computer and optical equipment	Machinery	Transport equipment	Other manufacturing
Galicia	9,00%	21,94%	7,49%	8,03%	4,37%	4,17%	13,12%	1,20%	3,04%	16,14%	11,52%
Castilla y León	10,33%	27,07%	2,44%	7,93%	11,30%	4,86%	9,96%	2,46%	3,59%	12,73%	7,33%
Castilla-la Mancha	10,45%	23,95%	7,33%	8,03%	6,51%	6,70%	12,87%	5,76%	3,37%	3,87%	11,15%
Catalonia	6,91%	15,74%	7,39%	7,85%	15,27%	3,48%	11,54%	5,36%	6,95%	10,83%	8,69%
Valencian Community	8,47%	15,74%	17,03%	6,48%	11,29%	10,57%	9,17%	3,91%	4,67%	5,99%	6,68%
Andalusia	15,53%	21,75%	4,53%	7,41%	7,29%	4,49%	11,44%	2,94%	2,58%	7,48%	14,55%
Murcia	9,03%	31,89%	2,86%	5,54%	13,64%	2,91%	13,32%	2,04%	4,70%	3,56%	10,50%
Canary Islands	17,14%	28,17%	3,87%	8,65%	5,32%	4,81%	12,80%	1,49%	1,01%	1,89%	14,84%
Campania	15,83%	15,74%	9,74%	7,71%	5,59%	4,25%	14,21%	5,29%	2,57%	12,04%	7,03%
Sicily	22,48%	17,02%	3,62%	4,96%	10,44%	6,67%	12,73%	4,62%	1,90%	3,42%	12,16%
Sardinia	22,60%	17,57%	2,82%	8,98%	10,06%	8,22%	14,97%	1,56%	1,82%	0,33%	11,08%

Source: Navarro et al. (2014).

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 4.

FIGURE 4. Comparative SWOT analysis Sectoral specialisation

STRENGTHS

- 1) Andalusia has a powerful public sector which may act as a lever for the performance of the regional innovation system.
- 2) Andalusia industrial employment stands out in the subsectors of "food, beverages and tobacco", "mining and quarries", and "basic products and metal products", all of them with significant development potential in the regional innovation system.
- 3) Having a very powerful primary sector, together with its important rural population, makes Andalusia a very important actor in the EU Common Agricultural Policy and the EU Rural Development Policy.
- 4) Andalusia has an important tourist activity and a relevant arts, entertainment, recreational activities and other services sector compared to similar regions.
- 5) The bursting of the construction bubble has balanced the weight of employment in this sector in comparison with similar regions.

WEAKNESSES

- 1) Very low percentage of employment in the industrial sector, only higher in this area than the Canary Islands between the reference regions, and far away of the figures of the non-insular regions.
- 2) Low percentage of employment in professional, scientific and technical activities.
- 3) Very pronounced weight of employment in retail, this being generally a low added value sector.
- 4) The relative importance of employment in the primary sector in Andalusia, constituted by employment in agriculture, fisheries and forestry activities, is among the highest in the reference regions, this being a sector of low added value.
- 5) Andalusia is the second of the reference regions that presented a greater concentration of employment in the five economic subsectors, being these subsectors mainly of low added value.

SWOT

OPPORTUNITIES

- 1) There are industrial subsectors with critical mass to concentrate industrial development policies, such as agri-food industry, mining, production of metal products, transportation and chemical industry, electricity and gas supply and water and waste treatment. Thus, the region has ample growth potential in the field of renewable energy.
- 2) Improve the positioning of agricultural activities in the international value chain, as well as to boost the Andalusian agri-food industry.
- 3) Promotion of innovation in the tourism sector and its synergies with arts, entertainment, recreational activities and health services.
- 4) Relevant construction sector that can be reoriented towards rehabilitation, new materials and new sustainable construction methods.

THREATS

- 1) Consolidation of the specialisation of Andalusia in services of low added value, especially linked to trade.
- 2) Consolidation of the industrial delay of Andalusia.
- 3) Loss of competitiveness of the agricultural and agroindustrial sector due to the specialisation in production of raw materials and agricultural products with low added value.
- 4) Excessive recovery of the construction sector to the detriment of the development of other economic sectors with greater added value.
- 5) Consolidation of the low weight of professional, scientific and technical activities, whose importance is very relevant in terms of the qualification of the human capital of the regional innovation system.

