Title: Determinants of land use conversion from tourist to residential in Maspalomas (Spain).

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Abstract: This work analyzes the forces that drive the conversion of official tourist complexes into residential accommodations. For this purpose, from a Land use change model framework, a Probit model that considers spatial autocorrelation is proposed, and probability that an nonhotel accommodation closes his activity within a time period is computed. The model has been applied to a sample of complexes located in the tourist zone Maspalomas-Playa del Inglés, in Gran Canaria, Spain, which has suffered an extraordinary process of residentialisation in the last decade. Results show that neighborhood influences in the probability of closure of the complexes, as well as their low quality and degree of specialization. From these results some recommendations are proposed about the strategies undertaken by policy makers and implied agents aimed at slowing down the process of residentialisation.

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units.

Keywords: Land use change model; Residential tourism; Non-hotel accommodation; Spatial Probit; Spillovers.

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1. Introduction

This paper deals with the phenomenon of conversion of tourist lodgings to residential use. Generally, a tourist lodging stops his activity when is not profitable any more due to obsolescence or other external and internal factors. This process of change is connected with the tourist area life cycle model (Butler, 1980 and 2000). According to Butler (1980), one possible scenario of the poststagnation phase is decline, where the resort shifts its function away from the official channels of tourism. Other alternative is rejuvenation, characterized by a renewed expansion of tourist development. The existing literature on poststagnation phase deals mainly about rejuvenation of the tourist resorts. In this regard, Agarwal (2002) offers a review of the studies dealing with restructuring of seaside resorts and, more specifically, Medina-Muñoz et al. (2016) focus on renovation of tourist establishments. Interestingly, little attention has been paid to the abandonment of the tourist activity and its consequences up to date. One of the few contributions was done by Baum (1998), which extends the Butler's ideas and states that the cycle may include either a reinvention phase or a strategic exit stage, that is, the withdrawal of the destination from tourism activity. In this latter stage new uses are allocated to tourism resources as a planned decision, such as commercial or residential purposes,

The nature of this problem cannot be generalized to any tourist destination, since the degree of the matter of conversion from tourist to residential use depends on the morphotypology of the tourist settlement, that is, the urban characteristics and origins of the tourist network. In particular, the phenomenon has affected significantly Maspalomas, the leading tourist zone in Gran Canaria, in the Canary Islands (Spain). In this destination, most of the lodgings were designed for tourist use and were initially

exploited, and authorities' interest consists on keeping tourist settlements away from residential use. On the contrary, in other tourist areas such as Costa Brava or the Community of Valencia, also in Spain, the tourist offer was primary conceived and directed to the second-home rental market. In these cases, a change of the land use from tourist to residential was not produced and authorities' management to change the urban landscape into a new one more suitable for non-residential tourism is limited.

From the economic point of view, the change in the use of the tourist lodging is framed in the literature based on land use change models (Irwin & Bockstael, 2002; Carrión-Flores & Irwin, 2004.). In brief words, the models assume that owners' decision to convert the use of their property is based on the maximization of the discounted utility obtained from maintaining or selling it. Initially, these models were conceived to represent the process of land use change from rural to urban land. Although these models can be applied to any process of land use change, to the author's knowledge, they have never been used to explain the change from tourist to residential use.

The present paper aims to investigate which forces drive the conversion from tourist lands to residential ones. For this purpose, a land use change model is proposed and estimated in the case study of Maspalomas (Gran Canaria) through a Probit model (following Carrión-Flores & Irwin, 2004) in which the dependent variable presents two categories, distinguishing the tourist resorts that have converted to residential housing in the sample period that goes from 2005 to 2012 from those which remain opened. This analysis allows finding which factors affect the closure of tourist resorts. Additionally, some policy recommendations are derived from the research findings, which may help managers or local authorities to revert or at least slow down the negative consequences of the process of land use change.

The paper is developed as follows: section 2 presents a literature review and describes the methodology applied, section 3 includes the case study, section 4 shows the estimation and results of the model, section 5 corresponds to the discussion of findings and managerial recommendations. Conclusions are exposed in the last section.

2. Literature Review

2.1 Residential tourism: typologies and impacts

Residential tourism is a phenomenon profusely analyzed and complex to conceptualize since it encompasses a variety of ways of mobility and residence (Perles et al., 2011; Huete et al. 2008; Leontidou & Marmaras, 2001; Mantecón, 2010). Several definitions have been proposed in the literature. Some of them focus from the supply viewpoint (Aledo & Mazón, 2004), where is defined as "the economic activity dedicated to the urbanization, construction and sale of residential tourist homes that constitute the non-hotel sector", and others from the demand side (Perles et al. 2011), where residential tourism is defined as a "phenomenon whereby visitors travel to the coast each season for leisure reasons and stay in private accommodation, as well as the phenomenon of residents, usually retired foreign citizens, who purchase homes in these tourist areas as their permanent residence for most of the year".

Last decades have witnessed an increasing residential tourist demand in different tourist destinations all over the world. According to the origin of the offer, two classes can be described:

a. Residential resorts that have been built specifically for private use. This is the case of some areas such as Mediterranean, Florida, Caribe, Mexico and Asia (Aledo et al., 2007). In this sense, the USA represents the first residential tourist market in the

world, followed by Spain, France and Italy (Perles et al, 2011). Tourist residents consist of two main groups: the first one includes natives that have a second home in the coast and stay there for holidays; the second group consists of retired foreigners who decide to spend large periods of the year in tourist areas. A significant proportion of them also buy a property as a second home. This phenomenon has been deeply studied in Spain (Huete et al., 2008).

b. Tourist lodgings that have been changed to residential use. When a tourist establishment is not profitable it may turn into residential use. This conversion leads to an increasing offer for permanent or temporary residential tourism, although usually lacking the standards of quality (Domínguez-Mújica et al., 2011; Garay & Cánoves, 2011). This specific process of change from tourist to residential use has been barely analyzed, in part because it is not a generalized problem, but it is a phenomenon that takes place in certain tourist areas, and it depends on the origins of the tourist development. Some studies concerning the Canary Islands are Parreño (2006) and Simancas et al. (2009). This paper focuses on this type of residential tourism.

