Mapping the environmental pressure due to economic factors. The case of Italian coastal municipalities

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Abstract

In this paper, we quantitatively characterize the sector specialization of the coastal municipalities that may affect the environment of the Italian coastal municipalities. We first quantified settlement pressure on the Italian coasts, then we provide an analysis of economic specializations by sectors of coastal municipalities. Finally, we develop a more specific analysis on the specialization and dependence of coastal municipalities. Focusing on two specific groups of economic sectors: i) those that depend on the sea as the primary source input and ii) those that do not depend on the sea but that have high environmental pressures. We provide evidence of the relationship between the two groups of sectors i.e. 'marine' sectors and. 'high pressure' sectors in coastal municipalities
Keywords: Coastal environment; Integrated Coastal Management; Territorial disparities.
JEL Classification: Q25; Q51; Q56; R11.

Mappatura della pressione ambientale dovuta a fattori economici. Il caso dei comuni costieri italiani

Sommario

In questo articolo, caratterizziamo quantitativamente le principali specializzazione settoriale dei comuni costieri che influenzano l'ambiente litoraneo. Prima si quantificano le pressioni di insediamento sulle coste italiane, successivamente si fornisce un'analisi delle specializzazioni economiche a livello settoriale dei comuni costieri. Infine, si sviluppa un'analisi sulla specializzazione e la dipendenza dei comuni costieri dall'ambiente. In particolare, ci concentriamo su due gruppi specifici di settori economici: i) quelli che dipendono dal mare come input primario e ii) quelli che non dipendono dal mare, ma con elevate pressioni ambientali. In questo modo forniamo la prova della relazione tra i due gruppi di settori, cioè i "marini" e quelli "ad alta pressione" nei comuni costieri.
Parole Chiave: Ambiente costiero; Gestione costiera integrata; Disparità territoriali.
Classificazione JEL: Q25; Q51; Q56; R11.

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Introduction

Coastal municipalities in Italy are 645, less than 8% compared to the 8,093 Italian municipalities (2011).[1] They cover an area of 43,121 km2, which represents 14.2% of the national territory (with an average area of about 67 km2 compared to a national average of 37 km2). Furthermore, in coastal municipalities resides a population of 16.6 million of inhabitants in 2011, accounting for about 28% of the Italian population (Table 1). The coastal municipalities have therefore a very high average population density, equal to 387 inhabitants per km2 (against a national average of 197 inhabitants per km2). This evidence immediately suggests a high human pressure on coastal areas resulting from longstanding economic and demographic Italian development.

Despite this large presence of human activities in the coastal areas, all over the world, we note a limited availability, at least to our knowledge, of research on coastal integrated management, at national or supranational level. Indeed, research on coastal integrated management is generally referred to specific case studies (e.g. Cantasano and Pellicone, 2014; Niavis, et al. 2017).

This work, instead, aims at providing a useful tool for a more aggregate level of analysis of the relationship between local economy and the in/direct pressure on the sea. The main goal of the paper is to provide a possibly complete and updated map on the characteristics of the Italian coastal municipalities and economic areas they belong to. It also provides consistent and clear indications on the human pressure and the possible environmental pressures on the coastal areas of the regions object of study. In this way, this paper could be a useful tool for implementing policies and coastal integrated management strategies (Cantasano and Pellicone, 2014; Olsen, 2003) that reduce the environmental pressures while preserving the economic activities related to ‘marine’ activities.

In order to reach the goal of the paper we need to highlight that Italian coastal municipalities include some large cities, which could bias the aggregate data. Then, to be more confident about the effective human pressure exerted on the Italian coasts, Table 1 shows the data on population density excluding the cities (coastal and non-coastal) with more than 500,000 inhabitants. In the case of coastal municipalities, it comes to Genoa, Rome, Naples and Palermo.

[1] Coastal municipalities are those defined as 'litoranei' by Istat, meaning those whose borders are touched by the sea.

In this way, excluding the large cities, our descriptive statistics denote very few changes. In fact, the coastal municipalities without the big cities occupy 13.7% of the Italian territory, with 22.6% of the population (11.8 million inhabitants) living there, which leads to a population density of about 287 inhabitants / km2 while the national average, calculated with homogenous standard, is of 174 inhabitants / km2.
At the same time, the change in population density between 2001 and 2011 (excluding the large cities) is higher (8 inhabitants / km2) compared to the figure that includes the big cities, a sign that the pressure of settlement on the four large coastal cities has slowed more than in coastal municipalities. It also should be noted that the four coastal cities excluded account for around 4.8 million inhabitants, almost 29% of all coastal municipalities, and this has a complex influence on the economic characterization of coastal municipalities, in particular in the case of Lazio (Rome) and Campania (Naples). Therefore, even excluding the larger coastal cities, the relative density of the coastal municipalities is still very high compared to the national average density (both with and without the big cities) and it is still increasing.

Tab. 1 Italian coastal municipalities in 2011 (Elaboration from ISTAT).

	Number	Size (km^2)	Population	Density (inhab/km^2)	Pop. density change 2011-2001
Italy	8093	302072	59433744	196.75	+8.0
Costal municipalities	645	43121	16671831	386.62	+7.0
% coastal	7.97	14.28	28.05	-	-
*Italy (>500000 inhabs excluded)**	8087	299953	52496335	173.8	+8.2
Coastal (>500000 inhabs excluded)	641	41314	11848912	286.8	+7.9
% coastal (>500000 inhabs excluded)	7.92	13.77	22.57	-	-

* 4 coastal municipalities (Genoa, Naples, Palermo and Rome), and 2 non-coastal (Milan and Turin)

The Italian coasts, then, are subject to strong human pressures with respect to the non-coastal areas and the environmental impact on the coastal and marine territory might be severe (Arto et al., 2012; Barzotto et al., 2014; Bowen and Riley, 2003, Turner, 2000). Furthermore, the resilience of these areas can be reduced (Guarascio et al., 2017; Modica and Reggiani, 2014, 2015) and their vulnerability can be increased (Modica and Zoboli, 2016).[2]

[2] This analysis may be also useful in the evaluation of natural disasters, in particular in the coastal areas and for flood risk (see for more details, Meroni et al., 2016; Modica et al., 2016 and Sterlacchini et al., 2016)

Nonetheless, we are confident that the presence of large cities do not bias our analysis. Then, as we said above, the goal of the analysis is to provide a characterization of the overall Italian coastal municipalities (of the selected regions) allowing to highlight their specialization in terms of economic activities and economic dependence on marine production sectors (i.e. sectors that are closely dependent on the ecological conditions of the sea because such as fishing). Moreover, we also highlight the environmental pressure due to high pollutant sectors in the coastal municipalities (the so-called high impact sectors). This second group of sectors deserves a more in depth discussion. Indeed, the selection of these sectors has been made up in the light of those economic activities not directly linked to maritime resources, but localized in coastal zones that may exert environmental pressures, on the coast and the sea on the basis of two main arguments: (i) the literature on pressures (see for instance Marin and Mazzanti (2013) and Fadda (2016)); and (ii) an indicator on the CO2 emission intensity, atmospheric pollutant and heavy metals per employed derived by NAMEA. (Moll et al. 2007). NAMEA tables provide the link between environmental pressures (in terms of air emissions) and economic data (e.g. employment, value added, and output)for branches of resident units (see Marin and Mazzanti 2013, for details).[3]

We then will be able to determine the presence of coastal areas that are subjected to a strong environmental pressure due to both the impact caused by the economic sectors depending on the sea and the high impact sectors and we can have evidence of a possible interrelation between the two groups of sectors.[4]

The data used in this analysis come from the Census of Industries and Services developed by ISTAT in 2011. These data provide a very detailed information at municipality scale on the characteristic of firms and employments that could be sufficient to characterize municipalities in terms of productive structure. The Census data are available at the municipal level for 352 sectors ATECO 2007 (at different levels of aggregation for Sections, Divisions, Groups), by size class (15 classes), by type of legal form (12 types) and other features (Marra and Turcio, 2016). For our purposes, we have used data on total employees for municipality for each sector

[3] In this way, even tough not perfectly, it may be possible to recognize CO2 emissions per each employed at sectoral level. This might be considered then as a proxy for high pollutant sectors (derived as a proxy of CO2 emissions by the sector), even not related directly to sea activities.