3.5. FIRM SIZE

In table 8 we can observe the data of the regions in the variables related to this dimension.

TABLE 8. Average firm size (2009)

Region	Average firm size
Galicia	11,8
Castilla y León	11,6
Castilla-la Mancha	9,3
Catalonia	11,9
Valencian Community	10,4
Andalusia	7,9
Murcia	10,1
Canary Islands	6,1
Campania	6,6
Sicily	5,1
Sardinia	5,2

Source: Navarro et al. (2014).

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 5.

FIGURE 5.
Comparative SWOT analysis Firm size

STRENGTHS

In this dimension it is not possible to speak of strengths of Andalusia, since the average size of Andalusian companies places it in the lower strip of the analyzed regions.

WEAKNESSES

- 1) Andalusia ranks seventh among the eleven reference regions in terms of the average size of the companies.
- 2) With the exception of the Canary Islands and Sardinia, all other regions that exceed Andalusia in GDP per capita in 2013 also outperform it in terms of the average size of companies.
- 3) The small size of companies is a clear handicap in terms of the ability of companies to invest in innovation, to access international markets, to participate in European and international innovation projects and to attract highly qualified workforce.

SWOT

OPPORTUNITIES

European Regional Policy offers a large number of instruments that can favor the development and growth of SMEs, such as measures to improve access to finance, business accelerators, support for R&D&i activities in SMEs, participation of SMEs in European innovation programs, support for clusters, and so on.

THREATS

Consolidation of the very small average size of Andalusian entreprises, impeding the improvement of the competitiveness of the region.

3.6. Economic Openess

In table 9 we can observe the data of the regions in the variables related to this dimension.

TABLE 9. Total exports (% GDP) (2009)

Region	Total exports (% GDP)
Galicia	24,81%
Castilla y León	16,09%
Castilla-la Mancha	8,01%
Catalonia	20,44%
Valencian Community	16,02%
Andalusia	9,72%
Murcia	15,50%
Canary Islands	6,26%
Campania	9,81%
Sicily	11,43%
Sardinia	14,24%

Source: Navarro et al. (2014).

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 6.

FIGURE 6. Comparative SWOT analysis Economic openess

STRENGTHS

- 1) Andalusian exports had shown a positive evolution in the 2006-2015 decade, with a cumulative positive variation rate of 58.07%.
- 2) Andalusia presented a strategic position for trade relations with North Africa. The cumulative variation rate of exports from Andalusia to North Africa in the 2006-2015 period is 169.22%
- 3) Large export capacity of some Andalusian sectors, such food, semi-manufactured and equipment goods. Among the equipment goods, the aeronautical sector alone represented more than 6% of the region's exports in 2015.
- 4) Energy products (coal, oil and derivatives, gas and electricity) also had a very important weight, since they represented more than 20% of Andalusian exports in 2012, although since 2015 they suffered a very important decrease mainly due to the drop in oil prices.

WEAKNESSES

The openess of the Andalusian economy, in terms of exports over GDP, was located in 2009 in the lower strip between reference regions, surpassing exclusively Castilla La Mancha and the Canary Islands.

SWOT

OPPORTUNITIES

- 1) Export growth possibilities in destinations that already had an important weight (European Union, North Africa, North America...).
- 2) Growth of exports in destinations with less weight in the exports of Andalusia, but in which the region could have some competitive advantage (highlighting the case of South America because of the historical relations).
- 3) Maintaining leadership in exports of the food processing sector and increase its added value.
- 4) Possibilities to increase exports of capital goods thanks to innovation in key industrial sectors with the support of industrial policy.

THREATS

- 1) Loss of positioning of Andalusian exports in the international value chain due to reduced private sector investment in innovation activities.
- 2) The progress of exports from developing economies, which represent a growing competition for exports from the region, especially for the agri-food industry.

3.7. Institutions and values

In table 10 we can observe the data of the regions in the variables related to this dimension.

