

TOURISM AND DIGITAL ENDOWMENT IN ITALY: A SPATIAL ANALYSIS

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Abstract

In consideration of the recent trend reversal in the number of foreigners' and residents' arrivals and nights spent in the Italian tourism system, this work is proposing to evaluate to what extent the endowment of infrastructures for telephonic and telematic and the digital endowment among the enterprises are able to boost the domestic tourism demand in Italy. The results of the proposed spatial models confirm the general assumption regarding the centrality of the digitalization processes, both from the public interventions perspective and from the entrepreneurial initiatives perspective. In this way, the need to harmonize public and private policies becomes pivotal in order to revitalize and stimulate the internal tourism demand in Italy. The policy implications can be read as an instrument for rebalancing a troubling trend involving the tourism demand in Italy of the last 30 years.

1. Introduction

From the era of digitalization, the structure and functioning of tourism systems have been revolutionized hand in hand with the development of Information Communication Technologies (Xiang, 2018). ICTs played a key role in changing attitudes and refining tourists' purchasing behavior, as well as working as a tool for tourism managers and leisure enterprises in managing and enhancing own business (Karanasios and Burgess, 2008). In a global tourism framework characterized by hyper-competitiveness, managing customer dissatisfaction, minimizing service failure and encouraging service recovery represent prerogatives for tourism players (Koc, 2017) and the endowment of digital facilities constitutes an opportunity to add value. In tourism industry, several kinds of service failure can occur due to low or malfunctioning digital endowment, for instance: for a tour operator, the gap between the perceived image before travelling and the real experience after having traveled (inseparability between destination and service); for a hotel, troubles in online room reservations (perishability of the product/service); for a restaurant, claims and complaints about mistakes between digital orders and served dish (heterogeneity of actors, managing orders and preparing dishes) (Kotler *et al.*, 2017). In these terms, the possibility to be able to rely on a well-working digital endowment means to increase opportunities to better manage consumers' service failures. While literature, from the side of demand, produced a broad range of qualitative and quantitative essays explaining the relationship between the use of innovative technologies and the tourist engagement (Buhalis, 1997; Claver-Cortés *et al.*, 2007; Kim *et al.*, 2008; Bulencea and Egger, 2014; Inversini *et al.*, 2015, Marques and

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Although the paper is the result of common reflections, §§1, 3 and 3.1 can be attributed to Dante Di Matteo; §2 can be attributed to Valentina Evangelista §4 can be attributed to Fabrizio Ferrari; §5 is in common.

Borba, 2017; Martins *et al.*, 2017), from the side of supply still emerge some shortcomings. Infrastructural assets, like the ICTs for telephonic and telematic, if fairly allotted on the national surface, could represent a great potential in order to overcome spatial disparities, by ensuring to the whole tourism industry the possibility to access to technologies able to engage and loyalize customers.

For what concerns the case study of this manuscript, focused on the Italian tourism framework, we can state that behind the reasons of studying the domestic tourism flows there are some mere consideration about the type and the characteristics of the Italian tourism demand in the period of the last 30 years. In particular, we noticed that, with reference to the arrivals, if at the beginning of the 90s the non-residents' demand was almost the half of the residents' demand (about 20 millions of non-residents' arrivals compared to around 40 millions of residents' arrivals), after a period constantly characterized by an increase of foreign tourists and a non-proportional increase of the resident tourists, in 2017 the number of arrivals of international tourists has almost reached the same size of the national tourists (about 60 millions of non-residents' arrivals and about 62 millions of residents' arrivals). A graphical representation of this trend is provided by the following Figure 1.

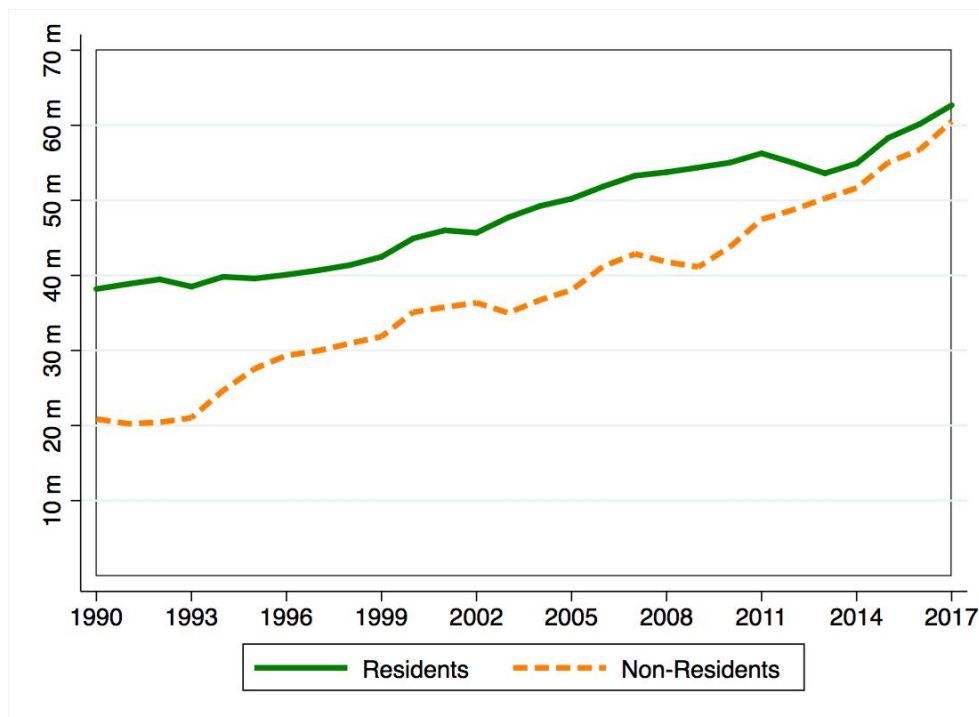


Figure 1: Tourists' arrivals in Italy by residents and non-residents (in millions). Time period 1990-2017. Source: authors' elaboration on Eurostat data.

The Figure 1, which shows that the growth rate of the non-residents' arrivals has been four times higher than the residents' arrivals, represents an expression of a clear modification in the nature of the Italian tourism system and several reasons can be hypothesized under this transition.

