

## The environmental setting, farming activities and rural accommodation prices

Celia Bilbao-Terol \*, Luis Valdés \*\*

**ABSTRACT:** The objective of this study is to analyze how the characteristics of the environment associated with agricultural activities influence the prices of rural tourism accommodation. To this end the model of hedonic prices is applied, which allows to break down the price of a good or service depending on the characteristics that it entails, including those of its environment. The study is carried out in the autonomous community of Asturias. The results indicate that the market values positively accommodation establishments located in municipalities with a high percentage of forests and pastureland, and negatively those located in municipalities with a high percentage of cultivated land. The study serves as a starting point for cost-benefit analysis of the policies aimed to promote activities that will improve the rural environment.

**JEL Classification:** Q21; Q26; Q29.

**Keywords:** rural tourism; environmental characteristics; agricultural activities; hedonic prices; environmental assessment.

### Entorno medioambiental, actividades agrícolas y precios en alojamientos rurales

**RESUMEN:** El objetivo de este trabajo es analizar cómo las características del entorno medioambiental asociadas a actividades agrícolas influyen en los precios de los alojamientos de turismo rural. Para ello se aplica el modelo de precios hedónicos, que permite descomponer el precio de un bien o servicio en función de las características que lo forman, incluyendo las de su entorno. El estudio se realiza en la comunidad autónoma de Asturias. Los resultados indican que el mercado valora positivamente alojamientos situados en municipios con alto porcentaje de bosques y praderas, y negativamente los situados en municipios con alto porcentaje de tierra cultivada. El trabajo sirve de punto de partida para realizar análisis

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\* Department of Economics, University of Oviedo. e-mail: [cbilbao@uniovi.es](mailto:cbilbao@uniovi.es).

\*\* Department of Applied Economics, University of Oviedo. e-mail: [lvaldes@uniovi.es](mailto:lvaldes@uniovi.es).

Contact: Faculty of Economics and Business, University of Oviedo. Av. del Cristo s/n. 33006 Oviedo, Spain.

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coste-beneficio de las políticas encaminadas a favorecer actividades que mejoren el entorno medioambiental rural.

**Clasificación JEL:** Q21; Q26; Q29.

**Palabras clave:** turismo rural; características medioambientales; actividades agrícolas; precios hedónicos; valoración medioambiental.

## 1. Introduction

The main purpose of a tourist's visit to a rural destination is the interaction with nature and rural culture (Farmaki, 2012). Therefore the environment is an especially attractive factor, perhaps the most important, for tourism in rural areas (Frochot, 2005; Molera and Albaladejo, 2007; Albaladejo and Díaz, 2009; Choo and Jamal, 2009; Deller 2010; Park and Yoon, 2009; Herrero and San Martín, 2012; García and Barrena, 2013). Thus, recent research associates the need to ensure that the environment is both of quality (Devesa *et al.*, 2010, Kastenholz *et al.*, 2012; Leco *et al.*, 2013) and authentic (Díez, 2012). However, although the mere presence of natural resources is sufficient to motivate a visit, it is not enough to achieve the satisfaction of tourists, as they are demanding consumers (Hernández *et al.*, 2013).

Some of the features of the environment are determined by the agricultural activities carried out in the area. This work aims to evaluate how the characteristics of the environment associated with agricultural activities influence the prices of the nearby rural tourism accommodation, analyzing which of these activities have a positive impact and which negative on said prices.

To achieve the objective the hedonic pricing model is used (Rosen, 1974). The model breaks down the price of a good or service on the basis of the characteristics that compose it. In our case, the service is the lodging provided by an establishment of rural tourism. The breakdown of the price depending on the characteristics, both intrinsic and its surroundings, allows to assign a monetary value to each part and analyse what effects variations of them have on the price of the accommodation.

Once known how the market values the environmental setting, a cost-benefit analysis of policies aimed at its improvement can be undertaken. Thus, for example, the benefit that the owners of accommodation establishments obtain by increasing the surface of pastureland in the area surrounding their establishments can be compared with the loss suffered by farmers due to the reduction of cultivated land. The analysis is also interesting for the owners of rural houses in their localization policy and for tourists in the choice of their rural accommodation.

The study is carried out within the Principality of Asturias, one of the pioneering regions in the development of tourism in rural areas and the fourth community in the number of places and establishments available in Spain for this type of touristic accommodation.

The structure of the work is organized as follows: the following section analyzes the evolution and current situation of rural tourism in Spain and Asturias. Then the Asturian geographical and environmental surroundings are described. Subsequently a brief review of the hedonic model and its main applications in the context of the tourism market are presented. The estimated model and the results obtained are included in Section 5. Finally, the main conclusions of the work are presented.

## **2. Rural tourism in Spain and Asturias**

Rural tourism in our country has always been perceived as an economic activity which serves to preserve the rural environment through the search for additional revenue to traditional agriculture, in an attempt to curb depopulation through the creation of jobs and also avoid the deterioration of the rural heritage (Cals *et al.*, 1995; Yagüe, 2002).

There are two factors or elements that have clearly characterized the evolution and situation of rural tourism in Spain:

- Tourism accounted for most of the budgets destined for rural development in Spain (National Geographic Institute, 2008), especially subsidies received from European Funds (FEDER, FSE, FEOGA) which financed the Community initiatives LEADER and the national programmes known as PRODER, aimed at the socio-economic diversification of the rural environment and putting a stop to the depopulation of rural areas. The Touristic Dynamization Plans (Planes de Dinamización Turística) promoted in the heart of the 2nd Framework Plan of Competitiveness of Spanish Tourism (Plan Marco de Competitividad del Turismo Español) were also important for the development of rural tourism in Spain (1996-1999).
- The transfer of competence in management and promotion of tourism to the autonomous communities. As a result of this process a range of tourist accommodations in the rural environment began to be developed with the help of public aid, coinciding with a transitional period where the autonomous communities assume the transfer from the central Government of competence in tourism matters (Panizo and Esteban, 2003), leading to a process of regulation and a legal framework of the activity of the rural accommodation (Pérez, 2001; Melgosa, 2004).