TABLE 10. Decentralisation, institutional quality and creativity

Region	Decentralisation level (2009)	Quality of institutions (2012)	Feeling of safety of walking alone in local area after dark (2010)	Perception most people can be trusted or you can't be too careful (2010)	Important to think new ideas and being creative (2010)	Important to try new and different things in life (2010)
Galicia	58	0,58	1,74	4,99	2,44	2,57
Castilla y León	58	-0,06	1,93	4,50	2,18	2,94
Castilla-la Mancha	58	0,21	1,84	6,06	2,46	2,64
Catalonia	58	-0,47	2,03	5,16	2,51	3,08
Valencian Community	58	0,15	2,12	5,14	2,32	2,85
Andalusia	58	-0,20	1,84	5,19	2,64	2,98
Murcia	58	0,28	2,13	4,47	2,61	2,96
Canary Islands	58	0,27	1,94	4,54	1,98	2,31
Campania	50	-2,41	2,36	4,75	2,34	2,61
Sicily	54	-1,91	2,43	3,69	2,66	2,85
Sardinia	54	-0,97	1,63	4,74	2,38	2,22

Source: Navarro et al. (2014).

The main conclusions of our comparative SWOT analysis in this dimension are included in figure 7.

FIGURE 7.
Comparative SWOT analysis Institutions and values

STRENGTHS

- 1) Andalusia has a intermediate-high level of self-government, which gives the regional level broad powers to implement policies to boost its regional innovation system. This variable is considered equivalent at the national level in Spain, surpassing Italian regions in this area.
- 2) Although the region did not show good behavior regarding the quality of the institutions, it is in a good position in the citizen's perception that "*most people can be trusted*".
- 3) Entrepreneurial and innovative character of the Andalusian population. According to the data taken into account in the European Social Survey of 2008, Andalusia was the second of the regions in which citizens gave greater importance to both having new ideas and being creative and trying new and different things in life.

WEAKNESSES

- 1) Andalusian population had a low level of perception of the quality of the institutions in relation to the reference regions, being in this variable the seventh of the eleven regions included in the study.
- 2) The region was located in a bad position with respect to the reference regions in the variable "feeling of security when walking only at night in the local area".

SWOT

OPPORTUNITIES

The new digital economy greatly increases the potential of entrepreneurship. Likewise, entrepreneurial actors must be main agents in the design and implementation of the RIS3 strategies. Therefore, Andalusia can take advantage of the entrepreneurial characteristics of its population to improve the performance of its regional innovation system.

THREATS

The emergence of new political parties, although positive in terms of surveillance of corruption in institutions, may involve problems of governance of innovation systems at national, regional and local levels.

4. Applicacion of results to Andalusian RIS3 Strategy 2014-2020

In this section we will apply the results of our comparative SWOT analysis to revise the relevance of the priorities specialisation and axes of action defined in the Andalusian RIS3 strategy 2014-2020, as well as to propose new lines of action and political measures that could have been included.

4.1. Priorities of specialisation and lines of action

As regards the importance of the specialisation priorities defined in the strategy, listed in the table 2, in the light of our comparative SWOT analysis we would highlight the relevance of the priorities of specialisation "territorially based endogenous resources", "tourism, culture and leisure", "health and social welfare" and "renewable energy, energy efficiency and sustainable construction". The lines of action contained in these four specialisation priorities are those that have impact on a greater number of the dimensions analysed in our work, and in which Andalusia has stronger points compared to the similar regions analised.

On the contrary, the lines of action included within the specialisation priority "*ICT and digital economy*" are those that have less weight in relation to the dimensions of our comparative SWOT analysis. However, this should not downplay this priority, as this area is considered a key horizontal aspect because of its influence on the performance of the regional innovation system as a whole.

On the other hand, in relation to the conclusions of our analysis, we consider that it would have been interesting to include in the strategy the following four new lines of action:

- a) Within the priority of specialisation "territorially based endogenous resources":
 - Promotion of European Funds synergies in the field of agriculture, food and environmental sector.
 - Innovation in waste and water resources management.
- b) Within the specialisation priority "tourism, culture and leisure":
 - Development of the health tourism business industry.
 - Cooperation in innovation between cultural and tourism sectors.

To conclude with this subsection, we would highlight that the structural dimensions of our comparative SWOT analysis which concentrate a higher number of the specialisation priorities and lines of action defined in the Andalusian RIS 3 strategy 2014-2020 are "geodemography", "technological specialisation" and "sectoral structure".

The relevance of "technological specialisation" and "sectoral structure" was predictable since the priorities of specialisation and lines of action have been defined by the public and private actors of the regional innovation system, which are themselves representatives of the technological and economic specialisation of the region. However, the influence of "geodemography" mainly due to the concentration of R&D&i activities in areas that depend fundamentally on natural resources, highlighting the specialisation priorities "territorially based endogenous resources", "agribusiness and healthy food" and "renewable energy, energy efficiency and sustainable construction". Likewise, the geographical situation of Andalusia and its peculiar climatic and natural conditions also have a great influence on the specialisation priorities "mobility and logistics", "advanced industry linked to transportation", "tourism, culture and leisure" and "health and social welfare".

