Tourism attractiveness in Italy. Some empirical evidence comparing origin-destination domestic tourism flows.

L'attrattività turistica in Italia. Alcune evidenze empiriche confrontando metodi per flussi origine-destinazione.

Francesca Giambona, Emanuela Dreassi, and Alessandro Magrini

Abstract This paper aims to model tourism attractiveness for the twenty Italian regions by using origin-destination flows. To this purpose we consider the Italian domestic tourism flows and a wide range of determinants within the theoretical framework referring to the destination competitiveness theories. Using the same set of covariates (selected from Istat and Enac), we propose a comparison between the Gravity model (commonly used in tourism research) and the Bradley-Terry modelling approach (to date not yet used for tourism). Using different model specifications different empirical findings are obtained. Strengths and weaknesses of both modelling approaches will be analysed and explained.
Abstract *Questo lavoro intende modellare l'attrattiva turistica per le venti regioni italiane utilizzando i flussi turistici interregionali origine-destinazione. A tal fine sono stati considerati i flussi turistici nazionali italiani e una vasta gamma di determinanti all'interno del quadro teorico che si riferisce alle teorie della competitivitá di destinazione. Utilizzando lo stesso set di covariate (selezionato da Istat ed Enac), proponiamo un confronto tra il modello Gravity (comunemente usato in ambito turistico) e il modello Bradley-Terry (fino ad oggi non ancora utilizzato per il l'analisi dell'attrattivit turistica). Usando diverse specificazioni teoriche si otterranno risultati empirici diversi. I punti di forza e di debolezza di entrambi gli approcci di modellazione verranno analizzati e spiegati.*

Key words: Tourism attractiveness, Domestic tourism flows, Bradley-Terry model, Gravity model.

Francesca Giambona
Dip. di Statistica, Informatica, Applicazioni (DiSIA), e-mail: emanuela.dreassi@unifi.it

Emanuela Dreassi
Dip. di Statistica, Informatica, Applicazioni (DiSIA), e-mail: francesca.giambona@unifi.it

Alessandro Magrini
Dip. di Statistica, Informatica, Applicazioni (DiSIA), e-mail: alessandro.magrini@unifi.it

1 Introduction

Domestic tourism represents about 80% of internal (inbound and domestic) tourism consumption in the OECD area [1]. The determinants of both domestic and international tourism flows have been extensively studied and results are documented by empirical literature [2]. As far as local development is concerned, domestic tourism is a key driver also in a mature country like Italy. The recent strategic plan for tourism of the Italian government [3] explicitly includes domestic tourism among the targets and interventions related to the reinforcement of the Italian brand's positioning and attractiveness. A deepen understanding of domestic tourism at subnational level is a condition for a more affective national policies planning.
Tourism attractiveness is an attribute of tourism competitiveness as competitiveness for a destination is "about the ability of the place to optimize its attractiveness for residents and non-residents, to deliver quality, innovative, and attractive (e.g. providing good value for money) tourism services to consumers and to gain market shares on the domestic and global market places, while ensuring that the available resources supporting tourism are used efficiently and in a sustainable way" [4] ; consequently, attractiveness has a key role in competitiveness as the increase of tourist flows (and more general tourism demand) is one target of competitiveness. Tourism attractiveness, in this paper, is analysed by using a model-comparison approach, by comparing the widely used gravity model (GM) respect to the Bradley-Terry model (BTM) not yet used in tourism issue. Both, BTM and GM are used to modelling origin-destination flows, but with different model specification and results interpretation. Gravity models have often been used to analyse tourism flows [5, 6, 7] with extensions to panel data [8, 9, 10] and spatial modelling [11]. Gravity models consider that bilateral flows between two countries are directly proportional to the countries economic masses and inversely proportional to the distance between them. However, the availability of origin-destination flows also allows the use of alternative models. The best-known model in the pairwise framework is the BTM [12]. It has been widely used in empirical applications when the structure of the data and the research questions have to be analysed using a pairwise comparison model [13]. In this paper we compare these modelling approaches in order to analyse the determinants of regional tourism attractiveness and to assess differences between GM and BTM.

