Choice of a tourism destination: complementary preferences and tourism subjective characteristics

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Abstract

The choice of a tourism destination is a central issue in the tourism microeconomic literature. The background of our analysis is Lancaster's approach by characteristics of the consumer's theory, applied to the international tourism demand. The major goal of this paper is to propose a modelling of the tourist demand, while making a significant improvement compared to the usual formalisations existing in the literature. Thus the model removes the usual assumption of perfect substitutability between the tourism destinations, which allows a finer analysis of the destination choice process.

1. INTRODUCTION

The approach by characteristics of the tourism demand is rather unexplored in the economic literature of tourism[1]. It was observed (since Quandt 1970) that the application of the traditional utility theory in tourism presents some serious drawbacks dues to an ignorance of the particularities of the tourism product. Firstly, the assumption of one representative tourist, who can visit simultaneously all the destinations (the maximum of the utility function is situated inside the budget plane) appears rather unrealistic. Secondly, the traditional theory of the utility can not take into account of one satisfactory manner either the evolution of the tourism products (i.e. the emergence of the news destinations or the decline of the others) or the demand for new products. The third one is due to the fact that the tourist can potentially go in any place in the world, so that the number of the "tourism goods" to integrate into the utility function could be almost infinite.

[1] Rugg (1973), Witt (1980), Smeral (1989), Morley (1992, 1998)

In order to surpass some as of these limits, our work borrows the theoretical framework of Lancaster (1966) consumer's theory, the characteristics approach. This type of approach is preceded in the tourism economy by: Rugg (1972), Morley (1992) and more recently Papatheodorou (2001). But their work is also based on a certain number of criticisable assumptions which we precisely intend to modify.

The recourse to the Lancaster's framework requires first of all a suitable definition of the tourism product. Consumers are not interested in goods as such, but in their properties or characteristics. The utility is being generated by the product's attributes and there is a technical relationship between goods (consumption technology). The individual's preferences are over characteristics and the budget constraints are over goods. We thus suppose, following Rugg that the tourist does not derive its utility from consuming tourism destinations, but from consuming certain attributes or characteristics specific to the destinations (for example the natural and cultural ones). In order to consume these characteristics the tourist must travel to the place of interest and spend a period of time. Therefore, the tourism product may be defined as: being in a particular destination, other than the daily environment, for a certain period of time

The choice between one and several destinations depends on the utility maximisation program under budget and time constraint. Therefore marshalian demand functions for the characteristics and for the duration of stay in each destination may be obtained. Rugg assumes that the choice of the destination is made only once the decision to travel is made. Morley (1992) made a significant contribution to the model adding the individual's decision to take a holiday or not.

Some of the assumptions from preceding models are used by our model and some are modified on a number of the significant points. In particular, Rugg and its predecessors make the assumption that the characteristics of different destinations are in a perfect substitution relation. This assumption implies that, for example, there would be no difference between the cultural characteristics produced by a stay in Greece and those produced by a stay in Sweden. Just as the consumable natural attributes in these two countries would be perfectly equivalent. The tourist would choose between these two countries only on the basis of one quantitative criteria (the costs and the relative quantities of attributes that each destination is able to offer). Obviously, this assumption seems completely unrealistic for these two destinations. Our intention to remove this strong assumption will reveal Rugg's model, by comparison, as a particular case to our model.

Technically speaking, we intend to surpass these limits by using a CES type function for tourism production-consumption process. This implies three new contributions. First, the introduction of imperfect substituability between attributes of tourism destinations. Secondly, the marginal production of characteristics is not constant in time any longer. Finally, the objective characteristics (tourism endowments of the destination) are no longer necessarily identical to the characteristics being perceived by the tourist (subjective characteristics).

The final objective of this paper is to identify the qualitative and quantitative determinants of tourism demand and obviously to determine the best (optimal) alternative among a certain number of the tours accessible to the consumer. Therefore one places himself within a discrete choice framework, using the indirect utilities to determine the final choice (Ben-Akiva and Lerman, 1985 for the theoretical framework).This methodology is often used in the transportation economics.

