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TOURISM, ENVIRONMENTAL QUALITY AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE AND POLICY IMPLICATIONS

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Tourism, environmental quality and economic growth: empirical evidence and policy implications

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Abstract: The causal relationship between tourist demand and supply is investigated employing four time series models: the first model includes nights of stay and number of supplied accommodation; the second model uses nights of stay and supplied beds (*i.e.* capacity); the third model employs nights of stay and the quality of supplied accommodation; finally, the fourth model includes nights of stay and the quality of supplied capacity. To test for Granger causality in the presence of a cointegration relationship between the economic variables of interest, a bivariate VAR model is used. Empirical results are from four distinctive models for Sardinia (Italy) over the time span 1955 to 2004. The first model suggests a unidirectional causal relationship running from demand to accommodation firms; the second model suggests a bi-directional causal relationship between demand and capacity. The third and fourth models indicate the existence of a unidirectional causal relationship running from quality to demand. This empirical finding implies that the environmental conservation policy (*Piano Paesaggistico Regionale*), adopted by the Region of Sardinia, may be feasible without compromising the number of tourists visiting Sardinia and hence, its economic growth.

Keywords: tourist demand, supply, quality, growth, Granger causality, policy intervention.

1. INTRODUCTION[1]

Internationally, tourism is one of the most important economic activities in terms of income, employment, balance of payments, tax revenues and foreign currency source. The *World Tourism Organization* (2001) reports that international trips have multiplied by 25 since the Fifties; in the year 2000, the income generated by international tourism was 200 times higher than that of 1950. Furthermore, the *World Travel & Tourism Coun*cil (2001) forecasts an annual growth rate for international trips of 4% in real terms until the year 2011. The quality of the supplied product and the environmental resources are characterised by scarcity and they are neither endless nor renewable. The more tourists that are attracted by the natural amenities of a certain location the greater the costs associated with negative external effects (*i.e.* pollution and congestion) that compromise the quality of life of local residents and deteriorates the natural ecosystems. From a strictly economic point of view, scarcity determines higher prices of quality natural resources with respect to other goods. Therefore, *ceteris paribus*, tourism specialisation is likely to enhance economic growth if based upon high quality resources (Lanza and Pigliaru, 1999). Examining the literature points out that natural resources enter directly into the utility function of tourist consumers creating a trade off between quantity and quality of resources. In the presence of uncertainty on future generation preferences, the optimal economic choice should be more conservative, in particular when the exploitation choices imply irreversible changes in the quality of natural resources (Fisher and Krutilla, 1975; Pigliaru, 2002). Therefore, in some circumstances, the optimum social solution requires a public intervention (Pigou, 1920; Palmer and Riera, 2003).

As pressure is growing to mitigate the negative externalities on the environment, concern is increasing over the negative impact on the economic growth caused by restrictions on the expansion of accommodation supply. On this issue, one analyses the relationship among tourism, environmental quality and economic growth extending the empirical work proposed by Lanza (1997), and Pigliaru (2002). The investigation of the causal relationship existing between tourism demand and supply can support policy makers in the short and long run decision

making process. In this paper, this causal relationship is analysed by employing a time series analysis and the concept of Granger causality. This methodology is being increasingly employed in recent empirical studies exploring different areas of economic growth (see for example Thornton, 1997; Khalafalla and Webb, 2001; Barot and Yang, 2002; Oh and Lee, 2004; Durbarry, 2004; Kim et al., 2004; Cortés-Jiménez and Pulina, 2006). This paper focuses on the Island of Sardinia (Italy), using as indicators of tourism demand and supply tourist nights of stay, number of accommodation firms, capacity (*i.e.* number of beds), quality of accommodation and quality of capacity supplied, respectively. The number of beds supplied takes into account the dimension of accommodation and can be thought of as a proxy of the quantity of services provided in the existing accommodation. Moreover, quality of supplied accommodation firms and capacity are defined by the quota of accommodation and number of beds within 3-5 stars category. These variables are treated as proxies of quality of existing accommodations and the overall environment. This hypothesis is plausible since the 3-5 stars tourist accommodations are located in areas with high levels of natural amenities. The annual frequency is employed for the time span between 1955 and 2004, for a total of 50 observations. The relationship between demand and supply framework introduces two main critical questions: the importance of a long run planning and the economic and environmental sustainability of tourism production. The organisation of the paper is as follows: the next section describes tourism activity and environmental policies issued by the Region of Sardinia. Section 3 discusses the model and the methodology used, and gives an account of the results achieved. Section 4 considers the policy implications deriving from the empirical analysis. Section 5 provides a conclusion.

