Amenities and location of hotels: a micro-economic model and estimations.

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Abstract

Among different determinants, amenities play a major role in the location of tourism activities. In Tourism Economics, an extensive literature investigates the influence of amenities either on destination choice made by tourists or on economic development, generally at a regional or national level. This paper aims at analysing the influence of amenities on the location of hotels at local level. In a first part, after a presentation of the context of our work and a brief survey of existing literature on the link between amenities and tourism, we introduce and describe the different relevant features of amenities that will be analysed. In a second part, using a micro-economic model of hotel entry inspired by urban economics literature, we analyse the influence of amenities characteristics on the number of hotels entering the market and on the regional profit generated under two alternative assumptions. Given the theoretical propositions, the third part is dedicated to econometric tests of the effect of amenities on accommodation capacity and on the creation of new hotels at French Functional Economic Areas level. Estimates give an insight into which of the two theoretical assumptions should be preferred.

1. Introduction

Tourism is an economic sector characterized by an important spatial concentration. Indeed, at the international level, the five most touristic countries concentrate nearly a third of international arrivals[1]. In France, more than half of the domestic visitors overnights concerns 3 regions out of 22 : Paris and Ile de France, Provence-Alpes-Côte d'Azur and Rhônes-Alpes[2]. Concentration at this level of analysis can easily be explained by natural endowments or emblematic resources (coast, ski resort, national capital) and by mass tourism. However, it seems less obvious to explain why tourism is also concentrated in rural areas, and why only 10 % of the rural French municipalities have 77 % of total amount of tourist accommodation. In Tourism Economics, many empirical works point out the influence of spatial features and amenities on accommodation price (J. M. Hamilton, 2007, A. Mollard et al., 2007, I. Vanslembrouck et al., 2005) or on tourism development (F. Capone and R. Boix, 2008, J-C. Dissart et al., 2008). Most of the time, these works are not based explicitly on a theoretical framework (D.W. Marcouiller and G. Clendenning, 2006) or rest on theoretical models which integrate space indirectly and consider spatial characteristics amongst many other features (A. Papatheodorou, 2001, D. Rugg, 1973). Moreover their analysis generally stands at a regional level. On another side, quite recently, a growing literature in urban economics managed to integrate amenities in their analysis of household location (J.K. Brueckner et al., 1999, P. D. Gottlieb, 1995, J. Wu, 2006). In comparison to the former, the influence of natural and patrimonial endowments is then analysed at a local level and using a micro-economic framework. In this paper, we propose to cross both approaches so that we could analyse the influence of amenities on hotel location at a local level. Defined as natural or man-made attributes strictly related to a territory, the notion of amenities involves that a location is characterized by its pleasantness and attractiveness. Following (J.K. Brueckner, 2003), we may consider three types of amenities : *natural amenities* generated by topographical and geographical features (such as rives, coastline, hills…), *historical amenities* generated by monuments, buildings, parks and other urban infrastructure from past eras, and *modern amenities* that might include different modern infrastructures such as theatres, swimming pools or tennis courts. From a spatial point of view, historical and modern amenities are generally local and punctual whereas natural amenities are most of the time more diffuse and can extend over more than one municipality. Therefore the microeconomic models sketched in section 2 takes into account that amenity could then influence tourists choice of location (and through them, hotels location) at a regional but also at a local level.

Our purpose is then to analyse how the regional level of amenity and the local level of amenity within the region influence tourist and hotels entry and location. We investigate two different models based on alternative assumptions on tourist behaviour. On one hand, we assume that tourists' decisions to go on holidays are based on a multinomial logit model where the total number of tourists is exogenous. On the other hand, we suppose that the local level of amenities determine whether tourists to decide to go or not on holidays. We then have a free entry model. The comparison of those two models entails the formulation of different theoretical propositions. Section 3 is then dedicated to an empirical application, designed to test the theoretical results and to give an insight into which of the two models should be preferred. The conclusion gives some policy implications and perspectives for future research.

2. A micro-economic model of hotels location

2.1. General assumptions

Spatial representation and amenity function

We consider *R* regions which are potential tourist destinations. Following (E. Von Böventer, 1967), we propose here to transpose urban economics framework to tourist location. We consider each region as an infinite linear space. A unique tourist site is situated at the origin, and consists of *n* different amenities of identical magnitude *a*. The level and number of amenities is exogenous. Let *x* denote the distance to the site. Each tourist takes up an infinitesimal band of space *dx* for his/her accommodation.