Independently of the origin, some authors alert on the negative consequences of an increasing offer of residential tourism lodgings in a destination (Aledo et al., 2007; Huete, 2009; Mantecón, 2010). Firstly, since part of the residential tourist is characterized by keeping a high seasonal behavior, during the low season residential resorts and their surroundings look abandoned and bleak; additionally, infrastructures and public services are under and overused in the low and high season, respectively, being a problem for the authorities. Secondly, the residential tourist‘s expenditure is lower than the traditional tourist. Consequently, the substitution of the tourist by the resident profile is negative for the economy of the zone (restaurants, shops, etc.).

Thirdly, in many occasions, these lodgings are rented, competing unfairly with the official tourist beds, which have to pay taxes and are required to offer a standard of quality and services.

Positive effects of residential tourism in the first type above have also been found (Huete et al, 2008; Mantecón, 2010). Mainly, residential tourism has entailed the socioeconomic development of many regions that have turned from economies based on the primary to building sector and many other associated ones. As a consequence, population increases and new facilities are available for the natives. Interestingly, there is a conflict between host citizens and academics when judging the consequences of the residential tourism. While academics usually give a negative vision, host citizens, on the contrary, support it arguing that positive impacts overcome negative ones (Mantecón, 2010).

2.2 Strategies to avoid resort decline

The phenomenon of land use conversion of a tourist lodging to residential use analyzed here occurs in the declining phase of the tourist lifecycle, when a tourist lodging is not profitable any more. According to Agarwal (2002), there is a variety of factors that may lead a tourist destination to decline, such as changes in demand-side trends, economic crisis and declining profit margins. In order to help the resort rejuvenation, the same author provides the responses to resort decline through a group of restructuring strategies. They can be divided into two groups: product reorganization and product transformation. Product reorganization strategies include investment and technical change, centralization and product specialization, while product transformation strategies include improving the quality of service, environmental enhancement, repositioning, diversification, collaboration and adaptation.

Literature shows recent examples of mature tourist destinations and the strategies accomplished for resort restructuring, which fall into the classification above. They are the case of Tenerife (Oreja et al., 2008), Catalonia (Garay & Cánoves, 2011), Turkey (Kozak & Martin, 2012), Palanga, Lithuania (Povilanskas & Armaitiene, 2011), Benidorm, Spain (Claver-Cortés et al., 2007; Ivars-Baidal et al., 2013), Gran Canaria, Spain (Medina-Muñoz et al., 2016), Calvia in Balearics and Maspalomas in Gran Canaria (Domínguez-Mújica et al., 2011), the Balearic Islands (Aguiló et al., 2005) or Malta (Chapman & Speake, 2011). The accomplishment of the rejuvenation strategies is diverse, since each tourist resort is affected by specific circumstances, and the agents' degree of implication in the task of restructuring a tourist area differs among destinations.

2.3 Land use change models

Land use is a multidisciplinary topic that has recently captured the economists' attention. There exists a large variety of methods to model land use. Irwin (2010) and Irwin & Wrenn (2014) offer a review of the alternative approaches. In general terms, land use change models can be classified into the following categories: (a) Econometric land use models with spatial simulation; (b) Spatial equilibrium models of urban land use pattern; (c) Agent-based computational models.

Econometric land use models assume the landowner's perspective and are based on a theoretic model (Capozza & Helsley, 1990) in which an agent will choose to develop his land when the net expected returns over time is maximized. Specifically, the land owner chooses the optimal time of conversion t^* of a parcel from rural to residential use by maximizing the expected discounted sum of benefits over an infinite time horizon. In these models, a categorical variable (whether binary or multinomial) is specified

defining land use, and is estimated by including diverse factors that influence land rents. Spatial heterogeneity and time are considered in the model. Some relevant studies included in this category are Irwin and Bockstael (2002) or Carrión-Flores & Irwin (2004).

Alternatively, spatial equilibrium models include spatial variation in the market clearing equilibrium condition, where alternative scenarios of urban development patterns are provided. Examples of these models are found in Wu & Plantinga (2003) or Tajibaeva et al. (2008). Finally, agent-based computational models focus on the transitional dynamics of land use (Filatova et al., 2009; Magliocca et al, 2009).

This paper follows the econometric approach above. Considering the context of the analysis of the conversion of an establishment from tourist to residential use, the specification of the model is as follows:

$$\max NB_i = \int_{t=0}^{t^*} TR(z_i, \tau) e^{-r\tau} d\tau + R(x_i) e^{-rt^*}, \quad (1)$$

where *NB* is the net benefit, *TR* is the expected present tourist rent, *R* is the expected one time gross return from selling a tourist lodging, *r* is the interest rate, and *z* and *x* are vectors of attributes of lodging *i* that influence tourist rent and return from selling the lodging.

The land conversion will occur when the net value of change is positive and the marginal benefits from developing in t^* are equal to the marginal benefit from tourist rent in t^*. Therefore, the first order condition obtained is

$$rR(x) = TR(z, t^*), \quad (2)$$

meaning that the tourist lodging should change its use when the expected annualized value from selling minus tourist rents is zero. Equation (2) is the basis of the empirical

model that is defined in probabilistic terms and estimates the probability of changing a tourist lodging to residential use.

In order to explain the forces that drive the change, some authors have incorporated variables that pretend to capture spillover effects on the parcels, that is, how variations in one resort affect its neighboring resorts.