In the first section we propose a critical analysis for Rugg's model, which represents the base model of the micro-economics characteristics framework applied to the tourism demand. After, we present the framework and the assumptions of our model, its structure will be detailed in the fourth section. Discussions concerning the implications of our formalization are proposed in the fifth part of this paper. Given the concern of constructing a tourist choice behaviour approach as close to reality as possible the transportation costs are introduce into the analysis in the last section of this paper. Identification of tourism demand determinants is therefore possible. We also propose an analytical expression for the threshold value of the transportation costs between alternate destinations, which will enable us to predict the tourist choice between one destination and several destinations. We finish with the conclusions, by reminding the principal results obtained, the limits and the future extensions suggested by the proposed formalization.

2. RUGG'S MODEL: A CRITICAL ANALYSIS

Rugg place his model of choice of a tourism destination within Lancaster's consumer's theory framework. The recourse to this framework requires beforehand a suitable definition of the tourism good. The utility is defined in reference to the attributes of the goods, the relation between the goods and these attributes being of technical nature. In consequence, the preferences for the goods are indirect, the goods exist only because one needs them to produce characteristics (attributes). More precisely, the tourist does not derive his utility directly from consuming or possessing tourism destinations, but from being in the particular destination for a certain period of time. It is in fact the time spent on the site which enables him to consume the destination's characteristics. The tourism goods are defined thus like the presence of an individual in the destination for a certain period of time. This tourism product formulation ensures the taking into account of its heterogeneous dimension, given the assumption that each destination allows access to a different combination of characteristics.

A model capable of describing the choice of a destination is developed around this definition of the tourism product. It supposes that the decision to go on a holiday is already made; it also assumes that the choice of the transportation mode is already made, just like the starting point (initial emplacement of the tourist) and the season (period in the year). The choice of the tourism destination is represented like a nonlinear – program:

$$\begin{aligned} \max_d U(z) \quad \text{s. c. } & z = b(d) \\ & R \geq p_d d + p_t m \\ & T \geq cd + tn \ \text{ où } \ z,\ d,\ p_d,\ p_t \geq 0 \end{aligned} \tag{1}$$

where:

- z – a vector which elements are destination characteristics ;
- d - a vector the elements of which are quantities of the various commodities consumed (days spent visiting each destination) ;
- $b(d)$ - production - consumption[2] function of characteristics by tourism commodities (days spent at the destination), the characteristics are assumed to be produced by commodities in different but constant proportions for each destination ;
- p_d - a vector of tourism prices (price of one day spent visiting each destination);
- p_t - a vector whose elements are transportation costs between all destinations pairs in the transportation network ;

[2] Like in the case of services, the tourism production and consumption process are hardly dissociable, given that the good is simultaneously produced and consumed, there is a non respect of the neo classical assumption of non interaction between the production and the consumption (Gadrey 1996).

- m - a permutation column vector, with binary elements : 1 if the tourist travel between the two destinations and 0 if the tourist does not travel between the two destinations ;
- R - a scalar, representing the income of the consumer ;
- T – the total time available for holidays ;
- c – a row vector with all elements equals to 1 ;
- t - a row vector whose elements are transportation times between the different destinations ;
- n – a column vector with elements 1 and 0 depending upon whether the tourist choose or not to use the corresponding link between destinations.

Rugg supposes a linear specification for the production function of characteristics b (d). The implications of this model are illustrated by a simple example. It considers characteristics z_1 and z_2 representing historical attractions and natural attractions, and four destinations (commodities) i.e. time spent in: Greece, Italy, Norway and Sweden. The production functions of the characteristics by commodities have the following form:

$$\begin{aligned} z_1 &= b_{1G}d_G + b_{1I}d_I + b_{1N}d_N + b_{1S}d_S \\ z_2 &= b_{2G}d_G + b_{2I}d_I + b_{2N}d_N + b_{2S}d_S \end{aligned} \qquad (2)$$

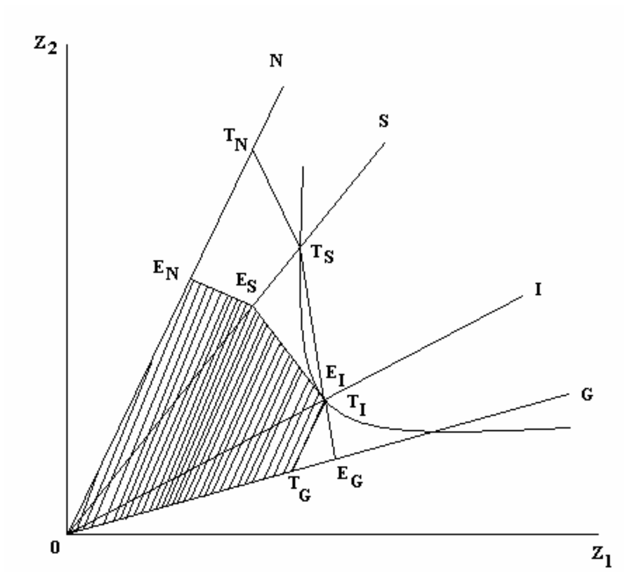
where the b_{ij} coefficients represent the characteristics endowments « i » of the country « j ».