2 Data and Models

Following the OECD definition domestic tourism is the tourism of resident visitors within the economic territory of the country of reference. In order to make a comparison between models used for O-D flows we use as dependent variable the Italian domestic flows between regions (NUTS2) available for the year 2016. The choice of covariates that could affect tourism attractiveness refer mainly on the push-pull factors theory. Push factors are related to individual motivations and even perceptions

of the destinations quality of life and image [14, 15, 16], so they are generally represented by individual level data. Pull factors are characteristics of the destination that arouse the desire for travel in the potential tourist and attract tourists to specific destinations. (generally include destination variables like natural attractions, cultural resources, recreational activities, and so on [17, 18]). Covariates are chosen on the basis of the theoretical framework by [19] who identified the main dimensions of competitiveness. In particular, we defined the following five dimensions within the supply side model: environment and scenery, heritage and culture, general infrastructures, tourism activities and situational conditions. For each dimensions several variable have been taken into account, but the final subset of explanatory variable is selected through a stepwise procedure (forward selection), considering the reduction of residual standard deviation.
Gravity model and the Bradley-Terry model are statistical tools to analyse flows when origin-destination matrix is available although they deal with data in a very different way. The basic differences between the two models are mainly due to the different belonging to two groups of different models, as GM belongs to the models with complementarity, whilst BTM refers to the models with competition [20]. In the following a more detailed methodological explanation will be provided.

2.1 Bradley-Terry model

The standard Bradley-Terry model [12, 22] considers the regions as players (e.g., i and j) with different abilities. If the ability of i (for $i = 1, \dots, M$) is higher than the ability of j (for all j), the number of times that i beats j is expected to be higher than the number of times j beats i, that is the number of tourists who prefer the region i coming from the area j. The model specifies the probability that in a pairwise comparison between i and j (for j that range from 1 to $M-1$) tourists prefer the region i to j, as follows:

$$P(i \text{ beats } j) = \pi_{ij} = \frac{\alpha_i}{\alpha_i + \alpha_j} \tag{1}$$

where α_i and α_j represent the ability parameters that measure the intensity of an unobservable (latent) trait in the two players. In the analysis of tourism the ability parameters are the attractiveness parameter of the competing regions. By expressing the model in the logit form, equation 1 becomes

$$\text{logit}(\pi_{ij}) = \lambda_i - \lambda_j \tag{2}$$

where $\lambda_i = \log \alpha_i$ and $\lambda_j = \log \alpha_j$ may be fixed or random parameter.

The basic model allows to make generalisations in several directions (Turner and Firth, 2012), for example, to specify ability as a function of covariates. If player covariates ($r = 1, \dots, p$) are used to explain differences in players' abilities, the parameters λ_i and λ_j are related to the covariates by a linear predictor

$$\lambda_i = \sum_{r=1}^{p} \beta_r x_{ir} + U_i \tag{3}$$

where U_i (and U_j) are normally distributed random terms. Following, equation 2 becomes

$$\text{logit}(\pi_i) = \sum_{r=1}^{p} \beta_r (x_{ir} - x_{jr}) + U_i - U_j \tag{4}$$

In the framework of the Bradley-Terry models, differences in attractiveness parameters (as measured by a fixed or random parameter shared by all pairs in which the same region is involved) are the factors that lead tourists to prefer one region over another. We call them ”ability” of the region to attract tourists.

2.2 Gravity model

Let Y_{ij} the flow from the i-th origin region to the j-th destination region. We consider a Poisson Generalized Linear Mixed Model (GLMM). We consider a set of fixed effects and a set of random intercepts and slopes (one for each destination region). The slopes relate to the logarithm of the distance between the centroid of the origin and destination regions. This, represents a gravity model [21]. The set of random slopes (exponentialized) describes the multiplicative effect of the logarithm of the distance for each destination region on the logarithm of the flow. Fixed effects are considered accordingly with covariates included o the Bradley-Terry model. However, a weakly linear relation is suggested for these and the logarithm of the flows. So, we consider $Y_{ij} \sim Poisson\,(\mu_{ij})$, then the linear predictor

$$\log \mu_{ij} = V_j + W_j \log(\text{distance}_{ij}) + \beta_1 x_i + \sum_{r=2}^{p} \beta_r x_{jr} \tag{5}$$

where V_j and W_j represent, respectively, sets of random intercepts and slopes (each referred to a destination j). A set of $p-1$ covariates, i.e. x_{jr}, are referred to the destination j, another, i.e. x_i, to the origin i. We estimate the model considering or not the internal regional flows. The classical Gravity model include these latter, but to compare results with the BTM we decided to estimate also the GM without the internal regional flows. The distance for internal regional flows are settled considering the radios of the circle with the same area of the region.