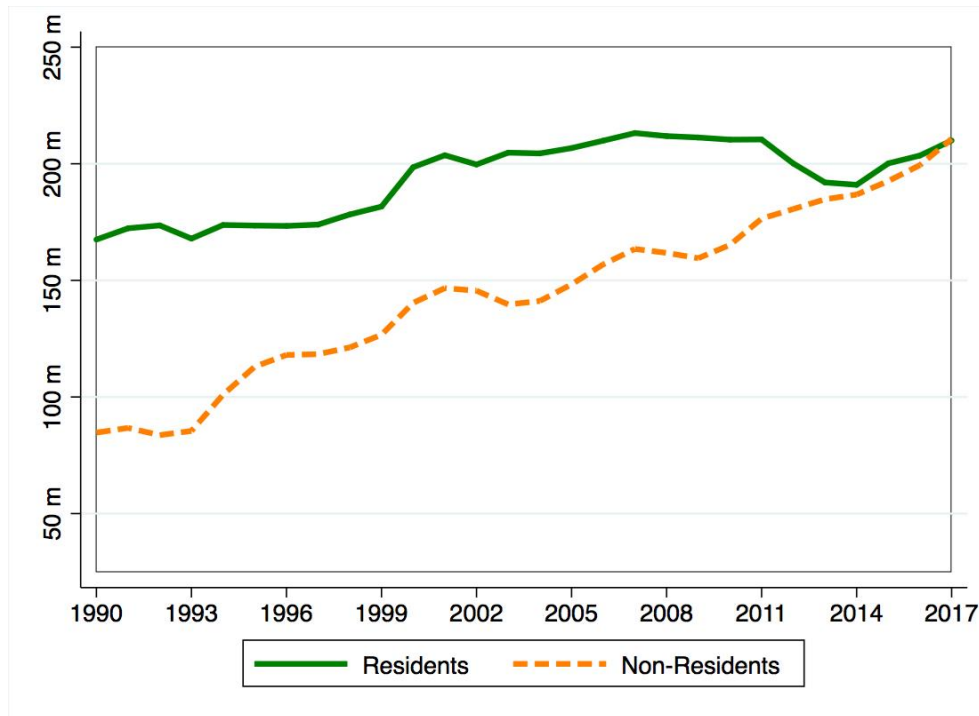


Figure 2: Tourists' nights spent in Italy by residents and non-residents (in millions). Time period 1990-2017. Source: authors' elaboration on Eurostat data.

For what concerns the nights spent we also observe a similar trend in the Figure 2, if compared to the arrivals. In particular, we notice that the number of non-residents' nights spent has constantly increased during the considered time period, ranging from the 84 millions of the 1990 to the 210 millions of the 2017; the number of residents' night spent instead – after a growing period from the beginning of the Nineties to early 2000 – remained stationary until the beginning of the second decade of 2000, where a 5-year period of constant decrease is observed, from the 2012 to the 2016. In 2017, the residents' nights spent start to grow again up to 209 million tourists but, for the first time ever in Italy, it is verified that the number of non-residents' nights spent has been higher than the residents' ones (210 millions against 209).

This brief general introduction with all the related implications in terms of numerical increase or decrease of the arrivals and nights spent in Italy from residents and non-residents open the door to a wider reflection. In a long time period such as the considered one, as literature teaches, a lot of occurrences can happen able to affect the regular course of event, especially in a very changeable sector as the tourism one. For example, we can imagine that a lot of Italian destinations, due to the *stagnation* or *maturity* phase of their life-cycle (Butler, 1980) could become more attractive for foreigners and less attractive for residents, and this can depend from several reasons (saturation, carrying capacity, threshold capacity, obsolescence in some offer features or elements, lack in essential services, changes in visitors' preferences, etc.).

The general assumption behind this study refers to the hypothesis that, if for the non-residents the Italian tourism «product» not only remains one of the most desirable in worldwide preferences but even increases with the passing years, for what concerns the residents' habits and preferences, it maybe appears outdated and overwhelmed and this is quite evident from the aforementioned general data. Under this scenario, if the

foreigners' demand keeps coming in Italy in an almost systematic way, as a result of the consolidated image of the Italian destination among the international tourists' preferences, the domestic demand needs new inputs, new stimuli, new arrangements, new visibility opportunities. In this view, we think that the role of the digital endowment, declined both in terms of public participation and in terms of private opportunities (see paragraph 3 for a better specification), represents one of the critical leverages to be moved with the purpose of 're-enable' the internal tourism demand in Italy.

On the basis of such premises, this paper explores the relationships between the domestic tourism demand and the digital environment in Italy (expressed by two synthetic indicators provided by the Tagliacarne Research Institute), through a five-years panel data involving 107 provinces (535 observations). The spatial control, through Moran's I and Lagrange tests, reveals a high dependence of results, meaning that tourism performances appear to be strongly influenced by neighborhood provinces' results. Among the main findings, enhancements in ICTs infrastructures and the presence of more tourism-related enterprises with increased digital endowment (i.e. restaurants, accommodations, operators, etc. with full access to innovative technologies) will probably result in a higher customers' engagement for the whole national tourism industry. Territories and enterprises with higher ICTs and digital endowment levels are more likely to engage customers and, on the grounds that in Italy there are still evident imbalances of ICTs and digital endowment between northern and southern provinces, public interventions for rebalancing technological assets are strongly suggested for improving the performances in a leading sector like tourism.

2. Literature review

Before tracing a synthetic portrait of impact of ICTs on tourism industry, a first definition of ICTs is required. In their review, Zhang *et al.* (2008, p. 628) defined ICTs as the «technologies used by people and organizations for their information processing and communication purposes». In the previous decade Peppard (1993, p. 5) asserted that ICTs are «the enabling mechanism which facilitates the processing and flow of this information, as well as the technologies used in the physical processing to produce a product or provide a service».

In the tourism literature, one the most prominent definitions could be attributed to Buhalis (2003, p. 7) which considered ICTs as «the entire range of electronic tools that facilitate the operational and strategic management of organizations by enabling them to manage their information, functions and processes as well as to communicate interactively with their stakeholders, enabling them to achieve their mission and objectives».

The digital *range* of Buhalis therefore includes hardware, software, telecommunications, netware, groupware, humanware (Buhalis and Jun, 2011), extending the Hojehghan and Esfangareh's definition (2011, pp. 308-309) which posited that ICTs could be defined as «the information processing and related equipment, software, semiconductors and telecommunications equipment».

From an historical point of view, the implementation of ICTs in to tourism sector dates back to 70s when the first Computer Reservation Systems (CRS) have been introduced (Garkavenko and Milne, 2008). In the 80s, ICTs started to transform tourism Global Distribution Systems (GDSs), improving interconnectivity among tourism operators (Ma *et al.*, 2003) but it was the advent and the global diffusion of the Internet in the 90s to provoke an absolute revolution in tourism (Buhalis and Jun, 2011).

This revolution could be divided in two different and clearly distinguishable eras: the era of digitization (1997- 2006) and the era of acceleration (2007- nowadays) (Xiang, 2018). During the former, ICTs were strictly perceived and used as tools for transforming traditional information in online contents: no substantial differences there were between online/offline materials and online/offline tourism representation and promotion. The latter is instead characterized by a more dynamic and interactive production of information: Wi-fi, Web 2.0, tablets, smartphones, open source, social media allowed suppliers and buyers to ubiquitously produce new information and rapidly exchange them with a potentially global audience. Moreover, ICTs are becoming strategic in the management of destination management, attractiveness, evaluation and experience.