This linearity between the duration of stay and the consumption – production of the characteristics implies a perfect substituability between the characteristics of the different destinations. One may find this assumption completely unrealistic. For example, there would be no difference in nature between the characteristics consumed in the time spent in Greece and those of a stay in Sweden. Thus the tourist, whose preferences are perfectly equivalent between the countries, would now choose only on the basis of a quantitative criteria (relative quantities of attributes that each destination offers) and cost (transportation costs and price of the tourism good). The model which one proposes in the second part of this paper precisely aims to remove this strong assumption.

Visits to each country generate characteristics in the following proportions: $\frac{b_{1G}}{b_{2G}}, \frac{b_{1I}}{b_{2I}}, \frac{b_{1N}}{b_{2N}}, \frac{b_{1S}}{b_{2S}}$ which can be observed in figure 1 as the rays: OG, OI, ON, OS.

Given the prices per day for each destination « i » p_{di}, the transportation cost p_t, the available income R, the time constraint and the transportation cost between alternate destinations, the maximum amount that the tourist may purchase from each good may be determined: E_N, E_S, E_I, E_G

Figure 1. Consumer Equilibrium in Rugg's model



The line which connects the points $\mathrm{E_N, E_S, E_I, E_G}$ represents the budget constraint, including transportation costs between alternate destinations. The temporal constraint is graphically obtained by connecting the points $\mathrm{T_N, T_S, T_I, T_G}$. The two constraints have a direct impact over the duration of stay. Therefore, it is the most restrictive constraint which will determine the boundary of the characteristics space accessible to the tourist: the income-characteristics frontier. In the case presented in figure 1, the individual characteristics opportunity set is represented by the grey surface.

Implicitly the author excludes all possibility of choice outside the characteristics opportunity set (the space located between the lines OG and OS - precisely surfaces OGz $_1$ and ONz $_2$). This assertion, which is not detailed by Rugg, is discussed in the following section and proves to be true in the model that one proposes.

Given that the tourist's objective is to choose the bundle of characteristics that maximize his utility, the optimum of the consumer is located at the tangency point between the indifference curve and the characteristics frontier. Thus with this graphic example, the consumer will choose to spend his holidays in only one country: Italy (E_I). We note that in the simple version of this model, without taking into account the transportation costs, the best alternative for the tourist relates to the choice of two holiday destinations (Italy and Sweden) by thus maximizing the quantity of the "consumed" characteristics.

The introduction of the monetary and temporal transportation cost between alternate destinations is an innovating element proposed by Rugg. Positive value for these costs determines a reduction in the quantity of the goods accessible to the tourist. Visiting a second destination generates a diminishing of tourist available time (due to the loss generated by the time spent in transportation) as well as an additional monetary expenditure. Therefore, when transportation costs are considered, visiting several destinations during the holidays is under optimal for the tourist who is unable to maximize his utility. In this vision the optimal solution for the individual is to visit only one destination for the longest time possible, this would enable him to consume a maximum amount of characteristics.

This result was not surprising at the time, in the ' 70, a period characterized by a strong increasing trend in mass tourism and by a very constraining transportation costs (monetary and temporal). Today, with the strong reduction of the travel costs and times which generate evolutions in the tourist behaviour, the above result appears at least contestable. An analysis in terms of threshold effect it seems to us a more realistic approach. Indeed, with very low transportation costs the monetary and time losses engaged by the visit of an additional destination, could be compensated (even exceeded) by the derived positive utility.

The critics that one could bring to the results of this model always seem to lead to the linear relationship existing between the consumption – production of the characteristics and the time spent in one destination. This assumption may have two major implications of on the model's result. Initially the marginal consumption of characteristics is constant independent of the time spent in one destination. For example the tourist would consume the same quantity of characteristics in the first day as in the "n" day spent in the destination. Moreover this specification contains the assumption of perfect substituability between the different destination's characteristics and finally it thus makes the individual indifferent between destinations.