2. TOURISM AND ENVIRONMENTAL REGIONAL POLICY

The rich endowment of natural resources, the climate, and the position in the Mediterranean Sea, makes the Italian island of Sardinia very attractive for visitors. The exploitation of environmental resources for economic purposes has been regarded as an opportunity for economic growth since the sixties, when the so called Sardinian Renaissance Plan (*Piano di Rinascita*) was issued under a national law (n.588, 1962) and approved by the Sardinia Government one month later (regional law

n.7, 1962)[2]. The Plan was funded by the national government through a development agency called *Cassa per il Mezzogiorno*, an agency that was created in 1950 to manage the convergence process between the more developed northern regions of Italy and the less developed regions of the South[3]. In the Renaissance Plan, education, transport, construction and environment, agriculture, industry, fishing, local craft and tourism are indicated as the main sectors of interest for economic development[4]. As far as the tourist sector is concerned, in the period between 1965-1969 a five-year executive plan was introduced in which the island was divided into six tourist districts called *Comprensori turistici* (five coastal areas and one internal). At that time, the idea of a tourist district was rather innovative since each *Comprensorio* included areas with homogeneous resources regardless of the administrative borders[5]. However, this rather advanced legislation and planning failed to create these tourism districts for lack of regional urban laws and effective safeguard measures, which represent the necessary conditions to harmonise interventions among the districts (Poddighe, 2001). Since then, and for a long period afterwards, tourism and environmental planning in Sardinia did not follow a long term strategy and, in the majority of cases, the absence of strong regional guidelines allowed local administrations to literally sell the coastline to external investors without any discrimination among projects according to environmental impacts. The relationship between tourism development and the environment in Sardinia passed through four main phases: the neutrality ('50s, '60s and first half of '70s), the concern (the second half of '70s and '80s), the turn point (end of '80s and '90s), the enforcement ('00s). During the '50s, the absence of tourism infrastructure drove the allocation of regional resources to fund the increase in tourist supply (e.g. hotels and complementary accommodation) and associated infrastructures; between the '60s and the first half of the '70s, the region starts the

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[2] The Italian island of Sardinia has a special statute which gives autonomy in legislation. All regional laws are downloadable from the Sardinian website: www.regione.sardegna.it

[3] The main purpose of the Agency is to finance public infrastructure and industrial projects. The agency is closed in 1984.

[4] Despite the recognition on the relevance of all sectors, this plan focuses mainly to the industrial development. For more information on the Renessaince Plan and the industrialisation strategy in Sardinia (Hospers, 2003).

[5] Anticipating the concept of *Local Tourism System* developed in the art.5 of the national tourism law n.135, 2001 (the so called *Legge Quadro sul Turismo*).

activity of tourist planning through the Renaissance Plan. After the failure of the *Comprensori Turistici*, private investment in the coastline was facilitated financing new tourism accommodations and enlarging the existing ones (regional law n.8, 1964). The regional urban planning law, at that time, gave the possibility to local authorities to divide the coastal areas into lots according to the investment bids of private companies[6].

In the second half of the seventies, and during the '80s government concern about the sustainability of economic and tourism development therefore began which resulted in a slow down of building along the coastline slow down through the introduction of a slightly more restrictive law and safeguard measures such as, for instance, the restriction to construct within 150 metres from the coast (regional law n.10, 1976). However, as far as investments in tourism accommodation is concerned, during the '70s and the '80s local and regional authorities appeared to be interested in the quantity of investment rather than the quality. As can be seen in Table 1, particularly in the '70s, the number of unoccupied dwellings (the so called second homes) increased dramatically.

