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Regional styles in enterprise and innovation policy

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In this presentation…

- so far, the literature has covered the topic of regional diversity in enterprise and innovation policies mostly by means of (comparative) case studies. More systematic analyses are still uncommon. This diversity does exist, also within a same country!

- policy diversity can be thought in terms of different, 'theoretically' identified policy mixes corresponding to more ore less proactive attitudes

- the mixes above are empirically investigated exploiting an ad hoc database containing every enterprise and innovation programme that has been implemented in Italian regions 2007-13

- this investigation relies on a fuzzy-set clustering approach that avoids simplistic black-and-white solutions and classifications

- results show the existence of remarkable regional heterogeneity, partly reflecting the well-known North-South divide, with some regions being proactive, some minimal, and others adopting hybrid policy styles.

Background ideas/1

In general, public decision makers are called to choose between alternative stances that, in various ways, influence different sectors of society and their relative welfare.

With regard to regional economic policy, these choices, and the policy preference functions upon which they are based, depend on a large number of interplaying factors, including: the features of regional assets and needs; the legal and institutional framework; the political belief of policy-makers; the pressure of organised social and economic interests, electoral coalitions, and public opinion.
Last but not least, choices also depend on the vision of development that the policymakers have in mind for the territory that they govern

Again in general, an everlasting debate opposes the supporters of the minimal state to the advocates of a proactive industrial policy … (Weiss, 1998; Chang, 2002)

Background ideas/2

Regional renewal and change can be promoted with different degrees of intensity, from minimal to proactive, and using different portfolios of policy instruments, which are identified here as 'policy mixes'

- ❑ policy instruments → techniques and tools that can be used by the policymaker in order to implement public policies (Howlett, 1991)
- ❑ regional policy mix →the interaction of different policies implemented by the same regional policymaker in order to pursue a set of goals that 'involve' one or more groups of local actors that are part of one or more local economic processes (Flanagan et al, 2011; Cunningham et al, 2013)
- ❑ meaningful mixes from a theoretical point of view → policy styles (Howlett, 1991)

We focus on enterprise and innovation policy

Proactive vs minimal styles in regional policymaking

A proactive policymaker

- ❑ prioritises the generation of new varieties of knowledge and competencies in the local system by focusing on R&D but also on collaborations/technology transfer activities and on the diffusion of key enabling technologies
- ❑ identifies targets that respond to a development strategy
- ❑ promotes large-scale local development projects

A minimal policymaker

- ❑ intervenes in a limited way, in order to correct certain market failures, not to distort the free market
- ❑ does not fancy policy targeting too much and prefers the use of horizontal and generic incentives
- ❑ possibly complements the lack of strategy with forms of social protection in declining industries and areas

An original, ad hoc dataset

The dataset: info on all the regional interventions actually implemented (and not merely planned) over the period 2007-2013 under the ROPs (POR) co-financed by the ERDF and the ESF.
We consider the resources provided through the calls for tenders appeared up to the end of October 2014.

The variables:

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
R&D supports	Pct of funds devoted to R&D support	20	50.1	24.4	11.9	94.8
Collaborations	Pct of funds devoted to support firm-to-firm, and university-industry collaborations	20	22.2	16.4	0.0	63.8
KETs	Pct of funds targeting key enabling technologies	20	13.5	11.3	0.0	34.8
Targeting	Pct of funds that are devoted to the support of specific industries	20	72.9	20.1	20.1	100.0
Local development	Pct of funds to large-scale, usually negotiated, projects of local development other than university-industry	20	9.6	16.6	0.0	53.3

Choices in cluster analysis

We will employ cluster analysis for

- a data-driven identification of policy mixes/styles
- grouping the Italian regions according to their policy mix

A first important choice regards the clustering philosophy that is more appropriate to the research goals and to the available data

A. hard clustering: assigns each region to one group, so that groups are mutually exclusive → black-and-white analysis

B. fuzzy clustering: assigns each regions to multiple groups, but with different degrees of membership → more nuanced analysis

In real-world policymaking, it is hard to imagine 'pure' styles resulting from completely consistent mixes of policies, with regions adopting them or not; the reality is, of course, much more nuanced.

Fuzzy-set clustering

Despite its long history (Dunn, 1974; Bezdek, 1981), this method has not yet gained, in the area of applied economic and social research, the popularity it deserves.

How does it work?

- as usual with non-hierarchical approaches, a particular number of clusters k (with k > 1) has to be assumed (next slide for this choice)

- let N denote a set of m-dimensional data points (the 20 Italian regions described by m = 5 classification variables)

- let f >1 be the desired degree of fuzzification (conventionally set at 2 for the reasons explained in Pal and Bezdek, 1995) …

- … and c_k the centroid of the k^{th} cluster.