The evolution of rural tourism in Asturias has not been oblivious to the strong growth in the offer of rural accommodation in Spain as a whole (Valdés, 2004; Cànoves *et al.*, 2004; Pulido *et al.*, 2008; Valdés and Del Valle, 2011) especially as Asturias was the first region to implement this type of tourism with the opening of the first rural hotel in Spain, «The Rectory» (La Rectoral) in Taramundi.

With regard to the characteristics of the rural accommodation in Asturias, current tourism legislation indicates that the establishments must be situated in traditional settlements of less than five hundred inhabitants, or on non-developable land, and

adopt three modalities: rural hotels, country houses and rural apartments (Pérez and Valdés, 2003). The speciality of agro-tourism is also contemplated, which applies to the rural tourism accommodation integrated into agricultural, livestock or forestry holdings, offering the customer the chance of involvement in carrying out certain tasks of the exploitation.

The country houses, on which this article focuses, are autonomous and independent dwelling places, whose characteristics are those of the traditional Asturian architecture of the area, which provide, at a price, the service of accommodation and, on occasions, other complementary services. They are classified in three categories identified by one, two or three «triskeles» depending on the quality of their facilities and services. The maximum capacity of the houses is 15 places, including supplementary beds, distributed in a maximum of 7 rooms.

There are two possible models of exploitation:

- a) Individualized reservation of rooms inside the family home, including breakfast.
- b) Reservation of the property as a whole for exclusive use by the client, under conditions and with the equipment, facilities and services that enable its immediate use.

### **3. The Asturian Environmental Setting**

The «richness of the natural environment» is the main reason for choice as a destination both for visitors to Asturias and for tourists staying in rural tourism establishments (Valdés *et al.*, 2013) and «Asturias, Natural Paradise» is the tourist logo of the Principality of Asturias, and reflects the importance of the natural environment in the promotion and touristic image of the autonomous community.

The main elements that explain the richness of the natural environment, landscape and environmental surroundings of great beauty, the various forms of human exploitation of natural resources and, consequently, the landscape diversity of Asturias and its important cultural and ethnographic heritage, are related to its rugged and mountainous terrain, landscape and climate.

The territory of the Principality of Asturias is basically divided into three parallel and longitudinal strips (Ministry of Environment, 2003): the coastal strip to the north, the mountainous strip to the south, and in the centre, the mountains and valleys. The flora and fauna stems from this general structure, and also the human activities, and therefore the different landscapes of the region.

According to the data provided by SADEI (2012), the main use of the Asturian countryside in 2010 is forestry (44%), comprising timber land, open land and woody mountain areas, followed by pastureland (30%). Farmland only represents 1.9% of the regional area, principally arable crops, such as cereals, legumes, and vegetables (Table 1).

**Table 1.** Surface according to use (2010)

<i>Total</i>	<i>Km<sup>2</sup></i>	<i>%</i>
	<i>10,602.41</i>	<i>100.0</i>
<i>Farmland</i>	<i>206.23</i>	<i>1.9</i>
Arable crops	193.22	1.8
Woody crops	13.01	0.1
<i>Pastureland</i>	<i>3,178.57</i>	<i>30.0</i>
Natural grassland	2,068.62	19.5
Pastures	1,109.95	10.5
<i>Forestry</i>	<i>4,669.04</i>	<i>44.0</i>
Timber highlands	3,499.77	33.0
Woody highlands (scrubland)	1,169.27	11.0
<i>Other surfaces</i>	<i>2,548.57</i>	<i>24.0</i>
Rough grazing	1,383.33	13.0
Unproductive terrain	578.90	5.5
Non-agricultural land	479.70	4.5
Rivers and lakes	106.64	1.0

Source: SADEI from data of the Ministry of Agriculture and Autoctonous Resources.

Fodder crops, for feeding livestock, are those which occupy a greater number of hectares of farmland in the region (70.9%), followed by fruit trees (16.5%) (Table 2).

**Table 2.** Agricultural surface according to crops (2010)

	<i>Hectares</i>	<i>%</i>
Vegetables	820	2.6
Tubers	1,750	5.7
Legumes	980	3.2
Cereals	360	1.2
Fodder crops	21,943	70.9
Fruit	5,101	16.5

Source: SADEI from data of the Ministry of Agriculture and Autoctonous Resources.

With regard to livestock, the predominant species both in number of farms and heads is cattle, with 72.4% and 81.1% respectively, followed in importance by sheep, while goats represent just 6% of the total (Table 3).

The protection of the environment is one of the cornerstones of the territorial policy of the Government of the Principality of Asturias to make compatible and

**Table 3.** Number of farms and livestock animals according to species (2010)

	<i>Farms</i>		<i>Animals</i>	
Cattle	18,736	72.4%	401,056	81.1%
Sheep	5,598	21.6%	62,819	12.7%
Goats	1,540	6.0%	30,599	6.2%

Source: SADEI from data of the Ministry of Agriculture and Autoctonous Resources.

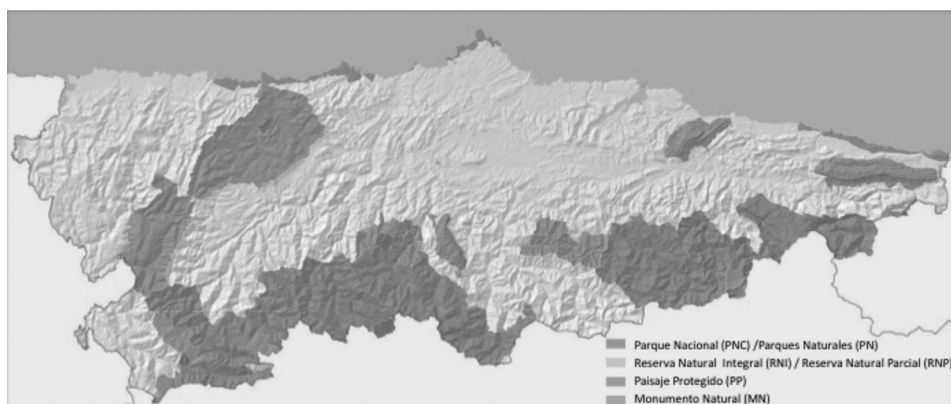
complementary the objectives of regional development and the conservation of the living resources and the natural environment<sup>1</sup>.