3 Results

The final subset of explanatory variable is selected through a stepwise procedure (forward selection), considering the reduction of residual standard deviation for the BTM. The analysis considers the twenty regions (level-2 units) and compares the

BTM and GM models. Random effects for the BTM have a standard deviation equal to 0.23788. For GM the estimate of standard deviation is 10.5737 for the intercepts and 0.8085 for the slopes. When we consider also the within flows we obtain a standard deviation of 12.9196 for intercepts and 0.9715 for slopes. Covariates are representative of local resources (*VILLAGES*= landscapes with historical villages (counts/1 000 km2) and *CULTENDOW*= cultural endowment index (counts/100 km2)), the tourism supply (*BEDS*= number of bed places over number of inhabitants) and transport services (*LOWCOST*=percentage of passengers of low-cost flights). Furthermore, we account for regional population size (*POP*=resident population (thousands) adjusted for outgoing flows). The signs of the covariates are as expected except for the *VILLAGES* variable. Its negative sign can be interpreted as follows: what matters is the presence of attractive historical villages although they are sparse over the territory. However, this result can be also the consequences of a heterogeneity across regions that is not taken into account trough a fixed effect. Table 1 reports the fixed effects estimates from both models. For the gravity model we have considered also the possibility of including internal regional flows. In GM the linear relations between the included covariates and the logarithm of the mean of the flows, are very weak, while in BTM are stronger. Figure 1 displays GM fitted flows (without internal regional flows) random intercept and slopes respect to the distance. Friuli and Trentino are more affected to distance than (on the contrary) Sicily or Molise.
Figure 2 describes the intercept random effects for the two models; both models do not consider internal regional flows. In is interesting the different positioning of Italian regions referring to the fitted values of GM and BTM: i) regions with concordant values as Molise and Lazio (low, low) or Trentino (high, high) or Toscana (medium, medium), ii) regions with different values as Piemonte or Friuli (low, high) or Marche (medium-low, high). Considering the standard GM (i.e. with internal flows) the discrepancy between the fitted flows using GM and BTM is more marked (Figure 3).

4 Conclusions

Although domestic tourism is only a part of total tourism flows, it remains a key driver of competitiveness in Italy. Recent economic crises have revealed a weakness of domestic tourism, which has undergone a period of stagnation and decline, recovering only since 2013, and only in some regions. From a destination point of view, if tourists are likely to find attractive and unattractive a specific destination is a key topic, as this is the key to improving destination performance and assisting, in this case, the Italian tourism industry to regain its attractiveness (competitiveness). In this contribution, a measurement of domestic attractiveness for the twenty Italian regions has been proposed based on an analysis of regional origin-destination tourism flows, by comparing two modelling approaches: the well-known Gravity model and the less-known (especially in tourism) Bradley-Terry model. The

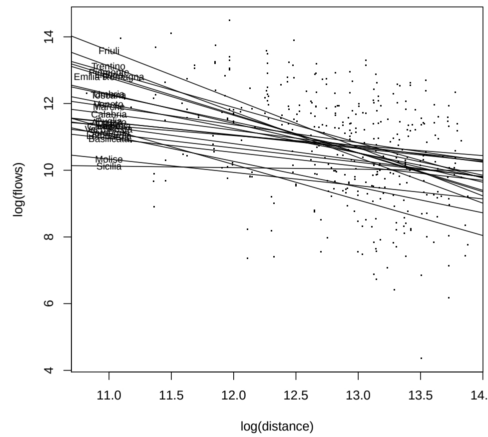

Fig. 1 Random intercepts and slopes from the Gravity model without internal regional flows (the Poisson linear mixed model)