4.2. Axes of action and political measures

With regard to the axes of action and political measures of the Andalusian RIS3 strategy 2014-2020, included in table 2, we would highlight the importance of axis 5 "education, talent and creative environments", whose political measures are of great relevance in relation to the conclusions of our comparative SWOT analysis in the dimensions "educational level of human resources", "technological specialisation", "sectoral structure" and "institutions and values". This highlights the importance of human capital as a fundamental basis for the performance of regional innovation systems.

Secondly, we must remark the relevance of axis 1 "efficient and competitive industry", mainly in relation to our comparative SWOT analysis in the dimensions "technological specialisation", "sectoral structure" and "company size". The importance of this axis is oustanding, especially considering the relevance of the industry as a point of connection of R&D activities with the market, and the need for increase in the low weight of the Andalusian industrial sector to overcome the low private investment in R&D&i activities.

At the other extreme, we can observe the lesser relevance of axis 8 "infrastructure" and axis 2 "enabling technologies" in relation to the conclusions of our SWOT analysis. However, both axes address very important horizontal issues for the proper functioning of the regional system as a whole.

At the level of political measures, the relevance of the ones related to entrepreneurial culture and creativity within axis 5 "education, talent and creative environments" stands out, since the population of the region has interesting entrepreneurial and innovative characteristics according to our SWOT analysis, both of which are critical skills for the development of the regional innovation system and can have an important impact on key sectors in the region such as tourist or cultural ones.

In other axis of action, we would highlight the relevance of other political measures such as "support for participation in international calls" and "deepening participation in networks", which remarks the importance of collaboration and international calls in R&D&i activities, and it is aspect to improve taken into account the low openess of Andalusian Economy.

On the other hand, we would consider interesting having included in the Andalusian RIS3 strategy the following new political measures in relation to the conclusions of our comparative SWOT analysis:

- a) Within Axis 1. Efficient and Competitive Industry:
 - Support for collaboration between public and private sectors in the scientific and technological fields related to specialisation priorities
- b) Within Axis 3. Innovative and Employment Generating SMEs:
 - Growth of the size of innovative companies
- e) Within Axis 4. Internationalization
 - Strengthening neighborhood relations
- d) Within Axis 5. Education, Talent and Creative Environments:
 - Promotion of training and research in sciences and engineering linked to the specialisation priorities selected.
 - Strengthening research capacities in Chemistry.
 - Strengthening the professional career of the researchers, as well as the professions of R&D&i management and technology transfer.
- e) Within Axis 6. Social Innovation:
 - Capacity building in innovation of public actors of the regional innovation system

To conclude this section, we have observed that the dimensions of our comparative SWOT analysis which concentrate a higher number of the political measures included in the Andalusian RIS3 strategy 2014-2020 are "technological specialisation" and "sectoral structure", since they are linked to measures aimed at strengthening the regional innovation system at the present through the development of R&D&i projects in the most relevant technological areas, related to the productive sectors with the greatest potential in the region.

However, we should not fall into an excessively short-term vision, since there are other dimensions, among which we would highlight "educational level of human resources" and "institutions and values", which are determinants for the performance of the regional innovation system in the long term and require major improvements due to the disadvantage of Andalusia in these areas.

5. Conclusions

The relevance of smart specialisation on the political agenda has risen until it reaches a key role in EU investment policies in the 2014-2020 programming period. More specifically, smart specialisation plays a key role in EU regional policy, since this policy the basis and the main source of funding of RIS3 strategies (European Commission, 2010, 2011).

In the period 2014-2020 all investments in R&D&i in Andalusia financed with EU regional policy funds have as its main policy document the RIS3 strategy of Andalusia (Junta de Andalucía, 2015). This strategy has been developed through a collaborative process between the regional government and the main players of the regional innovation system, and it tries to direct the public resources for the promotion of innovation towards those strategic areas in which the region has the greatest potential. 8 specialization priorities and 84 lines of action has been selected, as well as 8 priority axes of action and 42 political measures to support the regional innovation system. The starting point of the Andalusian RIS3 strategy 2014-2020 is the performance of a SWOT analysis of the regional innovation system, which is very complete and detailed but does not apply a comparative vision with respect to the innovation systems of other European regions.