The region also has 3,456.77 km<sup>2</sup> of protected natural areas, 32.6% of the surface of the region, with elements and natural systems of special interest and outstanding natural value, which have been declared as such in accordance with the current regulations (Table 4 and Figure 1).

**Table 4.** Spaces and protected areas (2010)

	<i>Number</i>	<i>Protected area (Km<sup>2</sup>)</i>	<i>% of the regional area</i>
Total		3,456.77	32.6
Parks (national and natural)	6	1,927.78	18.2
Nature reserves	10	127.02	1.2
Protected areas	10	1,373.28	13.0
Natural monuments	41	28.69	0.3

Source: SADEI from data of SIAPA - Deputy Ministry of the Environment and Territorial Planning.

**Figure 1.** Map of spaces and protected areas (2010)

Source: Principality of Asturias. Deputy Ministry of the Environment and Territorial Planning.

<sup>1</sup> Decree 11/1991, by which the Regional Regulations of the Organization of the territory of Asturias are passed.

#### 4. Applications of the hedonic model in the context of the tourism market

The hedonic model (Rosen, 1974) starts with the assumption that goods and services are formed by a set of characteristics or attributes and that their price is a function of them. Thus, in the case of rural tourism, the service of accommodation is formed by a set of attributes such as capacity, category, services offered or environmental quality, among others. The price of a given establishment depends on the type and quantity of attributes offered. The hedonic method consists in estimating the «price» of each of the attributes or characteristics that make up the service through market prices which the service takes when these vary. The estimated value of each attribute is its hedonic or implicit price as it is not directly observable in the market.

Analytically, the service of accommodation offered by a rural establishment,  $j$ , is composed of a vector of characteristics,  $z$ :

$$z_j = f(z_1, z_2, \dots, z_i, \dots, z_n) \quad (1)$$

where  $z_1, z_2, \dots, z_i, \dots, z_n$  represent each of its characteristics. Each accommodation service has a fixed market price associated with a fixed  $z_j$  value, so, assuming that the rural tourism market is balanced and is perfectly competitive, the market reveals a function,  $P_j(z)$ , which relates prices and attributes to the hostelry services.

$$P_j(z) = P(z_1, z_2, \dots, z_i, \dots, z_n) \quad (2)$$

The function (2) is the so-called hedonic price function. This function is an overview of the various situations of equilibrium for different valuations by consumers and for different levels of profits of the companies. Partially deriving the hedonic function with respect to each of the characteristics, the implicit or hedonic prices are obtained for each one:

$$P_i(z) = \frac{\partial p(z)}{\partial z_i} \quad (3)$$

These prices indicate the increase in expenditure which must be carried out in the tourist service in order to, *ceteris paribus*, obtain one more unit of the characteristic  $z_i$ .

The hedonic price method consists of a second stage in which, using the hedonic price estimates already calculated, the supply and demand equations are estimated for each feature. In this paper, only the function of hedonic prices is estimated, as the objective is to discover the implicit price of environmental characteristics without undertaking analysis of supply and demand<sup>2</sup>.

<sup>2</sup> Problems and solutions in the second stage of the hedonic model see: Brown and Rosen, 1982; Bartik, 1987; Ekeland *et al.*, 2004; Landajo *et al.*, 2012.

Empirically, the hedonic price method has been predominantly used to value housing characteristics, including the environmental surroundings of a dwelling. For tourism, the applications are more limited, as in most cases the intention is to analyze how the characteristics of accommodation affect pricing policies. The first article dealing with an addressed price hedonic method in a tourism context was the study by Sinclair *et al.* (1990). They examined the determinants of U.K package holiday prices to Malaga, Spain. Other relevant studies include those by Clewer *et al.* (1992) which analyzed the competitiveness of inclusive tour holidays in London and Paris, that of Pastor (1999) which examines the effect on price of different characteristics of city hotels and holiday hotels assuming that the hotel market is in a monopolistic competition. In this vein, Espinet *et al.* (2003), in their study of hotels in the sun-and-beach segment, also assume a monopolistic competition tourist market. Ferri *et al.* (2001) applied a hedonic price model to estimate Spanish price indices in the tourism industry after excluding price increases due solely to increases in service quality. Cox and Vieth (2003) use a hedonic price model to determine the marginal revenue from open areas in hotels. Thrane (2005) calculates the implicit prices of accommodation characteristics and analyses the problem of endogeneity between the hotel star rating variable and other accommodation attributes. Mangion *et al.* (2005) employ an «Almost Ideal Demand System» model to determine the price competitiveness of tourism destinations at a national level. Using the hedonic price model, they also examine how different characteristics of tourism products supplied by Mediterranean destinations may affect the overall price. Rigall-I-Torrent and Fluvià (2007, 2011) differentiate two sets of attributes, private and public, embedded in tourism products, in order to obtain insights for tourism managers and public policymakers when dealing with products and destinations which include public goods components. García *et al.* (2011) analyze the mechanisms of price formation in camping resorts in Spain. Their results highlight the importance of the geographical location of the establishment as well as its official classification in the valuation.