As observed by Pease *et al.* (2007), ICTs are still changing the spatial relationships within all industries both at local and global scale of analysis, determining, at an ever-increasing way, new ways of production, distribution, retailing and purchasing. Tourism does not represent an exception: on the contrary, it is being radically transformed by the ICTs both by the side of demand and by the side of supply (Sheldon, 1997).

On the demand side, ICTs are becoming increasingly pervasive in tourists' behaviors regarding the search for general information about the destination, travel planning, comparing offers and purchasing, living travel experience and evaluating post travel experience.

«Consumers empowered by home computing can access multimedia information about tourism products and organizations around the world instantly» (Garces *et al.*, 2004, pp. 603-604): therefore, a first impact of ICTs on tourism demand is related to the exponential multiplication of available information (Pan and Fesenmaier, 2006). This clearly has implications also on the supply side, enlarging the competition stage in favor of a larger amount of destinations, products and operators.

Since from the planning stage, ICTs show their crucial role for travelers: as reported by Kim *et al.* (2008) beyond 90% of tourists plan their holiday by themselves using ICTs. Before choosing a specific destination, potential travelers, irrespective of their willingness (or not) to buy tourism packages online, search general information about the geographical area of interest and its attractions on Internet, weighting up the open reviews of previous tourists (Frías *et al.*, 2008).

After the destination choice, the growing availability of information likewise guides tourists in the *jungle* of offers, allowing them to compare prices, quality, accessibility, and other relevant aspects in the travel definition (Xiang and Gretzel, 2010; Jalilvand and Samiei, 2012). A number of website and Internet search engine, for instance, provide free confrontations among tourism packages, hotels and accommodation, different transports, also combining them into travel solutions and/or summarizing offers posted and promoted on other websites. Tripadvisor and Trivago's algorithms are only two examples of this complex set of functions, which exponentially enrich the role

of information in the travel organization, and simultaneously extend the boundaries of the competitive stage for the tourism operators.

ICTs have a certain impact even in the travel experience and in the post travel evaluation. The large diffusion of social networks, supported by the more and more extensive distribution of enabling technologies and digital infrastructures, allows tourists to share their impressions, perceptions and feelings in real time, contributing to co-create the tourism experience and to build, *ex post*, a visual/virtual imaginary about the tourist destination (O' Connor, 2010; Lee *et al.*, 2011; Baka, 2016; Neuhofer *et al.*, 2014).

On the supply side, ICTs revolution has been even more radical: «the technologies have affected the way tourism organizations conduct their business and, in particular, the way organizations distribute their tourism products in the marketplace» (Garces *et al.*, 2004, p. 603). In the same vein, Buhalis (2003, p. 6) argued that ICTs «enhance the ability of organizations to manage their resources, increase their productivity, communicate their policies and market their offerings, and develop partnerships with all their stakeholders. [...] ICTs also enable organizations to expand geographically and coordinate their activities regionally, nationally and globally».

In their seminal work about the impacts of Internet on key players of tourism industry (hotels and accommodation structure, transports, tour operators, travel agencies *etc.*) Buhalis and Zoge (2007), adopting the framework of Porter's Five Forces, observed that the emergence of the Net and more generally speaking of the ICTs, deeply altered the organizational structure of the sector, the competition patterns and the rivalry level, re-distributing the bargaining powers of buyers and suppliers, lowering the barriers to entrance and redefining the effects of substitution.

The rivalry pressures have been expanded by ICTs both in a spatial and in an organizational view, enhancing transparency and the comparability of offers and simplifying imitation strategies among competitors. This widened the traditional areas of competition, allowing a greater number of tour operators – especially small enterprises – to easier promote their offer, therefore changing the structure of industry's rivalry. In organizational terms, some suppliers benefited from the partial disintermediation of the value chain, the customization opportunities and the scale economies deriving from cost savings caused by the diffusion of ICTs.

The effect of ICTs and in particular of Internet on the bargaining power of suppliers depends on the position and the power in the distribution systems of tourism industry. For instance, Garkavenko and Milne (2008) argued that travel agencies are particularly vulnerable because a greater number of travelers organizes by themselves their trip, overstepping their usual role, directly contacting the accommodation structures and the carriers (airlines, railways *etc.*). In order to face, suppliers have to develop new business model with a certain level of flexibility in order to face the changing market conditions and to manage their «digital exposure».

In terms of substitution, which clearly also depends on the travelers' willingness to change consumption behaviors, the Internet produced not a few issues. The exponential increase of the number of suppliers caused by the lowering of barriers to entrance do not directly produce a greater differentiation among tourism offers: the aforementioned imitation strategies and the facility to compare proposals from the buyers' side for the

transparency of disposable information made speedier, easier and lower the costs of substitution.

Also new entrants benefited from the revolutionized channels of distributions: Internet provided a number of platforms to interact directly with travelers and to establish profitable collaborative relations with other tourism businesses but economic investments in technologies and governmental barriers have not to be undervalued.

Discussed the impacts of ICTs on both tourism demand and supply, the more strictly geographical implications of the so-called digital divide for the tourism industry could be better understood. If ICTs are so pervasive, it is possible to assert that the digital endowment of regions and enterprises could affect the success of the tourism industries. As observed by Minghetti and Buhalis (2010, p. 277), «ICT-advanced tourists will find easier to arrange travel in high-and upper-access tourism regions and interact with digitally developed organizations. This provokes a sort of clusterization of the market that potentially marginalizes the less digitalized destinations that are able to attract only specific segments of domestic and foreign travelers. Furthermore, the lack of digital endowment of the tourism destination could also negatively influence the post-experience evaluation by tourists, determining a sort of cumulative effect».

In conclusion, despite a growing attention to the impact of ICTs on the tourism, empirical studies on the role of the regional digital endowment in determining tourist demand are still not widespread. This study tries to provide a first reflection on the topic through the Italian case.

3. Data and methodology

In this paper we try to understand in what measure the *digital power* is able to boost the domestic tourism demand. In order to evaluate to what extent digital endowment among enterprises and ICTs throughout the Italian provinces are able to enhance the tourism demand in Italy, a panel data involving 107 provinces through the five-year period of 2009-2013 has been observed. More in depth, the parameter related to the *nights spent* was regarded as preferable to be representative of the dependent variable in the purposed models. For what concerns the independent variables, with the aim to understand what the influence of the digital power on the domestic tourism demand is, we have decided to observe the relationships from two different perspectives: the *public* dimension (or *public participation*) – and the *private* dimension (or *private opportunity*).