In our work, we have carried out a comparative study of the region of Andalusia with other similar regions in structural dimensions considered decisive for innovation performance, using the Regional Benchmarking Tool proposed by the European Commission (Navarro et al., 2014).

Our results have allowed us to make contributions to the SWOT analysis contained in the RIS3 strategy for Andalusia 2014-2020. In the light of the results of our comparative SWOT analysis we have been able to evaluate the relevance of the specialisation priorities, lines of action, axes of intervention and policy measures contained in the strategy, as well as we have proposed some new lines of action and political measures.

Our work has shown that Andalusian RIS3 strategy 2014-2020 has taken into account properly the structural dimensions determining the innovative potential of the region, although the application of a comparative perspective has allowed us to complement it with 3 lines of action and 9 new policy measures.

In the new programming period 2021-2027 it is expected that regional innovation strategies will continue to have a fundamental role in EU regional policy, and we believe that Andalusia and other regions should deepen in the practice of regional benchmarking exercises, as the comparative SWOT analysis performed by us, to enrich regional innovation strategies design and its effectiveness.

Besides, it should be taken into account the impact that the NextGenerationEU Plan will have on the design of regional innovation strategies for the period 2021-2027, as it will mean an unprecedented increase in public investment in the EU, since it intends to invest an amount close to € 806,9 trillion in the period 2021-2023, being the total budget of EU Regional Policy for the period 2021-2027 of € 372,6 trillion (European Commission, 2021a).

The investments of the main instrument of the NextGenerationEU Plan, whose name is the Recovery and Resilience Facility, will be implemented through national recovery and resilience plans. These plans are subject to strict criteria for approval, highlighting the requirement that at least 37% of the investments must be destined to face the climate challenge and at least 20% of the investments to favor the digital transition. (European Parliament and Council of the European Union, 2021a). In the case of Spain, the aid of the National Recovery, Transformation and Resilience Plan amounts approximately to 70,000 million euros, a budget that must be largely implemented by the regions by virtue of their competences. The Commission's evaluation concludes that the Spanish plan dedicates 40% of its total allocation to measures that support climate objectives and 28% of its total allocation to measures aimed at the digital transition (European Commission, 2021b).

Likewise, the new Cohesion Policy Regulations 2021-2027 provide that at least 30% of ERDF investments, which are the main source of financing for RIS3 strategies, must be destined to contribute to the climate objectives of the EU (European Parliament and Council of the European Union, 2021b), in line with the EU Green Deal.

Taking into account the great conditionalities regarding the destination of investments imposed by the main financial instruments of the EU regional policy in the 2021-2027 period, it would be highly recommended to give significant weight in the design of the regional innovation strategies to investments in R&D&i related to climate change and the promotion of the digital transition. Good proof of this is the initiative launched by the European Commission called "Smart Specialisation Strategies for Sustainability (S4)" (Mccann & Soete, 2020). It aims to connect regional innovation strategies with EU general policies, particularly the EU Green Deal and the New Industrial Strategy for a Globally Competitive, Green and Digital Europe. The European Commission also points out that one of the main motivations for this initiative is to maximize the use of the Next Generation EU funds at the regional level. The regional authorities of Andalusia have already adhered to S4 initiative, and are currently working in the design of the Andalusian S4 Strategy 2021 -2027.

We can affirm that in the new period 2021-2027 the influence over regional innovation strategies of the political priorities set at the EU level, such as EU Green Deal or the new EU Industrial Policy, will gain importance. Nevertheless, we must not forget that the key point in the design of regional innovation strategies will continue to be a bottom-up approach based on the detection by the regional actors of the areas of specialisation in innovation in which the region has greater potential. To detect this strategic areas of specialisation the implementation of comparative exercises with other regions such as the one carried out in our work will continue to be highly recommended.