Table 1 Occupied and Unoccupied Dwelling in Sardinia. 1961-2001

Variables	1961	1971	1981	1991	2001
(1) Occupied dwellings	309.029	356.888	432.865	516.139	593.369
(2) Unoccuped dwellings	24.880	35.706	118.189	168.722	208.418
(3) Total dwellings (1)+(2)	333.909	392.594	551.054	684.861	801.787
(4) Ratio (2)/(1)	0,08	0,10	0,27	0,33	0,35
(5) Rooms in occupied dwellings	1.163.336	1.501.639	2.017.939	2.444.566	2.616.158
(6) Rooms in unoccupied dwellings	85.870	135.515	437.737	614.129	777.363
(7) Avg. rooms in occ. Dwelling	3,8	4,2	4,7	4,7	4,4
(8) Avg. rooms in unocc. Dwelling	3,5	3,8	3,7	3,6	3,7
(11) Resident population	1.419.362	1.473.800	1.594.175	1.648.248	1.632.000
(12) Size of territory (km²)	24.089,53	24.089,53	24.089,80	24.089,80	24.089,80
(13) Dwelling density (3)/(12)	13,86	16,30	22,87	28,43	33,28
(14) Unoccupied dwelling density (2)/(12)	1,03	1,48	4,91	7,00	8,65

Source: ISTAT, Istituto Nazionale di Statistica, Censimento della Popolazione e Abitazioni.

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[6] This procedure, was literally called *lottizzazione convenzionale* and was provided for the national urban planning law n.765 of 1967 that was reinforced in the 1969 with the regional n.17 (Poddighe, 2001).

The turning point towards stricter regulations is registered between the end of '80s and the '90s. In 1989, the Sardinian government set out guidelines and tools for planning at any territorial level (regional law n.45), and in 1993 the building permits were only allowed if they were at least 300 meters from the coastline (regional law n.23). As far as tourism accommodation is concerned, other regional funds were allocated to support new hotels, to enlarge the existing ones (law n. 40 1993 and n.9 1998). The policy to expand hotels –see Table 2- aimed to increase the economic impact of tourism in the region, to lengthen tourism season- characterised by a peak in August-, and to reduce the environmental and visual shocks generated by the presence of second home along the coastline[7].

Table 2 Hotels in Sardinia 1961-2004

Variables	1961	1971	1981	1991	2001	2004
(1) Number of hotels	270	380	500	564	690	756
(2) Beds	6.010	20.985	36.529	51.554	76.335	85.983
(3) Average beds per hotel	22,3	55,2	73,1	91,4	110,6	113,7
(4) Hotels density per km²	1,12	1,58	2,08	2,34	2,86	3,14
(5) Hotels density for population (each 1.000 inhabitants)	0,19	0,26	0,31	0,34	0,42	0,46

Source: ISTAT, *Istituto Nazionale di Statistica, Annuario Statistico del Commercio Interno and Statistiche del Turismo.*

In the first half of 2000, the concern about the environment and the sustainability of tourism growth is brought to the fore. The main step forward at this point in time, is the adoption in 2006 of the first Territorial Regional Plan for the coastal areas (*Piano Paesaggistico Regionale* or *PPR*). In the plan, the preservation of the social and natural environment is considered a priority to obtain economic and sustainable development. New buildings are forbidden to individuals and businesses within two kilometres along the coastline and a "luxury" tax is still under discussion for second homes and boats of non–residents holders.

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[7] One of the most interesting cases in Sardinia of tension between development of villas versus hotels is represented in 1997 by the *Ciga Immobiliare* investment project in *Costa Smeralda* which is in the northeast coast of the island. The project, called *Master plan*, is discussed in Piga (2003).

3. MODEL, METHODOLOGY AND RESULTS

The data for the Sardinian Region (Italy) used in this study consist of annual time series for total tourist nights of stays (*NS*), number of registered accommodation firms (*AC*), number of beds (*B*), the number of quality accommodation (*QAC*), obtained by dividing the number of 3, 4 and 5 stars accommodation by the total number of accommodation firms and, finally, the number of quality accommodation (*QB*) expressed in terms of number of beds, obtained by dividing number of 3, 4 and 5 stars bed spaces by the total number of registered beds. Data for each of the before mentioned variables are obtained from EPT and ESIT. The sample period is available from 1955 to 2004 but for the quality variables available from 1961 up to 2003. All data points are transformed into logarithmic scale and are shown in time series plots (Figures 1 and 2).