Applications of the hedonic method to rural tourism accommodation are scarce and in most cases they analyze how environmental surroundings influence rural tourism. In this vein, Le Goffe (2000) uses the hedonic price method to identify some of the external effects of agriculture by examining the rental price of rural self-catering cottages. Taylor and Smith (2000) use estimates derived from hedonic price equations and residual demand models to assess the role of environmental resources in product differentiating and as sources of market power. Fleischer and Tchetchick (2005) investigate whether rural tourism accommodation on working farms differs from accommodation on sites with no agricultural activity. Vanslebrouck *et al.* (2005) analyze how landscape features associated with agricultural activities influence the demand for and price of rural tourism. Hamilton (2007) examines the role played by coastal and other landscape features in relation to the attractiveness of tourist destinations. Mollard *et al.* (2007) test the role of environmental and regional characteristics used by tourism operators as a means of differentiating services.



## 5. Empirical research. Estimations

### 5.1. Data and definition of variables

To carry out the hedonic estimation, the prices of the establishments together with their characteristics are needed. The database used is extracted from the Official Guide of Touristic Accommodation 2009, where all official rural accommodation establishments in Asturias can be found.

It is unlikely that the different types of rural accommodation (rural hotels, rural apartments, country houses offering either individual rooms or the whole house) offer the same kind of services. Therefore, our study is reduced solely to country houses which offer the possibility of renting the entire house since, according to the method of hedonic prices, homogeneity in the service is necessary (Hamilton, 2007).

The guide contains information about prices in high and low season, characteristics of the accommodation and the address of 647 country houses entirely for rent. Those properties with incomplete information have been excluded from the sample.

Once the data has been gathered, the second step is to define the variables that are included in the hedonic equation. The dependent variable is the price per night in high season appearing in the guide, taken in Napierian logarithms. Of course, there may be deviations between the price finally contracted and that which appears in the guide, these deviations are normally produced at those times of the year when 100% occupation is not reached (Le Goffe, 2000; Mollard *et al.*, 2007). In high season it is estimated that 100% occupation<sup>3</sup> will be reached, so in general the contracted price will coincide with the price of the guide.

The explanatory variables are classified into three groups: —variables that reflect the characteristics of the establishment, those produced by the offeror, —variables that reflect the particularities of the environment where the accommodation is located and —variables that reflect the location of the establishment, routes of communication and proximity to other places. They are the following:

#### Particular variables of the establishment

A traditional problem encountered with regard to prices within the hedonic approach to tourism research is the possible correlation of both the category variables and of all other accommodation characteristics on overall rental prices (Sinclair *et al.*, 1990; Papatheodorou, 2002; Thrane, 2005; Rigall-I-Torrent and Fluvià, 2011). The category variables have been included in the function of accommodation characteristics, meaning that a specification error may arise because the variable category is an endogenous explanatory variable. Clearly, if accommodation has good equipment and a high-quality service, it will be more likely to achieve a high comfort category. In practical terms, this has probably resulted in an underestimation of the effect

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<sup>3</sup> This has been confirmed by the owners of the establishments through phone calls.

of many of the characteristics on prices, because the possible endogenous variables would have «absorbed» the effects of the other characteristics. In order to correct the correlation problems, the procedure of Sinclair *et al.* (1990) is adopted, and we took out the variables closely correlated with categories of comfort and those without enough variability. The resulting variables are similar to those included in the study of Vanslebrouck *et al.* (2005) and they are the following:

- Category: the country houses are classified in three categories of comfort from one to three triskeles, three being the highest category. There are two binary variables, triskele 2 and triskele 3, which take the value one if the country house has two and three triskeles respectively and zero otherwise. The reference category is therefore that of one triskele.
- Number of places: the total number of places available in the house.
- Internet: binary variable with a value of 1 if the house has Internet connection and zero if the case is the contrary.
- Pets: binary variable with a value of 1 if pets are allowed and zero if the case is the contrary.
- Cards: binary variable with a value of 1 if payment can be made by credit card and zero if the case is the contrary.

### **Environmental variables**

Defining environmental characteristics is difficult, since there are no ecological indicators to measure externalities. In this study, following previous work (Le Goffe, 2000; Vanslebrouck *et al.*, 2005; Mollard *et al.*, 2007; Andersson and Hoffmann, 2008) a global approach is chosen, measuring the use of the land for agriculture and forestry.

The environmental setting of each house is described by three variables: the percentage of forests, the percentage of grasslands and the percentage of crops compared with the total area of the municipality where it is located, these being the greatest uses of land in Asturias. These variables aim to measure the influence of agriculture on the environment.

The variable unit of livestock in the municipality was included in a first estimation, but its inclusion was dismissed due to its high correlation with the variable density of crops. Information about the environmental characteristics of the municipality where the house is located has been extracted from the Statistical Yearbook of Asturias (SADEI, 2012).

### **Location variables**

Two binary variables are created: the first has a value of one if the country house is situated in the central zone of Asturias<sup>4</sup> and zero in other cases, the second has a value of one if the municipality has a coastline and zero if it is inland.

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<sup>4</sup> The Principality of Asturias is divided into three administrative zones (Government of the Principality of Asturias, 1991): east, west and centre.

Table 5 shows the descriptive statistics of the variables included in the estimate.

**Table 5.** Summary of statistics of variables

<i>Variable</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Price (€)	113.9	50.32	35	600
Nº Places	5.19	1.983	1	14
% Forests	42.2	8.78	20.4	69.21
% Crops	1.79	2.47	0.048	22.53
% Grasslands	32.46	7.74	14.39	51.54
Triskele 1	0.33	0.471		
Triskele 2	0.55	0.498		
Triskele 3	0.12	0.324		
Internet	0.07	0.25		
Pets	0.31	0.46		
Cards	0.13	0.34		
Centre	0.26	0.44		
Coast	0.24	0.43		

## 5.2. Results

The results are in principle satisfactory (Table 6). The model explains in a high percentage, approximately 62%, the formation of the price of the establishments, which indicates that the functional form and characteristics included can be taken as reasonable. The joint significance F statistic also indicates that the equation is globally significant. All the estimated coefficients are significant at normal levels and have the expected sign, except perhaps the coefficient of the pet variable that is negative.