- The *public* dimension (or *public participation*, since here is supposed a public involvement for the considered parameter) related to the *digital power* here is expressed by weighting the ICTs endowment and the size of the Italian tourism industry⁵ (which we indicate here approximately, by considering the number of enterprises working in hospitality and food and beverage sectors). The index of ICTs

⁵ In the following models we will indicate the size of the tourism industry with the expression «A&R» – i.e. Accommodations and Restaurants – which refers to the number of enterprises who were involved in the considered time period (2009-2013) in the hospitality sector, by considering the number of hotels and complementary accommodation structures, other than the number of business activities involved into the provision of food and beverage products and services.

endowment (ICTs) represents the degree of openness of the territories (in this case, the provinces) towards the telephony and telematics sectors in Italy. It was formerly known as «index of infrastructural endowment for telephony and telematics» and it consists in a synthetic index (elaborated by Tagliacarne Research Institute) involving 4 different indicators: resident population in municipalities with a spatial surface covered for more than 50% by ADSL; resident population in municipalities with the whole surface covered by HDSL; resident population in municipalities with the whole surface covered by UMTS; resident population in municipalities with a spatial surface covered for more than 76% by ADSL. This index, in combination with A&R, will give a measure of how about the tourism enterprises falling into territories with good level of telephonic and telematics endowments are able to vehicle tourism flows in Italy and it was elaborated by considering as a break point the value of 100, below which the territories are considered as disadvantaged and upon which territories are considered as competitive under this point of view.

- The *private* dimension (or *private opportunity*, since here is supposed a private involvement for the considered parameter) related to the *digital power*, instead, here is expressed by weighting the Digital Endowment among the enterprises (DE) and the size of the Italian tourism industry (as before, see footnote 1). The index of Digital Endowment among the enterprises (formerly elaborated by Tagliacarne Research Institute) reflects a measure about the degree of digitalization of enterprises in Italy. It is expressed by the percentage of enterprises who are endowed by the highest type of broadband in Italy, the ADSL. In this case also, since this is a general measure, which not considers the economic sectors as separated, it will be combined in the estimations with A&R, in order to reflect a more accurate measure of tourism activities who are digitally endowed and then it will be tested on the dependent variable.

These last two combined independent variables will be the most interesting to evaluate when making inference with the dependent variable, which is – more simply – the size of annual domestic *nights spent* in Italy, at a provincial scale.

With the aim to strengthen the models, we decided to include into the estimations some control variables. In this case, for «control variables» we intend some dimensions – expressed in the shape of independent variables – which could have causal relationships with the domestic tourism demand and that could have influence on the same⁶. On such basis, the following control variables were considered:

1. *Tourism Enterprises Awareness*, with particular reference to the enterprises operating in tourism sector. This is an indicator elaborated by the Italian official centre for statistics (ISTAT), which is «aimed to detecting judgements and expectations of entrepreneurs about the main business variables (such as orders level, business trends, employment trends *etc.*)». We can summarize that this

⁶ This is regardless of whether there is a positive or negative influence: for example, the *population*, normally, has a negative impact on tourism; if the population grows it means that there are more people and therefore tourism, which is not a primary good, obviously slides in the scale of a consumer's priorities (presumably a population increase means having more young children and this means facing other expenses rather than those for travels and recreation). On the other side, the *per capita GDP*, obviously, does produces exactly the opposite effect on the tourist flows: it is quite evident that if the purchasing power increases, the propensity to spend for *non-core* products and services (such as those for tourism) also increases.

- represents something like an awareness of the tourism entrepreneurs on the own businesses' opportunities;
2. *Tourism Internet Usage*, i.e. the usage rate of internet for consulting products/services related to the tourism sector. At this purpose, ISTAT notes that «the information collected allows us to understand the habits of citizens and the problems they face every day [...] allowing us to understand how individuals live and how satisfied they are with their conditions, their economic situation, the area in which they live, the functioning of public services that should contribute to the improvement of the quality of life». On such basis, since we are interested to consider how much individuals, through the *digital power*, access to services related to the tourism sector, we include in the model the rate of «peoples of 6 years and more who have used internet in the last three months for consulting services related to travels and accommodations»;
 3. *Tourism Internet Purchasing*, i.e. the usage rate of internet for purchasing products/services related to the tourism sector. This indicator, elaborated by ISTAT, is quite similar to the previous one but with the only difference that here only individuals who have purchased products/services related to travels and accommodations are considered. For the same reasons expressed above, we are interested to consider how much individuals – through the *internet channel* – «have purchased in the last three months products and services» related to the tourism sector;
 4. *Literacy*, i.e. the school enrollment index of individuals involved into tourism processes. We believe that this variable is able to control for how much the schooling rate of individuals can influence the willingness to travel, because the higher literacy is, the more will be the need to travel for discover new places, boosting the hospitality sector. We computed this measure by considering the ratio between the number of graduates and the population density, weighted at a provincial extent for the considered time period;
 5. *Per Capita GDP*, because for obvious reasons an increase or decrease in the individuals' spending capacity can influence the opportunity to have (or not) a trip for tourism reasons.

All the variables are expressed through their natural logarithm. The descriptive statistics of all the aforementioned variables are summarized in the following table.

Abb.	Brief description	Source	Mean	Std. dev.	Min	Max
$\ln NS_d$	Domestic nights spent among Italian provinces (number, then natural logarithm)	ISTAT	13.87	1.14	10.76	16.34
$\ln ICTs^*A\&R$	Approximation of telephonic and telematic endowment (ICTs) among Italian provinces weighted for tourism industry (combined index, then natural logarithm)	Tagliacarne Research Institute, then own calculation	12.16	1.08	8.89	15.36
$\ln DE^*A\&R$	Approximation of digital endowment of enterprises (DE)	Tagliacarne Research	12.25	0.73	10.40	14.77

	among Italian provinces weighted for tourism industry (combined index, then natural logarithm)	Institute, then own calculation					
_n TEA	Tourism Enterprises Awareness among Italian provinces (rate, then natural logarithm)	ISTAT	4.50	0.11	4.34	4.62	
_n TIU	Tourism Internet Usage among Italian provinces (rate, then natural logarithm)	ISTAT	3.76	0.17	3.23	4.03	
_n TIP	Tourism Internet Purchasing among Italian provinces (rate, then natural logarithm)	ISTAT	3.48	0.20	2.72	3.84	
_n Lit	Literacy among Italian provinces (rate, then natural logarithm)	ISTAT, then own calculation	1.89	0.27	1.24	2.69	
_n GDPpc	Per Capita GDP among Italian provinces (number, then natural logarithm)	ISTAT	10.07	0.27	9.48	10.85	

Table 1: Descriptive statistics of the variables.

Note: Observations: N=535; Provinces=107; Years=5, period 2009-2013. Source: Authors' elaboration.