[4] See Lucchese et al., 2016; Marin and Modica, 2017 for considerations on economic exposure.

ATECO 2007 (with a selection of 120 areas in the levels of aggregation among the three available).
The analysis is conducted on seven Italian regions: Campania, Emilia Romagna, Friuli-Venezia Giulia, Liguria, Apulia, Sardinia and Veneto. These are the regions that have the most peculiar characteristics throughout the country in terms of length of coastal territory, number of coastal municipalities and ratio between coastal areas and hinterland areas, generalization over the entire Italian territory might be done, however to avoid redundancy we focus only on the above regions.

The paper is organized as follows: Section 2 describes the case studies and the Italian contrast between coastal and non-coastal areas. Section 3 shows the economic dependence on marine resources and areas of high environmental pressure for all the case studies. Section 4 concludes.

1. Study sites and methods

The main population data are available in Table 2 and are based on the data of the Census of population and housing of 2011 carried out by ISTAT. All the regions show higher population density in the coastal municipalities with respect to the hinterland, with the only exception being Veneto where the residential density is not very different from the Italian average: 254.44 inhab./km2 in the coastal municipalities, but it is a bit lower than the value of the non-coastal municipalities (264.80 inhab./km2). In this situation, the anthropological pressure is higher in the hinterland than in the coast (more details in Table 2).

This evidence shows that even if the total surface of coastal municipalities cover only a small part of the entire regional area however, coastal municipalities are usually subject to a strong human pressure greater than that of non-coastal areas. These data, however, reflect only the demographic characteristics. Regarding the economic data, there are some differences: according to the Census of Industries and Services developed by Istat in 2011, in Campania the employees in all sectors were 939,776 (17% of the total regional population), of these, 43% of the total were employed in activities located in coastal municipalities. This indicates an even higher density of employment for coastal municipalities, albeit slightly, with respect to the population density and, therefore, these coastal municipalities could be thought as net attractors of work.

Tab. 2 - Coastal and non-coastal municipalities of the selected regions, 2011.

	Number	Size (km^2)	Population	Density (in-hab/km^2)	Employment
CAMPANIA					
Total	551	13670.95	5766810	421.83	939776
Coastal	60	1748.02	2153646	1214.32	404103
Non Coastal	491	11922.98	3548285	421.83	505673
% Coastal	11	13	38	-	43
Main city		119.02	962003	808270	-
EMILIA ROMAGNA					
Total	348	22452.78	4342135	193.39	1518243
Coastal	14	1523.23	506031	332.21	151824
Non Coastal	334	20929.55	3836104	183.29	1366419
% Coastal	4	7	12	-	10
Main city		140.86	371377	263650	
FRIULI-VENEZIA GIULIA					
Total	218	7862.30	1218985	155.04	80450
Coastal	9	434.30	288490	664.27	18504
Non Coastal	209	7428.01	930495	125.27	61943
% Coastal	4	6	24	-	23
Main city		85.10	202123	237512	
LIGURIA					
Total	235	5416.21	1570694	289.99	433371
Coastal	63	1321.82	1262633	955.22	372700
Non Coastal	172	4094.40	308061	75.23	60671
% Coastal	27	24	80		86
Main city		240.29	586180	2439	
APULIA					
Total	258	19540.90	4052566	207.39	700432
Coastal	67	5993.03	1701712	283.95	316009
Non Coastal	191	13547.87	2350854	173.52	384421
% Coastal	26	31	42	-	45
Main city		117.39	316532	269642	
SARDINIA					
Total	376	24100.02	1639362	68.02	294992
Coastal	70	7452.70	835039	112.05	184472
Non Coastal	306	16647.32	804323	48.32	110520
% Coastal	19	31	51	-	63
Main city		85.45	149883	1763	
VENETO					
Total	581	18407.42	4857210	263.87	1642359
Coastal	11	1654.57	420986	254.44	144527
Non Coastal	570	16752.84	4436224	264.80	1497832
% Coastal	2	9	9	-	8
Main city		415.90	261362	62843	

When looking at the employment the picture is fuzzy, for instance In Emilia-Romagna the employees in all sectors were 1,518,243 (35% of the population), of these, about 10% of the total were employed in businesses located in coastal municipalities. This value still indicates a lower density

of employment than population density and therefore, the coastal municipalities of Emilia Romagna might be seen as net "exporters" of work. These data therefore draw a very heterogeneous picture between regions and it might be considered as a complete taxonomy of the entire country.

1.1. Absolute economic specialization

A first indicator of (absolute) specialization is represented by the percentage of each sector on the employment in the municipality. The main results are presented as the average of all municipalities of a region in Tab.3.

In Campania, considering the major sectors as presented by ATECO 2007, the primary sector (agriculture, forestry and fishing) represents an average of 1,53% of the whole municipal employment in the coastal municipalities with respect to about 0,6% in the non-coastal municipalities. Almost all the manufacturing sectors have a higher average of the percentage of the employment in the non-coastal municipalities than in the coastal ones. On the contrary, most of services have a higher average of the percentage of the employment in the coastal municipalities than in the non-coastal ones. More specifically, the trade represents a very high level of employment in the coastal municipalities (an average of 27,32% with respect to the 26,98% in the non-coastal municipalities), and the same happens in the sector of tourism.

In Emilia Romagna, the primary sector (agriculture, forestry and fishing) represents an average share of 5,99% of the whole municipal employment in the coastal municipalities with respect to about 0,79% in the non-coastal municipalities. These values reach relatively high levels in the sector of fishing (5,74%) with respect to agriculture (0,2%). The manufacturing sectors have in average a higher employment level in non-coastal municipalities than in coastal ones. The services, instead, show higher averages of employment in coastal municipalities, especially for activities linked to tourism.

In Friuli Venezia Giulia, the primary sector (agriculture, forestry and fishing) represents an average share of 6,53% of the whole municipal employment in the coastal municipalities with respect to 1,22% (with very high values for fishing). In the manufacturing sectors, the pattern shows a typical trend similar to other regions with higher averages in non-coastal municipalities.

Tab. 3 - Average share of employment of productive sectors of coastal municipalities of the regions under study and comparison with common non-coastal,%, 2011 for some selected sectors.

Coastal municipalities	Total empl.	A	03	B	C	D	E	F
Campania	**939776**	**0.28**	**0.14**	**0.06**	**16.3**	**0.18**	**1.83**	**10.**
Average for coastal	-	1.54	1.40	0.04	9.79	0.03	1.43	13.1
Average for non-coastal	-	0.64	0.01	0.16	19.71	0.06	1.02	17.22
Emilia Romagna	**1518243**	**0.45**	**0.20**	**0.08**	**29.84**	**0.42**	**0.50**	**8.88**
Average for coastal	-	5.99	5.74	0.04	16.84	0.05	1.00	10.67
Average for non-coastal	-	0.79	0.07	0.16	35.91	0.09	0.61	14.05
Friuli-Venezia Giulia	**352169**	**0.48**	**0.21**	**0.08**	**31.76**	**0.20**	**0.99**	**9.61**
Average for coastal	-	6.53	6.31	0.02	15.13	0.02	0.59	12.50
Average for non-coastal	-	1.22	0.09	0.26	31.91	0.35	0.41	16.06
Liguria	**433371**	**0.25**	**0.17**	**0.08**	**18.11**	**0.29**	**1.37**	**10.30**
Average for cosata		0.60	0.55	0.15	8.64	0.08	0.57	14.35
Average for non-coastal		0.91	0.05	0.24	19.47	0.01	0.22	24.56
Apulia	**700432**	**0.71**	**0.43**	**0.22**	**17.82**	**0.15**	**1.69**	**12.96**
Average for coastal	-	2.08	1.64	0.37	16.64	0.07	0.82	13.75
Average for non-coastal	-	0.99	0.02	0.29	18.58	0.14	1.26	17.24
Sardinia	**294992**	**0.94**	**0.72**	**0.60**	**12.55**	**0.39**	**1.92**	**13.89**
Average for coastal	-	3.17	2.75	1.18	11.78	0.07	1.16	18.61
Average for non-coastal	-	0.69	0.07	0.57	16.17	0.06	0.70	21.57
Veneto	**1642359**	**0.49**	**0.27**	**0.08**	**32.48**	**0.14**	**0.83**	**9.52**
Average for coastal	-	7.42	7.02	0.00	11.19	0.04	0.52	14.42
Average for non-coastal	-	0.59	0.06	0.16	39.48	0.13	0.53	13.14