For this purpose, diverse variables that provide information about the neighboring parcels have been included in the study. Spillover effects must be studied carefully, since the existence of spatial autocorrelation may invalidate the estimated model (Carrión-Flores & Irwin, 2004; Kaza et al., 2011).

Table 1 shows diverse factors that affect the conversion of a parcel and their respective estimated signs. They were extracted from the two following contributions, which include conversion factors that may be related to those in the present study:

- Irwin & Bockstael (2002) try to find an explanation to the sprawl phenomenon found in the land use conversion process from rural to urban, where both developed and undeveloped land is located within the same distance to the urban center. Methodologically they estimate a hazard model that supports the existence of negative spillovers among exurban land parcels converted to residential subdivisions, that is, undeveloped land that is adjacent to development is less likely to be developed residentially.
- Carrión-Flores & Irwin (2004) study the factors that entail land use conversion from rural to residential in Ohio. They applied a Probit model controlling for spatial autocorrelation and estimated the probability from rural to residential land use conversion. They find that the location of new residential development is influenced by preferences for lower density areas close to existing urban development.

Table 1. Summary of factors that influence land use change of parcels from rural to urban in the selected papers. The second column indicates the direction of influence on land use conversion of every factor.

Factors	Sign	Source
Distance to city	A	
Distance to town	+	
Population density	-	Carrión-Flores & Irwin (2004)
% residential area in a buffer	+	
% commercial area in a buffer	+	
Size	-	
% of neighboring land in developed uses	-	
Maximum density of allowable development	-	
Distance to city	-	Irwin & Bockstael (2002)
Parcel with agricultural use (1=yes, 0=no)	-	
Cost of conversión	-	

a. The sign depends on the distance: for parcels near the city, the sign is negative, and for parcels further from the city, the sign is positive.

Some of the factors included in Table 1 and their effect on land use conversion are noteworthy. For example, the relationship between distance to cities and probability of land use change from rural to urban differs from one study to another. While greater distance to city decreases the probability of changing land use according to Irwin & Bockstael (2002), this relationship changes in Carrión-Flores & Irwin (2004) depending on the distance: it is negative for parcels located within 14 miles from the city, while it is positive for parcels settled further from that radius.

Carrión-Flores & Irwin (2004) also include distance to nearest town and they find that parcels further from town have higher probability to change their land use type.

Population density is considered by Carrión-Flores & Irwin (2004) showing that lands located in areas with higher population density have less probability to convert to urban use. This evidence indicates that congestion effects from dense areas decrease the attractiveness of lands that are substantially developed.

With respect to the analysis of spillover effects, results obtained by Carrión-Flores & Irwin (2004) and Irwin & Bockstael (2002) differ. While Carrion-Flores & Irwin (2004) find that a higher percentage of neighboring residential uses increases the probability to convert a parcel to urban use, Irwin & Bockstael (2002) obtain an opposite relationship. Authors explain this difference due to the fact that population density has been considered only in Carrión-Flores & Irwin (2004).

2.4 Determinants characterizing land use conversion from tourist to residential

Table 1 includes specific factors influencing land use conversion from rural to urban use. Although applied to a different problem, some of them, such as size or population density, can be included as potential significant factors in the context of land use conversion from tourist to residential use. However, other determinants specific to the tourism case should be also considered. Since there is not any empirical model of land use conversion applied to the case of tourism destination up to date, these potential factors should be extracted from previous empirical findings. In particular, those characteristics of tourist lodgings identified by hedonic pricing models may represent a good choice. Since hedonic price models are used to detect the attributes of the tourist product that are valued by the market, it is expected that they also influence on the profitability of the tourist lodging and therefore in the decision to convert it into residential use.

Most of the applications of hedonic price models on tourism research aim at finding the attributes that characterize hotel rooms (Papatheodorou, 2002; Thrane, 2005; Rigall-Fluviá, 2011; Espinet, 2003; Alegre et al. 2013). In spite of that non-hotel accommodation is the main offer in some tourist destinations such as Gran Canaria or Costa Brava in Spain, only few studies have undertaken an empirical analysis to this kind of lodgings (Saló & Garriga, 2005; Juaneda et al., 2011; Moreno-Gil & Martín-

Santana, 2013). The scarcity of research in this market is mainly due to the difficulty in accessing to a census of the non-hotel accommodation offered to tourists, since a significant proportion of them are unofficially exploited. In this context, Juaneda et al. (2011) perform a comparison of the factors that contribute to define the price of hotels and apartments. Additionally, Saló & Garriga (2011) studied the valued attributes affecting the second-home rental market in Costa Brava. Moreno-Gil & Martín Santana (2013) analyzed non-hotel accommodation image in Gran Canaria.

Summing up, the standard attributes that influence a tourist accommodation found in the literature can be categorized into two groups: a) Structural factors, such as the category, capacity, the number of rooms per lodging, the availability of swimming pool, whether breakfast is included or not, the availability of parking or garden, and b) Location factors, such as see views, distance to beach, the population density of the neighborhood, distance to the town center and to the airport. All of them will be included as potential determinants of land use conversion from tourist to residential.

3. Case study

3.1 Tourism evolution in Maspalomas, Gran Canaria

The empirical study is a tourist area located in the South of the island of Gran Canaria, in the Canary Islands, Spain. It entails several coastal zones, such as Bahía Feliz, San Agustín, Playa del Águila, Playa del Inglés, Maspalomas and Meloneras, although the whole area is known by the tourist market as Maspalomas (Figure 1). This land enjoys of long sandy beaches and a great mild weather all the year round. So, a process of development of tourism offer started in the sixties and has grown dramatically to present. Since then, both hotel and non-hotel accommodation have been

built and offered to tourists, which are mostly German and British. In 2006 around two million tourists spent their holidays in the tourist area of Maspalomas, and approximately half of them stayed in apartments or bungalows. However, in 2013 only 30% of tourists chose non-hotel accommodation, although 58% of the total beds in that year correspond to bungalows and apartments.