Tourist behaviour

Tourist utility depends only on amenities *a*, with the utility function given by $U = f(a)$. The indirect utility function depends on tourist location *x* through travel costs, and is considered to be a linear function of indirect utility expected from amenities and of accommodation price and is given by $V(x) = V_a(x) - p(x)$. As the site includes *n* amenities, the tourist has to choose each day of his stay which amenity he's going to visit among the *n* amenities of the site. His choice will depend on his preference for variety. Indeed, if his preference for variety is null, he will then visit the amenity which offers him the greatest utility (in other words his favourite one) each day. If it's not the case, the probability he visits the other amenities will increase with his preference for variety. When preference for variety tends to infinity, all amenities will have the same probability of visit.

Therefore, we may consider that a tourist choose to visit amenity i with a probability P_i given by a multinomial logit formula :

$$P_i = \frac{e^{(V_{a_i}/\mu)}}{Z} = \frac{e^{(V_{a_i}/\mu)}}{\sum e^{(V_{a_i}/\mu)}}$$

where $V_{a_i}(x)$ is indirect utility linked to amenity i and μ measures tourist preference for variety of amenities (μ increase with tourist preference for variety). At this level, we consider that $V_{a_i}(x)$ equals to amenity utility a free of disutility generated by travel cost to tourism sites, so that : $V_{a_i}(x) = a - t|x|$, where t is unit travel cost. Following (D. McFadden, 1981) and subsequent papers (S.P. Anderson et al., 1988, A. de Palma and J-F. Thisse, 1987), according to the logit model, a representative tourist's indirect utility function expected from amenities is given by :

$$V_a(x) = \mu \ln Z = \mu \ln \sum_{i=1}^{n} e^{(a_i - |x|t)/\mu} = \mu \ln(n e^{(a-|x|t)/\mu})$$
$$= a - |x|t + \mu \ln n$$

Therefore, total indirect utility is given by :

$$V(x) = a - |x|t + \mu \ln n - p(x) \qquad (1)$$

These expressions imply that indirect utility expected from amenities increases with the amenity level a and with their diversity (n) and decrease with distance to the site. Moreover, it implies that marginal utility decrease with amenities diversity.

Tourists choose their location so that they maximise their utility. As their utility function decrease with distance to site, they trade off distance to site and accommodation price.

Hotels behaviour

As tourists, each hotel occupies an infinitesimal band of space and is able to accommodate a single tourist. In order to keep the model tractable, the costs are assumed to be constant in space and hence, the profit function is given by:

$$\pi(x) = p(x) - c \qquad (2)$$

Hotels locate so that they maximise their utility and entry in free.

2.2. Equilibrium under fixed number of tourists

Concerning entry conditions of tourists, we are facing different possibilities. Following (A. Papatheodorou, 2003), we firstly consider that tourists follow a two-stage choice process and that decision to go on holidays (or not) is an independent choice of where to go. The holidaymaking decision taken beforehand is assumed to be exogenously determined and the present model aims at modelling the second stage of the process decision. So let *N* be the (exogenous) number of tourists who decide to go on holidays. We suppose that tourists choose firstly their destination among the *R* regions and secondly their location within the chosen destination. As a result, a tourist chooses the destination *j* with a probability P_j given by multinomial logit formula :

$$P_j = \frac{e^{(V_j/\nu)}}{Z'} = \frac{e^{(V_j/\nu)}}{\sum_{j=1}^{R} e^{(V_j/\nu)}}$$

where V_j is indirect utility in destination *j* and ν measures tourist heterogeneity. For low value of ν, consumer heterogeneity is high and randomness prevails in the destination choice.

Number of tourists and hotels

In that case, the number of tourists in region j is given by :

$$N_j = P_j N = \frac{e^{(V_j/\nu)}}{\sum_{j=1}^{R} e^{(V_j/\nu)}} N \qquad (3)$$

As each hotel can accommodate only tourist, the number of hotels in equilibrium equals to number of tourists, *Nj*.

Accommodation price and hotel profit

In order to maximise their utility, tourists locate around the site and occupy a segment $\lfloor -N_j/2; N_j/2 \rfloor$. In spatial Nash equilibrium, price depends on hotel location and must be such that tourist utility is constant in space so that no tourist has an incentive to move. This condition leads to the fact that tourist net cost, that is to say price added to travel cost, remains constant.

Thus: $p(x) = C_T - t|x|$ where C_T correspond to net cost borne by tourists.