Nace rev2 sectors: A: Agriculture; 03: Fishing; B: Mining; C: Manufacture; D: Electricity; E:Water supply; F: Construction

Tab. 3 - (continued)

Coastal municipalities	G	H	I	J	K	L	M	P
Campania	**27**	**7.4**	**7.**	**1.49**	**2.22**	**0.96**	**7.49**	**1.12**
Average for coastal	27.3	4.34	18.2	1.17	1.16	0.99	7.13	0.52
Average for non-coastal	26.9	4.51	9.08	0.68	1.04	0.44	7.32	0.78
Emilia Romagna	**19.2**	**4.97**	**8.38**	**2.15**	**3.39**	**2.26**	**6.52**	**0.30**
Average for coastal	22.4	3.54	15.09	1.30	1.66	4.70	5.32	0.21
Average for non-coastal	18.1	4.80	9.16	1.07	0.86	1.70	4.24	0.20
Friuli-Venezia Giulia	**17.3**	**4.18**	**7.19**	**2.07**	**5.41**	**1.74**	**6.72**	**0.35**
Average for coastal	20.5	3.26	15.96	1.72	3.47	3.16	5.70	0.33
Average for non-coastal	17.7	3.09	12.84	0.89	1.12	1.36	4.61	0.41
Liguria	**20.58**	**8.97**	**8.97**	**1.76**	**3.04**	**2.15**	**7.91**	**0.34**
Average for cosata	24.35	3.72	22.35	1.19	1.09	3.57	6.34	0.30
Average for non-coastal	20.68	3.78	15.78	0.54	0.77	1.10	4.41	0.11
Apulia	**26.89**	**5.22**	**0.08**	**0.02**	**1.93**	**0.79**	**7.55**	**0.42**
Average for coastal	28.15	2.92	0.14	0.01	0.97	0.70	6.77	0.31
Average for non-coastal	28.80	3.84	0.08	0.01	1.27	0.47	6.42	0.31
Sardinia	**26.17**	**6.05**	**9.54**	**2.31**	**2.58**	**1.08**	**7.35**	**0.49**
Average for coastal	25.44	3.35	15.55	0.89	0.80	1.31	5.80	0.30
Average for non-coastal	28.43	4.55	11.43	0.52	0.38	0.19	5.59	0.18
Veneto	**21.26**	**4.40**	**7.39**	**2.03**	**3.42**	**2.26**	**6.15**	**0.28**
Average for coastal	25.09	4.37	15.58	0.74	0.63	3.73	4.81	0.25
Average for non-coastal	18.33	3.69	8.76	0.92	1.27	1.91	4.29	0.21

Nace rev2 sectors: G: Wholesale; H: Transport; I: Accommodation; J:Information and communication; K:Financial activities; L:Real estate; M: Professional, scientific and technical activities; P: Education; Q: Health, not included for space constraints. Results are available upon request

In Liguria, the primary sector (agriculture, forestry and fishing) represents an average share of 0,6% of the whole municipal employment in coastal municipalities with respect to about 0,9% in non-coastal municipalities. These values reach relatively high levels in the sector of fishing (0,5%) with respect to agriculture (0,04%), and this is the opposite trend of non-coastal municipalities. In Liguria, constructions represent a significant sector of employment, with average percentages that reach 14,3% in coastal municipalities and 24,5% in non-coastal municipalities. Most of services

have a higher average of the percentage of the employment in coastal municipalities than in non-coastal ones.

In Apulia, the primary sector (agriculture, forestry and fishing) represents an average share of 2,08% of the whole municipal employment in coastal municipalities with respect to about 0,99% in non-coastal municipalities. This percentage is mainly due to the employment in the fishing, which is 1,64% with respect to the 0,32% of agriculture. The manufacturing sector has an average employment of 16,63% in coastal municipalities and an average of 18,57% in non-coastal ones. It has to be noted that in some sectors, especially those in which a certain quantity of freshwater is required (such as the production of beverages or the leather manufacturing), the average employment is higher in coastal municipalities than in non-coastal ones. The building sector instead hires more people in non-coastal municipalities 17,24% with respect to 13,75%). Finally, in the sector of services the averages in the coastal municipalities (28,15%) is almost the same as in non-coastal ones (28,78%).

In Sardinia, the primary sector (agriculture, forestry and fishing) covers an average share of 3.17% of the occupation in coastal municipalities compared to a much lower 0.69% for non-coastal. This difference is due mainly to the level of employment of the fisheries sector, equal to 2.75% compared to 0.35% of the agriculture sector. These values are greater in comparison to the average share for the non-coastal areas. The opposite occurs in the manufacturing sectors, which have an average of 11,78% of employment in coastal municipalities and an average of 16.17% of employment in non-coastal areas. The constructions instead occupy a larger share of individuals in non-coastal areas (21.51% vs. 18.61%). Finally, with regard to services, the average share of employment of the commercial activities of the coastal municipalities (25.44%) is lower than the average of the employment shares of common non-coastal (28.43%), while accommodation services and catering (tourism), information services and communications, financial services, education and real estate activities are on average higher in the coastal municipalities.

Veneto in the primary sector (agriculture, forestry and fishing) covers an average share of 7.42% of total employment in the coastal municipalities compared to a 0.59% in non-coastal areas. In most manufacturing sectors and services, the employment shares exceed those of non-coastal areas, following a pattern similar to that of Emilia-Romagna.

2.2 Relative economic specialization

The economic specialization of the municipalities can be seen in relative terms through local specialization indices given by the ratio between the shares of each sector in each municipality with respect to the share that the same sector has in the regional employment. An index greater than 1 suggests a specialization relative to the region. More in detail, defined *i* the municipality and *j* the sector, the index of local specialization is given by:

$$Spec.loc_{ij} = \frac{A_{ij}}{\Sigma_i A_{ij}} . \frac{\Sigma_i \Sigma_j A_{ij}}{\Sigma_j A_{ij}} ,$$

where A_{ij} is the number of employees in the sector *j* in the municipality *i* and this implies that the following sums are: $\Sigma_i A_{ij}$ is the total number of employees for any sectors, *j*; $\Sigma_j A_{ij}$ is the total number of employees in the municipality, *i* and $\Sigma_i \Sigma_j A_{ij}$ is the total number of employees in the region.

Another indicator that measures the difference in specialization between coastal municipalities and the region consists of the index of dissimilarity. This is given by:

$$Ind.Diss. = \frac{1}{2} . \sum_i \left| \frac{A_{ij}}{\Sigma_i A_{ij}} - \frac{\Sigma_j A_{ij}}{\Sigma_i \Sigma_j A_{ij}} \right|$$

that is half of the sum of the absolute differences between the sum of the shares of sector j in the employment of the municipality *i*, and the sum of the shares of employment of sector *j* to the total regional employment in all sectors. This index varies between zero and one with zero indicating complete correspondence, and 1 full difference between the production structures of municipality *i* and region. The results are provided in Table 4 and graphically are represented in Figure 1

In summary, Campania shows a situation where the coastal municipalities show a dissimilarity index slightly lower, in average (0.55) than that of non-coastal ones (0.60) thus presenting a greater similarity, albeit slight, of production structure (employment) than non-coastal. Figure 1a confirms this slight tendency, although it is not delineable a dominant structure. In conclusion, although the coastal municipalities have a production structure typical and different from the non-coastal ones, (i.e. high shares of certain sectors municipal employment, specialization or de-specialization in given sectors), they influence the entire production structure in a slightly more pronounced way than non-coastal areas.

