A three dimensional approach to regional Smart Specialization Strategy; An application to Puglia Region

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September 2016

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Abstract

The aim of this paper is to describe an analytical tool able to support policy makers in defining regional policy for entrepreneurship. Given the growing interest about the themes of smart specialization assigned as policy objectives to the Regions, focus of the paper is at the regional level.

The three-dimensional strategic analysis considers simultaneously three kinds of data for each industrial sector: spatial concentration, cost competitiveness and export weight. Each of the three dimensions considered can be seen in turn as a specialization index since the data are related to the performance recorded at national level (benchmark). Depending on position (quarter) occupied by a specific sector in a graph, policy makers can have at one sight the relative weight of that sector in the regional economy and could have support in defining policies accordingly.

As an application, the paper presents last official available data for Puglia manufacturing sectors (2013). Moreover, the analysis could be also simply utilised to realize temporal comparisons. As an example, comparison between data for 2008 and 2013 have highlighted how Puglia has lost competitive advantages over time due to the economic crisis. However, analysis also shows how, in the same years, careful sectorial policies implemented (aerospace) has enabled the Region to emerge in this medium-high technology market also at an international level.

Once reached the full availability of homogeneous and internationally comparable data, the same analytical framework could be easily extended to assess the status of different national economies for drawing policy recommendations also at higher territorial levels.

Keywords: Regional policy; Smart Specialization Strategy; Industrial specialization; Policy tool; Three-dimensional strategic analysis.

1. Introduction

In the last years, in Europe there has been a growing interest about the themes of smart specialization assigned as a policy objective to the European regions (Bonaccorsi et al., 2009). The concept of Smart Specialisation Strategy (S3) has been developed at EU level (European Commission, 2010) and then adopted in a wider context (OECD, 2012). It indicates innovation strategies - flexible and dynamic - designed at the regional level but asked to ensure complementarity between EU, national and regional support for innovation, R&D, entrepreneurship and ICT.

In this framework, the new programming cycle of Cohesion Policy 2014 - 2020 requires, as an *ex ante* condition for use of community resources, that the national and regional authorities have drawn up strategies for research and innovation for the smart specialization. As a consequence, each region elaborated its necessary strategic document for the use of Community funds for the programming period 2014-2020 drawing on different analytical methodologies and tools (context analysis, SWOT, benchmarking, focus groups), instruments which unlikely are able to simultaneously handle more than one aspect of the economic phenomenon.

The new course of regional innovation policies opened new challenges to the European regions (McCann and Ortega-Argilés, 2013 and 2015). On the one hand, regions must ensure inclusive policies, on the other they must identify areas in which to specialize, drawing on competitive advantages and technological specializations more consistent with their potential for innovation in order to specify public and private investments needed to support the strategy.

However, if it is true that the smart specialization approach offers advantages for the design of appropriate innovation policy-making (Foray, 2014) and contribution to changing routines and practices of governance (Kroll, 2015), as well as some viable solution to the current global challenges (Rusu, 2013), yet some limits of this approach are already emerging (Capello 2013; Capello and Kroll, 2016). In fact, in this recent debate, some authors underlined the need to carefully consider the specificities of each regional mode of innovation (i.e., territorial patterns of innovation) in the design and implementation of regional innovation policies (Camagni and Capello, 2013; Caragliu and Lenzi, 2013). Others tried to connect smart specialization strategies in the perspective of the Quadruple and Quintuple Innovation Helixes models (Carayannis and Rakhmatullin, 2014).

This paper aims to address one of the potential weaknesses of the new course of innovation policy design in the European context: the difficulty in identifying the high value-added activities offering the best chance of strengthening a region's competitiveness, providing a new instrument in the policy makers' toolbox for prioritizing industrial sectors' performances. Moreover, through this paper the author hopes to give contribution to smart specialization debate also providing a regional case study, not yet numerous in the literature (Sandu, 2012; Simonen et al., 2015).