Figure 1 Nights of stay (*LNS*), accommodation firms (*LAC*) and beds (*LB*) – (1955 –2004)
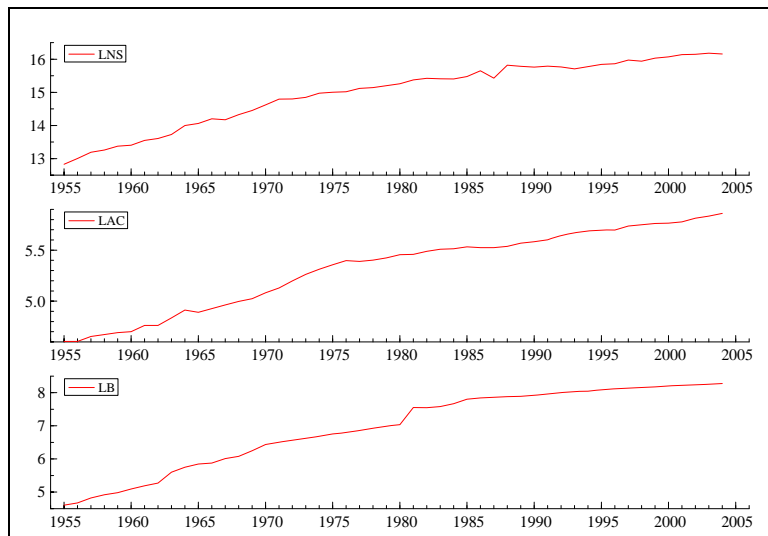
Figure 2 Quality of accommodation firms (*LQAC*) and quality of capacity (*LQB*)[8]
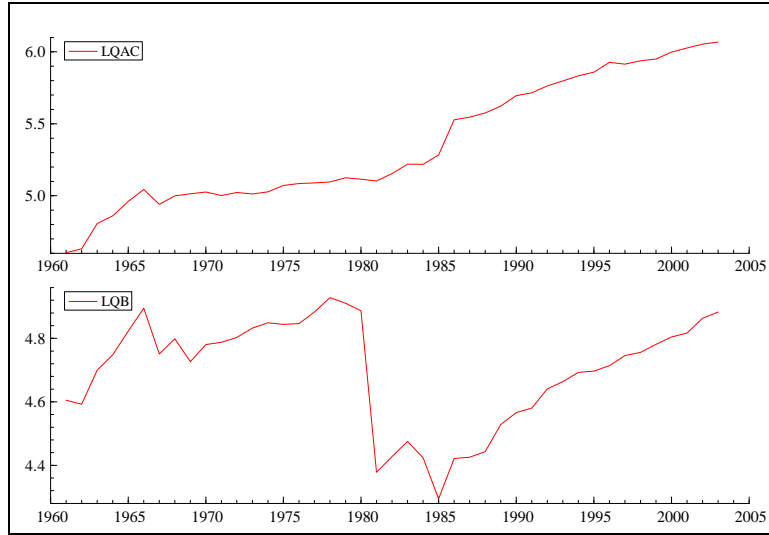
One adopts the following functions: $NS = f(AC)$ and $NS = f(B)$, $NS = f(QAC)$ and $NS = f(QB)$. Expressing the previous mentioned functions in a linear logarithmic regression form one investigates the following relationships:

$$LNS_t = \psi_0 + \psi_1 \, LAC_t + \upsilon_t \tag{1}$$

$$LNS_t = \varpi_0 + \varpi_1 \, LB + \varpi_t \tag{2}$$

$$LNS_t = \lambda_0 + \lambda_1 \, LQAC_t + \tau_t \tag{3}$$

$$LNS_t = \eta_0 + \eta_1 \, LQB + \nu_t \tag{4}$$

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[8] Figure 2 indicates a dramatic decrease in the ratio of number of beds in hotels with 3, 4 and 5 stars over the total capacity in the first part of the '80. The fall can be attributed to the increase in new non-hotels large firms (e.g. camp sites and tourist villages), a sub-market that was targeted with regional government funding in that period to stimulate the rise of mass tourism.

The first step is to test the order of integration of the natural logarithm of all the variables. Table 3 gives the results of the augmented Dickey-Fuller (ADF) and standard Phillips-Perron (PP) test statistics. These tests are used to detect the presence of a unit root for the individual time series and their first differences. Each of the series appears to be integrated of order I(1) in the level form but stationary in first differences (Engle and Granger, 1987). The PP test is consistent with ADF test.

