Planning for fragile territories: A comparative analysis of land take in two Italian regions

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Abstract

The phrase "Land take" refers to the loss of agriculture, natural and semi-natural land generated by human development. Recent research has focused on quantitative measurement of land take; however, not many scholars have so far analysed the quantitative relation between land take and its drivers, and still little explored is the connection between land-taking processes and spatial planning. By building upon previous studies, this paper explores drivers at the regional scale; the results are relevant for policy makers, as the key differences here highlighted relate to regional policies and planning measures in force.

Keywords

Land take, Spatial planning, Regression models.

Introduction

Following the European Environment Agency (2013), land take is here regarded as the "Change of the amount of agriculture, forest and other semi-natural and natural land

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taken by urban and other artificial land development", as this definition allows for a quantitative assessment of the phenomenon over the years, provided that consistent measurements are available within a given time frame.
By comparing land-taking processes at the municipal level in two Italian NUTS2 coastal regions, Liguria and Sardinia, this paper seeks to understand whether land take processes over two similar time periods show similar patterns. Liguria and Sardinia were chosen because of three key common features: first, the size able population move from rural to coastal areas that took place in the XX century; second, the fairly large number of municipalities, which in Italy are responsible for granting planning permits, and therefore directly affect land take; third, the strong planning rules aimed at controlling land development in sensitive areas.
Land take in the two selected regions was measured through GIS-based analyses on publicly available regional datasets; the spatial units coincide with the municipalities, while selected time intervals are as follows: 1960-1990 and 1990-2008 for Sardinia; 1960-1994 and 1994-2008 for Liguria, with a slight difference in time periods due to differences in land cover data availability for the two regions. We observed that land take quantitatively differs between the two regions, and that its growth shows different time patterns, as in Sardinia it started at 0.54% in 1960, rising to 1.59% in 1990 and 3.25% in 2008, while in Liguria it started at 1.99% in 1960, increasing to 6.24% in 1994 and 7.81% in 2008.

Land take and its regional drivers

After Zoppi and Lai (2014; 2015), to whom we refer for background literature justifying the selection of the method and of the variables, we regard land take as affected by physical aspects, by spatial planning-related factors, and by

socio-economic drivers. In the first group we consider the average size (PSIZ), slope (SLOP) and distance from the nearest town (PRS) of a municipality's non-artificial-land areas that were "taken" in a given time period; we also include various accessibility indicators, as: endowment of roads (ACCESS), proximity to the regional capital city (DISTCAPC) and to the nearest province town (DISTNEAC), and distance from the shoreline(DISC). In the second group the endowment of nature conservation areas (CONSAREA), and of natural and semi natural areas as defined in the landscape plans in force in the two regions (NAT) are included, as well as the amount of area in which special restrictions on land transformation are or were in place in Sardinia (in the so-called "coastal strip" since 2006 and prior to then in other areas identified by the former landscape plans: COASTRIP and OLPL respectively) and in Liguria (in the 300-metre and 1,000-metre buffer zones along the shoreline: COAST300 and COAST1K respectively).The third group consists of only one variable, residential density (DENS), accounting for polarization of urban settlements. Finally, a series of Moran tests were performed (after Anselin,1988), assuming that proximity matters (Tobler, 1970),and an autocorrelation variable was added (AUTC).The values that each driver takes in each municipality in the two regions in a given time period were calculated by using various GIS techniques.

Similarities and differences across the case-studies

After analysing the linear correlations between the dependent variables accounting for the size of land take in the two time periods (PLT_A and PLT_B) and their respective sets of drivers, an ordinary least squares model

was implemented for each region separately in the two time periods. The simplified key results are listed in Table 1.

		Comparison Sardinia-Liguria 1st time period (dep. variable: PLT_A)			**Comparison Sardinia-Liguria 2nd time period (dep. variable: PLT_B)**		
		Significance Sardinia	***Significance Liguria***	***sign***	***Significance Sardinia***	***Significance Liguria***	***sign***
Physical	*PSIZ*	***	***	Both +	***	-	Both +
	SLOP	-	-	Both +	-	***	Both +
	PRS	*	*	Both -	-	-	Both -
	ACCESS	*	-	Both +	***	-	Both +
	DISTCAPC	**	**	Both -	-	**	Opposite
	DISTNEAC	**	-	Both +	-	-	Opposite
	DISC	*	*	Both +	-	-	Opposite
Planning -related	*CONSAREA*	*	***	Both -	**	***	Both -
	NAT	***	**	Opposite	-	**	Both -
	COASTRIP	***		Opposite (but complex)	***		Opposite (but complex)
	COAST300		***			**	
	COAST1K		***			***	
	OLPL	***	***	Both +	-	***	Both +
Social	*DENS*	***	***	Both +	***	-	Both +
Autocorr.	*AUTC*	***	***	Both +	***	***	Both +

Tab.1– Qualitative comparison of the ordinary least square model's results (Significance levels: (***) $p \leq 0.01\%$; (**) $p < 0.5\%$; (*) $p < 20\%$; (-) $p \geq 20\%$.

The impact of PRS is negative in both periods and for both regions, which is not surprising, as land take is more likely to occur close to urban areas. In both regions the impact of PSIZ is positive and usually very significant, thus land take is larger in those municipalities in which the size of the parcels that become artificial is greater, hence spatial plans should favour the development of small plots over the development of big ones. Moreover, since the influence of DENS is always positive and mostly very significant, policies aiming at tackling land take should favour not just small plots, but also low residential densities. The variable DISTCAPC is significant and negative in both regions in the first time period, therefore, by attracting housing,

infrastructure and the tertiary sector, regional capital cities generally trigger land take. The impact of CONSAREA is always negative, thus nature conservation areas play a key role in contrasting land take processes, which suggests that spatial plans should fully integrate nature protection .To the opposite, positive effects on land take are associated with two other planning-related variables: one accounts for the amount of area where former landscape plans set conservative rules on development (OLPL), and the other for planning restrictions in force close to the coastline (COASTRIP in Sardinia and COAST1K in Liguria); as Dewi (2013) and Zoppi and Lai (2014) argue, restrictive rules in some areas may spur land take in the surrounding areas; however, since COAST300has a negative effect and is significant in both time periods, stricter planning rules can sometimes help counter land take. Finally, the most prominent differences in significance levels concerna planning variable (NAT), always significant in the first time period, and significant only in Liguria in the second time interval, and ACCESS, which impacts positively but is significant only in the Sardinian case, where it suggests that transport plans should balance accessibility opportunities across municipalities, while it is insignificant in Liguria, where regional transport plans could only marginally affect the layout of transport infrastructures, fairly constrained by the region's hilly topography.

Conclusions

By looking at two regional case studies, this paper has highlighted that most of the drivers of land take act similarly in different regional contexts. However, it has also shown that some regional peculiarities exist and that they concern transport infrastructure networks and planning restrictions.

Hence, not all the policies aimed at addressing land take can be developed similarly in different regional contexts, and a larger comparative study could help understanding whether the main drivers here identified as common to Liguria and Sardinia act as the main drivers, and in a similar way, also in other NUTS2 regions.

Acknowledgements

The authors are extremely grateful to Corrado Zoppi for his invaluable help with the model and statistical advice.

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