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Filippo Randelli and Federico Martellozzo

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The impact of rural tourism on land use. The case of Tuscany

Filippo Randelli, Federico Martellozzo

Univeristy of Florence

Abstract

Rural tourism (RT) has grown in many rural regions worldwide and today it is a stable driver of rural development. In this paper we argue that the growth of RT has to be totally divergent from seaside tourism development that tends to create holiday resorts and artificial villages with no identity. To built-up new houses in order to increase accommodation facilities in rural areas could have a twofold negative effect: compromise the beauty of the landscape, a basic local resource, and develop a rural mass tourism. In order to monitor the impact of RT on land use we propose to analyse the development of new building areas in the countryside using a GIS (Geographical Information System) approach. The main source of data for this analysis are the Global Human Settlement Layer (GHSL) of the European Union. The analytical model will be applied to the case of Tuscany.

1. Introduction

In the last two decades, rural tourism (RT) has grown in many rural regions worldwide. Many scholars relate the growth of RT with the need to escape from congested urban areas and the search of urban people for a natural life style (Béteille, 1996; Champion et al.,1998; Romei, 2008). After a period of development, with growth both in demand and supply, in the Nineties RT has moved into a more complex phase (Long and Lane, 2000). In this phase RT is no longer a minor agent of rural economy and today it is in the agenda of many local, regional and national policy makers (Hall et al., 2005).

RT is integrated with the economic, social, cultural, natural, and human local structures in which it takes place (Saxena et al., 2007; Saxena and Ilbery, 2008) and it can contribute to the diversification of farming income (especially on small family farms), bring additional benefits into the rural economy, counteract emigration from rural areas, encourage an increase in cultural exchange between urban and rural areas, and enhance the traditional values of rural life, as well as contribute to the general diversification of the economy (Sharpley and Sharpley, 1997; Roberts and Hall, 2001; Canoves et al., 2004).

From a classical point of view, this type of tourism is divided into two categories: “rural tourism”, as directly linked to rural spaces, closeness of nature and several types of leisure (Canoves et al., 2004) and “farm tourism”, as connected with visits of tourists to functioning farms (Pearce, 1990; Béteille, 1996). Even so, many scholars prefer to identify the RT as all typologies of tourism in rural areas (Garrod et al., 2005; Sanagustin Fons et al., 2011; Su, 2011; Randelli et al., 2014). In line with the latter perspective, in this paper we will consider as RT all typologies of tourism developped in rural areas.

During the period of growth, many farms started the transition and RT has offered a great chance to fill in the empty spaces (i.e. farmhouses) made available by the decline of rural areas. As part of the same evolutionary path, also many rural houses were transformed into second houses or bed and breakfast. Nevertheless RT should not contribute to the change in the land use or rural spaces (i.e. new buildings). Due to many speculative interests, a process of increasing of new building is treatening many rural high developed rural areas, for instance Catalunya in Spain, Tuscany in Italy, Provence in France. This process is fostered by the globalisation of countrysides (Wood, 2007) and in many rural areas the land is purchased by wealthy individuals (new rurals) from all over the world in order to live in isolation and quiet or to be a farmer, for instance a wine maker. All these trends have caused a commodification of rural areas. There is a common view in the literature that tourism turns local resources (i.e. landscape, culture, traditions, etc.) into a commodity, packaged and sold to tourists resulting in a loss of authenticity. When local amenities are consumable for tourists and new rurals, its authenticity is reduced (Taylor, 2001). Consequently, the destination appears less authentic, the value of the place is miniaturized and the local resources might be overexploited (Swain, 1989; Dearden and Hamon, 1992; Go, 1997).

The growth of RT has to be totally divergent from seaside tourism development that tends to create holiday resorts and artificial villages with no identity. Many coastal regions in Portugal, Italy, Greece, and particularly in Spain, have suffered this problem, where the coast line has been completely destroyed by blocks of apartments and huge hotels, lacking in green or natural areas (Sanagustín Fons et al., 2011). This could be a threat for RT sustainability: overdoing the urbanisation of rural spaces. To built-up new houses in order to increase accommodation facilities in rural areas could have a twofold negative effect: compromise the beauty of the landscape, a basic local resource, and develop a rural mass tourism. Furthermore, the mass tourist is usually attributed with passivity, lack of preparation, hurriedness or no interest in local customs, as well as with a minor spending power, and then with a cultural formation not able to appreciate and respect the local resources (Ballestrieri, 2005).

The goal of this paper is to propose an analytical approach to the study of RT development in rural areas. In order to be able to monitor the effect of the RT growth on the shape of rural areas, we will analyse the development of new building areas in the countryside of Tuscany using a GIS (Geographical Information System) approach. This approach could be replicated in other rural regions and the goal is to advise policy makers about the evolutionary path followed by the RT development.

The present paper is structured as it follows: in section two we introduce the theoretical framework, in section three we present the case study of Tuscany, in section four the analytical model and data are presented; in section five and six, results and some conclusions are reported.