Table 3 Unit root tests

Variable	ADF	Lags	PP	Lags
LNS	-1.56	1	-1.70	0
ΔLNS	-10.85 ***	0	-11.41***	3
LAC	-0.73	0	-0.65	0
ΔLAC	-6.65***	0	-6.67***	3
LB	-0.43	0	-0.19	4
ΔLB	-7.50***	0	-7.74***	5
LQAC	-1.63	0	-1.91	4
ΔLQAC	-6.03***	0	-6.07***	3
LQB	-1.69	0	-1.74	2
ΔLQB	-6.53***	0	-6.53***	1

Notes: (1) MacKinnon critical values for rejection of hypothesis of a unit root. (2) *** indicates significance at the 1%. (3) Δ denotes the first-difference operator. (4) Number of lags set to the first statistically significant lag, testing downwards; number of lags in the ADF test is set upon AIC criterion and PP test upon Newey-West bandwidth. (5) Constant and trend are included in all cases. (6) These tests are run employing Eviews 4.1, 2002.

Given the unit root results, the second step is to use the VAR (Vector Autoregression) approach that Johansen (1988) and Johansen and Juselius (1990) employed to investigate the cointegrating properties of a system. The joint F-test and the AIC, SC and HQ Information Criteria[9] are used to select the number of lags required in each case to assure white-noise residuals; thus, the chosen lag length is accordingly either one or two (Oh and Lee, 2004). The cointegration test results are presented in Table 4.

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[9] Akaike, Schwartz and Hannan-Quinn Information criteria, respectively.

Table 4. Tests for cointegration (Johansen procedure)

Model 1: LNS = f(LAC) - sample 1955-2004		
Hypothesis	r=0	r≤1
λ max test	15.63	11.0
Trace test	26.64**	11.0
Cointegration equation:		
LNS = 2.62 LAC – 0.0042 TREND		
(6.97) (-0.42)		

Model 2: LNS = f(LB) - sample 1955-2004		
Hypothesis	r=0	r≤1
λ max test	30.55***	1.27
Trace test	30.55***	1.27
Cointegration equation:		
LNS = 1.83 LB		
(34.00)		

Model 3: LNS = f(LQAC) - sample 1961-2003		
Hypothesis	r=0	r≤1
λ max test	35.80***	2.36
Trace test	38.17***	2.36
Cointegration equation:		
LNS = 12.32 + 0.71 LQAC		
(8.23) (2.60)		

Model 4: LNS = f(LQB) - sample 1961-2003		
Hypothesis	r=0	r≤1
λ max test	33.40***	3.29
Trace test	36.69***	3.29
Cointegration equation:		
LNS =15.66 + 0.18 LQB		
(5.07) (0.17)		

Notes: (1) Numbers in parenthesis are *t*-test, (2) **, *** denote that a test statistics at the 5% and 1 % levels of significance, respectively. (3) Cointegrating vectors were chosen on the basis of AIC and SC criteria. (4) Tests are run employing Eviews 4.1, 2002.

All the models in Table 4 are VARs employing on the one hand tourist number of stays (*LNS*) and, on the other hand, number of

accommodation (*LAC*), number of beds (*LB*), quality of accommodation (*LQAC*) and quality of capacity (*LQB*), respectively. In each case, a single significant cointegrating vector is identified using the maximum eigenvalue and trace statistics; however, in Model 1 only the trace statistics detects a cointegrating vector. Hence, one concludes that all variables are cointegrated, and causally related in each model (see also Thornton, 1997).

The third step is to carry out a Granger causality test (Sims *et al.,* 1990; Granger *et al.*, 1998; Khalafalla and Webb, 2001) augmented with the error-correction mechanism (*ECT*) as derived from the cointegration relationship (Table 4), as given in equations (5)-(6).

$$\Delta LY = \alpha_1 + \sum_{i=1}^{p} \beta_i \, \Delta LY_{t-i} + \sum_{i=1}^{p} \gamma_i \, \Delta LX_{t-i} + \eta_1 \, ECT_{t-1} + \varepsilon_t \quad (5)$$

$$\Delta LX_t = \alpha_2 + \sum_{i=1}^{p} \sigma_i \, \Delta LX_{t-i} + \sum_{i=1}^{p} \phi_i \, \Delta LY_{t-i} + \eta_2 \, ECT_{t-1} + \mu_t \quad (6)$$

Δ is the difference operator, and ε_t and μ_t are zero-mean, serially uncorrelated random error terms. The *t*-statistics on *ECT* coefficients indicates the existence of long-run causality, whereas the significance of *F*-statistics indicates the presence of a short-run causality. Tests results are provided in Table 5. Specifically, in Eq. (5) causality implies that ΔLX "Granger-causing" ΔLY in the short run, provided that some γ_i are not zero. Likewise, in Eq. (6) ΔLY is "Granger-causing" ΔLX in the short run if some ϕ_i is not zero. Independent variables "cause" the dependent variable in the long run if the error correction terms (Eqs. 5 - 6) are statistically significant. The Granger causality test with different lag selections is also conducted to examine the sensitivity of the test (Granger, 1988; Oh, 2005). The minimum final prediction error suggested by information criteria and a joint *F*-test on the coefficients are used to determine the appropriate lag length. Specifically, optimal lag one and lag two is determined in all the models (Oh and Lee, 2004). Results are provided in Table 5.