To verify a possible problem of multicollinearity between independent variables, we have applied the variance inflation factor test (VIF), obtaining VIF coefficients that in no case exceed the value of 4, the limit value below which it is assumed that there is no multicollinearity between the independent variables (Fox, 1991).

Given that the functional form for the hedonic equation is semilogarithmic the interpretation of coefficients is performed according to Halvorsen and Palmquist (1980). So the coefficient of the continuous variables multiplied by 100 indicates the variation in percentage terms of the price of accommodation due to a small change in the independent variable. For binary variables the effect on the price of the presence of the characteristic is given by the following transformation  $(e^{\beta}-1) \times 100$ .

Beginning with the variables related to the characteristics of the environmental setting it can be seen that the three are significant to the usual levels. This indicates that the accommodation establishments value their setting, they value the environ-

**Table 6.** Results of the hedonic estimation

<i>Variables</i>	<i>Coefficient</i>	<i>Standard Errors</i>	<i>t-Ratio</i>
Constant	3.6753	0.0905	40.625***
%Forest	0.0025	0.0012	2.115**
%Crops	-0.0100	0.0041	-2.424 ***
%Grasslands	0.0038	0.0014	2.702***
Coast	0.1777	0.0024	7.321***
Centre	0.0407	0.0215	1.891*
Triskele 2	0.0524	0.0205	2.557***
Triskele 3	0.1531	0.0290	5.271***
Places	0.1324	0.0048	27.530***
Internet	0.0758	0.0367	2.072**
Pets	-0.0776	0.0200	-3.880***
Cards	0.0720	0.0265	2.718***
R <sup>2</sup> adjusted	0.62		
N	647		
F-ratio	98.79		
p-value	0.000		

\* Significant to 10%. \*\* Significant to 5%. \*\*\* Significant to 1%.  
Dependent variable: the natural logarithm rent price for high season.

ment where they are located. The positive signs of the coefficients of the variables percentage of forests and grasslands indicate that the tourist accommodation price increases when these variables increase. Specifically, a 1% increase in the percentage of forests increases the price of the accommodation 0.25%.

The result is similar to that obtained by Mollard *et al.*, 2007 for the region of Drome (France) where an increase of 1% in the percentage of forests increases the price of the rent of the house between 0.20 and 0.22%. The variable has a range between 20% and 69% (Table 5), so that the accommodation located in the municipality with a greater density of forests is 12.25% more expensive than that situated in the municipality with less, *ceteris paribus*. Multiplying by the average price in high season (113.9 €), the difference in price of accommodation in the municipality with a higher proportion of forests compared with that which has less is 14 € per night in high season.

Similarly, when the percentage of grasslands in the municipality increases by 1%, the price of accommodation is increased by 0.38%, *ceteris paribus*. Le Goffe (2000) in his study for the region of Brittany (France) and Vanslebrouck *et al.* (2005) for the Flemish region also found a positive effect of the variable.

On the other hand, the negative sign of the coefficient in the variable percentage of crops indicates that the market values negatively this type of landscape. As previ-

ously pointed out, this variable has a high correlation with density of cattle as most crops in the Principality of Asturias are of the fodder type associated with livestock feed. In particular when the percentage of cropland increases by 1% the price of the accommodation diminishes proportionately. Le Goffe (2000) and Vanslebrouck *et al.* (2005) also obtain a negative effect of the increase of the surface destined to fodder crops in the price of the accommodation. Andersson and Hoffmann (2008) find the same effect but for the variable production of livestock. This is because fodder crops involve harmful practices for the environment such as the use of fertilizers, pesticides, and the destruction of certain species. They are also associated with a high density of livestock, which in turn produces air and water pollution derived from their organic waste and the degradation of the soil through stabling. On the other hand, the grasslands and forests improve the quality of the soil and water.

With regard to the variables of the accommodation, as expected, those related to the category and capacity have a strong positive influence on the price. Thus establishments with two triskeles are approximately 5.4% more expensive than those with one triskele, which multiplied by the average price means an increase of 6.15 €. The accommodation establishments of the highest category (3 triskeles) are 16.5% more expensive than those of a lower category (one triskele). In most studies, the category variables have a very large and highly significant effect on price (Le Goffe, 2000; Mollard *et al.*, 2007) particularly for the highest category (Clever *et al.*, 1992; Espinet *et al.*, 2003; Rigall-I-Torrent and Fluvia, 2011). A higher category means an increase in the quality and services offered by the accommodation which in turn allows differentiation through prices. These results highlight the importance of the equipment of establishments and may be useful to obtain insights for tourism company managers in their investment policies.

When the number of places increases by 1% the price increases by 13%, so establishments with the largest number of places, set at 14, are 182% more expensive than those with one place *ceteris paribus*, in monetary terms an increase in price of 207.29 € of the largest house in comparison with the smallest.

Internet access and the possibility of paying with credit cards increase the price of the accommodation by 7.8% for the first variable and 7.5% for the second, *ceteris paribus*.

On the other hand, establishments which allow pets have a decrease of 8% in the price. In the work carried out by Mollard *et al.* (2007) also found a negative influence on prices for cottages located on a farm, obtaining a coefficient which was not significant. Although the variables farm-pets are not the same, in the two works, similar negative signs are obtained in two variables associated with the presence of animals.

Mollard *et al.* (2007) noted the duality: some consumers consider them positive while others believe them to be a source of dirtiness, unpleasant smells and insects, but no explanation result is found. Therefore, for a better justification of this fact it would be appropriate to extend future investigation into pet-friendly accommodation and their constraints, as well as the customer perception because allow pets in the accommodation is aimed at well-differentiated demand segments.

The location variables have a positive effect on the price of the accommodation, especially the variable coast. If the house is located in a municipality with a coastline, its price is increased by approximately 19% compared to another house situated inland. On the other hand, accommodation establishments located in the central area of the Principality have a 4% average higher price than those located in other areas. The central area of the Principality is the best communicated and where most of the services of the region are concentrated so it is assumed that the price of the accommodation is higher.