2. Theoretical framework

In recent years EEG has attracted increasing attention by economic geographers (Frenken, 2007; Boschma and Martin, 2010), also in the study of RT (Randelli et al., 2014; Brouder, 2014). As Boschma and Martin (2007) put it, EEG is concerned with how the processes of path creation and path dependence interact to shape geographies of economic development and transformation. In this paper, we will apply the EEG concepts in order to reveal the mechanisms of development following the first phase of path creation.

In an evolutionary scenario who drives the change in the phase of maturity when RT in not anymore a novelty and it permanently drives the rural development? According to Boschma and Frenken (2006), EEG examines how the spatial structure of the economy emerges from the micro-behaviour of individuals and firms. The economic landscape is the result of an evolutionary sequence in which innovations were selected because, for some reason, they were a better fit than others to the existing rural configuration (Randelli et al., 2014). As choices are made by companies at the micro-level, this paper addresses to local individuals, both residents and entrepreneurs, and their strategies over time. On the contrary, once the path creation has been successful, the rural areas might attract also foreign investors and venture capital in a global countryside perspective (Wood, 2007). It follows that the reconstitution of rural places under globalization,is made by the interaction of local and global actors, with the possibility of different interests and contrasting goals among them.

Selection occurs also at the macro-level of markets. Market competition acts on variety as a selection device, opening and closing “windows of opportunities”. In a dynamic economy, fitter novelties become more dominant over time through selection, enabling more innovative firms to expand their production capacity and market shares at the expense of less innovative firms. Many researchers have pinpointed new demands for a natural life-style, a current of Naturophilia, which

has emerged with considerable strength in highly industrialized countries (Shaw and Williams 1994; Hall *et al.* 2005). Furthermore, the re-launching and recovery of RT demand in recent years may be attributed to changing patterns of leisure time, the segmentation of holidays and the development of long weekends (Cànoves *et al.* 2004). Over time, in a context of growing market, rural areas might be challenging an over exploitation of local resources. The market is an exogenous factor and it tends to accumulate investments and power both locally and globally. It follows that in a fragile environment as the rural areas, the regulation of local investments is crucial.

The regulation of local resources and the control both on land use and investments is a matter of local and regional authorities. The selection environment then includes also institutions, whose effects become especially visible when a major institutional change occurs and the "playing field" on which firms compete changes dramatically (Boschma and Martin 2010). Thus, understanding the transition of rural economies towards specialisation in tourism requires an analysis of institutions, as relevant enabling and constraining contexts.

In conclusion, we will explain rural transitions towards a mature RT development path by the interplay of different drivers, both local and global. Globalization processes introduce into rural localities new networks of global interconnectivity, which become threatened through and entangled with existing local assemblages, sometimes acting in concert and sometimes pulling local actors in conflicting directions (Nederveen Pieterse, 2004). Rural localities are transformed by new connections with global networks, global processes and global actors, but this is possible only with the enrollment and acquiescence of local actors which should understand that the reconstitution process of rural areas does not mean a subordination of local hallmarks, rather a negotiation and manipulation of them, through local policies (Massey, 2005). In a mature stage of a development path, the micro-behaviour of individuals and firms tend to be driven by the global liberalized market. The effect of markets in rural areas may tend to the overexploitation of local resources and any change in a fragile area, such as rural areas, is irreversible (Boschma and Martin, 2010). It follows that the role of local and regional institutions, included the universities and researching centre, is crucial in a mature stage of RT development and the sustainable future of rural areas deals with the ability of institutions to regulate the processes and consequences of globalization