Moreover, in equilibrium, the zero-profit condition of hotels entry must be respected and the situation is such that profit of the hotels located at the limit of the segment is null. This condition yields:

$\pi(N_j/2) = p(N_j/2) - c = C_T - \frac{tN_j}{2} - c = 0$ so that

$$C_T = \frac{tN_j}{2} + c$$

This implies that accommodation price is given by :

$$p(x) = c + \frac{tN_j}{2} - t|x| \quad (4)$$

This expression leads directly to the profit function:

$$\pi(x) = p(x) - c = \frac{tN_j}{2} - t|x| \quad (5)$$

Regional profit

To find the expression of regional profit, profit function (Eq. (5)) is integrated on the segment $\lfloor -N_j/2; N_j/2 \rfloor$, which yields to:

$$\Pi_j = 2\int_0^{N_j/2} \pi(x) = \frac{tN_j^2}{4} \quad (6)$$

Indirect utility in destination j

Using equations (1) and (4), indirect utility in destination *j* can be written as :

$$V(x) = a_j + \mu \ln n_j - c - \frac{tN_j}{2} = V_j$$

Considering here that the realised indirect utility in destination *j* is the same as the indirect utility perceived ex ante by tourists, this expression implies that number of hotels is, in the end, given by :

$$N_j = \frac{e^{(a_j + \mu \ln n_j - c - \frac{tN_j}{2})/\nu}}{\sum_{j=1}^{R} e^{(a_j + \mu \ln n_j - c - \frac{tN_j}{2})/\nu}} N \quad (7)$$

As this expression cannot be solved mathematically, we will perform numerical simulations in section 2.4 to go further in our analysis.

2.3. Equilibrium with free entry of tourists

In this section, we explore the results obtained with respect to another assumption concerning conditions of tourists' entry in destination *j*. We suppose that tourists go on holiday if their expected utility is higher than a threshold $\underline{u}$. In this case, everything works out as if each region would face a potentially infinite pool of tourists. Accordingly, we have a free entry of tourists model and consider that tourists enter the region and locate at *x* until their indirect utility *V(x)* remains superior to $\underline{u}$.

Accommodation price and hotel profit

As in the previous model, tourists locate around the site so that they maximise their utility. In Nash spatial equilibrium, accommodation price must vary with *x* to ensure that indirect utility is the same in all locations. Considering equation (1), this condition will be respected if:

$$V(x) = a - |x|t + \mu \ln n - p(x) = \underline{u}$$

$$p(x) = (a - \underline{u} + \mu \ln n) - |x|t \tag{8}$$

By analogy with urban economics, the latter gives the "bid-price" function for accommodation or, more properly in our case, the function of tourists' willingness to pay for amenities. As we could have expected, the willingness to pay for amenities decrease with growing distance to site and increase with amenity level *a*, preference for variety μ and amenities diversity *n*.

According to equations (2) and (8), the profit function is then given by:

$$\pi(x) = (a - \underline{u} + \mu \ln n) - |x|t - c \tag{9}$$

Number of tourists and hotels

As the willingness to pay function decreases with growing distance to site, hotels locate around the site in order to maximise their profit. Furthermore, with respect to the zero-profit condition, they enter the region *j* until their profit is null and locate up to a distance limit x_{lim} determined by:

$$\pi(x_{\lim}) = (a - \underline{u} + \mu \ln n) - x_{\lim} t - c = 0$$

So that we get:

$$x_{\lim} = (a - \underline{u} + \mu \ln n - c)/t \quad (10)$$

Hence, hotels locate on a segment *S* corresponding to $[-(a - \underline{u} + \mu \ln n - c)/t; (a - \underline{u} + \mu \ln n - c)/t]$. Total number of hotels entering the region *j* in equilibrium is given then by the segment *S* length:

$$N_j = 2x_{\lim} = \frac{2(a - \underline{u} + \mu \ln n - c)}{t} \quad (11)$$

Regional profit

To find the region profit *Π* in equilibrium, we have to integrate the profit function on the segment *S* length. Then, considering (9) and (10):

$$\Pi_j = 2\int_0^{x_{\lim}} \pi(x) = 2\int_0^{x_{\lim}} a - \underline{u} + \mu \ln n - c - xt$$

Which gives:

$$\Pi_j = \frac{(a - \underline{u} + \mu \ln n - c)^2}{t}$$

2.4. Simulation and results

In order to go further in analysis and to compare results obtained with both theoretical models (the fixed number model and the free entry model), in this section, we perform numerical simulations. To simplify, we consider the case of only two regions (so that $R = 2$). For both model, we set the different parameters as followed: $c = 3$, $t = 1$, $\nu = 1$, $\mu = 1$. In the first model, we consider that total number of tourists is $N = 50$. In addition, we consider here the case where the tourist utility threshold $\underline{u} = 5$. In the first region, parameters remain constant. That region includes 3 different amenities ($n_1 = 3$) of a magnitude equal to $a_1 = 20$. The second region is such as $n_2 = 2$. Given these values of parameter, we simulated the effect of an increase of local amenity level in the second region a_2 on the number of hotels and on regional profit in both regions according to the fixed number model (Figure 1) and the free entry model (Figure 2).