In parallel to this trend, the phenomenon of changing the land use from tourist to residential has affected significantly Maspalomas. The offer of non-hotel accommodation, that includes apartments and bungalows, has suffered a sharp decline in the last decade, since approximately 26% of these accommodation units have changed their use from tourist to residential. This process of conversion has generated a strong controversy among the different agents involved: the government and local authorities, who are trying to impose new regulations through policies of restructuration, the private owners of the tourist lodgings, who feel their rights to private property damaged, and the tourists, who may suffer the negative impacts derived from coexisting with residents, since they have different needs.

There are some reasons why apartments and bungalows are suffering a decline process. A decisive factor is obsolescence of the lodgings, including physical, functional and managerial. This process has been reinforced by changes in market trends, which have involved the fact that non-hotel accommodation has turned out an old-fashion offer (Simancas, 2012). Additionally, most of the apartments and bungalows are owned by little investors who own one single unit. This atomization of the property has led to the absence of rejuvenation processes in the area. The profile of owners is characterized by showing a behavior similar to microcapitalists (Santana, 2005), and are interested in maximizing profitability in the short term. Therefore, under

these circumstances, there exists a great difficulty in reaching an agreement by the owner's association.

Authorities have adopted several strategies and laid down some policy measures focused at sustainability of the tourism industry:

- A moratorium law, which was introduced in early 2000s in the Canary Islands, prohibiting new tourist resorts excepting few specific cases. Its objective was protecting the land from the depredating process of building new tourist areas and abandoning the obsolete ones (Hernández-Martín et al., 2015).
- The creation of a consortium among different public institutions in 2008, aimed at rehabilitating infrastructures of the tourist zones such as access to the beaches, parks, parking facilities, etc.
- The promotion of rejuvenation of resorts by creating in 2013 rules that favored investment and renovation of the obsolete lodgings (Law 2/2013 of Renovation and Modernization of Tourism in the Canary Islands).

The above measures have not turned out to be efficient and results are not as expected since rehabilitation of resorts has to deal with the problem of atomization of property in the first place, and additionally, with the strict regulations and excessive bureaucracy imposed by the authorities that make the process of renovation very difficult to fulfill.

Currently, there exists an active discussion in Gran Canaria about the regulations that should drive the tourist areas. In 2013, the Law 2/2013 stated that those resorts located in tourist areas should be intended for tourists, while residential use was not allowed. The heavy land use conversion of the non-hotel accommodation in the last decade did not seem to worry private stakeholders about the consequences of this law

until 2015, when a decree that develops the Law 2/2013 was approved. This decree forces the tourist resorts to use them according to the corresponding plan of improvement of the area. At the same time, municipal authorities promote a plan of improvement and modernization that is about to be approved. This plan determines that almost all resorts in Maspalomas have tourist use and establishes significant sanctions to all the owners that default on this law.

These circumstances have generated a debate still unsolved that involves all the political institutions, many owners of the accommodations who are natives in a high proportion, and tourists.

3.2 Empirical Model

The framework corresponding to land use change models is applied in this tourist context. The model assumes that during the time period analyzed agents involved took their decisions of changing the lodging use freely, depending uniquely on their private circumstances. Legal restrictions are considered null in practice. Therefore, the decision rule shown in (2) is rewritten in probabilistic terms:

$$Prob\{(Closed_i) = rR(x_i) - TR(z_i, t^*) + \varepsilon(\theta_i, t^*) \geq 0\}, \qquad (3)$$

showing that the probability that an apartment or bungalow has closed in the specific period is equal to the probability that the difference between the marginal revenue of maintaining the activity and the revenue of selling the lodging to private use is larger than zero. Subindex *i* denotes the apartments or bungalows considered in the sample; $P(Closed_i)$ is the probability that lodging *i* has closed during the period 2005-2012 and ε_i is the error corresponding to observation *i*, which is normally distributed and depends on θ_i, a vector of unobserved characteristics.

From (3), a Probit model is proposed, which is specified as follows:

$$P\{(Closed_i) = \Phi(x_i\, z_i, \beta) + \varepsilon(\theta_i, t^*) \geq 0\}, \quad (4)$$

where $\Phi(x_i\, z_i, \beta)$ is the cumulative density function which follows a standard normal distribution where $(x_i z_i)$ is a vector of *K-1* variables included in the model (structural and location variables) and β is a vector of *K* parameters, including the constant.

Additionally, when estimating the Probit model, the nature of the data are susceptible to suffer from spatial autocorrelation, and ignoring it will result in biased and inconsistent estimators. For this reason, a spatial autorregresive Probit model will be considered in this study.

According to LeSage & Pace (2009), a spatial autocorrelation Probit model takes the following form:

$$y^* = \rho W y^* + \beta^0 1 + (x_i, z_i)\beta^1 + \varepsilon, \qquad \varepsilon \sim N(0, I_n). \quad (5)$$

LeSage & Pace (2009) argue that the Probit model assumes that the choice between 0 and 1 options depends on the difference in utilities associated to each decision, that is: $y_i^* = U_{1i} - U_{0i}$. So, y^* represents an *nx1* vector reflecting the latent unobservable utility associated with the closed-open status of the tourist resorts and it is assumed that follows a Normal distribution, *1* is an *n* rows vector of ones, β^0 is the intercept and β^1 the *K-1* vector of coefficients of the model.

Matrix W_{nxn} represents the influence of the closed-open status of lodgings in a neighborhood of a given lodging. The weight matrix W_{nxn} has been constructed from the row standardisation of other matrix of order *n* with elements $w'_{ii} = 0$, and w'_{ij}, with $i \neq j \in \{1,2, \dots, n\}$, takes values 1 or 0 whether the resort *i* is connected with resort *j*, considering the *r*-nearest neighbors of the resort *i.*

The determination of which observations are considered neighbors is crucial for the model estimation. In order to test the sensitivity of the model estimation, several weight matrices W were considered assuming different number of *r*-nearest neighbors.