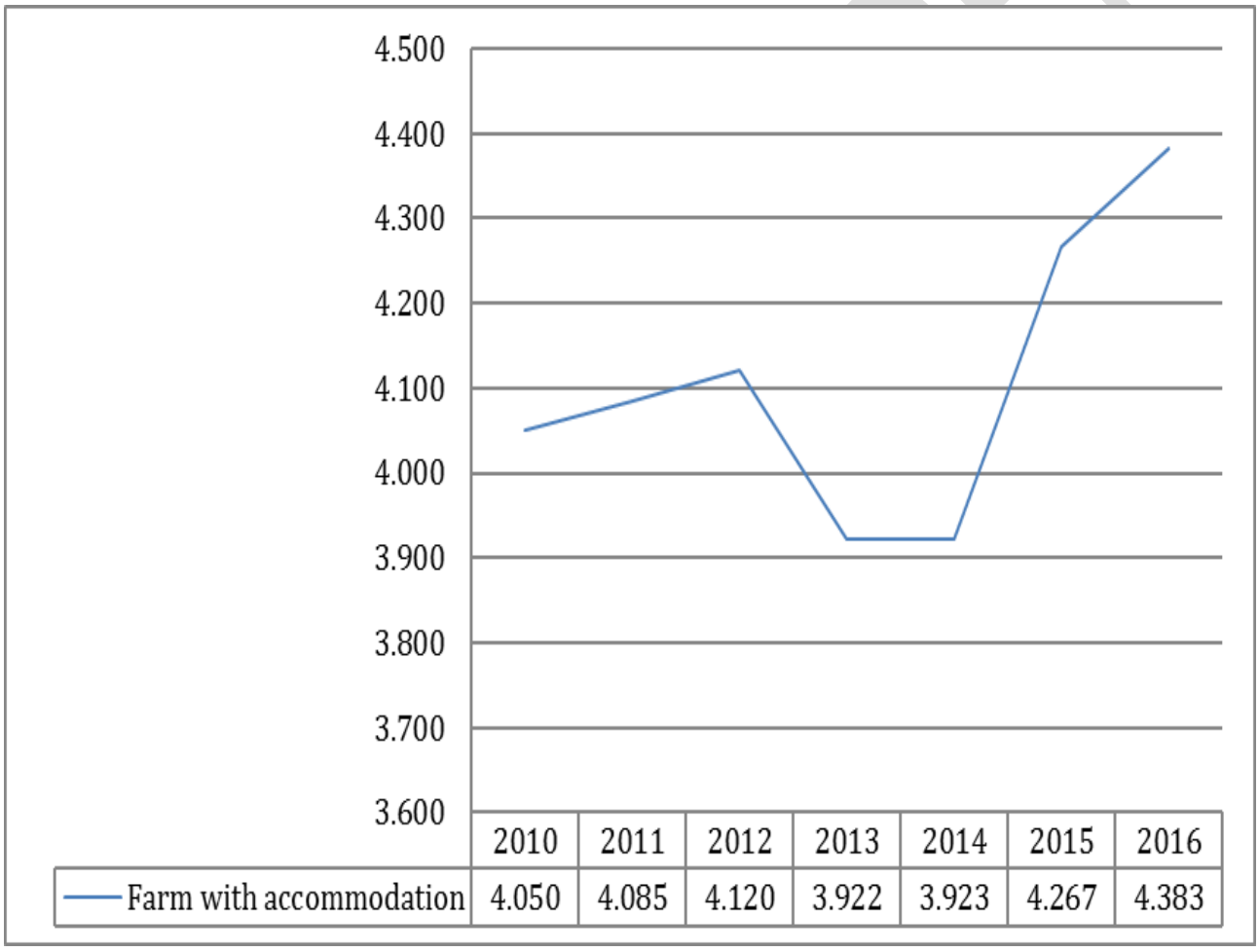
3. The evolution of RT in Tuscany and the threat of sustainability

The success of RT in Tuscany can be explain with the alignment of different processes involving amenities, farmers, regional and European policies and the market. Due to the crisis of sharecropping, its heritage of a large pool of empty buildings was a primary input for development

of tourism. The development of RT took off when ongoing processes at the macro level reinforced the transition towards RT, in particular the European funding for multifunctionality within agriculture and new trends in the tourism market (urban residents seeking a natural life-style). Following new regional laws regulating tourism on farm, since 1987 farmers have been investing in setting up and than constantly improving the quality of *agriturismo* (Randelli et al., 2014).

During the period of growth, many farms started the transition and today Tuscany has reached a mature stage of development. In the last few years, after a decrease due to the economic crisis, the number of *agriturismo* (accommodation in the farm) has continued to grow (see fig. 1).

Fig. 1 Number of agriturismo (accommodation in the farm) in Tuscany.



RT has offered a great chance to fill in the empty spaces (i.e. farmhouses) made available by the decline of rural areas, but it should not contribute to the change in the land use (i.e. new buildings). Furthermore, new flows of tourists are invading rural areas, although sometimes they are not accounted by statistics because they do not spend the night (for instance, cruise tourists docked in

Livorno) or they stay in the urban areas. Besides tourists, Tuscany attracts many wealthy individuals from all over the world in order to live in isolation and quiet or to be a wine maker (Randelli and Perrin, 2010). Hines (2010) defines them as "permanent tourists", a conceptual hybrid based on which is remarkable the analogy between both the activities of rural gentrifiers and those of traditional tourists and the fact that rural gentrifiers are pursuing these activities in a regular and constant fashion.

As a matter of facts, it is possible to glimpse in Tuscany the beginning of massification of RT. Small towns such as San Gimignano or Montepulciano are literally invaded every day by thousands of tourists with a real risk of depleting local resources. Due to many local and global speculative interests, in the developed tourist rural areas of Tuscany the pressures for changes in the land use towards a development of new building is real.

As indicator of rural areas urbanization, we propose to analyse the trend in the new building area in Tuscany in the period 1990-2015. In this paper, we use the changes in land use as a proxy of the massification of RT in Tuscany. We are aware about the limitations of such approach as we are not able to diversify among different uses of new buildings. On the other hand is clear in the literature (for a review see García-Hernández, 2017) that a consistent growth in the tourism flows tends to grow the building sector, for instance second houses (rural gentrification, see Hines, 2010) and new tourism accommodations (Sanagustin Fons et al., 2011). Both second houses and new accommodations push the residents out of the most valuable areas (for instance old towns and farmhouses on the hill), towards new buildings around small towns down the valleys. This means that the city's residential function is threatened and a vicious circle may start: fewer residents, fewer traders catering for residents, and more businesses catering for tourists. The loss of population then may reinforce the massification of tourism on the small towns. It follows that second and holiday houses occupy the interface between the two policy areas of leisure and housing.

4. Methods and data

The main source of data for this analysis are the Global Human Settlement Layer (GHSL) of the European Union[1], and the National Statistical Census of Tourism (see section 4.1). The analytical

[1] From the Copernicus website: "The GHSL manufacture is the result of a collaborative process between numerous individuals and institutions.