Table 5 Granger causality results based on vector error-correction model

Model 1. LNS = f(LAC) – sample 1955 – 2004

	ΔLNS	ΔLAC	F-test	t-test
				ECT$_{t-1}$
ΔLNS	-	(0.53)	-0.149 (-1.23)	
ΔLAC	(0.41)	-		0.065 (2.29**)

Model 2. LNS = f(LB) – sample 1955 – 2004

	ΔLNS	ΔLB	F-test	t-test
				ECT$_{t-1}$
ΔLNS	-	(3.74**)	0.034 (2.64**)	
ΔLB	(0.23)	-		0.042 (3.07***)

Model 3. LNS = f(LQAC) – sample 1961 – 2003

	ΔLNS	ΔLQAC	F-test	t-test
				ECT$_{t-1}$
ΔLNS	-	(1.35)	-0.142 (4.18***)	
ΔLQAC	(0.18)	-		0.019 (0.86)

Model 3. LNS = f(LQB) - sample 1961 – 2003

	ΔLNS	ΔLQB	F-test	t-test
				ECT$_{t-1}$
ΔLNS	-	(0.99)	-0.087 (-3.88***)	
ΔLQB	(0.46)	-		0.022 (0.770)

Notes: (1) ***, ** and * indicate that a test statistics is significant at the 1%, 5% and 10% levels of significance, respectively. (2) The *F*-statistics tests the joint significance of the lagged coefficients of the independent variables. Numbers in parentheses are *F*-statistics. The figures show the significance level. (3) ECT_{t-1} denotes the error correction term. Numbers in parentheses are *t*-statistics.

Model 1 (Table 5) indicates that a unidirectional relationship exists running from demand (*LNS*) to accommodation firms (*LAC*), as the coefficient of the cointegrating vector is statistically significant at the 5% level. However, there is no evidence of the existence of a short run causal relationship between demand and supply. As Granger *et al.* (1998) and Khlafalla and Webb (2001) point out, the ηs are the estimated

values of the error correction vector of the dependent variable that adjust deviations from the cointegrating relationship. Hence, the observed change reflects the adjustment needed in each period to correct for past deviations from the level implied by the cointegrating relationship. In the first equation (Model 1), the coefficient of the *ECT* shows that 6.5% of the deviation of supply accommodation (treated as the dependent variable) from the long run cointegrating equation equilibrium is corrected in each period. Because changes in supply are causes of variations in demand, the *ECT* coefficient (η_1) indicates that demand responds rather slowly to changes in supply. In Model 2, the empirical results give evidence of a short run causal relationship running from capacity to demand. Furthermore, a long run bi-directional causality between demand (*LNS*) and beds supply (*LB*) is indicated. In terms of rates of adjustment, the observed change in tourist flows (*LNS*) of 3.4% reflects the deviation of tourism demand from the long run cointegrating equation equilibrium corrected each period. Because changes in demand are causes of variations in capacity, one concludes that beds supply in each period shows a very slow response to changes in demand. Similarly, the change in beds supply of 4.2% denotes the deviation of beds supply from the long run cointegrating equation equilibrium corrected in each period. Hence, demand in each period confirms a slow response to changes in capacity. Model 3 shows no evidence of short run causal relationships existing between the quality of accommodation supplied and demand. However, a long run unidirectional causality running from quality (*LQAC*) to demand (*LNS*) is detected. In terms of rates of adjustment, the observed change in tourist flows (*LNS*) of 14.2% reflects the deviation of tourism demand from the long run cointegrating equation equilibrium corrected in each period. Because changes in demand cause variations in quality, one concludes that accommodation quality in each period shows a relative slow response to changes in demand. Finally, in Model 4 there is evidence of the existence of a unique long run causal relationship running from quality of capacity supplied (*LQB*) to demand (*LNS*), confirming the results achieved in Model 3. In terms of rates of adjustment, the observed change in tourist flows (*LNS*) of 8.7% reflects the deviation of tourism demand from the long run cointegrating equation equilibrium corrected each period. Because changes in demand cause deviations in quality, one concludes that the quality of capacity in each period shows a slow response to changes in demand.