Figure 1 : Influence of a_2 on (*fixed number model*)

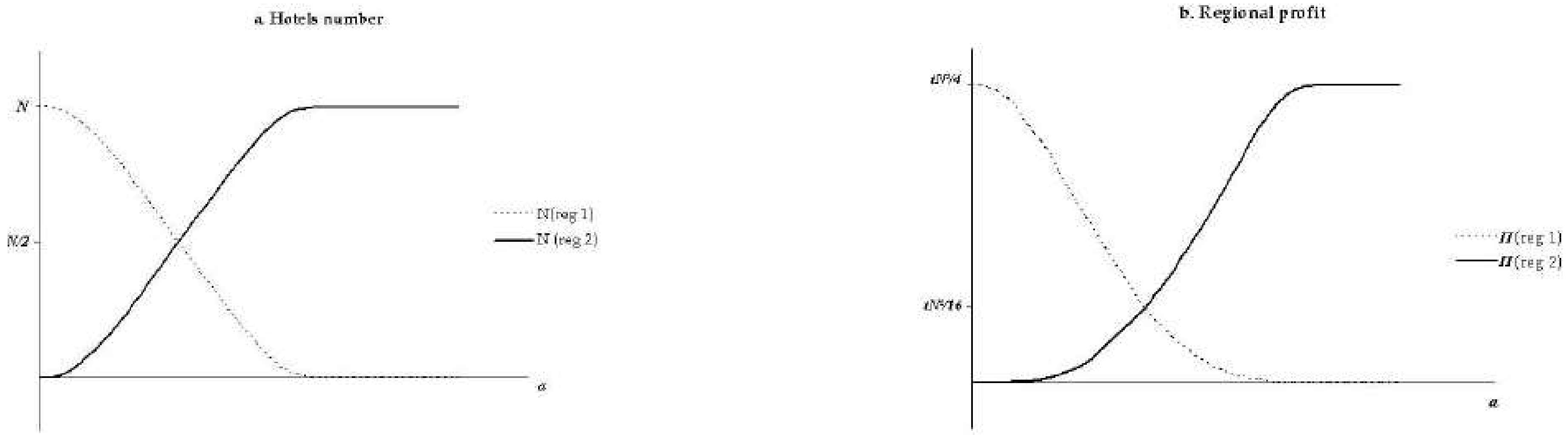
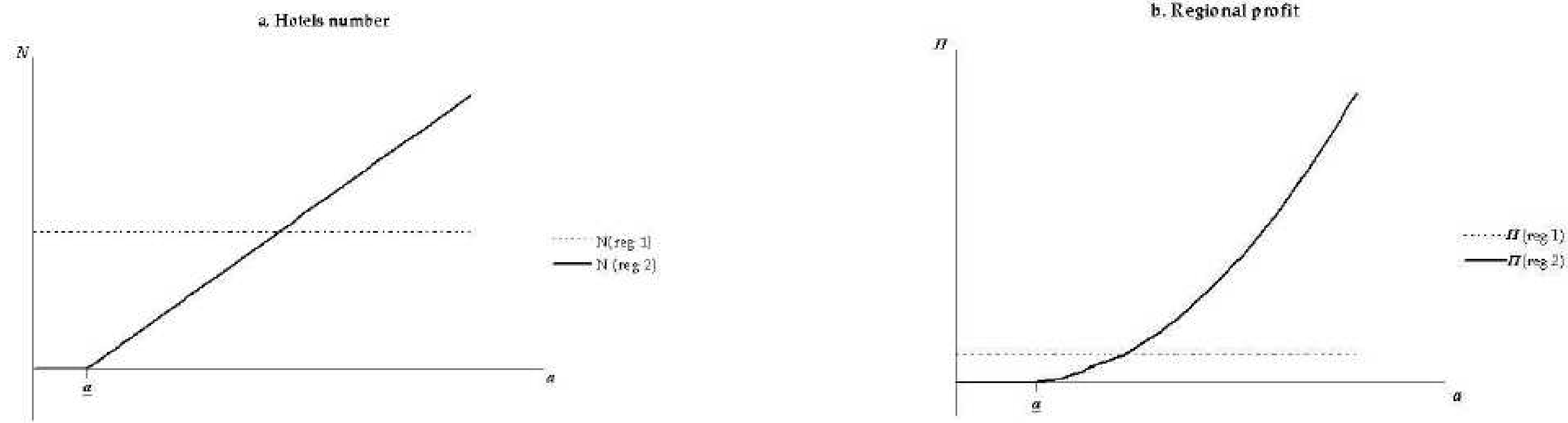


Figure 2 : Influence of a_2 on (*free entry model*)



The first point we could make out is that, with both theoretical models, local amenity level (and thus the number of amenities and the preference for diversity parameter as well), increase the number of hotels entering the region and regional profit.