The GHSL profited from the close collaboration and the funding support of the Economic Analysis Unit of DG REGIO, European Commission. In particular Lewis Dijkstra and Hugo Poelman who contributed actively to this version of the GHSL. The generation of the GHSL population data would not have been possible without the access to the data hosted by the Center for International Earth Science Information Network (CIESIN) and the discussions with Robert Chen and Kytt MacManus".

In 2014, Joint Research Centre (JRC), organised the 1st Global Human Settlement Workshop, which led to the Manifesto for a Global Human Settlement Partnership. The participants of this workshop formed the core group of

investigation proposed in this paper relies on simple methods elaborated on a merge of these two source of data (see section 4.2).

4.1 Data, descriptions and sources. GHSL, is a "relatively" young set of products regarding the location of the human presence on the planet, which is freely accessible from everyone. Its development is supported by a joint venture between the Joint Research Centre (JRC) and the DG for Regional Development (DG REGIO) of the European Commission, together with the international partnership of the GEO Human Planet Initiative. Its main scope is to produce advanced and up-to-date global spatial information describing the human presence on the planet and its intensity.

The database features 3 main base layers (i.e.: GHS BUILT-UP, GHS POP, and the GHS Settlement Model) for circa four dates in time (from 1975 to 2015).

These datasets are the result of combining multi-sensors satellite imagery with population census data.

The GHS BUILT-UP LDS (G_B-U) layer (derived from Landsat images) (Pesaresi et al., 2015) features a spatial grid informing about built-up presence globally. Information is provided for the four dates elicited above and grid is available with different spatial resolutions[2]. The information conveyed by each gridcell is the percentage of the cell covered by artificial (built-up) area.

The GHS POP layer (G_POP) (EC and JRC, 2015) is structured to match G_B-U's spatial format, and the information conveyed per each grid-cell is the number of people living within the cell. In other words, this raster dataset spatially depicts population distribution and density.

The GHS Settlement Model (G_S-M) (Pesaresi et al. 2016) is a thematic land use map of the degree of urbanization as conceived by EUROSTAT through its urbanization model (Dijkstra and Poelmann, 2014; Eurostat 2017). It combines the information featured in the two other dataset described above to assign each grid cell a different degree of urbanization value (table 1).

Grid Code	Label	Description
0	"natural cells", neither rural nor urban.	Cells with no population and/or no urban at all. Cells that do not fit in any of the other 3 categories.
1	"rural cells" or base (BASE)	Single or contiguous cells (8-connectivity) with

what is now the GEO Human Planet Initiative, which includes now more than 180 members from 100 different institutions all around the globe. The pre-releases data of the GHSL was shared among the GEO international partnership since 2014. Discussions with the members helped improving the quality of the GHSL significantly.

[2] Datasets are offered with grids a with different spatial resolution: 3m, 250m, and 1km. In this study we relied on datasets with a spatial resolution of 1 km.

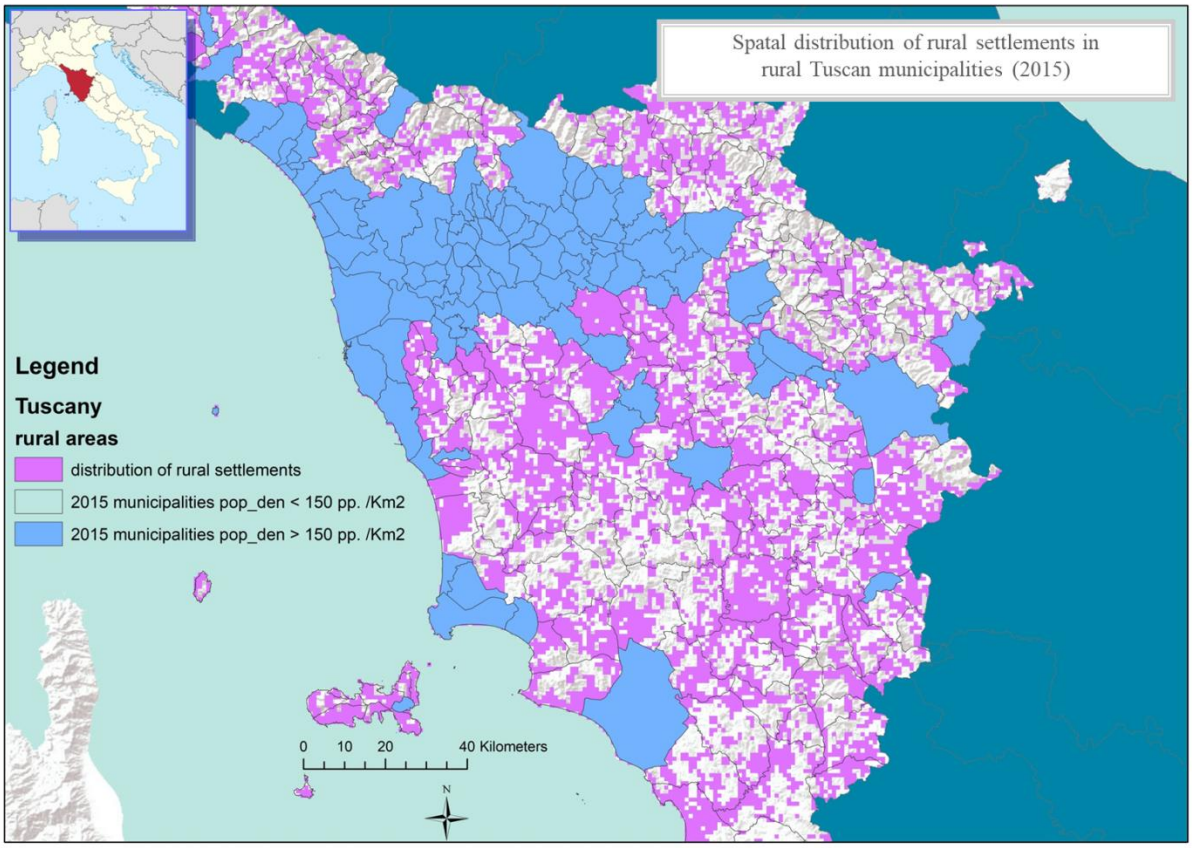
		a population of less than 5000 inhabitants (for the 1km grid).
2	"urban clusters" or low density clusters (LDC)	Towns, suburbs and small urban areas. Contiguous cells (8-connectivity) with a minimum population of 5000 inhabitants (for the 1km grid).
3	"urban centres" or high density clusters (HDC)	Cities or larger urban areas: contiguous cells (4-connectivity, gap filling) with a density of at least 1,500 inhabitant/km2 or a density of built-up greater than 50%, and a minimum of 50,000 inhabitants per cluster.