The model can be tested. For this we have chosen two country houses with the same characteristics, the only difference being their environment. The two country houses have one triskele, three places, no Internet, pets and payment by credit card are not allowed, they are not situated in the central zone or in a municipality with a coastline. One house has good environment characteristics: the forest percentage is 46.92%, that of crops is 1.18% and 30.13% for grassland. The other house has worse environment characteristics: the forest percentage is 34.24% that of crops is 0.1% and 17.34% for grassland. The price difference according to the guide is 5.5 € per night, whereas according to the estimated model it is 5 €. Therefore the estimated model is adequate.

## 6. Conclusions

In this work a hedonic pricing model has been used to identify the influence of the rural environment characteristics on the price of the nearby touristic establishments. The results indicate that accommodation situated in areas with forests have higher prices than those situated in municipalities with a high percentage of cultivated land.

The work also shows the price differences depending on the geographical situation of the municipality. The establishments located in coastal areas have a higher price differential than inland municipalities, the same being true if they are closer to the central area of the region.

In addition, the study reveals how variables related to the equipment of the accommodation and services affect its price. It is obvious that the higher level the category (3 triskeles being the highest), the higher the prices, but it is significant that the increase in price from 2 to 3 triskeles is much more marked than from 1 to 2. This may be due to the requirements and services stipulated by the classification criteria for the highest category and also the policies of differentiation and positioning based on a greater quality of service imply a higher price compared to the rest of the offer.

Therefore, when the owners are going to set the prices of their accommodation, apart from the economic and financial ratios, they must also bear in mind if there are environmental aspects which may have an influence, a factor which is also important both for new establishments as well as those which want to reconsider their pricing policies. Concurring with the proposal of Díez (2011) on the need for methodological

tools that allow the rural areas to integrate planning policies, we see that this methodology and empirical research would provide a valid instrument that would make it possible to analyze how the environment of the establishments influences pricing policy, enabling comparisons with the competition and so improving profitability by bettering the environment where the accommodation is located.

In agreement with Pulido and Cardenas (2011) who proposed to «*establish limitations to uncontrolled urban development*» in rural areas, the results show the importance of the environmental factor, in order to improve the competitive position in prices and environmental and economic sustainability. To this end and following the recommendations of Valdés and Del Valle (2011), the integration of activities and public and private managers are necessary in agricultural, environmental, planning, urbanism and tourism matters among others, with the aim of integrating a sustainable environmental, economic, social and patrimonial development within the territory.

The information obtained, although it must be taken with limitations since it only takes into account the benefits obtained by the rural establishments and not by other agents such as day-trippers, owners of surrounding houses or the public in general, is interesting for decision-making on environmental policies, which would favour the competitiveness of the rural areas.

It should not be forgotten that an objective of the Common Agricultural Policy (PAC) is the promotion of agriculture which is both sustainable and respectful of the natural environment. Community action limits any pollution of agricultural origin, promotes the development of the production and use of biofuels, defends biodiversity, values forests and supports the initiatives of prevention of fires and protection of the wild, natural habitats and birds. Works of this type help to establish subsidies or taxation of agricultural activities that affect the environment. In this sense, Sandera and Polasky (2009) also indicate that knowledge of the economic impact of environmental improvements justifies actions aimed at its undertaking.

A future line of research would be to research more profoundly a more segmented analysis by type of accommodation, including not just rural houses, but also rural hotels and country guest houses of individual contracts whose prices are not fixed per unit of accommodation, but rather by the number of places or rooms. This would allow us to complete the integral analysis on the pricing policies of the rural accommodation establishments, not only in Asturias but also extrapolated to the rest of the national rural tourism.

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## References

- Albaladejo, I. P., and Díaz, M. T. (2009): «Tourist preferences for rural house stays: Evidence from discrete choice modelling in Spain», *Tourism Management*, 30(6), 805-811, <http://dx.doi.org/10.1016/j.tourman.2009.01.001>.
- Andersson, H., and Hoffmann, R. (2008): «Spatial Competition and Farm Tourism. A Hedonic Pricing Model», paper provided by American Agricultural Economics Association in its series 2008. Annual Meeting, July 27-29, Orlando, Florida, N° 6156.
- Bartik, T. J. (1987): «The Estimation of Demand Parameters in Hedonic Price Models». *Journal of Political Economy*, 95, 81-88, <http://www.jstor.org/stable/1831300>.
- Brown, J. N., and Rosen, H. S. (1982): «On the estimation of structural hedonic price models», *Econometrica*, 50 (3), 765-768, <http://www.nber.org/papers/t0018.pdf>.
- Cals, J.; Capella, J., and Vaqué, E. (1995): *El turismo en el desarrollo rural de España*, Madrid, Ministerio de Agricultura Pesca y Alimentación.
- Cánoves, G.; Villarino, M.; Priestley, G., and Blanco, A. (2004): «Rural Tourism in Spain: an analysis of recent evolution», *Geoforum*, 35, 755-769, <http://dx.doi.org/10.1016/j.geoforum.2004.03.005>.
- Choo, H., and Jamal, T. (2009): «Tourism on organic farms in South Korea: A new form of ecotourism?», *Journal of Sustainable Tourism*, 17(4), 431-454, DOI:10.1080/09669580802713440.
- Clewer, A.; Pack, A., and Sinclair, M. T. (1992): «Price Competitiveness and Inclusive Tour Holidays in European Cities», in *Choice and Demand in Tourism*, Johnson, P., and Thomas, B. (eds.), London, Mansell, 123-143.
- Commission of the European Communities (1993): *Pour une signalétique européenne harmonisée dans le domaine du tourisme rural et analyse des circuits d'informations, de distribution et de vente*, Document de la D. G. XXIII, Unit Tourisme.
- Cox, J. L., and Vieth, G. R. (2003): «Hotel investment in open area», *Annals of Tourism Research*, 30, 342-352.
- Decreto del Principado de Asturias 11/1991, de 24 de enero, por el que se aprueban las directrices regionales de ordenación del territorio de Asturias.
- Deller, S. (2010): «Rural poverty, tourism and spatial heterogeneity», *Annals of Tourism Research*, 37, 180-205, <http://dx.doi.org/10.1016/j.annals.2009.09.001>.
- Devesa, M.; Laguna, M., and Palacios, A., (2010): «The role of motivation in visitor satisfaction: Empirical evidence in rural tourism», *Tourism Management*, 31, 547-552, <http://dx.doi.org/10.1016/j.tourman.2009.06.006>
- Díez Santo, D. (2011): «La planificación estratégica en espacios turísticos de interior: Claves para el diseño y formulación de estrategias competitivas», *Investigaciones Turísticas*, 1, 69-92, <http://dx.doi.org/10.14198/INTURI2011.1.05>.
- (2012): «El empleo de diagnósticos matriciales en la planificación estratégica de espacios turísticos de interior: una propuesta metodológica aplicada sobre el interior de Alicante», *Boletín de la Asociación de Geógrafos Españoles*, 60, 273-296, <http://www.boletinage.com/60/13-DIEZ.pdf>.
- Ekeland, I.; Heckman, J. J., and Nesheim, L. (2004): «Identification and estimation of hedonic models», *Journal of Political Economy*, 112, 60-109, <http://core.kmi.open.ac.uk/download/pdf/7113092.pdf>.
- Espinat, J. M.; Sáez, M.; Coenders, G., and Fluvia, M. (2003): «Effect on prices of the attributes of holiday hotels: a hedonic approach», *Tourism Economics*, 9, 165-177.
- Farmaki, A. (2012): «An exploration of tourist motivation in rural settings: The case of Troodos, Cyprus», *Tourism Management Perspectives*, 2(3), 72-78, <http://dx.doi.org/10.1016/j.tmp.2012.03.007>.
- Ferri, J.; Monfort, V., and Uriel, E. (2001): «Precios hedónicos y rentas de localización en el sector turístico español», en Valdés, L.; Monfort, V.; Pulido, J. I., and del Valle, E. (eds.),