Coefficient ρ measures the degree of dependence among the resorts that have closed, and a positive sign indicates that the closure of a resort is positively influenced by the closure of nearby lodgings. When ρ=0 the standard Probit model is obtained.

Since the probability of closure is a nonlinear function of the explanatory variables, care must be taken when interpreting the coefficients of the model. According to LeSage & Pace (2009), when spatial autocorrelation Probit is considered, changes in the explanatory variables that are associated with firm *i* influence not only the dependent variable value of firm *i* but also the dependent value of other firms, say *j*. These cross-partial derivatives are also known as *spatial spillover effects*. Therefore, total changes in the explanatory variables are the sum of direct and indirect (or spillover) effects.

3.3 Data

The sample studied entails 402 non-hotel accommodation units (apartments/bungalows) located in Maspalomas (Gran Canaria). Figure 1 shows the map of the tourist zone and the units included in the sample. Data have been delivered by Patronato de Turismo de Gran Canaria, a public institution in the island, and extracted from tourist web pages. The information about the lodgings entails two periods of time (2005 and 2012) in order to detect whether they have closed during that interval or not. From a total of 402 non-hotel apartment and bungalows opened in 2005, 26.8% were not functioning any more in 2012.

Figure 1. Map of the tourist area of Maspalomas in Gran Canaria. The points indicate the location of the 402 non-hotel accommodation units included in the sample. Green-colored points denote non-hotel units that officially operate as tourist offer within the period 2005-2012. Red-colored points denote non-hotel units that closed their activity within the period 2005-2012. Main Shopping Centers and accesses to beaches are also located in the map.

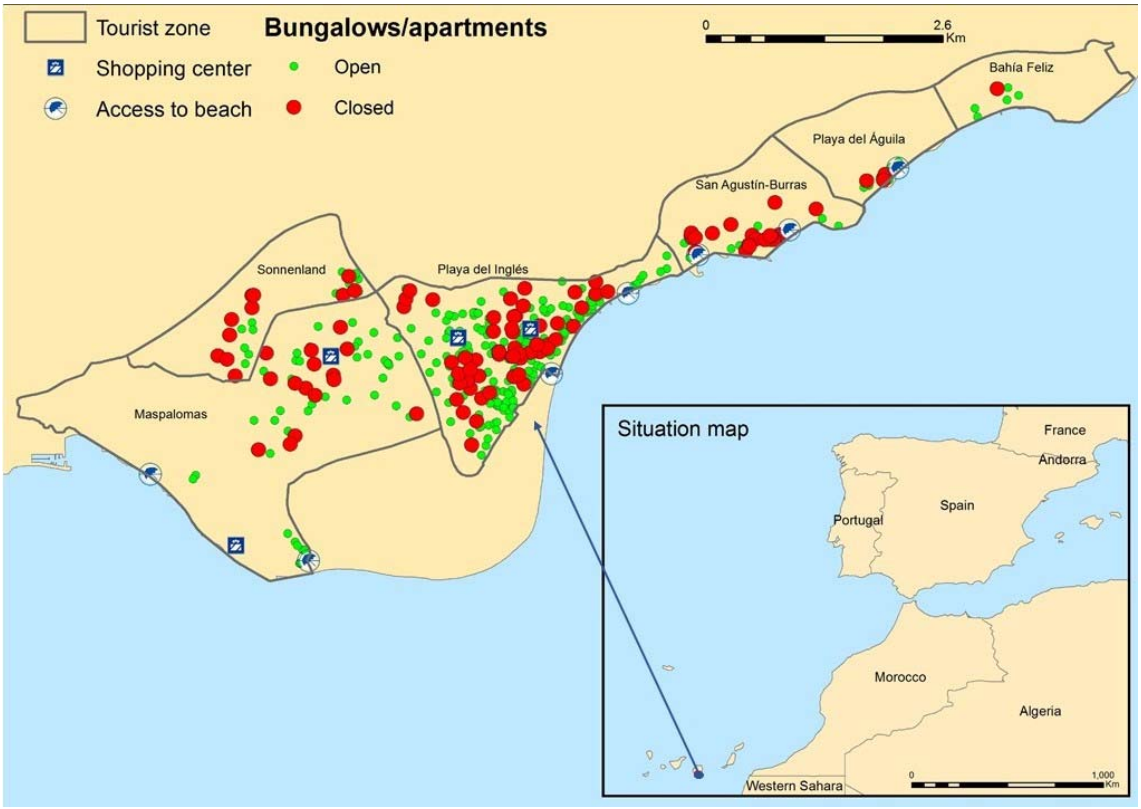

Table 2 shows the description of the variables included in the analysis. They have been selected according to the traditional attributes considered in hedonic price models in the tourist literature (section 2.4) and those specific for land-use conversion (section 2.3). Data have also been conditioned to their availability and policy restrictions of public institutions polls that do not allow the deliverance of microdata.

The object of study is the variable *Closed*, that is a qualitative variable which takes value 1 if the resort has closed during the interval 2005-2012, and 0 otherwise. The structural variables included in the study are: *Year*, which is defined as the year of construction of the resort, *Apartment*, a categorical variable that takes value 1 if the resort is made up of apartments, and 0 if it is integrated by bungalows; the *Category* of

the resort; whether a *Pool* is an included amenity or not; *Persons/unit,* which is the maximum number of persons allowed per unit; *Total beds,* which represents the total capacity of the resort; *Restaurant*, a qualitative variable that takes number 1 if a restaurant is available in the resort or 0 on the contrary; *Coordinate X* and *Coordinate Y,* which are the UTM X and UTM Y coordinates, respectively.