REFERENCES

- Balzat, M. (2006). An Economic Analysis of Innovation. Extending the Concept of National Innovation Systems. Edward Elgar.
- Becattini, G. (1990). The Marshallian Industrial District as a Socio-Economic Concept. In F. Pyke, G. Becattini & W. Sengenberger (Eds.), Industrial Districts and Inter-firm Cooperation in Italy. IILS.
- Cooke, P. (1992). Regional Innovation Systems: Competitive Regulation in the New Europe. *Geoforum*, 23, 365-382. https://doi.org/10.1016/0016-7185(92)90048-9
- Dosi, G. (1982). Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change . *Research Policy*, 2 (3), 147-162. https://doi.org/10.1016/0048-7333(82)90016-6
- European Commission. (2010). Regional Policy contributing to smart growth in Europe 2020. Retrieved February 14, 2021, from https://ec.europa.eu/regional_policy/en/information/publications/communications/2010/regional-policy-contributing-to-smart-growth-in-europe-2020
- European Commission. (2011). Regional Policy for Smart Growth in Europe 2020. Retrieved February 14, 2021, from https://ec.europa.eu/regional_policy/en/information/publications/guides/2011/regional-policy-for-smart-growth-in-europe-2020
- European Commission. (2012). Guide to Research and Innovation Strategies for Smart Specialisation (RIS 3). Retrieved February 14, 2021, from https://s3platform.jrc.ec.europa.eu/s3-guide
- European Commission. (2019). Regional Innovation Scoreboard 2019. Retrieved February 14, 2021, from https://ec.europa.eu/growth/industry/policy/innovation/regional_en
- European Commission. (2020). European Innovation Scoreboard 2020. Retrieved February 14, 2021, from https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1150
- European Commission. (2021a). The EU's 2021-2027 long-term Budget and NextGenerationEU. Retrieved September 11, 2021, from https://op.europa.eu/en/publication-detail/publication/d3e77637-a963-11eb-9585-01aa75ed71a1/language-es

- European Commission. (2021b). Proposal for a Council Implementing Decision on the approval of the assessment of the Recovery and Resilience plan for Spain. Retrieved September 11, 2021, from https://op.europa.eu/en/publication-detail/-/publication/d3e77637-a963-11eb-9585-01aa75ed71a1/language-es
- European Parliament and Council of the European Union. (2013). Regulation (EU) No 1303/2013 laying down common provisions on the ERDF, the ESF, the Cohesion Fund, the EARFD and the EMFF and laying down general provisions on the ERDF, the ESF, the Cohesion Fund and the EMFF. Retrieved February 14, 2021, from https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=celex%3A32013R1303
- European Parliament and Council of the European Union. (2021a). Regulation (EU) Na 2021/241 establishing the Recovery and Resilience Facility. Retrieved September 11, 2021, from https://eurlex.europa.eu/legal-content/ES/TXT/?uri=CELEX%3A32021R0241
- European Parliament and Council of the European Union. (2021b). Regulation (EU) Na 2021/1060 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy. Retrieved September 11, 2021, from https://eur-lex.europa.eu/legalcontent/ES/TXT/?uri=CELEX%3A32021R0241
- Foray, D., David, P., & Hall, B. H. (2009). Smart Specialisation The Concept. European Commission Knowledge Economists Policy Brief n° 9. Retrieved February 14, https://ec.europa.eu/invest-in-research/monitoring/knowledge_en.htm
- Freeman, C. (1987). Technology and Economic Performance: Lessons from Japan. London, New York: Printer.
- Freeman, C., & Pérez, C. (1988). Structural Crises of Adjustment, Business Cycles and Investment Behaviour. In G.Dosi et al. (Eds.), Technical Change and Economic Theory (pp. 38-66). Pinter Publishers.
- Frenken, K., Van Oort, F., & Verburg, T. (2007). Related Variety, Unrelated Variety and Regional Economic Growth. Regional Studies, 41, 685-697. https://doi.org/10.1080/00343400601120296
- Fujita, M., Krugman, P., & Venables, A. (1999). The Spatial Economy: Cities, Regions, and International Trade. MIT Press.
- Groenendijk, N. (2010). EU and OECD Benchmarking and Peer Review Compared. In F. Laursen (Ed.), The EU and Federalism: Polities and Policies Compared (pp. 81-202). Ashgate.
- Hong, S., Oxley, L., & McCann, P. (2012). A Survey of the Innovation Surveys. Journal of Economic Surveys, 26(3), 420-444. https://doi.org/10.1111/j.1467-6419.2012.00724.x
- Huggins, R. (2010). Regional Competitive Intelligence: Benchmarking and Policy-making. Regional Studies 44(5), 639-658. https://doi.org/10108000343400802331312
- Junta de Andalucía. (2015). Estrategia de Innovación de Andalucía 2014-2020, RIS3 Andalucía. Retrieved 14, 2021, https://www.juntadeandalucia.es/organismos/empleoformacionytrabajoautonomo/consejeria/sobre -consejeria/planes/detalle/34504.html
- Krugman, P. (1991). Geography and Trade. MIT Press.
- Krugman, P. (1995). Development, Geography, and Economic Theory. MIT Press.
- Lundvall, B.-Å. (1988). Innovation as an interactive process. From user-producer interaction to national systems of innovation. In G. Dosi et al. (Eds.), Technical Change and Economic Theory (pp. 349-367). Pinter Publishers.