Table 1. Main criteria guiding the algorithm at the base of the degree of urbanization model developed by EUROSTAT (Dijkstra and Poelmann, 2014).

The other dataset used in the following analyses regards information about tourism (R-T). This information is contained in the National Statistical Census of Tourism 2015. This dataset contains information regarding exclusively the number of tourist, the length of their staying, and the nationality of the tourist. Data are available at the municipality level.

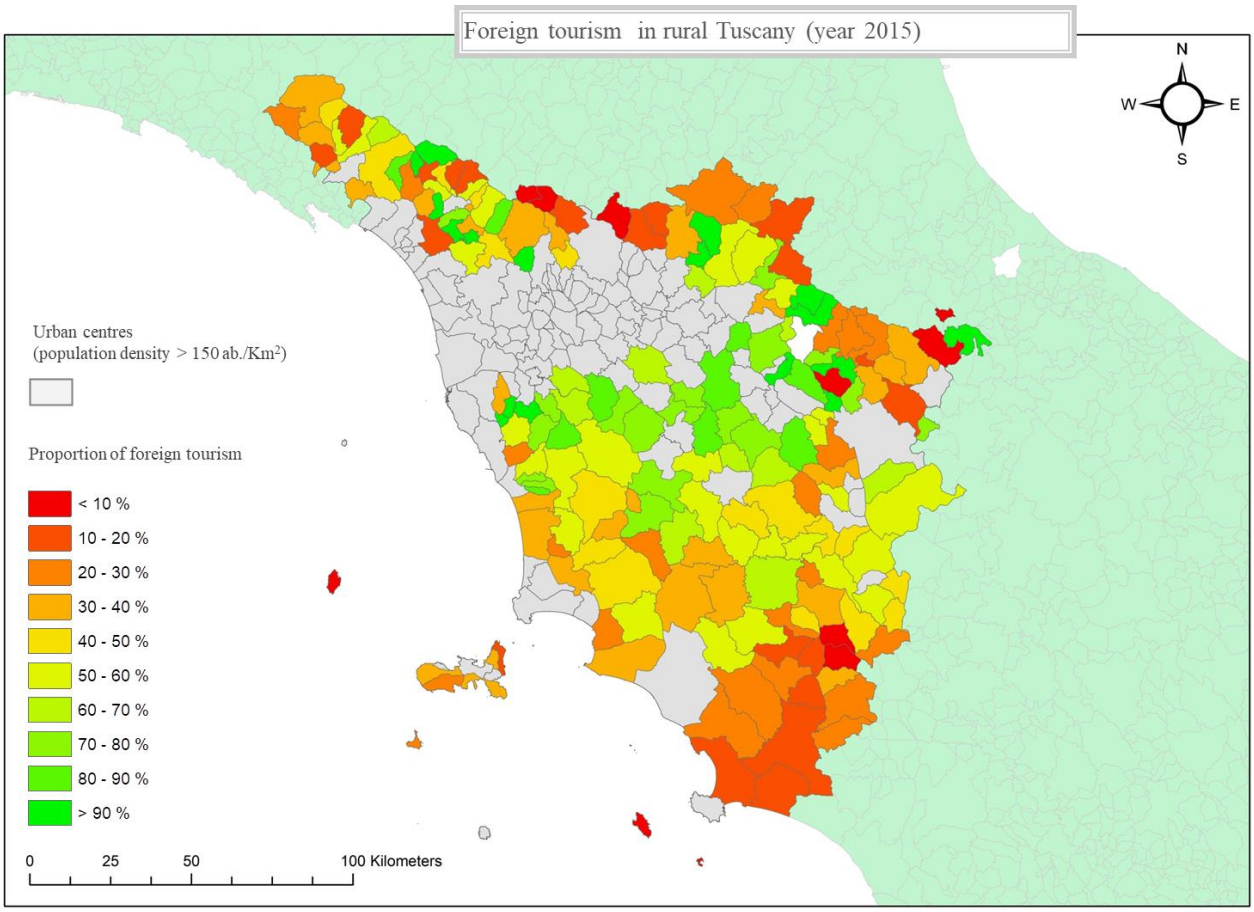
4.2 Analytical methods, variables, and basic assumptions. The focus of this paper is on Tuscany, therefore we limited the analysis to the data about Tuscan municipalities and land (Figure 2). Since RT is supposed to characterize rural municipalities, we first selected using G_POP for the year 2015 the municipalities in Tuscany with a population density lower than 150 inhab./km^2, so to extract the rural municipalities matching the definition of the OECD (Organisation for Economic Co-operation and Development) or a municipalities to be considered rural (150 inhab./km^2).