Apart from the standard structural variables, a number of relative location variables have been considered. In order to build these variables, resorts and different sites of interest have been geocoded, and the GVsig program has been used to create them. First, in order to detect whether the different tourist zones have experienced different behavior, the lodgings were located in some areas (*Bahía_Feliz, Playa_Inglés, Maspalomas, San-Agustín, Sonneland, Playa_Aguila*). These areas were identified according to the main natural attraction (beach) or geographic accident in it and are represented in Figure 1. The variables take value 1 if the lodging belongs to that area and 0 on the contrary. Second, distance from each resort to the main tourist shopping centers have been measured (*Dist_SCFaro2, Dist_SCKashba, Dist_SCVaradero, Dist_SCYumbo*). Initially there is also interest in detecting whether there exists difference between new and old shopping centers in the way they may influence on the neighboring resorts. Finally, distance to nearest shopping center (*Dist_NearestSC*) and distance to nearest beach (*Dist_NearestBeach*) have been also included.

The number of neighboring lodgings that closed their tourist activity is also a potential regressor of the model. However, in order to include it, an instrument for addressing endogeneity problems is necessary. In this respect, Carrión- Flores & Irwin (2004) solved this problem by using temporary lagged values for regressors with potential endogeneity. Nevertheless, this alternative could not be implemented here

since there is not reliable information about the exact year when the tourist activity stopped. So, this factor is not included in the model.

Table 2. Definition and descriptive statistics of the variables for non-hotel resorts in Maspalomas used in the empirical model (5).

Variables	Definition	Mean	Std. Dev.	Min.	Max.
Closed	Closure of the resort between 2005-2012 (1=yes, 0=no)	0.268	0.443	0	1
Structural					
Year	Year of construction	1980.74	7.49	1969	2004
Apartment	Apartment/bungalow (1=apartment, 0=bungalow)	0.534	0.499	0	1
Category2	Category of the resort, 2 stars or 2 keys	0.49	0.50	0	1
Category 3	Category of the resort, 3 stars	0.07	0.267	0	1
Pool	Pool in the resort (1=yes, 0=no)	0.907	0.289	0	1
Persons/unit	Max. number of persons per unit	3.24	0.815	1.55	6
Total beds	Total capacity of the resort	185.49	199.21	6	1017
Restaurant	Restaurant available in the resort	0.25	0.435	0	1
Units	Number of units in the resort	59.16	66.77	2	432
Location					
Bahia_Feliz	Located in Bahía Feliz (1=yes, 0=no)	0.014	0.121	0	1
Playa_Ingles	Located in Playa del Inglés (1=yes, 0=no)	0.621	0.485	0	1
Maspalomas	Located in Maspalomas (1=yes, 0=no)	0.186	0.39	0	1
San_Agustin	Located in S. Agustín-Burras (1=yes, 0=no)	0.116	0.321	0	1
Sonneland	Located in Sonneland (1=yes, 0=no)	0.034	0.183	0	1
Playa_Aguila	Located in Playa del Aguila (1=yes, 0=no)	0.019	0.139	0	1
Dist_SCFaro2	Distance to SC* Faro 2 (m)	2266.86	1417.14	193.55	8072.15
Dist_SCKashba	Distance to SC Kashba (m)	1452.02	1154.39	69.94	5937.29
Dist_SCVaradero	Distance to SC Varadero (m)	3 834.41	1 614.93	579.93	9 906.52
Dist_SCYumbo	Distance to SC Yumbo (m)	1 504.16	1 179.5	71.51	6 699.06
Dist_NearestSC	Distance to nearest SC (m)	933.06	961.44	69.94	5 937.29
Dist_NearestBeach	Distance to nearest beach (m)	854.19	628.43	42.22	2 554.62
Coordinate X	UTM X coordinate	453521	199024	440141	4433887
Coordinate Y	UTM Y coordinate	3070593	807.98	3068140	3073277

*Shopping Center

4. Results

The selection of the best weight matrix W in (5) was performed by estimating the model considering a sequence from 1 to 30 closest neighbors to each observation (that is, firstly, building a weight matrix that links each observation with its closest neighbor, next, linking each observation with its two closest neighbors for the following potential weight matrix and so on) and choosing the model with lowest Akaike Information Criterium. According to this, the weight matrix that best captures the spatial correlation is the one that considers the 15 nearest neighbors.

The estimation of the model shows that from all the factors considered, *Category2*, *Category3*, *Apartment*, *Persons/unit*, *Restaurant*, *Beds* and *Coordinate Y* turned out to be significant for the model. It is noteworthy that the only location variable among them is *Coordinate Y*. The spatial regression parameter ρ is positive and significant, showing that there exists a positive correlation in the probability of closure within a neighborhood.

Table 3 shows the results considering both the standard Probit model and the Spatial autocorrelation Probit model. The Akaike Information Criterium (AIC) and the Loglikelihood coefficient show that the spatial autocorrelation model improves the standard Probit model. When comparing the coefficients of both models they present similar values in both estimations, and all the variables are significant in both cases except the intercept in the spatial Probit model.

The results of Table 3 show the influence of some lodging's attributes on the probability to close. Thus, lodgings with higher categories have less probability to close during the period studied. This is also the case for apartments with respect to bungalows. High number of beds per unit increases the probability to close, together

with high number of total beds while accommodations with restaurant are less prone to close.

Table 3. Standard Probit and Spatial Autorregressive Probit estimation (SAR) for the model (5).

Variables	**Coefficients Probit**	**Coefficients SAR Probit**	**Directed effects**	**Indirect effects**	**Total effects**
Intercept	-0.80**	-0.46			
Category2	-0.34**	-0.33**	-0.09	-0.08	-0.17
Category3	-1.24***	-1.34***	-0.36	-0.33	-0.69
Apartment	-0.50***	-0.44***	-0.11	-0.11	-0.23
Persons/unit	0.16*	0.14*	0.03	0.037	0.07
Restaurant	-0.64***	-0.69***	-0.18	-0.17	-0.36
Beds	0.0013***	0.0013***	0.0003	0.0003	0.0007
Coordinate Y	0.25***	0.18***	0.049	0.045	0.039
ρ		0.47***			
AIC	422.98	416.39			
Log Likelihood	203.49	199.19			

Note: ***, **, * denote significance at 1, 5 and 10%, respectively.