- Lundvall, B.-Å. (1992). National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning. Pinter.
- Malerba, F., & Orsenigo, L. (1990). Technological Regimes and Patterns of Innovation: A theoretical and Empirical Investigation of the Italian Case. In A. Heertje, & M. Perlman (Eds.), Evolving Technology and Market Structure (pp. 283-306). Michigan University Press.
- McCann, P., & Ortega-Argilés, R. (2013). Modern Regional Innovation Policy. *Cambridge Journal of Regions, Economy and Society*, 6(2), 187-216. https://doi.org/10.1093/cjres/rst007
- McCann, P., & Ortega-Argilés, R. (2013). Smart Specialisation, Regional Growth and Applications to EU Cohesion Policy. *Regional Studies*, 49(8), 1291-1302. https://doi.org/10.1080/00343404.2013.799769
- McCann, P., & Soete, L. (2020). Place-based innovation for sustainability. Publications Office of the European Union, Luxembourg. https://doi.org/10.2760/250023
- Nauwelaers, C., Veugelers, R., & Van Looy, B. (2003). Benchmarking National R&D policies in Europe: Lessons from Belgium. Final report for the Federal Public Service for Scientific Affairs.
- Navarro, M., Gibaja, J., Franco, S., Murciego, A., Gianelle, C., Barbara, F., & Kleibrink, A. (2014). Regional benchmarking in the smart specialisation process: Identification of reference regions based on structural similarity. S3 Working Paper Series N°6. Retrieved February 14, 2021, from https://s3platform.jrc.ec.europa.eu/-/regional-benchmarking-in-the-smart-specialisation-process-identification-of-reference-regions-based-on-structural-similarity
- Nelson, R., & Winter, S. (1977). In Search of a useful theory of innovation. *Research Policy*, 6(1), 2–112. https://doi.org/10.1016/0048-7333(77)90029-4
- Nelson, R., & Winter, S. (1982). An Evolutionary Theory of Economic Change. Harvard University Press.
- Pérez, C. (1983). Structural Change and the Assimilation of New Technologies in the Economic and Social System. *Futures*, 15(4), 357-375. https://doi.org/10.1016/0016-3287(83)90050-2
- Porter, M. (1990). The Competitive Advantage of Nations. MacMillan.
- Rakhmatullin, R., Hegyi, F., Ciampi, S., Gomez, J., & Mieszkowski, K. (2020). Methodological Manual. Developing Thematic Interregional Partnerships for Smart Specialisation. A Practical Guide to Building and Managing Interregional Smart Specialisation Partnerships. Retrieved February 14, 2021, from https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/methodological-manual-developing-thematic-interregional-partnerships-smart-specialisation
- Rosenberg, N. (1976). Perspectives on Technology. Cambridge University Press. https://doi.org/10.1017/CBO9780511561313
- Tomlinson, M., & Lundvall, B.-Å. (2001). Policy learning through benchmarking national systems of competence building and innovation–learning by comparing. Report for the 'Advanced Benchmarking Concepts' (ABC) Project. Retrieved February 14, 2021, from https://www.academia.edu/24150494/Policy_learning_through_benchmarking_national_systems_of_competence_building_and_innovation_learning_by_comparing
- World Economic Forum. (2020). The Global Competitiviness Report 2020. Retrieved February 14, 2021, from https://www.weforum.org/reports/the-global-competitiveness-report-2020

ORCID

Luis Palma Martos https://orcid.org/0000-0001-5834-3629
Noemí Pulido Pavón https://orcid.org/0000-0001-6629-2358

© 2021 by the authors. Licensee: Investigaciones Regionales – Journal of Regional Research - The Journal of AECR, Asociación Española de Ciencia Regional, Spain. This article is distributed under the terms and conditions of the Creative Commons Attribution, Non-Commercial (CC BY NC) license (http://creativecommons.org/licenses/by-nc/4.0/).