2. Material and methods

A new approach for describing and prioritizing regional industrial sectors is presented here. The three-dimensional strategic analysis of regional manufacturing sectors is based on their performance, obtained by analyzing three different dimensions simultaneously. The analysis is summarized in a single graph, in which each sector is associated with three different indicators, as described below:

1. spatial concentration (on the x-axis of a *modified* Cartesian plane);
2. competitiveness (on the y-axis);
3. exports (area of the points in the plane).

For each dimension, through some appropriate specialization indices, it has been calculated the relative weight of the regional sectors compared to the corresponding national ones, chosen as a benchmark. The use of these kinds of indices proves very convenient: merely comparing the value of the index with the unit (1), anyone can find if the "weight" of the regional industry is greater, equal to or lower than the relative weight at national level, depending on the index is greater than, equal to or less than one, respectively.

The dimensions this analysis is based on are presented here in more detail:

1. *Spatial concentration* - it has been selected the location quotient (LQ), computed as the industry's share of the regional total employment divided by the corresponding share calculated at the national level.

2. *(Cost) competitiveness* - it is the ratio of value added per employee and labor costs per employee. It represents a summary of the measure of efficiency of production processes and provides guidance on competitiveness in terms of (only) cost. To obtain the relative specialization index, the cost competitiveness index of the regional sector has been compared to the corresponding national cost competitiveness index.

3. *Exports* - it has been calculated a specialization index of exports obtained by dividing the regional share of industry goods exports (compared to total regional manufacturing exports) and the corresponding share calculated at the national level.

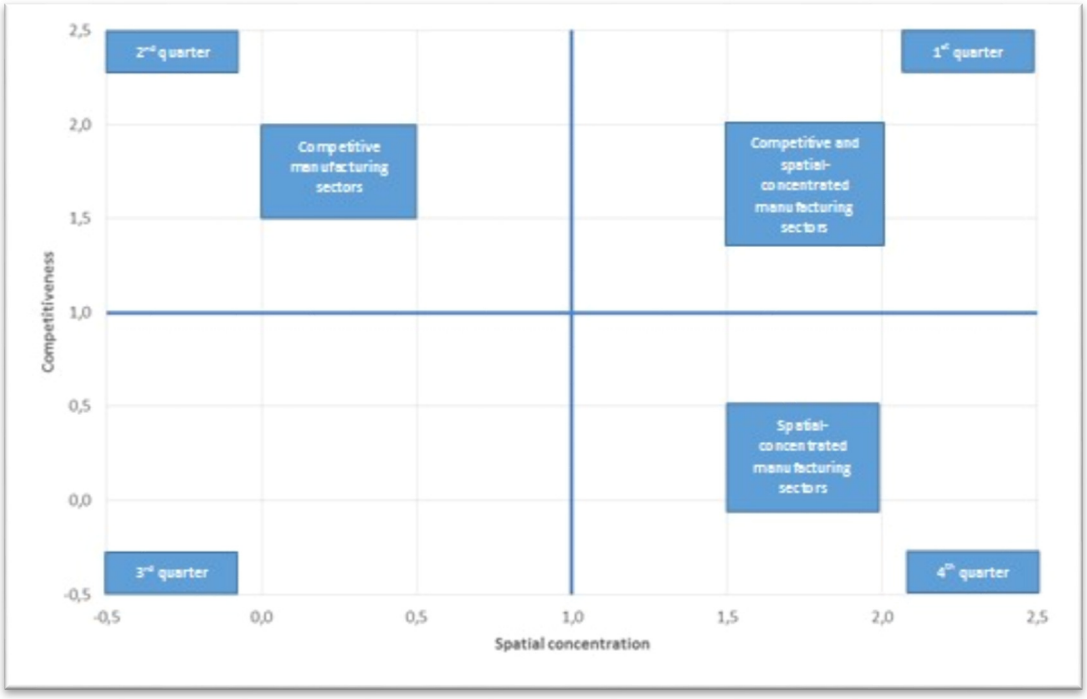
To understand how different sectors are positioned relative to the size of specialization and competitiveness, a *modified* Cartesian plane has been appropriately divided into four quadrants. Using the same definition of specialization index, two lines have been plotted corresponding to abscissa and ordinate equal to one (1). The first quarter registers values of abscissa and ordinate greater than one, while the others are numbered, starting from this, in the counterclockwise sense. According to this convention:

1. industrial sectors located above the horizontal line (first and second quarter) are those in which region under examination is competitive (competitiveness indicator ≥ 1). Similarly, sectors below the horizontal line (third and fourth quarter) have not proven particularly competitive (competitiveness indicator < 1);

2. industrial sectors located on the right of the vertical line (first and fourth quarter are those in which region under examination appears specialized (specialization indicator ≥ 1). Similarly, the areas on the left of the vertical line (second and third quarter) do not show specialization (specialization indicator < 1).

Figure 1 presents the general aspect of the three-dimensional strategic analysis.

Figure 1: The three-dimensional strategic analysis



Finally, the relative weight of exports is represented by the area of the points in the Cartesian plane. To facilitate the identification of specialized sectors in exports, points have been differently colored.

The three-dimensional strategic analysis could be usefully utilized in a three-fold perspective, as described in detail above.

First, from a positive perspective, once all industrial sectors have been positioned in the plane, the graph could be used, in general, to measure the "state of health" of the entire regional manufacturing industry at the instant indicators are referred to. Ideally, there should be the concentration of the sectors considered strategic at the regional level in the first quarter and, subsequently, a good presence of sectors in the second (competitive sectors) and in the fourth quarter (specialized sector).

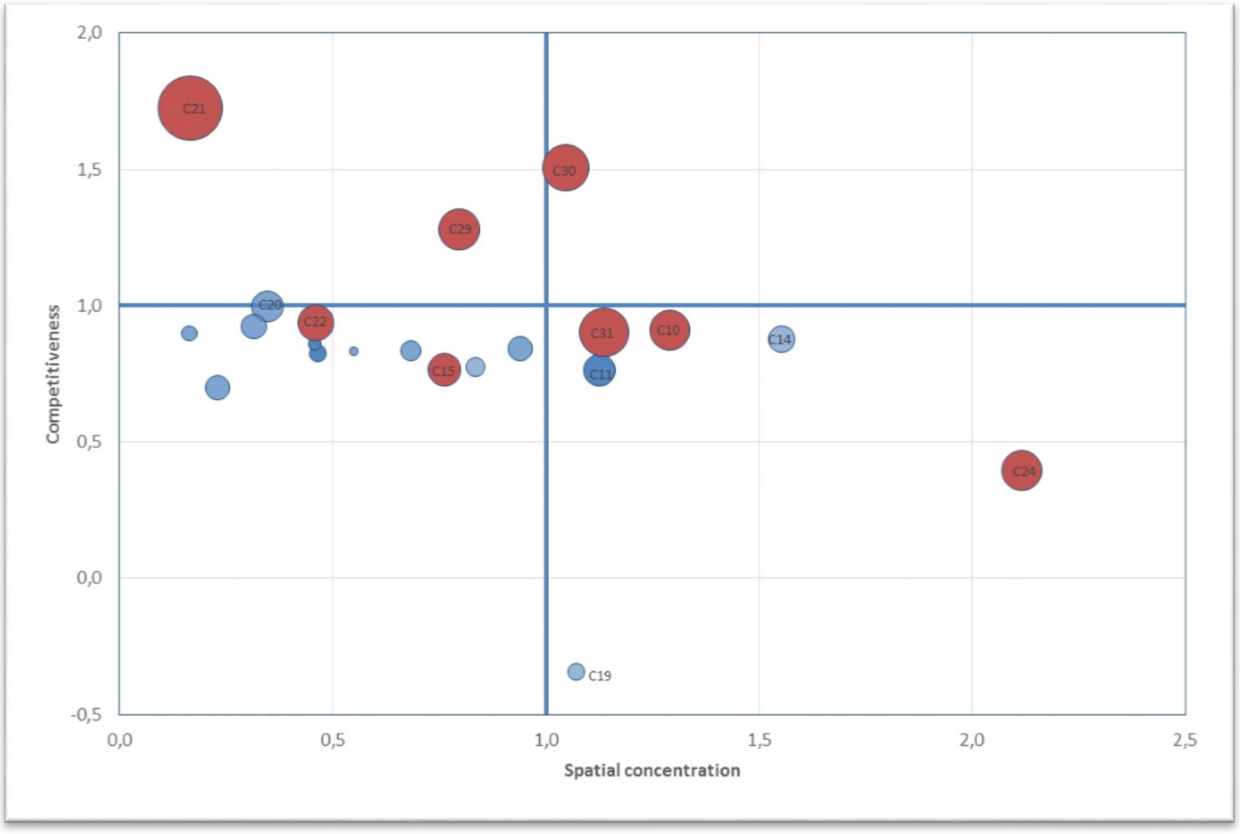
Second, from a normative point of view, some interesting policy implications can be drawn from the empirical analysis presented. Just to give some examples, policy makers should decide to invest in infrastructures to promote localization of industries already competitive (second quarter) but not particularly concentrated in the region or, differently, decide for funding programs meeting the real needs of SMEs in order to strengthen their competitiveness (fourth quarter).