In order to better interpret the effect of each factor on the probability of closure of each tourist resort, marginal probabilities have been computed for the mean values of the regressors, distinguishing between direct and indirect or spillover effects. The last three columns of Table 3 show the corresponding marginal effects of the probability of closure after the variation of the different regressors.

The model shows that resorts (apartments or bungalows) with a category of 2 keys have a probability of closure 9% lower than others with 1 key. Resorts with 3 keys (or stars) have a probability of closure 36% lower than resorts with 1 key. Apartments have a probability of closure 11% lower than bungalows. An increase of 1 person in the number of persons allowed per unit increases by 3% the probability of closure. Resorts with restaurant have a probability of closure 18% lower than those that do not have this facility. An increase of one bed in the total capacity of the resort increases by 0.03% its probability of closure.

Impacts corresponding to indirect effects are lower than direct effects. In order to interpret spillover effects adequately, one must keep in mind the fact that indirect effect does not indicate the impact on the probability of closure of every neighbor, but the accumulated impact on all neighbors. Consequently, considering that in the present model the 15 nearest neighbors are taken into account as immediate neighbors, the impact on every particular neighbor is rather smaller than indicated in Table 3. The most relevant spillover effects correspond to *Category3*. The indirect effect for *Category3* means that a rise to *Category3* for observation *i* implies that the sum of probabilities of closure for all *i*'s neighbors reduces in 0.33.

The Likelihood ratio test of the joint significance of the model coefficients rejects the null hypothesis, showing that the model is jointly significant. Table 4 shows the accuracy rate of the correct predictions, obtaining 67% of correct predictions for those lodgings that remained opened, and an accuracy rate of 71% for those lodgings that closed their tourist activity. In absolute terms, 77 out of the 108 establishments that closed have been correctly predicted, while in the case of those that remained open, 199 out of 294 have had a correct forecast.

Table 4. Prediction table showing correct and incorrect classification of the observations based on the expected calculations and the cutoff point.

	Estimated equation		
	***Closed*=0**	***Closed=1***	**Total**
P(*Closed*$_i$=1)≤0.268[*]	199	31	230
P(*Closed*$_i$=1)>0.268	95	77	172
Total	294	108	402
%Correct	67%	71%	68%
%Incorrect	33%	29%	32%

[*]0.268 is the proportion of non- hotel accommodations that closed within the interval 2005-2012. It is the cutoff point in order to take into account for prediction purposes the fact that the number of closed establishments is significantly lower than those that remained opened.

5. Discussion

The empirical analysis reveals some of the forces that drive land use change from tourist to residential use in the specific case of Maspalomas (Gran Canaria, Spain). Some of them are noteworthy, such as the influence of the environment surrounding a lodging. Specifically, it was found that the closure of non-hotel accommodation units in the neighborhood increases the probability of closure of a unit. The existence of spatial autocorrelation in the analysis of land use change models is a common concern in other applications (Carrión-Flores & Irwin; 2004 and Irwin & Bockstael, 2002). Corrections for spatial autocorrelation in the Probit model have recently been developed (Lesage & Pace, 2009) and, consequently, the presence of spatial autocorrelation has been included in the model. The consideration of spatial autocorrelation in the Probit model entails the existence of spillover effects in the context of the closure of tourist establishments. To our knowledge, spillover effects have been only studied among tourist destinations (Yang-Yang & Wong, 2012; Marrocu & Paci, 2013; Yang-Yang & Fik, 2014), while the present study analyzes spillover effects in the same destination.

Other crucial aspect for the non-hotel accommodation unit is the category. The estimation of the Probit model shows that higher category apartments or bungalows are less prone to convert into residential use. This result agrees with common recommendations for restructuring mature destinations. Specifically, category is a proxy for renovation, in the sense that incentives to promote increasing the category of a lodging involve its physical renovation, which is one of the usual strategies for rejuvenation of a mature destination (Agarwal, 2002; Aguiló et al., 2005; Garay & Cánoves, 2011; Ivars-Baidal et al., 2013; Medina-Muñoz et al., 2016). However, to our knowledge, this fact has not been analyzed in the context of land use change in a tourist area.

The finding that apartments are less prone to closure than bungalows may be explained by the fact that selling price of a bungalow is significantly higher than the price of an apartment. The difference between the selling prices is mainly due to that in general a bungalow has larger available surface than an apartment. However, the rental prices are comparatively similar, as can be roughly confirmed by visually comparing rental prices between both types of offer on any available booking web page. Therefore, keeping a bungalow has a higher opportunity cost than an apartment. Additionally, apartments have lower fixed maintenance costs.

In spite of that hedonic price models and land use change models differ, some of the attributes that affect positively the price offered by a tourist lodging affect negatively its probability of closure as well. This is the case for the category and size (number of beds) of the non-hotel accommodation units, which appeared as factors positively valued by the market in hedonic pricing applications (Saló & Garriga, 2011; Juaneda et al., 2011). The relationship between factors influencing land use conversion and market-valued lodging attributes is expected. A lodging including attributes appreciated by the market lead to higher prices and presumably higher revenues, what implies that the owner is lower prone to sell the property for residential use. Therefore, the results show the convenience of using lodging's attributes obtained by the application of hedonic pricing models as explanatory variables in land use conversion models.