As for the methodology, in this study the spatial analysis was regarded as preferable, because of the extremely high values found in correspondence of the Moran's and Lagrangian tests (Anselin, 1988). More generally, this kind of estimation involves almost all the provinces of Italian peninsula (from the sample there were excluded only those provinces instituted after the considered period, such as, for instance, the province of Barletta-Andria-Trani) and this lead to consider that it is likely that by estimating a global effect on a whole national territory implies that a strong probability of bias in estimation can occur. On such basis, the simple Ordinary Least Square method of processing data (OLS) cannot be considered appropriate in this kind of estimation and this was substantially confirmed after having tested for the two aforementioned spatial dependence tests (Anselin, 2009). In particular, when we refer to spatial analysis models, we are considering that we are in presence of spatial autocorrelation between some variables in nearby or «neighboring» areas (Briggs, 2010). In this case, all the purposed estimations are affected by spatial dependence as shown by Moran's and Lagrangian tests (which are reported in Appendix to this article, for each of the three models) and, in particular, the spatial dependence tests revealed that we are in presence both of spatial error and of spatial lag in the models. For these reasons, in order to provide a full reliable estimation, both spatial error and spatial lag models are computed in all estimations.

As for the *spatial error* model, the general formula takes the following structure:

$$y = \beta_o + X\beta + \lambda W_{\varepsilon} + u \quad [1]$$

where y represents the set of $N \times 1$ observations regarding the dependent variable; β_o is the intercept; X is the $N \times K$ matrix of observations regarding the explanatory variables; β is the $K \times 1$ vector of regression coefficients; W_{ε} represents the spatial weights matrix, λ is the *lambda* spatial autoregressive coefficient term and u is an error term, also known as «white noise» (Matthews, 2006; Briggs, 2010). On the other side, in order to compute also the *spatial lag* model, the general formula comes as follow:

$$y = \beta_o + X\beta + \rho W_y + \varepsilon \quad [2]$$

where y , as previously, is the $N \times 1$ matrix of dependent variables observations; β_o is the intercept; $X\beta$ is the $N \times K$ matrix of observation on exogenous explanatory variables computed by considering the $K \times 1$ vector of regression coefficient; ρ is the *rho* spatial autoregressive coefficient; W_y is the $N \times 1$ vector of spatial lag for the dependent variables (y) and ε is a vector of normally distributed random error terms (Matthews, 2006; Briggs, 2010).

3.1. Results

The first elaborations are related to the *public* dimension (or *public participation*), by considering the combined impact of ICTs endowment (ICTs) and Accommodation and Restaurant facilities (A&R) on the domestic tourism demand (NS_d) as main independent variable, and all the other control variables as secondary independent variables. The results are summarized in the following table (models 1 and 2).

Dependent Variable: Domestic Nights Spent (NS_d)	Spatial error model (1)	Spatial lag model (2)
ICTs*A&R (combined)	0.792*** (0.0440)	0.781*** (0.0432)
TEA	1.426*** (0.3825)	1.579*** (0.3737)
TIU	-0.513 (0.3743)	-0.692* (0.3528)
TIP	-1.536*** (0.2589)	-1.588*** (0.2556)
Lit	1.363*** (0.1727)	1.370*** (0.1742)
GDPpc	1.413*** (0.2174)	1.194*** (0.1906)
constant	-11.05*** (2.6315)	-20.58*** (2.7411)
λ (lambda)	0.937*** (0.0607)	
rho		0.819*** (0.1370)
Variance ratio	0.507	0.497

Squared corr.	0.482	0.506
Sigma	0.79	0.80
Log likelihood	-633.83	
Wald test of lambda, $\lambda=0$: $\chi^2(1)=$	237.906 (0.000)	
Likelihood ratio test of lambda, $\lambda=0$: $\chi^2(1)=$	35.461 (0.000)	
Lagrange multiplier test of lambda, $\lambda=0$: $\chi^2(1)=$	139.807 (0.000)	
Acceptable range for λ	-4.059 $<\lambda < 1$	
Wald test of rho=0: $\chi^2(1)=$		35.741 (0.000)
Likelihood ratio test of rho=0: $\chi^2(1)=$		20.126 (0.000)
Lagrange multiplier test of rho=0: $\chi^2(1)=$		32.963 (0.000)
Acceptable range for rho		-4.059 $<\rho < 1$
NUTS-3 provinces	107	107
Population control	Yes	Yes
Observations	535	535

Table 2: Effects of ICTs and Accommodations&Restaurants on domestic tourism flows – Public dimension perspective (NUTS-3). Years 2009-2013.

Note: all variables are expressed in their natural logarithm; standard errors are given in brackets; ***denotes statistical significance at $p < 0.01$, *denotes statistical significance at $p < 0.10$. Source: authors' elaboration.

From the Table 2 it appears quite clear that the main independent variable, the combined estimation of ICTs and Accommodation and Restaurant Facilities (ICTs*A&R), has a positive effect on the domestic tourism flows (NS_d), showing almost equal values both in the spatial error model and in the spatial lag model ($\beta_1 = +0.792$; $\beta_2 = 0.781$), and the values assume the highest significance levels ($p < 0.01$). The similarity between the values of the two models implies a good fit of the data to the proposed models; in other terms, we can say that, as expected from the assumption of this manuscript, the variable «ICTs*A&R» represents a good and reliable predictor of the dependent variable (domestic tourism demand) and, for the aforementioned purposes, the *public* dimension (or *public participation*), with its centrality in the process of modernization of the digital infrastructures, plays a primary role for enhancing the domestic tourism demand. As regards the other independent variables of the models (that we called «control variables»), in the Table 2 we found strong positive values for «Tourism Enterprises Awareness» ($\beta_1 = +1.426$; $\beta_2 = 1.579$), «Literacy» ($\beta_1 = +1.363$; $\beta_2 = 1.370$) and «per capita GDP» ($\beta_1 = +1.413$; $\beta_2 = 1.194$); on the other side, with some surprise, we observe that the control variable related to the «Tourism Internet Purchasing» has a significant negative effect on the dependent variable ($\beta_1 = -1.536$; $\beta_2 = -1.588$), while the other negative value is provided by the control variable «Tourism Internet Usage», but in this case the significance is only limited to the value of the spatial lag model ($\beta_2 = -0.692$), since the value of the related spatial error model does not produce statistical significance. All the possible explanations of these results, in particular for what concerns the negative values, are postponed to the following paragraph.

The second elaborations are related to the *private* dimension (or *private opportunity*), by considering the combined effect of Digital Endowment among the enterprises (DE) and Accommodation and Restaurant facilities (A&R) on the domestic tourism demand

(NS_d) as main independent variable, and all the other control variables as secondary independent variables. The results are summarized in the following table (models 3 and 4).