Proposition 1: *an increase of local level of amenity (as well as an increase of amenities diversity) has a positive impact on the number of hotels and on regional profit generated.*

Let us now turn to the comparison of the functions. According to the fixed number model, the number of hotels and the regional profit functions are positive as long as the level of amenity is positive. Whereas, under the free entry model assumptions, the local amenity level must exceed a certain threshold $\underline{a} = \underline{u} - \mu \ln n + c$, so that the number of hotels and the regional profit become positive. Thus :

Proposition 2: *when the potential number of tourists is exogenous (fixed number model), hotels enter the region and generate a regional profit as long as amenities are present and whatever may be the level of amenities. Whereas, if the number of tourists is endogenous (free entry model), the local level of amenity must exceed a certain threshold so that tourist development appears*

According to the fixed number model, the number of hotels (as well as the regional profit) is a sigmoid function of the local amenity level which has a point of inflexion at the level of amenity such that the number of hotels equals $N_r = \frac{N}{2}$ (regional profit equals $\frac{tN^2}{16}$). Under these assumptions, tourist outcomes are bounded and admit maximum values which are N hotels and a regional profit of $\frac{tN^2}{4}$. Whereas the free entry model lead to convex functions of the local level of amenities and to a number of hotels and regional profit potentially infinite. Consequently,

Proposition 3*: according to the fixed number model, tourist development is driven mainly by demand. Then potential of tourist development is limited and determined by exogenous factors such as tourist income. Whereas in the second model, the number of hotels and regional profit are pulled by supply and could increase as long as the local level of amenity grows.*

The comparison of the situation of the first region with both theoretical models is also interesting. In the fixed number model, the number of hotels and the regional profit in the first region decrease with the increase of the local level of amenities in the second region. Whereas it remains constant under the free entry of tourists assumption. Therefore :

Proposition 4 : *it shows that when the number of tourists is a fixed and exogenous, hotel entry in one region occurs at the expense of the other one and reduce its regional profit. Whereas, under the free entry of tourists assumptions, the number of tourists and the regional profit of the second region grow without diminishing tourist development in the first one.*

To remain simple and keep the models tractable, we have considered that the regions included only one tourist site. But, we can intuitively extend the results to the case of regions with several sites separated in space. Under the hypothesis of a fixed number of tourists, the number of tourists (and hotels) entering a region would be a function of its average level of amenities. Whereas in the free entry models, the number of tourists and hotels (and then the tourist development) would depend on the local level of amenities.

In the next section, we propose to test some of those theoretical results.

3. Estimations

3.1 The econometric model and dependent variables

Linked to the previous micro-economic models, the following estimations aim at testing the effect of amenities on two types of economic outcomes at a local level. Our scale of study is the French "bassins de vie", which are Functional Economic Areas (FEA) aggregating municipalities and which are defined as the smallest area over which its population has access to both basic services and employment (INSEE, 2003). The choice of this unit of analysis has been made because they correspond to fairly small units and are defined according to economic reality rather than purely administrative boundaries. Nevertheless, because of data reliability problems, we have restricted the sample used in our econometric estimations to the 1745 rural and small towns FEAs among the existing 1916 FEAs.

Turning now to the economic outcomes, the first one results from the theoretical number of hotels and concerns the accommodation capacity Q in the local area j. Data for analysis were drawn from INSEE (French national bureau of statistics) database relative to municipality level accommodation capacity. These data have been aggregated into FEAs level.

Afterwards, to control for differences in FEAs size, this variable has been normalised by FEA population to obtain the number of hotel rooms per 1000 inhabitants in 2000. The second dependent variable aims to proxy regional profit and thus the potential of tourist development. For that purpose, we data on hotel creations *B* in each local area *j*. Therefore, we used here the number of new hotels created or taken over in 2000. This data has been extracted from INSEE SIRENE local database and also aggregated into FEAs level. Like most count data, this independent variable is characterised by a non-normal distribution and by very few distinct values (Table 1). As a consequence, a Poisson model seems to be more suitable and will be used in our estimations.