Tab. 4 - Local specialization index of productive sectors (employment) in coastal municipality compared to non-costal municipality, 2011.

	A	03	B	C	D	E	F	G
Campania								
Average index for coastal municipality	5.50	10.3	0.69	0.60	0.18	0.78	1.23	1.01
Average index for non coastal munic.	2.28	0.09	2.52	1.21	0.35	0.56	1.62	1.00
Emilia-Romagna								
Average index for coastal municipality	13.24	29.1	0.54	0.56	0.12	1.99	1.20	1.16
Average index for non coastal munic.	1.74	0.38	2.06	1.20	0.22	1.22	1.58	0.94
Friuli-Venezia Giulia								
Average index for coastal municipality	13.70	30.3	0.27	0.48	0.10	0.60	1.30	1.18
Average index for non coastal munic.	2.57	0.43	3.05	1.00	1.80	0.42	1.67	1.02
Liguria								
Average index for coastal municipality	2.39	3.27	1.83	0.48	0.26	0.42	1.39	1.18
Average index for non coastal munic.	3.62	0.28	3.06	1.09	0.04	0.16	2.38	1.00
Apulia								
Average index for coastal municipality	2.93	3.79	1.64	0.93	0.42	0.48	1.06	1.05
Average index for non coastal munic.	1.40	0.06	1.29	1.04	0.93	0.75	1.33	1.07
Sardinia								
Average index for coastal municipality	3.37	3.81	1.97	0.94	0.17	0.60	1.34	0.97
Average index for non coastal munic.	0.73	0.10	0.96	1.29	0.16	0.36	1.55	1.09
Veneto								
Average index for coastal municipality	15.13	25.7	0.00	0.34	0.31	0.63	1.52	1.18
Average index for Average index for non coastal munic.	1.24	0.22	2.08	1.23	0.94	0.62	1.38	0.85

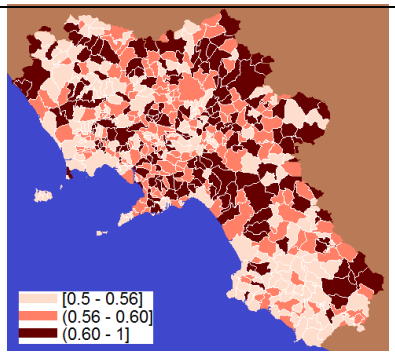
Nace rev2 sectors: A: Agriculture; 03: Fishing; B: Mining; C: Manufacture; D: Electricity; E:Water supply; F: Construction; G: Wholesale

Tab. 4 - (continued).

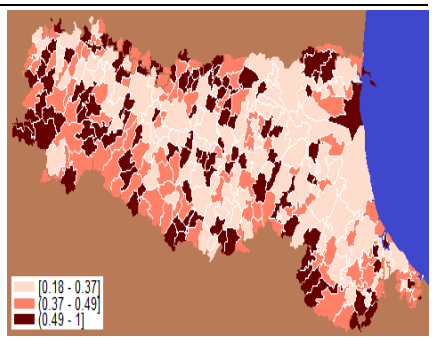
	H	I	J	K	L	M	P	***Dissimilarity Index***
Campania								
Average index for coastal municipality	0.59	2.48	0.79	0.52	1.03	0.95	0.47	0.55
Average index for non coastal munic.	0.61	1.23	0.46	0.47	0.45	0.98	0.70	0.60
Emilia-Romagna								
Average index for coastal municipality	0.71	1.80	0.61	0.49	2.08	0.82	0.69	0.43
Average index for non coastal munic.	0.97	1.09	0.50	0.25	0.75	0.65	0.65	0.44
Friuli-Venezia Giulia								
Average index for coastal municipality	0.78	2.22	0.83	0.64	1.82	0.85	0.92	0.46
Average index for non coastal munic.	0.74	1.79	0.43	0.21	0.78	0.69	1.15	0.55
Liguria								
Average index for coastal municipality	0.41	2.49	0.68	0.36	1.66	0.80	0.89	0.39
Average index for non coastal munic.	0.42	1.76	0.31	0.25	0.51	0.56	0.33	0.54
Apulia								
Average index for coastal municipality	0.56	1.79	0.55	0.50	0.89	0.90	0.75	0.26
Average index for non coastal munic.	0.73	1.07	0.49	0.65	0.59	0.85	0.75	0.28
Sardinia								
Average index for coastal municipality	0.55	1.63	0.38	0.31	1.21	0.79	0.62	0.31
Average index for non coastal munic.	0.75	1.20	0.22	0.15	0.18	0.76	0.37	0.40
Veneto								
Average index for coastal municipality	0.99	2.11	0.36	0.19	1.65	0.78	0.88	0.46
Average index for Average index for non coastal munic.	0.84	1.19	0.46	0.36	0.84	0.70	0.73	0.47

Nace rev2 sectors: H: Transport; I: Accomodation; J:Information and communication; K:Financial activities; L:Real estate; M: Professional, scientific and technical activities; P: Education; Q: Health, not included for space constraints. Results are available upon request.

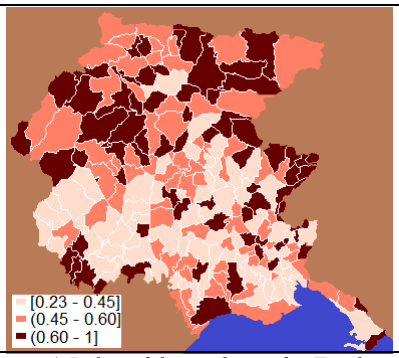
Fig.1 - Index of dissimilarity for the municipalities of regions under study, 2011



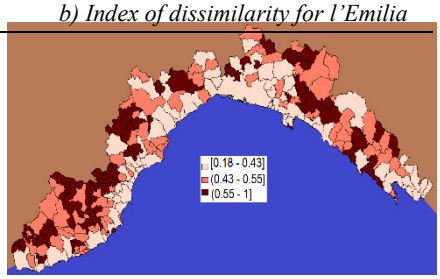
a) Index of dissimilarity for Campa-



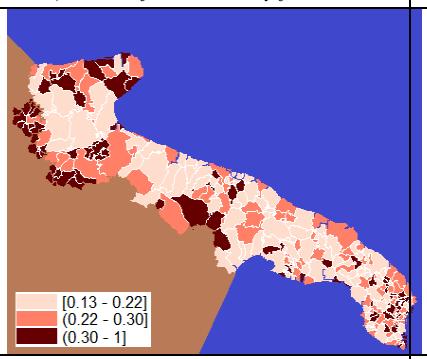
b) Index of dissimilarity for l'Emilia



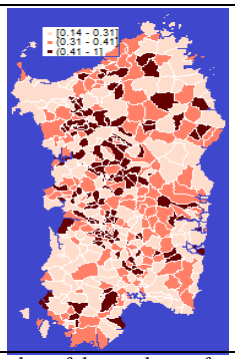
c) Index of dissimilarity for Friuli



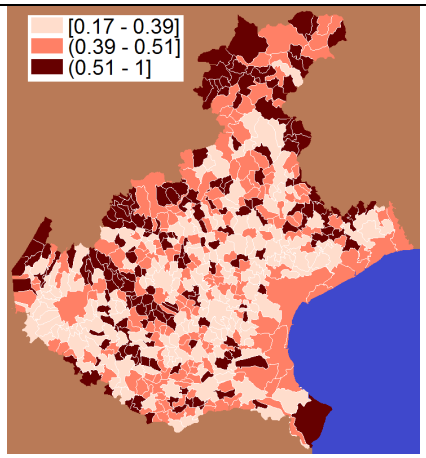
d) Index of dissimilarity for Liguria



e) Index of dissimilarity for Apulia



f) Index of dissimilarity for Sardinia



g) Index of dissimilarity for Veneto

Emilia Romagna shows a varied situation, as shown by the dissimilarity index presented in the last column of Table 4 and in the Figure. 1b. Coastal municipalities present an identical dissimilarity index, with an average value of 0,44 very close to the 0,45 of coastal municipalities, presenting a lack of differentiation in the productive structure (employment) with respect to non-coastal municipalities. It is therefore possible to conclude that, even if costal municipalities have typical productive structures different from those in non-coastal municipalities, they nevertheless influence the entire regional productive structure much more than non-coastal municipalities.