Fig. 2. Area of Interest, rural municipalities, and distribution of rural settlements within them.



Then, we aggregated at the municipality level and only for the selected rural municipalities the information conveyed through the G_B-U, G_S-M , and R-T datasets (e.g. Fig. 3).

Fig. 3. Proportion of foreign tourism per municipality in Tuscany for the year 2015.



The main scope of this paper is to investigate, explore, and depict the potential influence that urbanization may have on tourism massification, which for municipalities relying on RT may have a harmful impact. As a matter of fact, urbanization has been proven to be among the most unsustainable land use transition dynamics (Foley et al., 2005) because it is hardly reversible, it consumes resources that is not capable of regenerating (Martellozzo et al., 2014), and because it is responsible of a large share of global GHG emissions (Grimmond et al. 2007). Its impact could be even harsher when considering the amount of rural landscape that it has consumed and on which RT is fundamentally rooted.

To this end, we calculated how much built-up expansion ($\Delta BU_{1995\text{-}2015,}$ eq.1) happened in rural municipalities (both as a proportion of available land and in total km^2 lost) between 1990 – year in which approximately started a boom in RT in Tuscany – and 2015, almost present days (reference time for the most up-to-date available data).

$$(\Delta BU_{1995\text{-}2015})_i = (G\_B\text{-}U_{2015})_i - (G\_B\text{-}U_{1995})_i \qquad [eq.1]$$

Where $(G\_B\text{-}U_{2015})_i$ and $(G\_B\text{-}U_{1995})_i$ are the amount of G_B-U (built-up areas) respectively in 2015 and 1995 for the i^{th} municipality. This information, although being important *per se* - and although it is relevant especially when compared with all the municipalities in Tuscany (see Table 2) to offer a general contextualization - for the scope of this analysis it is not sufficient to establish how much urbanization happened in rural municipalities, but we needed also to calculate how much of this expansion targeted peculiarly rural and natural areas within rural municipalities. In other words we need to answer the question: How much of the urbanization that happened in rural municipalities consume new natural and rural landscapes? To do so we overlaid the spatial grids of G_B-U and G_S-M in order to extract and aggregate the extent of G_B-U falling within classes 0 and 1 of the G_S-M, for both reference years 1995 and 2015. Their delta (ΔBU_RNA, eq.2) point out precisely the amount of built-up growth happened at the cost of rural and natural land within rural municipalities, hence identifying built-up expansion that directly eroded the main resource for rural tourism.

$$(\Delta BU\_RNA_{1995\text{-}2015})_i = (G\_B\text{-}U\_S\text{-}M_{2015})_i - (G\_B\text{-}U\_S\text{-}M_{1995})_i \qquad [eq.2]$$

Where $(G\_B\text{-}U\_S\text{-}M_{2015})_i$ and $(G\_B\text{-}U\_S\text{-}M_{1995})_i$ are the amount of built-up growth for the i^{th} municipality from the G-B-U dataset happened at the cost of natural and rural classes of the G-S-M dataset, respectively for the years 1995 and 2015.