- VI Congreso AECIT, *Nuevas Tendencias de Ocio y Turismo: su especial problemática en destinos singulares*, Jaén, AECIT, 247-262.
- Fleischer, A., and Tchetchick, A. (2005): «Does rural tourism benefit from agriculture?», *Tourism Management*, 26, 493-501.
- Fox, J. (1991): *Regression Diagnostics: An introduction*, Sage, Newbury Park.
- Frochot, I. (2005): «A benefit segmentation of tourists in rural areas: A Scottish perspective», *Tourism Management*, 26 (3), 335-346, <http://dx.doi.org/10.1016/j.tourman.2003.11.016>.
- García López de Meneses, T., y Barrena Figueroa, R. (2013): «Preferencias del visitante de establecimientos de turismo rural. Estudio en Navarra», *Cuadernos de Turismo*, 32, 141-153, <http://revistas.um.es/turismo/article/view/177491>.
- García, A. F.; Sánchez, J. L., y Marchante, M. (2011): «Una aproximación al estudio de la formación de los precios en el mercado de acampamentos turísticos», *Cuadernos de Turismo*, 28, 59-73.
- Halvorsen, R., and Palmquist, R. (1980): «The Interpretation of Dummy Variables in Semilogarithmic Equations», *The American Economic Review*, 70 (3), 474-475.
- Hamilton, J. M. (2007): «Coastal landscape and the Hedonic Price of Accommodation», *Ecological Economics*, 62, 594-602, <http://www.mi.uni-hamburg.de/fileadmin/fnu-files/publication/tol/RM3699.pdf>.
- Hernández Mogollón, J. M.; Campón Cerro, A. M.<sup>a</sup>, y Di Clemente, E. (2013): «El turista rural en entornos de alta calidad medioambiental», *Revista de Análisis Turístico*, 16, 21-31, <http://www.aecit.org/jornal/index.php/AECIT/article/viewFile/154/132>.
- Herrero, A., and San Martín, H. (2012): «Influence of user's psychological factors on the online purchase intention in rural tourism», *Tourism Management*, 33, 341-350, <http://dx.doi.org/10.1016/j.tourman.2011.04.003>.
- Instituto Geográfico Nacional (2008): *Atlas Nacionales de España: Turismo en espacios rurales y naturales*, Madrid, Centro Nacional de Información Geográfica. Ministerio de Fomento.
- Ivars Baidal, J. A. (2000): «Turismo y espacios rurales: conceptos, filosofías y realidades», *Investigaciones Geográficas*, 23, 59-88, <http://hdl.handle.net/10045/388>.
- Juan Martínez, F., y Solsona Monzonis, J. (2000): *Alojamiento turístico rural. Gestión y comercialización*, Madrid, Síntesis.
- Kastenholz, E.; Carneiro, M. J.; Peixeira, C., and Lima, J. (2012): «Understanding and managing the rural tourism experience. The case of a historical village in Portugal», *Tourism Management Perspectives*, 4, 207-214, <http://dx.doi.org/10.1016/j.tmp.2012.08.009>.
- Landajo, M.; Bilbao-Terol, A., and Bilbao-Terol, C. (2012): «Nonparametric Neural Network Modeling of Hedonic Prices in the Housing Market», *Empirical Economics*, 42(3), 987-1009, <http://link.springer.com/article/10.1007%2Fs00181-011-0485-9#page-1>.
- Lane, B. (1994): «What is rural tourism?», *Journal of Sustainable Tourism*, 2(1-2), 7-21, DOI:10.1080/09669589409510680.
- Le Goffe, P. (2000): «Hedonic pricing of agriculture and forestry externalities», *Environmental and Resource Economics*, 15(4), 397-401, <http://link.springer.com/article/10.1023%2FA%3A1008383920586#page-1>.
- Leco, F.; Pérez, A.; Hernández, J. M., and Campón, A. M. (2013): «Rural Tourists and Their Attitudes and Motivations Towards the Practice of Environmental activities such as Agrotourism», *International Journal of Environmental Research*, 7(1), 255-264, [http://www.ijer.ir/article\\_604\\_31.html](http://www.ijer.ir/article_604_31.html).
- Mangion, M. L.; Durberry, R., and Sinclair, M. T. (2005): «Tourism competitiveness: price and quality», *Tourism Economics*, 11, 45-68.
- Melgosa, F. J. (2004): «El Régimen jurídico-administrativo de los alojamientos rurales en España», en Melgosa, F. J., *Derecho y Turismo*, Ávila, Universidad de Salamanca.
- Ministerio de Medio Ambiente (2003): *Atlas de los paisajes de España*, Madrid, Centro de publicaciones MMA.