In Friuli Venezia Giulia, both coastal and non-coastal municipalities have on average a positive localized specialization (>1) –with respect to the regional average- in the primary sector (the same as in the previous two regions). It is possible to find differences in the manufacturing of fish and shellfish, sector that represents a high specialization of non-coastal municipalities. This is due to the high level of specialization of some non-coastal municipalities very close to coastal municipalities. In some manufacturing activities, coastal municipalities are de-specialized but there are some subsectors in which coastal municipalities are highly specialized, such as the fruit manufacturing, the textile industry, and oil refining. In some sectors in which coastal municipalities are de-specialized (index <1), they have in average a higher specialization index than non-coastal municipalities.

Liguria, with an average index of 0.39 coastal municipalities, has a stronger similarity of their productive structure (employment) with respect to non-coastal municipalities (index 0.54). Therefore, coastal municipalities have a typical productive structure very different from non-coastal munici-

palities, they have a certain specialization or de-specialization with respect to the regional average in the different productive sectors (e.g., manufacturing vs. services), but nevertheless they influence the whole Ligurian productive structure, much more than non-coastal municipalities. This result reflects also the fact the 86% of the whole employed people belong to companies localized in coastal municipalities.

In Apulia (Figure 1e), coastal municipalities have a positive average (>1) in the local specialization (with respect to the regional average) in the primary sector (2.93), value given by a higher local specialization in almost all the primary sub-sectors (agriculture 1.23; forestry 6.38; fishing 3.79). Non-coastal municipalities, instead, are in average specialized in this sector (1.39), but have an exclusive specialization only in the agriculture (3.09) and forestry (8.39). Coastal municipalities are de-specialized in manufacturing. In some other sectors in which coastal result to be de-specialized (index <1), these have in average a lower specialization index than non-coastal municipalities. It is the case of energy, water and garbage, transports, education, public health.

Sardinia has a pretty varied situation because there is not a clear pattern distinguishing coastal and non-costal municipalities. Some sectors have an absolute specialization in coastal municipalities, but do not have a relative specialization with respect the region, where the same sectors present higher shares of sectorial employment. Other sectors, instead, have a high absolute specialization in non-coastal municipalities, but do not have it in relative terms with respect to the region. Moreover, it is possible to figure out intermediate situations where there is not an absolute specialization either in costal or in non-coastal municipalities. The average dissimilarity index in coastal municipalities is 0.31 and is lower than the average index in non-coastal municipalities (0.40). This shows that coastal municipalities have a higher degree of similarity of the productive structure (employment) with respect to non-coastal municipalities. Finally, Figure 1f shows that the highest degree of dissimilarity is in the inner part of the region. Given this evidence, it is possible to conclude that, even if coastal municipalities have typical productive structures different from those of non-coastal municipalities, they influence the whole regional productive structure. This result reflects also the fact that the 63% of the whole employed people work for companies localized in coastal municipalities.

In Veneto (Fig.1g) the results and the productive structure result to be coherent with those obtained for Emilia Romagna and then it is possible to refer to the conclusions obtained for that region.

2. Results and Discussions

The analysis and the indicators above can be detailed for two groups of sectors that represent a more direct interface between the local economy and marine resources, namely sectors highly dependent on sea (‘marine’ sectors) and ‘non-marine’ sectors with high pressures on the coastal environment, from now on ‘high impact’ sectors (EEA, 2013).

First, as part of the census data for the sectors ATECO 2007, were identified sectors that are closely dependent on the sea because of its ecological conditions (i.e. fishing).

The four groups of selected sectors are shown in Table 5. Compared to the classification ATECO, they have been identified by selecting the entire section (as in the case of the 'activity of accommodation and catering'), or specific Divisions (as in the case of 'fishing and aquaculture' which belongs to Section A, Agriculture, and 'shipping', which belongs to Section H and so on), or individual groups (as in the case of 'canned fish' and 'construction of ships and boats' which belong to Section C, manufacturing).

Tab. 5 - Sectors dependent on marine resources by sections, divisions and groups ATECO 2007.

Sectors depending on the sea	***Section***	***Division***	***Group***
1. Sectors related to fishing		03: fishing and aquaculture	10.2: processing and preserving of fish, crustaceans and mollusks
2. Shipbuilding			30.1: construction of ships and boats
3. Maritime transport		50: maritime transport and inland water	
4. Tourism and related services	I: accommodations services and catering	79: travel agencies, tour operator and other reservation service and related activities	

The sectors of fishing and tourism need some clarifications. In the case of fisheries, as already noted, the census data may represent an underestimation of the actual systematic employment sector, which reduces the weight of the industry compared to other organizations that work with enterprise more structured (Mazzanti and Zoboli, 2009). A more thorough analysis of the figures for fishing will be carried out in future works.

In the case of tourism, it is obvious that the distinction between marine tourism and other accommodation and food activities is not immediate. However, to our level of analysis, that we recall lies in analysis of the em-

ployment in this sector for the coastal municipalities it might be logically expected that the sea is the main attraction for tourist destination and recreation in coastal municipalities. Anyhow, the activities of accommodation and catering in medium and large coastal cities, such as Genoa in Liguria, may cover activities that have nothing to do with the marine tourism but unfortunately, there is not a systematic survey of the motivations of the presences in hotels and acquaintances of shops, which allow a clear picture to the municipal level. More detailed analysis on the number of tourists will be developed in future works. The economic variables (employment, in our case) for these four aggregates of sectors can point that coastal municipalities, and the areas they belong to, are economically dependent on the sea.

These same groups of sectors are the immediate interface between the local economy and the sea and present, always according to the productive techniques they use, significant environmental impact on the marine resources, on the coasts and on the environment in general. For example, in terms of CO2 emissions per each employed person, fishing and maritime transports are among the sectors with the highest indicators (Mazzanti et al., 2012). According to this same indicator, tourism seems to be a "light" sector in terms of expected direct impacts, but several other sectors are linked to tourism, such as touristic service providers or tourists themselves. Moreover, even if the justification of tourism or of the stay is not linked to the sea, for the fact itself that it takes place in maritime municipalities it makes some pressures on the maritime-coastal environment. On the other hand, these same sectors critically depend on the availability and the quality of natural maritime and coastal resources, without which fundamental inputs are missing. These groups of sectors are therefore the midpoint of a "sustainable maritime economy" which may guarantee continuous incomes and employment, both quantitatively and qualitatively significant, using natural and environmental resources.

A second group of sectors is made up of those "high pressure" economic activities, that is to say those activities not directly linked to maritime resources, but localized in coastal zones and that may exert environmental pressures, both directly and indirectly, on the coast and the sea (pollution, industrial risks, permanent territorial changes). These are sectors belonging to heavy industries or intensive manufactures of resources. These sectors have been selected on the basis of: (i) the literature on pressures; and (ii) an indicator on the CO2 emission intensity, atmospheric pollutant and heavy metals per employed derived by NAMEA., (Moll et al. 2007).