Dependent Variable: Domestic Nights Spent (NS_d)	Spatial error model (3)	Spatial lag model (4)
DE*A&R (combined)	1.188*** (0.0537)	1.189*** (0.0525)
TEA	1.499*** (0.3502)	1.684*** (0.3390)
TIU	0.036 (0.3445)	-0.233 (0.3220)
TIP	-1.305*** (0.2318)	-1.309*** (0.2261)
Lit	0.521*** (0.1374)	0.559*** (0.1369)
GDPpc	0.563*** (0.2111)	0.499*** (0.1767)
constant	-9.089*** (2.4765)	-21.74*** (2.2191)
λ (lambda)	0.9536*** (0.0456)	
rho		0.924*** (0.0707)
Variance ratio	0.556	0.574
Squared corr.	0.556	0.594
Sigma	0.72	0.73
Log likelihood	-586.78	-590.10
Wald test of lambda, λ=0: χ²(1)=	436.846 (0.000)	
Likelihood ratio test of lambda, λ=0: χ²(1)=	46.594 (0.000)	
Lagrange multiplier test of lambda, λ=0: χ²(1)=	210.051 (0.000)	
Acceptable range for λ	-4.059 <λ< 1	
Wald test of rho=0: χ²(1)=		170.488 (0.000)
Likelihood ratio test of rho=0: χ²(1)=		39.946 (0.000)
Lagrange multiplier test of rho=0: χ²(1)=		78.677 (0.000)
Acceptable range for rho		-4.059 <rho< 1
NUTS-3 provinces	107	107
Population control	Yes	Yes
Observations	535	535

Table 3: Effects of DE and Accommodations&Restaurants on domestic tourism flows – Private dimension perspective (NUTS-3). Years 2009-2013.

Note: all variables are expressed in their natural logarithm; standard errors are given in brackets; ***denotes statistical significance at p<0.01. Source: authors' elaboration.

For what concerns the *private* dimension (or *private opportunity*) of the digital *power*, the Table 3 shows clear results in regard to the effect of the Digital Endowment among the enterprises (DE) on the domestic tourism flows (NS_d). In particular, if compared to the previous models (1) and (2), we can observe that the *private* dimension of the digital *power* among the tourism sector, here expressed by combining the diffusion of the digitalization among the enterprises of all kind weighted for the size of the tourism industry, has a greater impact on the domestic tourism demand. More in detail, the coefficients are significant both for the spatial error model and the spatial lag model ($\beta_3=1.118$; $\beta_4= 1.189$) and the approximatively identical values of both estimations can be read, like before, as a measure of goodness of fit of the models to the proposed data. Moreover, their related p-values shows a maximum significance level ($p<0.01$). Just like the previous models (1) and (2), the main independent variable of the models (3) and (4) represents a very good predictor of the independent variable, here expressed by the national (or domestic) tourism demand. As for the «control variables» here used, we notice some analogies and some differences in respect to the previous model related to the public *dimension*; in particular, the value of the variable «Tourism Enterprises Awareness» still remains nearly identical to the previous models (1) and (2), with a strong positive impact on the dependent variable ($\beta_3=1.499$; $\beta_4= 1.684$), while the values related to the control variables «Literacy» and «per capita GDP» – while remaining positive in sign – shows lower values in the coefficients' term ($\beta_3=0.521$; $\beta_4=0.559$ for «Literacy»; $\beta_3=0.563$; $\beta_4=0.499$ for «per capita GDP») if compared to the same variables in the previous models. On the other side, as for the negative values, the control variable «Tourism Internet Purchasing» still remains strongly negative in coefficients ($\beta_3= -1.305$; $\beta_4= 0.499$) with the maximum significance level ($p<0.01$) both in spatial error model and in spatial lag model, while the other control variable «Tourism Internet Usage» here does not show any significance from the statistical point of view, for both the estimations, differently from the previous estimation, where it shows a positive coefficient in the spatial lag model (2). At the end of the reading of all these results, we can state that some estimations confirm the general purposes of this paper, in particular for what concerns the strong impact of the digital *power* on the domestic tourism, expressed both in terms of *public* participation and in terms of *private* opportunity. By contrast, there are some coefficients – here we refer to the ones related to the values of «Tourism Internet Purchasing» and «Tourism Internet Usage» –that, at first sight, leave us perplexed, even after having controlled them carefully in terms of all the possible significance parameters for the reliability of the estimations, which show in all cases a great adaptability and an excellent fit to the proposed models. But, actually, the possible interpretation of these findings comes simpler than it sounds, and all the eventual policy implications and technical considerations are postponed in the section 4.

The reasons for what have been applied the spatial regression models in both the estimations' tables are provided into the related Appendix at the end of the paper, showing the values of Moran's I, Lagrangian and Robust Lagrangian Multipliers tests (Anselin *et al.*, 2006) for all the four models (1) (2) (3) and (4), in order to detect the spatial dependence both for the spatial error models (1) and (3) and for the spatial lag models (2) and (4).

4. Discussion

At first glance, from the results coming out by models proposed in the previous paragraph, some significative evidences appear immediately detectable and they are briefly summarized in the following highlights:

- The digital endowment, seen from both perspectives (*public* participation and *private* opportunity), if well implemented among structures and tourism-related facilities, is able to produce consistent positive effects on the domestic tourism demand, in order to contribute to revitalize it and rebalance the recent trends reversal described into the paragraph 1;
- A positive awareness among the tourism-related enterprises which operates in the national hospitality industry is likely to have positive reflection on the residents' tourism demand;
- The usage of the internet channel for consulting products and services related to the tourism industry, most of the times does not have statistical effects in the face of the domestic demand, and when it produces some significative effect, the sign is negative;
- The purchase of products and services linked to the tourism industry, made by using the internet channel, in all the estimations seems to have a negative (and robust) impact on the aggregate domestic tourism demand;
- An enhanced literacy level among the resident population seems to be able to produce positive effects on the domestic tourism demand;
- Increased levels of the consumers' spending capacity, as expected, is likely to produce better performances in terms of national tourism flows.