Table 1: Summary statistics

Variables	Obs.	Mean	S. deviation	Minimum	Maximum
births	1745	0.3249284	1.13047	0	26
ln_rooms	1745	1.449466	1.307645	-1.288091	6.964493
green	1745	44.59854	24.70073	0	98.03214
shannon	1745	1.043889	0.2420329	0.1217059	1.770655
enviro	1745	37.96965	33.26731	0	100
visitors_mean	1745	21520.93	63512.6	0	1065747
visitors_mean_sq	1745	4.49e+09	4.29e+10	0	1.14e+12
ln_nb_sites	1745	0.1694391	0.4082346	0	2.639057
ln_ind_sport	1745	1.961225	0.2532788	0	2.397895
reg_overnights	1745	9189161	1.14e+07	1316867	6.19e+07
population	1745	12160.22	9582.092	270	60700

Finally, we suppose accommodation capacity *Q* and hotels births *B* at time *t* depends on the existing amenities situation measured by a set of variables *Z* and on control variables *X* at time *t-1*. As a result, econometric models will be given by :

$$\ln Q_{j,t} = q_o + q_1 Z_{j,t-1} + q_2 X_{j,t-1} + \varepsilon$$

and

$$\Pr(B_{j,t}) = \frac{e^{-\lambda_j} \lambda_j^{B_j,t}}{B_{j,t}!} \text{ where } \ln(\lambda_j) = b_o + b_1 Z_{j,t-1} + b_5 X_{j,t-1} + \varepsilon'$$

3.2 Independent variables

Concerning amenities characteristics, the theoretical model leads us to distinguish three types of variables. The first ones are related to local amenity level and measure possible sources of tourist attractiveness in each FEA. The second ones relate to the diversity of local amenities in each area *j*.

And at last, in order to test the influence of regional amenities features on the local situation, a third category of variables corresponding to amenity level in region *m* to which belongs each FEA *j* is introduced.

Local amenity level

The first set of variables related to local amenity level includes 4 indicators and 6 dummies, which allow us to describe FEAs natural, recreational and patrimonial amenities. The 3 indicators are:

- an indicator of green area (**green**), corresponding to the proportion of the FEAs area occupied by green areas, that is parks, grassland, forests and bushes. This indicator has been calculated by aggregating natural resource data, drawn from the European database Corine Land Cover 2000.

- an indicator of landscape diversity (**shannon**) : this indicator has been built applying the Shannon index formula to Corine Land Cover data : $I = -\sum_{i=1}^{12} P_i \ln(P_i)$ where P_i is the proportion of FEAs area occupied by each of the 12 types of land cover considered in that database and denoted *i* [3]. According to this formula, for a given number of land cover types, the indicator is all the more important as the distribution is equitable.

- an indicator of environmental quality (**enviro) :** this index is equal to the proportion of FEAs area integrated within at least one of different natural protection areas or areas of natural interest, set up in the framework of French, European or international policies[4]. This data have been extracted mainly from French Ministry of environment databases.

In addition to these indicators, 6 dummies have been introduced to point out the potential influence of two tourist emblematic amenities (F. Aubert et al., 2008, D.W. Marcouiller et al., 2004) : sea and mountains. Hence, we introduced a dummy for coastal FEAs (**coast**) and a dummy for the FEAs contiguous to the previous or located in their hinterland (**coast_hinterland**). Concerning the mountains, we have chosen to mark off the FEAs which include a ski resort (**ski**) [5]. Afterwards, we have chosen to split the remained mountainous FEAs into 3 classes established by zonings created in the framework of two Regional planning and development policies [6]: high mountainous FEAs (**high_moutain**), mountainous FEAs (**mountain**), at last the FEAs not included in the two other categories but included in considered as being in a massif (**massif**).

Apart from these sources of information on natural amenities, another database has been mobilised in order to evaluate the level of patrimonial amenities. This database is the ODIT tourist site database which make each year an inventory of the most important tourist sites in France (such as castles, museums, prehistoric caves…) and register the number of people visiting them. This database allowed us to identify the principal tourist sites (that is to say with more than 20 000 visitors per day during 300 days) present in FEAs and to have an idea of their attractiveness. Thus, from these information, we generated another variable of local level of amenities which corresponds to the average of number of people visiting the different ODIT sites present in the FEAs in 1999 (**visitors_mean**). In order to test the convexity of the function according to which the local amenity level act upon the dependent variables, and then to have information on which theoretical model seems to be the most relevant, we added the square form of this last variable (**visitors_mean_sq**).

Diversity of local amenities

Another variable has been drawn from the ODIT database. This one is linked to the diversity of amenities and corresponds to the number of ODIT tourist sites present in the FEAs (**ln_nb_sites**). The second database used at this level is the Inventaire Communal database realised in 1998, which provides information on the presence of different infrastructures at a local level. We used this database so that we could build a second indicator of amenities diversity related to the diversity of sport and recreational infrastructures (**ln_ind_sport**). As the information was rather limited, the indicator simply consists of the number of infrastructures types present in the FEAs out of 10 which have been selected as relevant. According to the theoretical model, we used in estimations the log forms of these two variables.