4. POLICY IMPLICATIONS

The empirical results reported in this paper can aid the policy maker in decision making. One has detected a unidirectional relationship running from tourist demand to supplied accommodation firms. This outcome is compatible with the actual environmental conservation policy issued by Sardinian Region (*PPR*) –building restrictions of new firms within 2 km from the coastline that should not compromise tourist flows, and hence economic growth. This finding is further reinforced by the existence of a rather slow adjustment of supplied accommodation to variations in demand that implies the lack of a fast feedback within the long run equilibrium.

The bi-directional causal relationship that exists between firms' capacity and tourist flows (Model 2, Table 5) can be interpreted in two ways. On the one hand, one may argue that a policy aimed at increasing capacity in terms of the number of new firms is suitable; however, this policy would be in contrast with the previous finding of unidirectional causality running from demand to the number of accommodation firms. On the other hand, it seems reinforcing the actual conservation policy aimed at restructuring and modernising the existing infrastructure especially within the historical centres and inner areas. Examples in this direction are tourist infrastructure such as bed and breakfast, agrotourism activities and *alberghi diffusi*[10] that are regarded as having a lower environmental impact.

A further step of the analysis has involved the investigation of the causal relationship between demand and quality supply, both in terms of the quota of high quality accommodation firms and the capacity of quality firms, respectively. The number of beds in 3-5 stars accommodation can be thought of as a proxy of the quality of tourist services and environment overall. In both cases the empirical evidence has shown as demand is long run causal related to the quality supply. One concludes that economic growth can be heightened by the expansion of quality. Policy makers could therefore enhance a long run tourism planning process by sponsoring Sardinia as a diversified heritage destination

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[10] According to the regional law (n. 27, 1998) *alberghi diffusi* have two main characteristics: location and structure, that is, they have to be localised in the inner centre of a town; and have rooms that are located in one or more houses within the town centre, while the reception, restaurant and other facilities are located in a different building within a maximum distance of 200 meters from the rooms.

characterised by its rich and unique culture, history, traditions and environmental amenities along the coastline as well as in inner rural areas. However, without "courageous" regional intervention at the legislative level in preserving and managing the scarce social, human and natural resources, private tourism entrepreneurs will not be able to be competitive at an international level, to attract new niches of demand that can bring long run wealth to the local population.

5. CONCLUSIONS

The main objective of this study was to test whether either the tourist demand-driven growth or the supply-driven growth hypotheses hold for the case of Sardinia (Italy). The existence of these relationships have been analysed using a cointegration framework. Four distinctive models were run. The results of the tests for cointegration have indicated that all the pair variables employed are cointegrated, (*i.e.* demand (*LNS*) and number of accommodation firms (*LAC*), capacity (*LB*), the quality of accommodation supplied (*LQAC*) and the capacity of quality firms (*LQB*), respectively) implying that a long run relationship exists amongst these variables in each of the models.

The multivariate Granger causality results from the VEC (Vector Error Correction) analysis highlight key findings. The empirical evidence suggests that demand drives the supply of accommodation; however, a long run bi-directional Granger-causal relationship exists between demand and capacity. The latter finding can be interpreted in two fold ways: either it supports a policy aimed at increasing the capacity in terms of the number of new accommodation, or it might sustain a conservation policy intended to restructure and modernise the existing infrastructure. However, the former hypothesis is confutable according to the first empirical outcome, that is, demand Granger causes number of accommodation firms. Hence, the latter hypothesis has been investigated further by including two variables that capture the quality of accommodation and capacity provided in the region. In both the cases, a unidirectional Granger-causality is found running from quality to demand. Hence, the quality of the infrastructure, services and environment overall drives tourist flows in the island of Sardinia, and hence gives an important boost to economic growth. These empirical findings are consistent with the economic hypothesis that a positive

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shock of demand, in presence of a rigid supply, causes a price increase of the tourist good. Therefore, if one expects an increasing propensity of tourism consumers for high quality environment, the conservation policy should generate economic growth.

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05/12 *Rosina Moreno, Raffaele Paci and Stefano Usai,* "Innovation clusters in European regions"

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05/06 *Maria Gabriela Ladu,* "Total factor productivity growth and employment: a simultaneous equations model estimate"

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