In order to have a more punctual examination about the impact of the singular independent variables on the domestic tourism demand, an explanation for each coefficient will be provided. For what concerns the impact of the ICTs on the domestic demand, the results (1) (2) – as expected in the statement of this paper – confirm the general assumption: this means that if the enterprises working in tourism industry (here expressed with the food and beverage and hospitality enterprises) can benefit from an enhanced levels of the endowment of telephonic and telematics, it is probably that this combination of factors would generate an acceleration in the domestic tourism demand. In the compute of this variable a positive effect emerges on the dependent variable of +0.792 in case of spatial error model, and a similar positive effect of +0.781 in case of spatial lag model. In the description of this variable (see paragraph 3), the conditionality that this is a measure which depends in large (or almost completely) part from the *public* participation in the process of investments in information technologies has been stressed. For instance, this means that it is not possible to pursue the objective to attract more domestic tourists in territories where the endowment of information and communication technology is lacking and, consequently, this endowment is not at the disposal of the tourism-related enterprises for improving the own attractiveness and technological efficiency. Likewise, it is also probably that those tourism-related enterprises, which operates on territories where the local governments and administrations are reticent in favor of the recruitment of the necessary monetary budget and accessory resources for implementing the ICTs, will not be willing to make investments on the own business for improve the digital technologies (for example, an hotel located in a ultra-remote area with poor ICTs endowment maybe will not be interested in implementing a personal online platform for reservation or joining into a

digital shared consortium with other operators). On the basis of such evidence, it is possible to state that the *public* participation in the process of co-creation of the conditions for reinforcing the Information and Communication Technology in favor of the enterprises working in the hospitality sector would represent a priority for the central and local governments, if one of the goals of the tourism policies was represented by the increase of the domestic tourism demand, just like as occurred in China in the early years of 2000, where the central governments were crucial for determining the greatest tourism expansion moment in the Country's history (Ma *et al.*, 2003).

In regard to the other main independent variable used into this study, the digital endowment diffused among the tourism enterprises, we observe that it has a fully significant and positive coefficient towards the dependent variable, both for the spatial error model (+1.188) and for the spatial lag model (+1.189). In this regard, a prior consideration is that the effect of the *private* dimension on the domestic tourism demand is higher than the one considered before, the *public* dimension, and this can tell us that the enterprises engagement in regard to the openness towards the digital endowment is presumably more decisive for stimulating the national demand instead of the involving of the central and local governments, although the effects of the two dimensions are strictly linked among each other. Since here the index of Digital Endowment, weighted on the tourism facilities and enterprises, concerns those enterprises which are equipped with the highest type of broadband currently available in Italy (ADSL), we can assume that the more the enterprises are willing to adopt this type of digital technology the higher will be the probability to engage a larger number of tourists, always by considering the residents one, and this is also consistent with Berné *et al.* (2015), who found in their study a deep positive relationship between the market performances of tourism businesses and the use of digital technologies, meaning that an increase of the market share, number of customers and the competitive position is the reflection of an increased number of tourists and nights spent on the hosting territory. Of course, it appears quite evident that the possibility to adopt a digital endowment for an enterprise depends by the measure in which the respective hosting territory is effectively endowed by the appropriate infrastructures of Information and Communication Technologies and, for these reasons, we can say that the two main independent variables are chained: if one increases, the other is likely to have a proportional increase.

After having discussed the effects and the possible implications deriving from the two main independent variables, now we start considering the coefficients of the «control variables» used in all the estimations. In particular, for what concerns the «Tourism Enterprises Awareness», there are no doubts that this parameter has a positive impact on the domestic tourism demand in all cases, since the respective coefficients are basically identical in all the four estimations (1) (2) (3) (4) and the related probability values show always considerable significance levels. Given that this parameter is elaborated by ISTAT with the purpose of understanding what is the current and future degree of optimism regarding the possible achievements and performances of the tourism-related enterprises and facilities, we can conclude that the more positive the ambience of the tourism sector is, the higher will be the possibility of the tourist operators and practitioners to influence the domestic tourism demand in Italy. Also in this case, positive perceptions – and thus positive awareness towards the own business – might be expected if the general sector trend is incline towards a positive conjuncture

period (multiple variables may affect this variable, such as climate conditions, economic recessions, risks of international terrorism, levels of bureaucratization of the national legislation on tourism *etc.*) and studies have demonstrated that even in periods of economic recessions the environmental benefits and costs of tourism are perceived as positive for the mass tourism destinations (Garau-Vadell *et al.*, 2018).

One of the main singularities regarding the results of this analysis is the one represented by the two control variables «Tourism Internet Usage» and «Tourism Internet Purchasing». In the case of TIU, it shows a negative value with low levels of significance only in the model (2), while in all the other models it does not show any significant value; on the other side, in case of TIP, it shows strong negative coefficients in all the estimations (1) (2) (3) (4), with the maximum level of significance ($p < 0.01$). One can expect that a major usage of internet channels or a major rate of purchasing of tourism-related products and services provided by internet channels can enhance the domestic tourism demand but, in this case, we observe remarkable negative values in the coefficients related to these variables, in particular for what concerns the «Tourism Internet Purchasing». The interpretations and the possible reasons behind this value can be multi-faceted:

- one hypothesis is that both the «consultation» and the «purchasing» of the tourism-related products and services made by digital channels express the prerogative of a precise market segment, in this case represented by the so-called *youth* tourism market. They are, by and large, young «price-conscious» (Carr, 1998) travelers in search for a tourist destination and characterized by a low purchasing power, who are used to assemble their «tourism package» through the digital channels, in order to save money on the overall cost of the travel experience (accommodation, transportation, entrance tickets, accessory services, *etc.*) and to avoid the costs of the *intermediation* services. On the other side, especially in Italy, we can denote another important portion of the tourism demand, the *senior* market, which is disinclined towards the use of digital technologies and characterized by a higher purchasing power (Huber *et al.*, 2018), for whom the presence of the *intermediation* (for reservations, travel arrangements and all the possible products and services needed during a travel) is still of great importance. Since in this analysis the domestic tourism demand was considered as aggregate and not divided by type of visitors, this could mean that, in presence of an uncontrolled growth of the *youth* market in face of the *senior* market, the excessive process of *disintermediation* (Tse, 2003) may bring towards an erosion of large part of the domestic demand, which would result into a downturn of the residents' tourism flows;
- another hypothesis concerns the degree of loyalty of the domestic tourism demand in the choice of the desired destination. In particular, we refer to the evidence that in Italy there are several kinds of tourism offers – from the seaside tourism, mountain, thermal, rural, lake, to the naturalistic tourism, and so on – and for a considerable portion of the domestic demand, the choice of a specific destination or a specific accommodation represents something like an automatic mechanism deriving from a well-established repetitiveness in the purchasing process. Moreover, recent statistics coming from the report «Travels and Holidays» among the Italian domestic demand (ISTAT, 2017) show that the 37% of tourists has not even made any reservations, and the 33% of this quota is wont to go to friends and relatives (Munoz *et al.*, 2017) for taking holiday periods, by missing – in this way – to the official arrivals and

nights spent statistics (Gaspareniene and Remeikiene, 2016). This aspect could explain the non-necessity to have recourse to digital technology for consulting and/or purchasing tourism-related products and services. But, in this way, the general assumption of improving the own digital endowment for the tourism enterprises and facilities would disappear for the aim to engage domestic flows, and this could be also a reason explaining the general decrease of Italian tourism demand in face of the non-residents' one.