Finally, the analytical tool proposed can be also utilized to take into consideration the dynamic economic evolution, by following through the time transition of regional manufacturing sectors, especially to understand effects of sectorial policy. A case study is illustrated in the section below.

3. Results and discussion

As an application, this paper shows the three-dimensional strategic analysis of regional manufacturing sectors for the last available data of Puglia Region (ISTAT, 2016). Figure 2 shows regional industrial sectors in the different quarters of the *modified* Cartesian plane according to their performance registered in 2013.

Figure 2: Apulian manufacturing sectors. Year = 2013



Source: Author's elaboration on ISTAT data

Legend – Manufacturing sectors
C10 - Manufacture of food products
C11 - Manufacture of beverages
C14 - Manufacture of wearing apparel
C15 - Manufacture of leather and related products
C19 - Manufacture of coke and refined petroleum products
C20 - Manufacture of chemicals and chemical products
C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22 - Manufacture of rubber and plastic products
C29 - Manufacture of motor vehicles, trailers and semi-trailers
C30 - Manufacture of other transport equipment
C31 - Manufacture of furniture

In the first quarter, manufacturing sectors for which the selected indicators show competitiveness and specialization at least equal to that at the national level are presented. In 2013, the only sector in this quarter is 'Other transport equipment' – C30 in the NACE structure - (including the sub-sector 'Manufacture of air and spacecraft and related machinery').

In turn, the second quarter includes industrial sectors that showed a competitive performance at least equal to the national average in 2013. The three sectors concerned are 'Chemicals and

chemical products' (C20); 'Pharmaceuticals' (C21) and 'Vehicles' (C29). The latter two sectors also recorded a better export performance than the national average. Finally, in the fourth quarter the manufacturing sectors for which Puglia shows spatial concentration at least equal to that recorded in the rest of Italy. Six the sectors concerned: 'Food Products' (C10); 'Beverages' (C11); 'Basic metals' (C24); 'Wearing apparel' (C14); 'Coke and refined petroleum products' (C19), and Furniture' (C31). Moreover, three sectors have a relatively greater export weight than the national figure: "Food", "Basic metals" and "Furniture".