- Molera, L., and Albaladejo, I. P. (2007): «Profiling segments of tourists in rural areas of South-Eastern Spain», *Tourism Management*, 28, 757-767, <http://dx.doi.org/10.1016/j.tourman.2006.05.006>.
- Mollard, A.; Rambonilaza, T., and Vollet, D. (2007): «Environmental Amenities and Territorial Anchorage in the Recreational-Housing Rental Market: A Hedonic Approach with French Data», *Land Use Policy*, 24(2), 484-493, <http://dx.doi.org/10.1016/j.landusepol.2006.07.003>.
- Panizo, F., and Esteban, Á. (2003): «Turismo y Constitución: veinticinco años de estabilidad política, crecimiento económico y desarrollo turístico», *Revista del ICE*, 811, 297-320.
- Papatheodorou, A. (2002): «Why people travel to different places», *Annals of Tourism Research*, 28, 164-179.
- Park, D. B., and Yoon, Y. (2009): «Segmentation by motivation in rural tourism: A Korean case study», *Tourism Management*, 30, 99-108.
- Pastor, V. J. (1999): «Un análisis de los precios hoteleros empleando funciones hedónicas», *Estudios Turísticos*, 139, 65-87.
- Pérez, J. M. (2001): *Régimen jurídico del turismo rural*, Madrid, FITUR, Feria Internacional de Turismo.
- Pérez, J. M., y Valdés, L. (2003): «La ordenación del turismo rural en el Principado de Asturias: un largo y difícil camino hacia la sostenibilidad», en Valdés, L., y Pérez, J. M. (dirs.), *Experiencias públicas y privadas en el desarrollo de un modelo de turismo sostenible*, Oviedo, Fundación Universidad de Oviedo.
- Pulido, J. I. (coord.) (2008): *El turismo rural. Estructura económica y configuración territorial en España*, Madrid, Síntesis.
- Pulido, J. I., y Cárdenas, P. J. (2011): «El turismo rural en España. Orientaciones estratégicas para una tipología aún en desarrollo», *Boletín de la Asociación de Geógrafos Españoles*, 56, 155-176, <http://dialnet.unirioja.es/descarga/articulo/3722434/1.pdf>.
- Rigall-I-Torrent, R., and Fluvà, M. (2007): «Public goods in tourism municipalities: formal analysis, empirical evidence and implications for sustainable development», *Tourism Economics*, 13, 361-378.
- (2011): «Managing tourism products and destinations embedding public goods components: A hedonic approach», *Tourism Management*, 32, 244-255.
- Rosen, S. (1974): «Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition», *Journal of Political Economy*, 82 (1), 35-55, [http://www.stern.nyu.edu/networks/phdcourse/Rosen\\_Hedonic\\_prices.pdf](http://www.stern.nyu.edu/networks/phdcourse/Rosen_Hedonic_prices.pdf).
- SADEI (2012): *Anuario Estadístico de Asturias 2010*, Oviedo, Sociedad Asturiana de Estudios Económicos e Industriales.
- Sandera, H. A., and Polasky, S. (2009): «The value of views and open space: Estimates from a hedonic pricing model for Ramsey County, Minnesota, USA», *Land use Policy*, 26, 837-845, <http://doi:10.1016/j.landusepol.2008.10.009>.
- Sinclair, M. T.; Clewer, A., and Pack, A. (1990): «Hedonic prices and the marketing of package holidays: the case of tourism resort in Málaga», in Ashworth, G., and Goodall, B. (eds.), *Marketing Tourism Places*, 85-103, London, Routledge.
- Taylor, L. O., and Smith, V., K. (2000): «Environmental Amenities as a Source of Market Power», *Land Economics*, 76, 550-568.
- Thrane, C. (2005): «Hedonic price models and sun and beach package tours: the Norwegian case», *Journal of Travel Research*, 43, 302-308.
- Valdés, L. (2004): «El turismo rural: Una alternativa diversificadora. Líneas estratégicas de su Expansión», *Papeles de Economía Española*, 102, 298-315.
- (dir.) (2013): *El turismo en Asturias en 2012*, Sistema de Información Turística de Asturias, Principado de Asturias, Documento web disponible en <http://www.sita.org/>.

- Valdés, L., y del Valle, E. (2011): «Situación y perspectivas del turismo rural en España», *Estrategias de actuación. Papeles de Economía Española*, 128, 201-220.
- Vanslebrouck, I.; Van Huylenbroek, G., and Van Mennesel, J. (2005): «Impact of agriculture on rural tourism: a hedonic pricing approach», *Journal of Agricultural Economics*, 56(1), 17-30. <http://doi:10.1111/j.1477-9552.2005.tb00120.x>.
- Vera Rebollo, F. J.; López Palomeque, F.; Marchena Gómez, M., and Antón Clavé, S. (2011): *Análisis territorial del turismo y planificación de destinos turísticos*, Valencia, Tirant lo Blanch.
- Yagüe, R. M. (2002): «Rural tourism in Spain», *Annals of Tourism Research*, 29 (4), 1101-1110, [http://dx.doi.org/10.1016/S0160-7383\(02\)00025-7](http://dx.doi.org/10.1016/S0160-7383(02)00025-7).