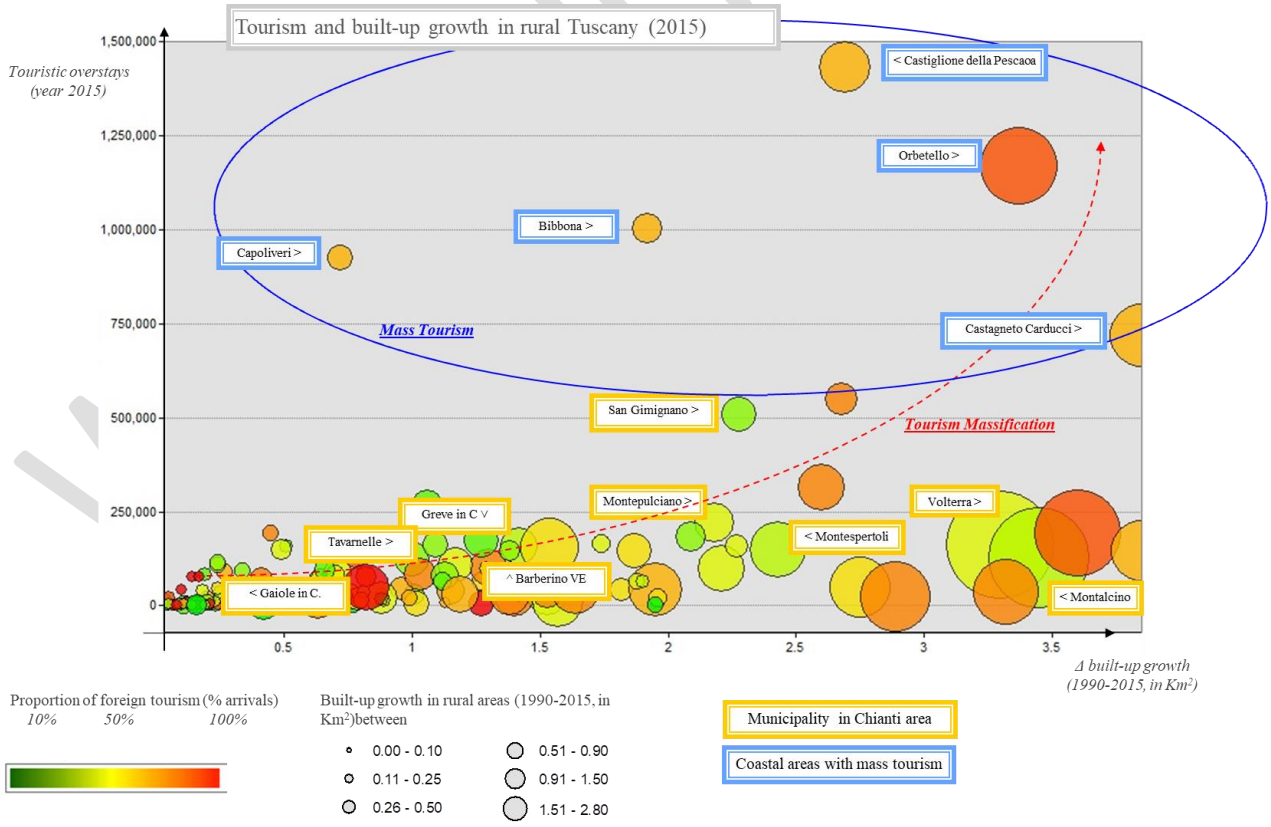
5. Results

Generally speaking, landscapes in Tuscany are quite well preserved, especially in rural areas which still have high landscape values. The landscape represents for Tuscany a fundamental element of its identity, a decisive added value as well as a factor of attraction capable of promoting the competitiveness of the territories. The Region regulates the use of the territory with the Piano Paesaggisitico (Landscape Plan). The main objective is to ensure the preservation, recovery, upgrading, valorisation and management of the landscape while promoting the competitiveness of the territories as a development tool. It follows that many typical areas of the Tuscan landscape are protected and the construction of new buildings is in these areas forbidden, particularly in hilly areas, which are more easily visible. Outside the protected landscaping areas, the regulation of new buildings is instead a matter for municipalities that can derive good financial resources from granting permits to build

For instance, municipalities on the coast, experienced from medium to high urban growth and the expansion happened at the expenses of natural and rural land (e.g. “Orbetello”, “Castiglion della Pescaia”, “Castagneto Carducci”, in Fig. 4 the bubbles seating on top/top-right). This phenomenon - characterized as mass tourism (see the high volume of total overnights stays on the Y axis in Fig. 4) - is well known (Sanagustín Fons et al., 2011) and it is not limited to the Tuscan coast but it affects shorelines worldwide.

Some rural municipalities, which are world-famous for enchanted charming rural landscapes have experienced significant built-up expansion. Another indicator usually accepted in tourism research as an indicator of value and health of tourism within a region is the proportion of foreign touristic flows. This indicator in our case study portrays a variegated situation and as a result, it is difficult to identify any relevant pattern, however, it is worth to mention that generally speaking tourism in Tuscany is capable of attracting a good proportion of foreign flows almost everywhere, but fig. 2 indicates how inner areas have in general higher proportion of foreign tourism than the municipalities on the coast.

Fig. 4. Built-up expansion and volume of tourism in rural areas in Tuscany municipality between 1990 and 2015.



Nevertheless, it is worth to draw a general context for Tuscany built-up expansion in recent decades (Fig. 5). As expected the municipalities that experienced the most built-up expansion are urban municipalities (seat on the far top-right of fig. 5), whose growth is accompanied by high population density as well. Conversely, many of the rural municipalities that constitute the core of precious protected rural areas (e.g. the Chianti region) experienced very limited built-up expansion (these seat on the far bottom-left of fig. 5), also in regards of littler population density.

Municipalities that instead should rise some concerns are the ones that have experienced relevant built-up growth which cannot be appropriately justified with adequate population density level. These are the ones sitting on the bottom-right of fig. 5, therefore suggesting that built-up expansion in these municipalities is not for residency but for other purposes. Furthermore, the colour indicates that most of the growth happened at the expense of natural and rural areas therefore deleting precious natural landscape, which is even scarier if we note that these municipalities are world-famous location for RT (e.g. "Montalcino", "Montepulciano", "Volterra", "San Giminiano", etc.). These and other considerations are further addressed in the following section.