Overall, analysis undertaken show a not particular regional economic performance in 2013, especially if evaluated by the number of "leader" industries (the ones in the first quarter). However, industries that historically characterize the Apulian productive structure show themselves specialized in at least one of the three dimensions analyzed, as confirmed when industrial sectors included in the regional strategical document are compared with the results deriving from the analysis just exposed (Table 1).

Table 1: Correspondence between Apulian strategic manufacturing sectors and the three-dimensional strategic analysis' results

Apulian strategic manufacturing sectors	NACE code	NACE description	Three-dimensional strategic analysis' results
Aerospace	C30	Other transport equipment	Competitive and spatially concentrated sector (first quarter)
Mechatronics	C27	Electrical equipment	(third quarter)
	C28	Machinery and equipment n.e.c.	(third quarter)
Agrofood	C10	Food products	Spatially concentrated sector (fourth quarter)
	C11	Beverages	Spatially concentrated sector (fourth quarter)
Humans' well-being	C21	Pharmaceuticals	Competitive sector (second quarter)

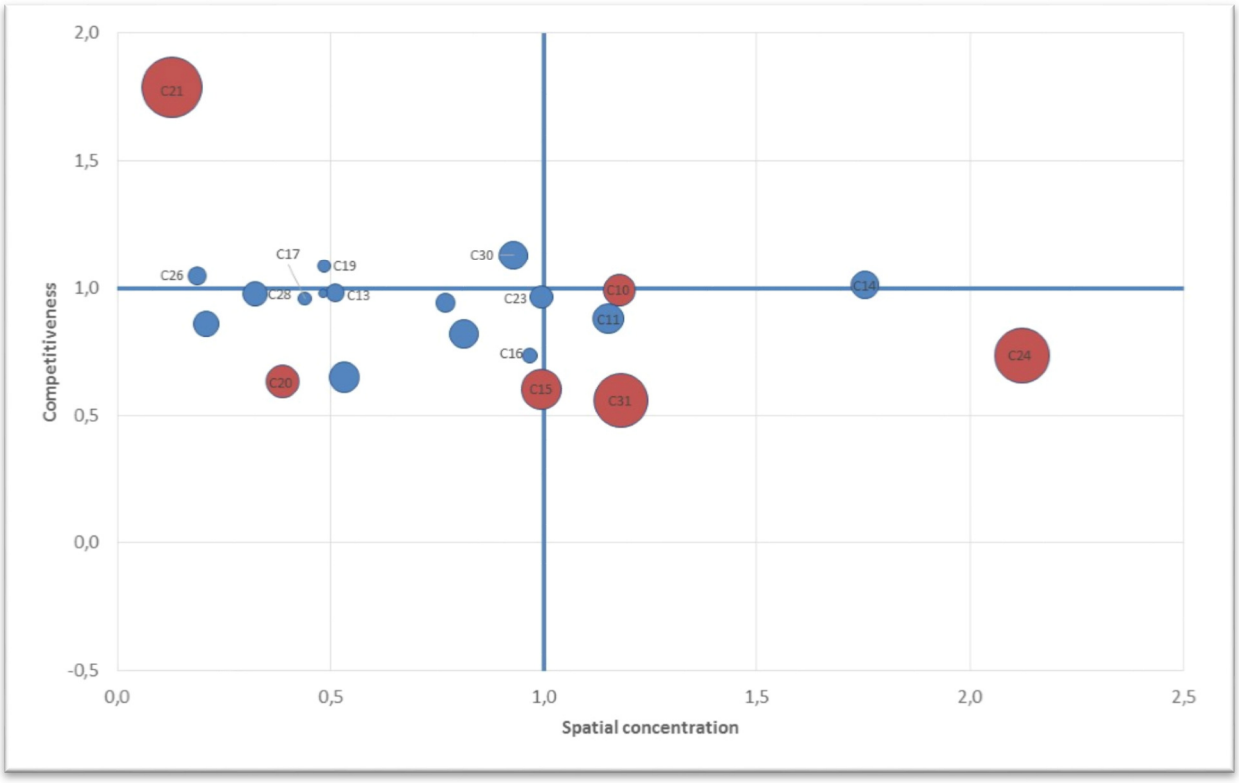
Moreover, the analysis exhibits a strong association between spatial concentration and/or competitiveness of an industry and its export capacity: the most efficient industries (pharmaceuticals first, followed by the transport industries) and those that historically characterize the regional production structure (metallurgy, food, mechanics, upholstered furniture) also record the best performance in terms of exports.