Even if this indicator represents a non-exhaustive set of pressures, it can be disaggregated according to the ATECO sectorial economic divisions into a wide range of pressures and can summarize several environmental

characteristics of the productive sectors. For example, the intensity of CO2 per employed summarizes the energy technology of the sector, which is in turn linked to the capital intensity of the sector (plant design). therefore It can indirectly suggest the presence of localized aggregate pollution, the intensive presence of infrastructures (e.g., communications and transports), the presence of industrial incidents. Further details on the pressures of some of these sectors will be presented in future works.

The sectors selected on the basis of the literature and the indicators deriving from NAMEA are shown in Table 6 and are composed either of whole ATECO section or of Divisions selected within Section C, Manufacturing activities. It should be noted that, while the mining, quarrying, manufacturing, energy, water and waste, and those selected are manufacturing-intensive emissions per employee, in the cases of extractive and construction sectors the direct emission, according to NAMEA, are relatively low. However, these two sectors are intensive of the territory, in the sense that involve permanent or semi-permanent alterations, and also produce a high intensity of waste (by weight) thus loading the territory of high overall environmental pressures (see, among others, Mazzanti, Paleari, Zoboli 2007).

Tab. 6 - High environmental pressure sectors by sections and divisions ATECO 2007.

High environmental pressure sectors	***Section***	***Division***
1. Extractive sector	B: mining and quarrying	
2. Coal and oil		19: coke products deriving from oil refining
3. Chemistry		20: chemical products
4. Non-metallic Minerals		23: manufacture of other products from the processing of minerals not metallic mineral
5. Metallurgy		24: metallurgy
6. Metal products		25: metal products (except machinery and equipment)
7. Energy Production	D: supply of electricity, gas, steam and air conditioning	
8. Water and waste	E: water supply sewerage, waste management and remediation	
9. Construction	F: construction	

The joint consideration of specialization of coastal municipality in sectors that are directly related to the sea (in economic-environmental terms) and the specialization of coastal municipality in sectors of high environmental pressure can then provide an overview of: (i) dependence of the economy from the sea; (ii) the pressure of the local economy on the sea, through the impacts of 'marine' and high pressure sectors that are resources

intensive; (iii) potential conflicts between economic sectors that are dependent from the sea and the high environmental pressure sectors that overwork the sea and the coasts.

2.1 Campania

In Campania much of the coastal municipalities has a high share of employment in sectors related to the sea. The average share of employment of coastal municipalities is around 21%, well above the average for non-coastal (about 9%).

It is however important to note that the index of local specialization for sectors depending on the sea is less than 1 in very few occasions (5 coastal municipalities of 60). The index of local specialization of coastal municipalities in average is equal to 2.4 compared with a 1.08 for non-coastal (where there are tourist activities that affect the data).

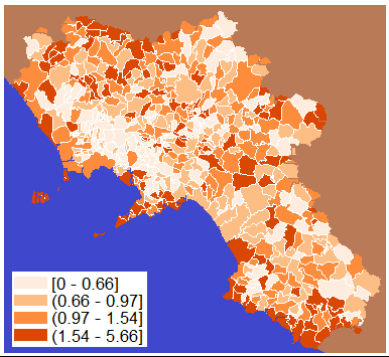
At the same time, the total employment for sectors with 'high environmental pressure' is equal to 16%. The coastal municipalities have an average of shares slightly higher (17.2%), but lower than in non-coastal areas (24.04%). However, that the indices of local specialization of these sectors in the majority of cases is less than 1 and the average value of the indexes of local specialization in coastal municipalities is slightly above this threshold (1.05). This value is lower than the average of the index of specialization of non-coastal municipalities (1.46).

So as a first conclusion in several coastal municipalities, there is the presence of high environmental pressure on the environment however this plays a greater role in non-coastal areas. Table 7 and Figures 2a and 2b show that in many coastal municipalities coexist sectors depending on the sea and intensive sectors that have high impact on the environment.

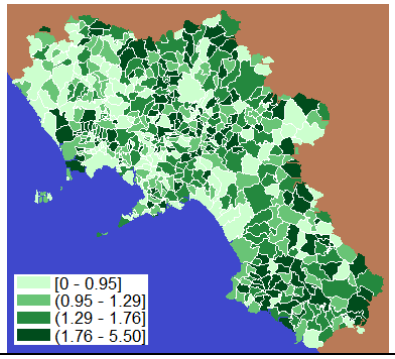
Tab. 7 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality (if negative: relative specialization in sectors with high pressure), Campania, 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Naples	1.09	0.56	0.53
Average index for coastal municipalities	***2.45***	***1.05***	1.4
Average index for non-coastal municipalities	***1.08***	***1.46***	-0.38

Fig. 2. - Local specialization index for "marine" and "high pressure" sectors in the municipalities of Campania, 2011.



a) Local specialization index "marine" sectors



b) Local specialization index "high impact" sec-

2.2 Liguria

In Liguria, most of coastal municipalities has high levels of occupation in sectors linked to the sea, as they are defined here. In some cases, these shares are over the 50% and are in most cases higher than the regional average (12%), and only in few municipalities they are lower than 10%. The average of coastal is around 24%, significantly higher than the average for non-coastal (16%), with a significant variability. It has to be noted, anyhow, that tourism is the leading sector, in the whole region and for both types of municipalities. Tourism has employment shares very close to the total (with a low variability among coastal municipalities).

The result of the relative weight of tourism among the maritime sectors may derive from an underestimation of the effective number of employed in the fishing and other sectors linked to the sea (transports). Moreover, some sectors, such as shipbuilding and maritime transports, are presented with companies and employees only in some municipalities, in particular in larger ones (e.g., the maritime transports in Genoa that use the 4% of the total operators) or in some very specialized municipalities (such as shipbuilding in Ceriale, Ameglia, Lerici). These same sectors present shares that, even if low overall, they are nevertheless multiple with respect to the same sectors in non-coastal municipalities.

It is relevant to note that the local specialization index for the sectors depending on the sea (ratio between the share of the sectors in the municipality and the share of the sectors in the region, Table 8) in less than 1 (lack of specialization) for 11 coastal municipalities over 63. In some cases, these are the main cities and Genoa, that have complex economic structures. In any case, in the other 52 coastal municipalities the index reaches values >1 with peaks of 5. The local specialization index of coastal municipalities is on average 2.1 with respect a value of 1.3 for non-coastal ones (where there are touristic activities influencing the data).

For the sectors identified here as a 'high environmental pressure', Liguria shows a 18.8% of total employment. The coastal municipalities have an average of units lower (17.3%) compared to non-coastal municipalities (about 30%). In addition, the local specialization indices of these sectors in coastal municipalities are very often less than 1 (lack of specialization), with an average of 0.9. Non-coastal municipalities instead, show an average of 1.6 (specialization relative to the region). This would seem to indicate a poor relative importance of these sectors in the economy of the coastal municipalities.

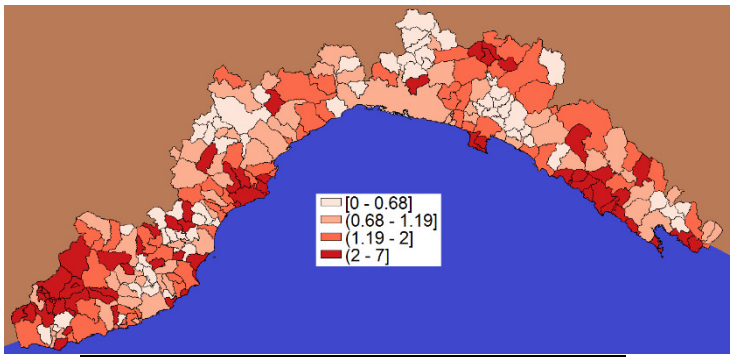
The overall figure for sectors with high pressure is generally dominated by constructions, which represent the bulk of the overall share in all municipalities (coastal or not), with some tips to 30%, and in only 12 coastal municipalities represent less than 10 % of total employment.

Finally, in 24 coastal municipalities the local specialization indices are greater than 1. This figure is certainly influenced by the construction sector, where there is widespread specialization in many coastal municipalities. The strong presence of the constructions may be partly related to the tourist activity, which is strong in the coastal municipalities.