Regional amenity level

Regional amenity level has been indirectly evaluated in using a proxy. This variable denoted **reg_overnights** corresponds to the number of overnights visitors in each French region registered in 2000 by Tourism Directorate and SOFRES institute (Tourist Demand Survey).

Control variable

In order to control for differences in FEAs size, we added a control variable corresponding to the FEAs number of inhabitant, drawn from the national census of the population carried out by INSEE in 1999 (**population**).

3.3 Results

Table 2 present estimates for the OLS and the Poisson regressions, using respectively the log of the number of hotel rooms per 1000 inhabitants in 2000 and the number of new hotels created or taken over in 2000 as dependent variables.

We may first notice that both types of estimations are characterized by relatively satisfying goodness of fit, as R^2 adjusted and pseudo-R^2 are about respectively 0.45 and 0.23. Furthermore, we performed a Goodness-of-fit procedure in order to judge of the dispersion of the second dependant variable and this test confirmed that the choice of Poisson models is relevant with these data.

Models 1 and 4 correspond respectively to OLS and Poisson estimates integrating only local amenities variables. The results show that nearly all the chosen variables have a positive and very significant effect on the accommodation capacity and on creation of new hotels in FEAs. As expected, the most effective natural amenities seem to be the coast, ski resort and high mountain. Nevertheless being mountainous FEAs play a non-negligible role on the studied economic outcomes whereas the massif FEAs have a more important accommodation capacity but don't have significantly more creation of hotels. More surprising are the results obtained with the coast-hinterland dummy. Indeed, while we could have thought that being contiguous to coast FEAs would constitute a potential of tourist development, the estimates show that being near a coastal FEAs constitute clearly a drawback, as if coastal FEAs would catch a major part of hotels. Turning now to the indicators of natural amenities, having a greater proportion of surface occupied by green areas or characterized by an environmental quality constitute an advantage and explain partially accommodation capacity whereas landscape diversity seems to have a significant effect on the creation of new hotels. Concerning the patrimonial amenities, the average level of attractiveness of the FEAs tourist sites evaluated with the variable visitors_mean has a little but positive and very significant effect on accommodation capacity whereas the results obtained with Poisson estimations are weaker. Nevertheless, the first result seems too be interesting as it shows that, even in rural areas, patrimonial and not only natural amenities matter for tourist development at a local scale. At this stage we also tried to test the influence of amenities diversity. And estimates confirm a significant and positive impact.

Table 2: Amenities effects estimates

	OLS regressions Log(hotel rooms per 1000 inhabitants in 2000)			Poisson regressions (number of new hotels created or taken over in 2000)		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
green	0.006811***	0.00708135***	0.00698475***	0.00201048	0.00308176	0.00310878
shannon	0.18781893*	0.16568597	0.16428489	0.67973915***	0.58433994***	0.58569336***
enviro	0.00311696***	0.00309138***	0.00306736***	0.00503423***	0.00491211***	0.00492413***
coast	1.0855737***	1.0985072***	1.0947643***	0.44179905***	0.50767248***	0.50983135***
coast_hinterland	-0.15218532**	-0.14468889*	-0.14983141**	-0.45483263**	-0.44893699**	-0.44913804**
ski	2.7845634***	2.7500898***	2.7446874***	2.3524696***	2.2578377***	2.2607849***
high_mountain	1.5541952***	1.5161343***	1.5108262***	0.71915674***	0.62190639**	0.62667036**
mountain	0.60863523***	0.59419457***	0.59445443***	0.43704865***	0.40055765***	0.40227962***
massif	0.32291693***	0.3366942***	0.33261108***	0.21983568	0.27387118	0.27825578
visitors_mean	1.898e-06***	1.914e-06***	3.151e-06***	8.282e-07*	9.168e-07*	5.187e-07
visitors_mean_sq			-1.998e-12*			6.312e-13
ln_nb_sites	0.3149419***	0.32033015***	0.28453659***	0.2501619***	0.28518664***	0.29769763***
ln_ind_sport	0.72354815***	0.73404233***	0.72625105***	1.2667385***	1.283311***	1.2822664***
reg_overnights		4.539e-09**	4.519e-09**		1.549e-08***	1.547e-08***
population				0.00002253***	0.00002248***	0.00002245***
R^2 adj. // *pseudo*R^2	0.455	0.453	0.457	0.238	0.243	0.243
Log Likelihood	-2407.8183	-2405.4219	-2403.8289	-1144.0494	-1137.0319	-1136.9448
Sample size	1745	1745	1745	1745	1745	1745

*** significant at the 1% level, ** at the 5% level, * at the 10% level

Indeed we can see that patrimonial sites diversity as well as sport and recreational infrastructures diversity have a positive and very significant influence on both accommodation capacity and creation of hotels.