In any of these possible interpretations, the values of the considered coefficients open the doors to a wider reflection, which suggests the implementation of multiple methodologies considering the direct involvement of resident tourists towards the use of the digital technologies for purchasing or consulting tourism-related products and services.

For what concerns the control variable «Literacy», we observe that it produces statistical effects in all the four models, but the coefficients are higher in case of models (1) and (2) in face of models (3) and (4). We used this parameter, weighted for the provincial population, in order to consider to what extent, for example, the capacity of search for digital information, the effectiveness in communication and the possibility to create digital contents, are able to affect the propensity to travel of domestic individuals. As expected, we found in our models a confirmation that the «Literacy» is able to push the domestic demand, extending to the tourism market what has been already proved for other products' market segments.

The last control variable used in the estimations is the per capita provincial Gross Domestic Product. The per capita GDP is a measure commonly used in the majority of estimation models, in particular when referring to the tourism systems, since it provides an income measure able to influence the purchasing or the consumption of the *secondary goods*, such as those related to the tourism expenditures. As largely expected, also considering the main baseline literature, the per capita GDP produces positive statistical effects in all the four proposed models (1) (2) (3) (4), meaning that a general increase of income levels will probably suppose a major willingness to travel of the domestic demand.

We consider it appropriate to emphasize that all the results provided into the Tables 2 and 3 have been computed by considering the probability to be biased due to the geographical extent of this analysis, which involves almost all the provinces of the Peninsula. This means that, in short, the results are totally affected by spatial dependence, i.e. it is unlikely that an effect may occur in a province without that the same occurs also in the neighboring provinces.

5. Concluding remarks

This study can be regarded as a first exploratory attempt to understand the weight of the digital endowment and the role of Information Communication Technology in tourism industry. In particular, as previously stated, we have chosen to consider into the analysis only the effects of these two dimensions on the domestic tourism demand, on the basis of the recent and perturbing trends deriving by the official statistics concerning the evolution of foreigners' and residents' tourism demand in Italy.

With this in mind, we have been wondering whether it might be possible to take advantage of the *power* and the potential possibilities arising from the diffusion of the digital technologies in tourism with the purpose to revitalize the domestic tourism demand, which is suffering from an alarming shrinking of the internal flows as opposed to the considerable booming of the foreigners tourists towards the Italian provinces. At this purpose, we have clarified in the methodology section of this paper that the choice to use a regression model taking into account the possible presence of spatial dependence among variables has been supported by the spatial dependence tests, which have confirmed both the presence of spatial error and the presence of spatial lag in all the estimations, as largely expected from the nature of data, which consisted in a panel dataset involving almost all the Italian provinces in the five-years' time period of 2009-2013.

On the basis of the results showed in the section 3 and discussed in the section 4, we can state that our predictions related to the role of the digital endowment in Italy have been confirmed in the computing of the data. In particular, as for the two main predictors, both the public dimension (or participation) and the private dimension (or opportunity), if posed in relation with the digital endowment express a very positive influence on the domestic tourism demand. In other words, if the enterprises operating in the tourism sector are allowed the possibility to have at its disposal the best Information and Communication Technologies in terms of infrastructures for telephonic and telematics, on one side, and if the tourism-related enterprises were more willing to adopt the best digital technologies (here expressed by the use of the highest type of broadband in Italy), on the other side, it would be probable that the domestic tourism demand will start to be on the upswing. In this view, it appears quite evident that these two dimensions are strongly correlated, since the tourism enterprises cannot make use of the best digital technologies if the public governments do not ensure the enterprises the possibility to take advantage from a comprehensive and functioning spatial endowment of digital infrastructures.

Among the other positive findings coming from the control variables used in the analysis, we have found that a general positive conjuncture period among the tourism-related operators and practitioners have a consistent influence on the domestic demand, as well as a generalized increase of the per capita gross domestic product and an enhanced rate of the individuals' literacy (with regard to the master's degree level of school enrollment).

By contrast, we found a generalized and full significative negative sign on the dependent variable when considering the rate of purchasing of tourism-related products and services by using the internet channels. It is right on this critical point that future studies will be called upon to deepen what the reasons behind the negative value of this variable are and what the possible biases under the parameters of this variable may occur in these kinds of estimations. Furthermore, the great variability and diversity of the evolution dynamics of each singular territory can represent a limit to the effectiveness of the econometric estimation techniques used into this article. For example, the non-linear and increasing complexity of the *Learning Tourism Destinations* (Schianetz *et al.*, 2007) could generate significative variations in the timing of implementation of different forms of investments or development plans, in terms of digital endowment as hypothesized in this article, and this may represent surely a bias element in this kind of quantitative analysis.

In conclusion, we can state that the weight of the ICTs in tourism and the levels of digital endowment among the tourism-related enterprises represents two essential leverage to be moved with the aim to let the growth of the internal tourism demand in Italy restart, in terms of global nights spent of Italian tourists towards Italian destinations.

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Appendix

- Fitted models (1) & (2) – *public* dimension: $n_{iNS}(\text{domestic}) = n_{iICTs} * A\&R + n_{iTEA} + n_{iTIU} + n_{iTIP} + n_{iLit} + n_{iGDPpc}$
Ho: spatial dependence among provinces, Alt: no spatial dependence;
 - Fitted models (3) & (4) – *private* dimension: $n_{iNS}(\text{domestic}) = n_{iDE} * A\&R + n_{iTEA} + n_{iTIU} + n_{iTIP} + n_{iLit} + n_{iGDPpc}$
-

Ho: spatial dependence among provinces, Alt: no spatial dependence;

Weights matrices: Distance-based type (inverse distance); Distance band: $0.0 < d \leq 10.0$

	(1)	(2)	(3)	(4)
Spatial Error				
(Moran's I)	19.191° (0.000)		23.204° (0.000)	
(Lagrange multiplier)	139.807° (0.000)		210.051° (0.000)	
(Robust Lagrange multiplier)	108.688° (0.000)		131.723° (0.000)	
Spatial Lag				
(Lagrange multiplier)		32.963° (0.000)		78.677° (0.000)
(Robust Lagrange multiplier)		1.844 (0.175)		0.348 (0.555)
df	1	1	1	1
Weights (W) matrix dimension	535x535	535x535	535x535	535x535
Row-standardized	Yes	Yes	Yes	Yes
Minimum distance:	0.0	0.0	0.0	0.0
Maximum distance:	12.1	12.1	12.1	12.1
Largest minimum distance	0.83	0.83	0.83	0.83
Smallest maximum distance	6.22	6.22	6.22	6.22

Appendix 1: Diagnostic tests for spatial dependence in OLS estimations. Fitted models (1) and (2) for public dimension, fitted models (3) and (4) for private dimension – (NUTS-3). Years 2009-2013.

Note: p-values are given in brackets; denotes the presence of spatial dependence.

Source: authors' elaboration.