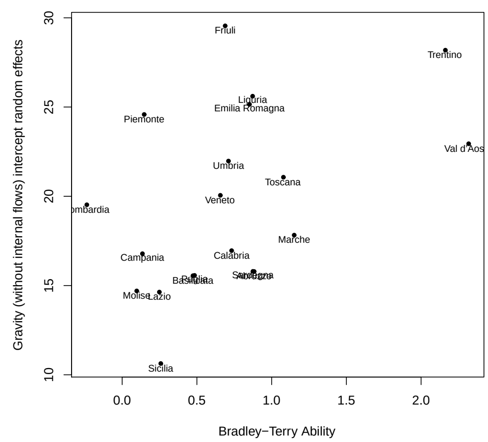

Fig. 2 Random intercepts from Gravity model *versus* the ability parameters from the Bradley-Terry model

Bradley-Terry model found new application on tourism system evaluation, and compared to the usual Gravity model, the Bradley-Terry model changes drastically point of view as it specify attractiveness in a competition point of view. There are many differences between the two models. Mainly, the gravity model, compared to the Bradley-Terry model: *i*) models a flow and not a probability, as it belongs to the category of models with complementarity (nor competition), *ii*) takes into account the distance between origin and destination, *iii*) by including slope random effects for the distance between origin and destination, evaluates for each destination the decay effect of attraction of tourism respect to the distance, *iv*) it can consider also within flows (flows of tourists that move inside each region), *v*) includes covariates,

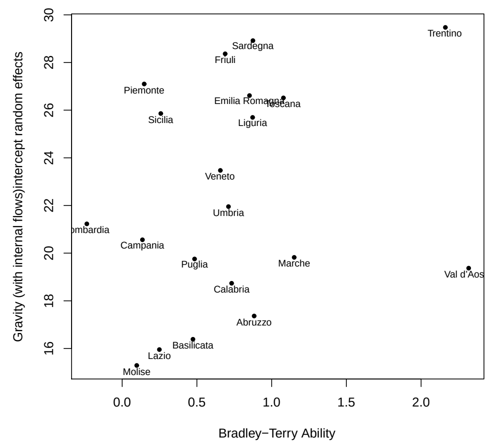

Fig. 3 Random intercepts from Gravity model considering regional within flows *versus* the ability parameters from the Bradley-Terry model

Table 1 Fixed effects from Bradley-Terry and Gravity models

covariates	estimate	s.e.	p-value
Bradley-Terry Model			
population	-6.921e-05	2.840e-05	0.01481
beds	5.709	0.6812	$< 2e-16$
villages	-0.05768	0.02011	0.00413
cultendow	2.299e-03	9.858e-04	0.01968
lowcost	7.762e-03	4.787e-03	0.10494
Gravity Model without internal regional flows			
internal regional flows			
intercept	10.31	0.2641	$< 2e-16$
population	3.792e-04	4.226e-05	$< 2e-16$
beds	7.769e-01	1.889e-03	$< 2e-16$
villages	-1.798e-01	7.218e-05	$< 2e-16$
cultendow	2.668e-03	2.724e-06	$< 2e-16$
lowcost	2.242e-03	1.313e-05	$< 2e-16$
Gravity Model with internal regional flows			
internal regional flows			
intercept	1.031e+01	2.707e-01	$<2e-16$
population	3.815e-04	3.941e-05	$<2e-16$
beds	-1.499e-01	1.686e-03	$<2e-16$
villages	-1.585e-01	6.448e-05	$<2e-16$
cultendow	1.783e-03	2.480e-06	$<2e-16$
lowcost	2.008e-05	1.158e-05	0.083

referring them to the origin or destination, accordingly to their meaning. The use of GM or BTM is not a trivial issue, indeed empirical findings highlight that regions are more or less attractive on the basis of model specification, even if for some regions, i.e. the better and the worst in attractiveness terms, results are very similar.

The availability of a more detailed tourist flows matrix (at the provincial level, for example) could be useful to investigate more deeply the determinants of tourism attractiveness. However, at present, only provincial information is recorded only for the destination, i.e. we would have only region-province tourism flows.

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