Fuzzy C-means algorithm

The membership value of unit i to cluster j is the quantity of primary interest. It is given by:

$$m_{ij} = \left(\sum_{k=1}^{K} \left(\frac{d_{ij}}{d_{ik}} \right)^{\frac{2}{f-1}} \right)^{-1} \qquad [1]$$

Squared Euclidean norms

where the numerator is the distance between the unit and the centroid of cluster j , i.e. $d_{ij} = \|x_i - c_j\|$

while the denominator represents the distance between the unit and the centroid of every possible cluster, i.e. $d_{ik} = \|x_i - c_k\|$

Centroids are initially selected at random, then [1] is computed for every j and each unit is assigned to the cluster with higher membership. Then, the real centroids for each one of the previous crisp clusters are identified, and [1] is computed again with respect to these new centroids. This procedure is repeated until centroids are stable, i.e., as long as a further iteration would not bring any (non-negligible) change in the degree of membership

The appropriate number of clusters

The methodological literature proposes for this evaluation a number of cluster validity indexes

Cluster validity index	*Reference*	*Optimal k when index is*	*n. of clusters (k =)*				
			2	*3*	*4*	*5*	*6*
Partition coefficient	Bezdek (1974)	max	0.75	0.57	0.61	0.57	0.53
Modified partition coefficient	Dave (1996)	max	0.51	0.36	0.48	0.46	0.43
Partition entropy	Bezdek (1981)	min	0.39	0.73	0.74	0.87	0.98
Crisp silhouette	Kaufman and Rousseeuw (1990)	max	0.62	0.42	0.52	0.50	0.42
Fuzzy silhouette	Campello and Hruschka (2006)	max	0.65	0.52	0.62	0.58	0.50
Xie and Beni	Xie and Beni (1991)	min	0.20	0.51	0.22	0.21	0.83

- ❑ *k = 2* is a first-best solution
- ❑ *k = 4* comes out to be the second-best solution according to the majority of validity indexes taken into account, and therefore, it will be also object of the following analysis

Uncovering policy styles with cluster centroids

Centroids are artificial values that are not observed in the original data. Notwithstanding, their combination in each cluster reveals what characterises each policy style

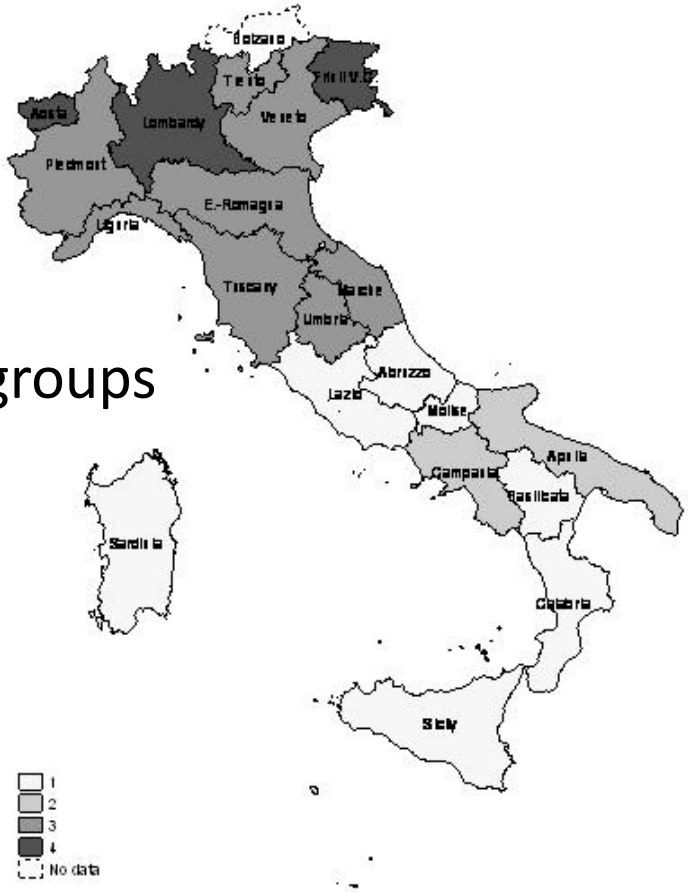
k	*Cluster id*	*R&D*	*Collaborations*	*Targeting*	*KETs*	*Local development*
k = 2	Clus 1 (South)	28.95	10.81	59.27	5.53	19.01
	Clus 2 (North)	66.68	30.87	83.72	20.09	1.81
k = 4	Clus 1 (S)	29.55	10.53	51.61	4.29	12.18
	Clus 2 (S)	18.72	8.97	83.09	5.63	50.11
	Clus 3 (N)	61.05	24.55	81.79	20.27	1.43
	Clus 4 (N)	84.93	47.43	90.50	20.41	0.26