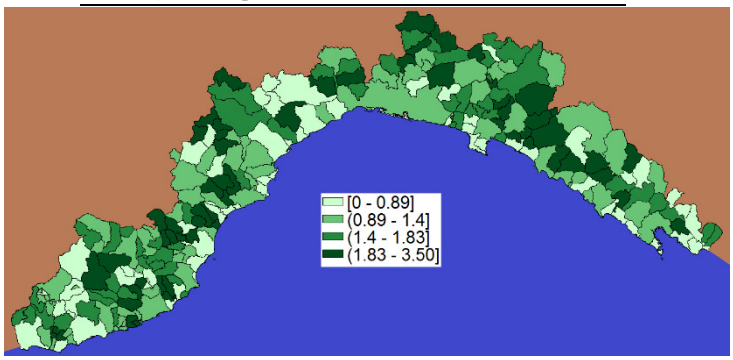
Tab. 8 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality (if negative: relative specialization in sectors with high pressure), Liguria, 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Genoa	0.79	0.95	-0.15
Average index for coastal municipalities	***1.74***	***1.21***	0.53
Average index for non-coastal municipalities	***1.07***	***1.30***	-0.23

Fig. 3 - Local specialization index for "marine" and "high pressure" sectors in the municipalities of Liguria, 2011.



a) Local specialization index "marine" sectors



b) Local specialization index "high impact" sec-

Table 8 and Figures 3a and 3b show that in many coastal municipalities there is a specialization in 'marine' sectors higher than those in 'high pres-

sure' sectors. However, for 14 coastal municipalities the situation is reversed with an index of specialization in the high-pressure sectors that exceeds that in the sectors related to the sea (between these municipalities there are also larger cities as Genoa and La Spezia). Even in the presence of a link between tourism and specialization in construction, a dominant sectors among those at 'high pressure', many coastal municipalities contemporary show an important presence of sectors that depend on the sea and sectors not related to the sea but that have high (potential) impacts on environment (environmental risks) and on the same marine activities.

2.3 Apulia

In Apulia, most of coastal municipalities present high shares of employment in sectors linked to the sea. The average of the shares of coastal is around 16%, a much higher value than the one of non-coastal municipalities (8.55%). Also in this case, these data are largely controlled by tourism, whose employment shares are very close to the total (with a low variability among coastal municipalities).

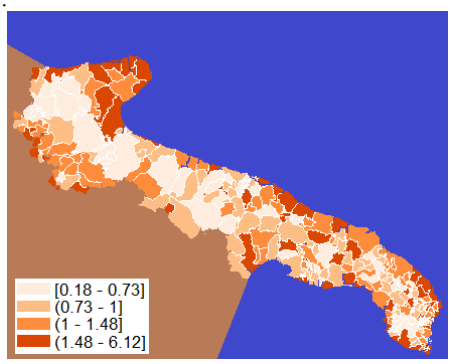
The same considerations adopted for the two regions previously analyzed count here and we can therefore conclude that the economic dependence on the sea of coastal municipalities is controlled by tourism, both directly and, presumably, as sector of demand of fishing products.

Values for the 'high environmental pressure' sectors are very similar to those of the regions previously analyzed. The percentage of total employment in Apulia is equal to 19.23%. The coastal municipalities have an average share of 19.94% that is lower than non-coastal areas (23.91%). It should be noted, however, that the indices of local specialization of these sectors, in the majority of cases, are less than 1 and the average value of the indexes of localization in coastal municipalities is slightly above this threshold (1.04). Even for Apulia a big impact is due to the construction industry and the manufacture of metal products. We can say that in some cases, certain sectors such as construction and the manufacture of metal products, have a high index of specialization also in coastal municipalities. Table 9 and Figures 4a and 4b summarize these results.

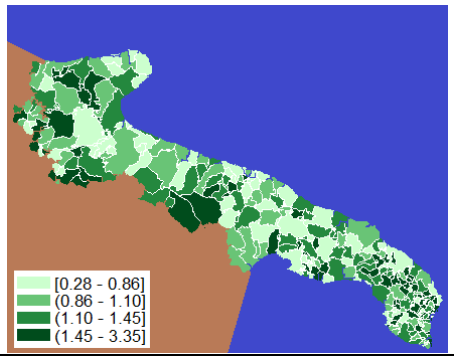
Tab. 9 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality (Apulia, 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Bari	0.89	0.71	0.18
Average index for coastal municipalities	***1.86***	***1.04***	***0.82***
Average index for non-coastal municipalities	***0.99***	***1.24***	***-0.25***

Fig. 4 - Local specialization index for "marine" and "high pressure" sectors in the municipalities of Apulia, 2011.



a) Local specialization index "marine" sectors



b) Local specialization index "high impact" sec-

2.4 Sardinia

In Sardinia, most of coastal municipalities present high shares of employment in the sectors linked to the sea, as we define them here. These shares are often higher than the average regional share (18%) and only in few municipalities it is lower than 10%. The average of the share of the coastal is around 19%, definitely higher than the average for non-coastal ones (11.7%), with a low variability. It is to be noted, still, that, as in the case of Liguria, also these data are largely dominated by tourism, that has employment shares very close to the total (with a low variability among coastal municipalities).

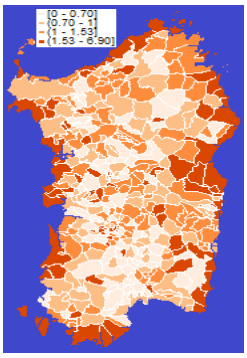
The same considerations adopted for Liguria can be applied to the Sardinian case. Summarizing, these data can derive from an underestimation of the effectively employed in the fishing sector and in other sectors linked to the sea (transports). Moreover, sectors such as shipbuilding and maritime transports are present only in some "hub" municipalities, and especially in those with larger dimensions. It is anyhow relevant to note that Sardinia presents local specialization indices, for the sectors depending on the sea, higher than 1 (presence of specialization) in most of municipalities. For 15 municipalities over 70, instead, the local specialization index results to be lower than 1 (lack of specialization). In some cases, these are main cities and Cagliari which have complex economic structures. In any case, the localized specialization index of coastal municipalities is on average 1.74 with respect to 1.07 for non-coastal ones (where some touristic activities are considered, which influence the data). Also for Sardinia we can conclude that the economic dependence on the sea for coastal municipalities is dominated by tourism, both directly and, presumably, as sector of demand of fishing products, shipbuilding and maritime transports (passengers).

For the sectors identified here as a 'high environmental pressure', Sardinia has a share of 21.24% of total employment. In the coastal municipalities the average share is slightly lower (25.6%) than non-coastal municipalities (27.6%). Furthermore, the indices of local specialization of these sectors, in the majority of cases, prove to be higher than 1 (the presence of relative specialization with respect to the region), with an average value equal to 1.21. This value is lower, albeit slightly, the average of the indices of local specialization of non-coastal areas that have a value equal to 1.3. This would seem to indicate a certain relative importance of these sectors in the economy of the coastal. Table 10 and Figures 5a and 5b show the main results for Sardinia

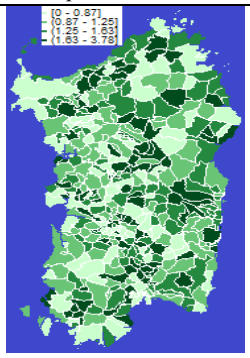
Tab. 10 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality (if negative: relative specialization in sectors with high pressure), Sardinia 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Cagliari	0.86	0.67	0.19
Average index for coastal municipalities	***1.74***	***1.21***	***0.53***
Average index for non-coastal municipalities	***1.07***	***1.30***	***-0.23***

Fig. 5 - Local specialization index for "marine" and "high pressure" sectors in the municipalities of Sardinia, 2011.



a) Local specialization index "marine"



b) Local specialization index "high impact" sec-

2.5 The regions of the North Adriatic sea: Emilia-Romagna, Friuli-Venezia Giulia, Veneto

The regions overlooking the North Adriatic Sea, Emilia-Romagna, Friuli-Venezia Giulia and Veneto have in common some homogeneous characteristics that are hereinafter listed. In these regions, most of coastal municipalities have high shares of employment in sectors linked to the sea and that often result to be higher than the respective regional averages. The averages of the shares of coastal municipalities are in Emilia-Romagna, Friuli-Venezia Giulia and Veneto all very similar among them and respectively 21.4%, 24.8% and 25.5%: these values are largely higher than the respective averages for non-coastal municipalities (between 9% and 13%).