Fig. 5. Urban expansion in Tuscan municipality between 1990 and 2015.

6. Discussion and concluding remarks

The tourism industry is one of largest industries in the world with a global economic contribution (direct, indirect and induced) of over 7.6 trillion of U.S. dollar in 2016 and it is supposed to continue to grow from 1.235 million in 2016 up to 1.800 million of arrival worldwide in 2030 (UNWTO, Tourism Highlights, 2017).

It is clear that RT, once time a minority tourism market, is now a valuable contribution to rural economies not only in financial terms but with many other potential benefits such as new jobs, farm income support and in general reusing the abandoned rural settlements. On the other hand, at a mature stage of development some problems might emerge, for instance environmental issues, socio-cultural threats and traffic congestion (for a review see García-Hernández et al., 2017).

The sustainability of a rural destination also implies obtaining a satisfactory tourist experience, so the impact that increasing volumes of visitors may have on that experience is also crucial for RT (Riganti and Nijkamp, 2008). In recent years, there has been a shift of tourist's motivation, usually aware of the quality of the experience that may be more adventurous and meaningful. This change increases the demand for authentic, artisan products, heritage food, arts, crafts and pastimes, highlighting a need to connect with ancient traditions and ways (Hines, 2010) and the success of RT can be partially explained with this trend. In this paper, we argue that to turn rural resources (i.e. landscape, culture, traditions, etc.) into a commodity is a risk, and RT might bring to the depletion of resources and a lost of authenticity.

In this paper, we focus on the threat of rural areas urbanization which is to say the risk of an increase of new buildings in the rural areas. In order to monitor the impact of RT on land use we propose to analyse the development of new building areas in the countryside using a GIS (Geographical Information System) approach. We have proposed to explain the changes happening in the countryside with an evolutionary perspective. The interplay of different drivers, both local and global, may produce a large variety of effects. At a mature stage of RT development, global players and wealthy individuals might be interested in investing in rural settlements and historical small rural towns. The liberalization of markets and increasing integration of the global economy, together with the expansion of transport and electronic communication networks, the opening of borders and increased pattern of transnational migration, as well as growing consciousness of global perspectives on the environment and other issues, have all prompted, intensified and exaggerated processes of social and economic restructuring in rural areas (Woods 2007). It follows that sustainable planning is crucial, involving local community and preserving local resources.

In the case of rural areas in Tuscany, RT has reached a mature stage (Randelli et al., 2014) and today the countryside is threatened by congestions of small towns (i.e. San Gimignano,

Montepulciano, Montalcino) and rural gentrification. The analysis of data on land use in Tuscany are able to measure the growth of new buildings in the period 1990-2015. In few municipalities of rural Tuscany, the size of built-up growth has been higher than the rest of rural municipalities, with a similar trend to coastal municipalities. For instance, in San Gimignano, Montalcino, Volterra and Montepulciano, the total built-up area in the period 1990-2015 has grown at a similar rhythm urban areas (see fig. 5) although without the same population density. These municipalities are icons of RT in Tuscany and they still preserve a rural landscape. In these municipalities, the land use is regulated by the Regional Landscape Plan and any changes is not allowed. As a consequence, changes in land use are shifted to unprotected areas where new houses are allowed, often to host "expelled" residents by the iconographic landscaped areas. What is concerning is the rural gentrification going, and the ongoing process of globalization which is pushing for further development of RT. As shown in fig. 4, these municipalities are following the same path of coastal municipalities, which is to say mass tourism.

Our analysis has only touched upon the impact of RT. As a matter of fact, we must be aware of the limits of the data we have used in our analyses. Those limits basically concern the fact that we don't know whether new buildings are houses, industrial plants or infrastructures. However we can reasonably speculate that these are mostly for non-residential accomadation, otherwise we would see the built-up expansion matching either higher level of population density (fig. 5), or an industrial boom, which is not the case in Tuscany. Nevertheless, even if we feel that our results are quite consistent, we have to bearin mind that the GHSL repostory was not developed to precisely measure the impact of tourism on landscape conservation. For this reason, it would be quite informative to know more about the final use of new built-up areas, therefore research agenda on this issue should also include a comparison/validation with data from the national building census or similar. In addition, future research should also focus more on other consequences that growth of RT in the countryside may potentially have, such as traffic congestion, air pollution, and rural gentrification.

To put that more in perspective, building on the obesrvations given here, future research should provide a trade-offs analysis evaluating both costs and benefits of RT development. Consequently, identifying new potential sustainable pathways for RT development would be an intriguing question. In other words, it would be useful to evaluate the increasing marginal impacts associated with RT growth, under different scenarios, on social, economic, and environmental landscapes. Indeed, it would be interesting to more generally think through the real benefits and the resilience of mass tourism anywhere: are we really sure that local communities proportionally benefit from an (eccessive) increase of the number of tourists? Are we really sure that the foreseen economic

redistribution in these areas justifies the inevitably associated social and environmental burden? Where's the threshold? These and other issues constitute a promising research agenda for resilient RT for future years.

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