Italian regions with hard clustering

Had we employed hard clustering, this would be more or less the situation

2 groups

4 groups



Italian regions with fuzzy clustering, $k = 2$

Region	m_{iSouth}	m_{iNorth}	*Closest hard clustering:*
Abruzzo	0.72	0.28	Cluster 1 (South)
Basilicata	0.78	0.22	Cluster 1 (South)
Calabria	0.86	0.14	Cluster 1 (South)
Campania	0.75	0.25	Cluster 1 (South)
Lazio	0.69	0.31	Cluster 1 (South)
Molise	0.95	0.05	Cluster 1 (South)
Apulia	0.74	0.26	Cluster 1 (South)
Sardinia	0.93	0.07	Cluster 1 (South)
Sicily	0.99	0.01	Cluster 1 (South)
E. Romagna	0.12	0.88	Cluster 2 (North)
Friuli V.G.	0.13	0.87	Cluster 2 (North)
Liguria	0.13	0.87	Cluster 2 (North)
Lombardy	0.19	0.81	Cluster 2 (North)
Marche	0.06	0.94	Cluster 2 (North)
Piedmont	0.03	0.97	Cluster 2 (North)
Tuscany	0.04	0.96	Cluster 2 (North)
Trento	0.14	0.86	Cluster 2 (North)
Umbria	0.25	0.75	Cluster 2 (North)
Aosta Valley	0.09	0.91	Cluster 2 (North)
Veneto	0.33	0.67	Cluster 2 (North)

Italian regions with fuzzy clustering, $k = 4$

Region	m_{i1}	m_{i2}	m_{i3}	m_{i4}	*Closest hard clustering:*
Abruzzo	0.59	0.08	0.25	0.08	Cluster 1
Basilicata	0.63	0.15	0.14	0.08	Cluster 1
Calabria	0.49	0.21	0.24	0.07	Cluster 1
Lazio	0.52	0.09	0.31	0.08	Cluster 1
Molise	0.98	0.01	0.01	0.00	Cluster 1
Sardinia	0.76	0.14	0.07	0.03	Cluster 1
Sicily	0.92	0.04	0.03	0.01	Cluster 1
Campania	0.02	0.96	0.01	0.01	Cluster 2
Apulia	0.03	0.94	0.02	0.01	Cluster 2
E. Romagna	0.08	0.05	0.71	0.16	Cluster 3
Liguria	0.09	0.05	0.59	0.27	Cluster 3
Marche	0.01	0.01	0.97	0.02	Cluster 3
Piedmont	0.04	0.02	0.80	0.14	Cluster 3
Tuscany	0.03	0.02	0.86	0.10	Cluster 3
Trento	0.08	0.06	0.68	0.17	Cluster 3
Umbria	0.11	0.04	0.76	0.08	Cluster 3
Veneto	0.24	0.08	0.45	0.23	Cluster 3
Friuli V.G.	0.03	0.02	0.15	0.80	Cluster 4
Lombardy	0.04	0.04	0.14	0.78	Cluster 4
Aosta Valley	0.06	0.04	0.37	0.53	Cluster 4

A regional innovation paradox?

Average degrees of membership, regions grouped by innovativeness (a) and stage of development (b)

		$k = 2$		$k = 4$			
	n. of regions	m_{iSouth}	m_{iNorth}	m_{i1}	m_{i2}	m_{i3}	m_{i4}
(a) Rank in the RRSII 2006 among EU regions							
>150	8	0.76	0.24	0.49	0.31	0.11	0.09
101-150	5	0.28	0.72	0.20	0.05	0.66	0.10
top 100	6	0.22	0.79	0.13	0.05	0.45	0.37
(b) % of the EU average GDP (PPP/inhabitants) in 2007							
below 75%	4	0.84	0.17	0.37	0.54	0.08	0.03
≥ 75 % and < 100 %	5	0.73	0.27	0.61	0.08	0.25	0.05
≥ 100 %	11	0.18	0.82	0.11	0.04	0.55	0.30

It is in economically weaker regions that there would be more need for innovation and structural change but local governments are unable, or unwilling, to proactively pursue these goals

Are central and peripheral regional policies substitutes or complements?

Variable means in Convergence regions (Apulia, Calabria, Campania and Sicily) with and without national programmes for lagging-behind areas

Variable	(a) regional programs only	(b) regional programmes & National Operational Programmes where regional allocation is specified	(c) regional programmes & National Operational Programmes where regional allocation is specified or imputed
R&D	23.71	40.67	40.68
Technology transfer	10.33	17.71	17.28
Selectivity	75.23	80.47	85.90
Local development	34.82	26.83	29.89
KETs	7.32	16.78	16.26

Thank you for your attention!

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An overview of the data