To illustrate the effectiveness of the analytical instrument proposed in tracing evolution of sectorial performance, especially as a result of regional policies, a test-bed has been advanced.

During the programming period 2007-2013, Puglia Region have strongly supported the aerospace industry by promoting first the establishment of the "productive district" (Regional Law 23/2007), then the national meta-district, and, finally, the Technological Cluster. Region has also focused on the internationalization of the sector, providing support measures to businesses that intended to open up foreign markets, and on research and innovation, promoting highly innovative impact projects submitted by large and medium-sized enterprises, and some other tailored policies in support of SMEs. Regional sources estimate that in total were mobilized investments for about 180 million euro, of which about a third of public subsidies.

Figure 3 shows again regional industrial sectors in the *modified* Cartesian plane according to their performance registered in 2008.

Figure 3: Apulian manufacturing sectors. Year = 2008



Source: Author's elaboration on ISTAT data

Legend – Manufacturing sectors
C10 - Manufacture of food products
C11 - Manufacture of beverages
C13 - Manufacture of textiles
C14 - Manufacture of wearing apparel
C15 - Manufacture of leather and related products
C16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17 - Manufacture of paper and paper products
C19 - Manufacture of coke and refined petroleum products
C20 - Manufacture of chemicals and chemical products
C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
C23 - Manufacture of other non-metallic mineral products
C24 - Manufacture of basic metals
C26 - Manufacture of computer, electronic and optical products
C28 - Manufacture of machinery and equipment n.e.c.
C30 - Manufacture of other transport equipment
C31 - Manufacture of furniture

It is immediately apparent that in 2008, at the beginning of the programming period 2007-2013, the performance for the macro-sector in which the aerospace industry is included (C30) was not characterized neither by competition nor by a particular export weight. Anyway, at the same time it is clear that the crisis has had devastating effects on the regional economy, expanding the number of industrial sectors transited to the third quarter in which no notable performance are recorded.

Concluding remarks

The three-dimensional strategic analysis proposed has proved to be effective in illustrating the current status of a European region's economy, as well as its transition throughout the last economic crisis.

The analytical tool developed in the paper would consequently enable to prioritize performances of industrial sectors, enriching framework in which industrial and innovation policies are decided. In fact, interesting policy implications can be drawn from the empirical analysis presented. The exercise proposed, where suitably enhanced and expanded to a wider context, could be used to support the choice of specific policy interventions differentiated depending on the placement of the sectors in the quadrants of the *modified* Cartesian plane,

However, in order to draw more solid policy indications, availability of more data is necessary to make the analysis same more robust. Some directions in which to direct an in-depth analysis.

First, it would be profitable to repeat the exercise varying from time to time the chosen indicators.

Second, the exercise should be extended appropriately on a time basis, also averaging data over a short to medium term time interval (e.g., 3-5 years).

Third, comparisons should be proposed also considering international benchmarks.

Finally, in some cases it would be of particular interest to deepen the analysis for some sub-sectors (NACE 3 or 4 digits. An example is the sub-sector Manufacture of aircraft and spacecraft and related machinery which forms part of NACE 2-digit industry C.30 Manufacture of other transport equipment).

Acknowledgements

The author would like to thank Francesco Grillo and her colleague Stefano Marastoni for their valuable insights at an early stage of the analysis development, and Giuseppe Lollo and Rossana Mancarella for their helpful assistance.

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