In models 2 and 5, we added our proxy of regional amenity level, corresponding to reg_overnights. Even if the coefficient is rather weak, estimates show that regional level of attractiveness determines almost partially accommodation capacity and hotel creation at a local level. At last, we performed a third set of estimations (models 3 and 6), aiming at testing the convexity of the function linking the local amenity level to the dependent variables. To do so, we introduced the square form of visitors_mean variable. The estimates here are relatively flimsy, as the coefficient are non significant with the Poisson model and quite significant with the OLS estimation. However, model 3 shows that visitors_mean_sq has a quite significant and negative coefficient. If confirmed, this result could lead us to conclude to the concavity of the function analysed and to consider the fixed number of tourists model more relevant.

4. Conclusion

Using a micro-economic approach, this paper aimed at analysing the influence of amenities on location of hotels at a local level under two alternative assumptions on the conditions of tourists' entry (fixed number vs. free entry). Both model point out that the level and the diversity of amenities at a local level influence the numbers of hotels and the regional profit generated. Comparing the results obtained with the two models led to different qualitative results. First of all, when the total number of tourists is exogenous, tourist development inside a region is restricted for a large part by demand determinants (such as income) whereas when it is endogenous, tourist development is essentially determined by amenities level and pulled by supply. Secondly, when the potential number of tourist is independent of amenities, the model suggests that there will be tourist development as long as amenities are present and whatever may be the level of amenities. Whereas, if the level of amenities is likely to determine tourists' decision to go on holidays, the local level of amenity must exceed a certain threshold so that tourist development appears. Thirdly, in the case of a fixed number of tourists, the model leads us to the conclusion that the number of tourists entering the region (and so the number of hotels) depends on the global tourists' perception of the regional level of amenities, in contrast to the case of free entry, where tourists enter the region according to the level and diversity of amenities at a local level. Finally, at a higher level, with a fixed number of tourists, hotel entry in one region occurs to the detriment of the other ones and the situation ends in a zero-sum game. On the contrary, under the other assumption, tourist

development in one region doesn't contribute to the decline of the other regions. This last result is particularly interesting as the implications in terms of regional planning policies won't be the same.

Our empirical analysis has been built in order to test some of the theoretical results. And it shows that hotel capacity and development at a quite local level (the one of French functional areas) depends on natural endowments (green area, landscape, coast, mountains), on recreational and patrimonial amenities (ski resort, tourist sites such as castle, prehistoric caves…) but also on the diversity of the latter. Estimates also give an insight on the fact that the fixed number of tourist models seems to reflect reality better, as the regional level of amenities has a significant and positive effect on FEAs hotels capacity and creation. Nevertheless, our analysis must be carried on in different ways. First, our empirical analysis could be consolidated in testing the effects of our independent variables on other dependent variables (i.e. accommodation employment growth) or in replacing amenities variables with a synthetic index of amenities. Concerning the theory, the present model could be improved in integrating more than one sites and in analysing the influence of concentration of tourist amenities on hotels location.

Notes

1. France, Spain, United-States, China and Italy represent together 31,4 % of international arrivals in 2008 (Source : French Tourism directorate).

2. Ile de France, Provence Alpes Côte d'Azur and Rhônes Alpes have respectively 33,5 %, 10,8 % and 9,1 % of domestic visitors overnights in France in 2008 (Source : INSEE, Tourism Directorate).

3. The landscape diversity indicator has been built from 12 categories of land use (corresponding to the following CLC classes : artificial lands, parks, agricultural areas, permanent cultures, grassland and bushes, forests, sand, low vegetalised surface, glacier, wetlands, continental waters and maritime waters)

4. 7 different types of zoning have been used to establish our indicator of environmental quality related to French National Parks, Regional Nature Parks, Nature reserve, "Zones humides" and Sites of special scientific interest, European Special Protection Area and Important Bird Area, International Ramsar convention on wetlands.

5. The coastal and ski resort FEAs have been identified in using French Tourism Directorate classification of tourist FEAs. The FEAs contiguous to the coastal ones have been identified from coastal FEAs and in using a contiguity matrix.

6. The two policies concerned are the French Aid scheme for less favoured areas and the "Loi massif". We have chosen to distinguish the different types of mountainous FEAs in using zonings rather than an altitude threshold because we considered that the zoning established was able to better reflect the different constraints and opportunities of these areas.

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