The zone effect is not significant for any of the six different zones considered in the sample. We can conclude that in spite of the different zones comprise diverse characteristics that a priori could affect the probability of closure of the lodging, the particular tourist zone does not affect the lodging in general. In this respect, Saló & Garriga (2011) found significant municipality effect when explaining the rental price of

second homes in Costa Brava. They argue that significant municipality effect is a proxy of local public goods and services management. All the zones considered in this paper belong to Municipality of San Bartolomé de Tirajana, therefore they are all ruled by the same government.

Distance to the beach is one of the attributes that are most valued by the tourists according to the estimations of the hedonic price models (Saló & Garriga, 2011; Alegre et al., 2013; Papatheodorou, 2002; Thrane, 2005). In the present study, this attribute was not relevant to explain the probability of closure of a lodging. However, the location variable *Coordinate Y* turned out to be relevant showing that the more North facing, the higher probability to close. According to the cartography of the island, the more North facing lodgings correspond partly to areas that are obsolete and need a renovation in spite of being close to the beach, such as San Agustín-Burras, Playa del Águila and Bahía Feliz, and partly to zones that are further from the beach, such as Sonneland.

The existence of tourism facilities such as theme parks or shopping centers are usually valued by the tourists and the introduction of them is one of the strategies for coastal restructuring (Agarwal, 2002; Priestley & Mundet, 1998). In the study case, however, no evidence was found about the relationship between being located near a shopping center and the probability of closure. Three of the four shopping centers included in the analysis were built several decades ago and they need a renovation. Attempts to reach an agreement among their owners in order to accomplish it have been made but they have been unsuccessful up to date. This fact may have influenced on the results obtained.

5.1 Policy implications

The finding that neighboring behavior affects the tourist lodgings must be taken into account by authorities when designing restructuring strategies. In fact, the spillover

effect derived by the closure of tourist resorts is currently a matter of controversy in Gran Canaria, where there exists a conflict of interests among several parts difficult to deal with: Authorities, who pursue to preserve tourist areas away from residential zones; Tourist managers, who are also against the residential use of originally tourist lodgings; Private owners, who fight for their right to use their private property freely; And certain niche of tourists, who stay for long periods of time in the property and rent it in the private market.

At present, there is an open debate in the Canary Islands with respect to this problem and authorities are struggling to reach a consensus among all the involved agents. In fact, authorities' efforts to impose regulations on the tourist areas in 2015 have failed due to the pressure of the private owners and have been recently abolished. New proposals are being studied currently to regulate the tourist areas.

In general, regulations to control the residentialisation of tourist areas are difficult to apply, and this problem reaches much higher dimension in other tourist settlements such as Costa Brava and the Community of Valencia where the typology of tourist network was more complex.

Policy makers are aware of the importance of quality and have proposed incentives to tourist lodgings' owners to promote investment and increasing their category. Unfortunately, although some owners are involved in this process of rejuvenation, results are not as expected since regulations to restructure tourist lodgings are too strict and there exists a complex bureaucracy difficult to manage that makes this process arduous and in some cases even impossible to accomplish.

Thus, our findings confirm the suitability of some actions followed by authorities. Nevertheless, some new management recommendations, derived from the findings

obtained in the present analysis, can be made to the agents involved in the tourist activity:

- If new non-hotel resorts are being built, managers should take into account that apartments are less prone to close their tourist activity than bungalows, and authorities should promote apartments instead of bungalows, since they need less surface of land, and keep a less predatory behavior.
- Authorities should try to find a way to control for the correct status of tourist lodgings (whether officially exploited or under residential use) and the adequacy of their facilities, so that their image does not affect negatively the neighborhood.
- Authorities should establish more flexible regulations to facilitate restructuration, specifically, renovation of the tourist lodgings.

5.2 Limitations

This study includes several limitations which are necessary to bear in mind. First, due to data availability restrictions, the empirical model does not include essential factors that influence on the phenomenon of residentialisation, such as revenues from tourist exploitation, sell price of the lodgings and transaction costs. The factors currently considered in the model work as imperfect proxies of these elements. Second, other attributes influencing the closure of tourist lodgings, such as the quality of lodging facilities and surrounding area, were not available either. Data have been obtained from an official institution as well as from web pages and did not include any statistics of these attributes. Nevertheless, this kind of information was not registered for establishments that closed within the period 2005-2012, what makes the task hard to accomplish in the future.

6. Conclusions

The main aim of this paper was to find some of the forces that drive the land use conversion from tourist to residential. In this regard, the land use conversion models, originally applied to analyze land change from rural to urban use, have shown as a suitable methodology to analyze this phenomenon in tourism research. Additionally, lodging attributes previously identified in the application of hedonic price models can be used in land use conversion models in combination with other factors coming from this literature.

The empirical analysis has been applied to study the process of residentialisation of the non-hotel accommodation, which includes apartments and bungalows, in the tourist area of Maspalomas, Canary Islands, Spain. Summarizing, the findings have revealed that the factors that mostly influence on land use conversion in this area are: (a) Resort quality, which is characterized by the category; (b) Typology of the resort: apartments have shown higher resilience to the conversion trend than bungalows; (c) The state of neighboring resorts: a spillover effect is produced in the propensity to close the lodging unit. The existence of some facilities, such as restaurants, also is a positive factor to maintain the tourist activity in the resort. However, other factors that in principle may influence on the phenomenon, such as the distance to the main attractions in the area (beach or shopping centers), did not appear to affect the conversion from tourist to residential use. From these findings, some strategies to slow down the withdrawal of these resorts from the official tourist activity are provided for the public and private stakeholders.

In this paper, the phenomenon of residentialisation of a tourist zone has been analyzed in a specific tourist area (Maspalomas) which is characterized by two facts: a) The main supply corresponds to non-hotel accommodation; b) Land use is mostly

qualified as tourist and originally exploited by tourist agents. In order to compare the conclusions obtained in here with other situations, a similar analysis can be applied or extended to other destinations where this process occurs or is susceptible to take place.

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