What differs with respect to the comparison with the previous regions is a high variability both at a sectorial level and considering the entirety of the sectors depending on the sea. It has to be noted, indeed, that, differently from previous cases, the regions overlooking the North Adriatic Sea present two highly leading sectors: fishing and tourism. Often, municipalities with a high level of employment in the touristic sector also have a high level of employees in the fishing sector, as already observed before. In this macroregion, by the way, the values linked to the fishing are higher and more variable. Furthermore, there are situations in which the fishing covers almost all the employment levels in coastal municipalities, also without any correlation with the touristic activities. For example, it is useful to see the case of Goro in Emilia-Romagna where the fishing sector occupies the 64.63% vs the 3% employed in tourism. Another example can be Porto Tolle in Veneto, with percentage of 37.4% in fishing and 6% in tourism. Finally, in Friuli-Venezia Giulia, Marano Lagunare occupies shares of 45% in fishing and 12% in touristic activities.

Even in this case, it is possible to apply some generic considerations: this can derive from an underestimation of the effective employees in fishing and other sectors linked to the sea (transports). Moreover, sectors such as shipbuilding and maritime transports are present only in some “hub” municipalities, especially in the larger ones. It is relevant to note that in these regions the local specialization index for those sectors depending on the sea is frequently much higher than 1 (more in detail 2.26 in Emilia-Romagna; 3.06 in Veneto and 2.47 in Friuli-Venezia Giulia) showing a strong localized specialization in sectors linked to the sea. Given this evidence, it is therefore possible to conclude that for the regions overlooking the North Atlantic Sea, Emilia-Romagna, Friuli-Venezia Giulia and Veneto the economic dependence from the sea of coastal municipalities is largely

dominated by tourism and fishing, even more than in previous regions, because of a stronger localized pressure on the few coasts available. Tourism, but especially intensive fishing, are sectors with an ambiguous and complex relationship with the environment, and we will deal with this in a future development of this work.

Also for the sectors here identified as with a "high environmental pressure", the North-Adriatic regions, present homogeneous characteristics hereinafter listed. These activities are present in the economy of the North-Adriatic regions with values included between 17.5% in Emilia-Romagna and 18.6% in Friuli-Venezia Giulia of the total number of employees, coastal municipalities present a lower average of shares (between 14.40% of Emilia-Romagna and 17.8% in Veneto) with respect to non-coastal municipalities (about 25% in all the regions). Moreover, the localized specialization indexes of these sectors are very often lower than 1 (lack of specialization), being in average equal to 0.9 in all the regions versus an average for non-coastal municipalities ranging from 1.30 (Veneto) and 1.42 (Emilia-Romagna). Tabs 11, 12 and 13 and Fig.6 show that the few coastal municipalities have a strong specialization in maritime sectors. Instead, it results to be low the specialization in "high-impact" sectors.

Tab. 11 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality (if negative: relative specialization in sectors with high pressure), Emilia Romagna 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea'	Index of local specialization for sectors with high pressure	Difference between the two index
Rimini	1.75	0.60	1.15
Average index for coastal municipalities	***2.26***	***0.82***	1.44
Average index for non-coastal municipalities	***0.99***	***1.43***	-0.44

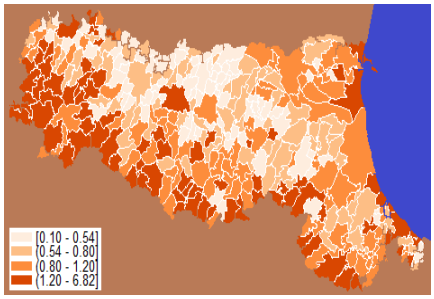
Tab. 12 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality, Friuli-Venezia Giulia, 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Trieste	2.04	0.53	1.50
Average index for coastal municipalities	***2.47***	***0.88***	1.59
Average index for non-coastal municipalities	***1.29***	***1.39***	-0.10

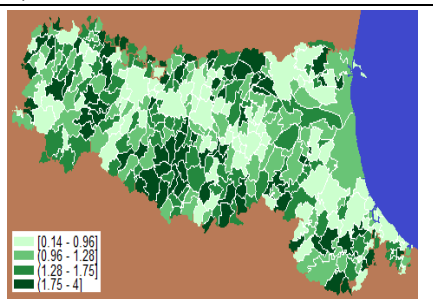
Tab. 13 - Comparison between specialization index of sectors related to the sea and sectors with high impact for coastal municipality, Veneto, 2011.

Coastal Municipality	Index of local specialization for sectors depending on sea	Index of local specialization for sectors with high pressure	Difference between the two index
Venice	2.19	0.65	1.55
Average index for coastal municipalities	***3.06***	***0.97***	2.09
Average index for non-coastal municipalities	***1.11***	***1.30***	-0.19

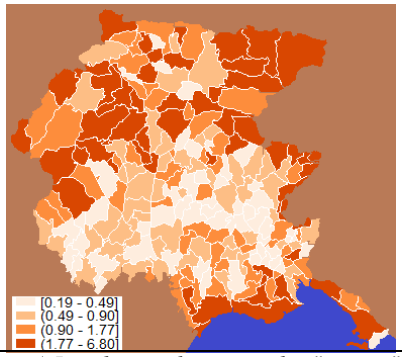
Fig. 6 - Local specialization index for "marine" and "high pressure" sectors in the municipalities of regions overlooking North Adriatic sea, 2011.



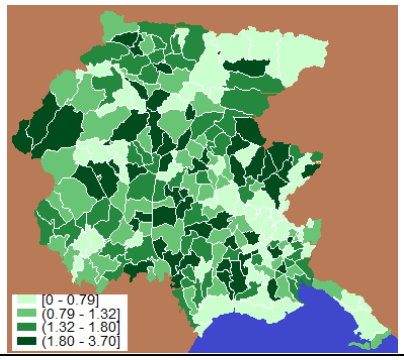
a) Local specialization index "marine"



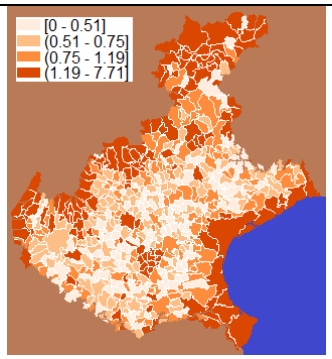
b) Local specialization index "high



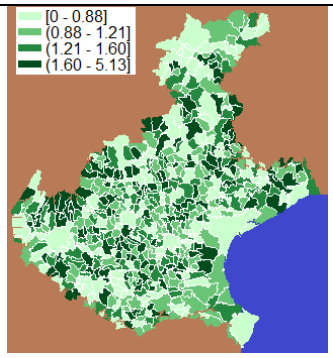
c) Local specialization index "marine"



d) Local specialization index "high



e) Local specialization index "marine"



f) Local specialization index "high

Conclusion

We show that coastal municipalities seem to attract more importance than non-coastal, however the huge impact on the marine resources in the coastal municipalities might be considered in a double way. First, 'marine' sectors play a key role in the wealth and in the economy of the country. Second, 'high impact' sectors put a high pressure on the coastal environment that might influence the 'marine' sectors both in term of use of marine resources that lower touristic potential. Our study shows that in some regions the two groups of sectors coexist and then particular attention have to be devoted in regulating the exploitation and use of marine resources in order to have a positive economic balance between all sectors.

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