Therefore, adding a new destination to his holiday will not provide him with more utility. Given these implications, the individual does not find in one's profit to change the destination and its best alternative will be to remain in only one destination for the longest possible time.

This limit of the model can be exceeded by another specification of the production - consumption functions of the characteristics. In the following section one will use a CES specification function which allows the introduction of a degree of imperfect substitution between the characteristics belonging to different destinations. This type of formalization will also enable us to surpass the limits mentioned previously.

3. THE HYPOTHESES AND THE FRAMEWORK OF THE MODEL

Even if Rugg's model presents an undeniable progress on the former formulations of the tourism demand, it also presents a certain number of limits that we precisely propose to exceed in this section. Our model borrows the framework and some of the assumptions of the preceding models, but modifies them on a number of the significant points.

In particular, Rugg and its successors make the assumption that the characteristics of the different destinations are perfectly substitutable. For example, there would be no difference in nature between the cultural characteristics produced by a visit in Greece and those produced by a stay in Sweden. Just as, for the preferences of the tourist, the natural attributes that may be purchased in these two countries would be perfectly equivalents. Thus, the tourist would choose between these two countries only on the basis of quantitative criteria. Obviously, this assumption seems completely unrealistic for these two destinations. And even when countries are close from the cultural and geographical point of view, the characteristics of each one of them always present a sufficient element of specificity, so that this perfect substitutability assumption appears very debatable (Morocco, Algeria Tunisia; Greece, Turkey, South of France, Italy, Spain; Germany, Austria; Japan, Korea; China...). There is a large combination of factors (economic, socio - cultural and psychological) which may influence the preferences of an individual for a destination rather than another. Analysing these factors in the microeconomic demand modelling, can lead us to much finer results, as we propose in the following developments of this paper

From a technical point of view, this perfect substitutability is translated in precedent formalisations into the use of a linear function to describe the production of the characteristics process (equation 2). The consumer's preferences for the tourism commodities depend on the form of this function, because the utility is defined over the characteristics. In order to introduce an imperfect substitution between the destinations we chose to describe the characteristics production function by a CES specification. Even if more difficult to manipulate, this formulation enables us to take into account, in more realistic manner, the specificities of the destinations. Thus the perfect substitutability of Rugg and its predecessors appears like a particular case to our model.

We make the implicit assumption that the tourist has a stronger preference for the tourism goods compared to the goods that he can consume at home; on this basis we suppose that the decision to leave on holiday is already made. Therefore the only conditions so that the individual does not take holidays will be of a budget nature and non - correspondence between its preferences and the accessible bundles of characteristics. It is supposed (like Rugg) that the tourist already chose the transportation mode, the date, the duration of his stay and the starting point. He only has to choose he’s stay: one or more destinations among those which are accessible, and the time of stay: the corresponding demand for the characteristics.

The tourism product is comparable to a stay of some period of time in one or more destinations. This physical presence on the site during a given period makes it possible to the traveller to benefit from the different characteristics. It is the consumption of these attributes which motivates him and which one will find in his utility function.

It is considered that the tourism demand takes a complementary form: for example the tourist is brought " to consume " transportation, restoration, lodging; scenic beauty, culture, tradition; public and private goods; exposed and sheltered goods. The model developed here uses a complementary specification to represent the preferences over tourism goods of the consumer. More precisely, one introduces a complementarity relation between the consumption of the different types of the characteristics. The preferences of the individual over the consumption of each type of characteristic are given by the utility function. These preferences can be regarded as specific for each consumer (for example the individual " r ", prefers to consume 60% of natural characteristics and 40% of cultural characteristics).

Therefore, the consumer (tourist) makes a trade off between the characteristics, rather than between the destinations. Even if the individual derives utility by consuming characteristics, this consumption is related to the time spent in a destination: the more the stays on the site and more he is exposed to the specific characteristics. Compared to the usual models, which suppose a constant marginal consumption of the characteristics (linear function of consumption - production), our model generates a positive and decreasing quantity of characteristics consumed per additional unit of time (CES function).

The implications of this model may be illustrated in a simple formalisation which retains only two countries (tourist destinations) and two types of characteristics[3]:

- the cultural characteristics: all that concerns culture, tradition, history, social environment;
- the natural characteristics: scenic beauty, natural sites, climate, environment;

Like Rugg, we made the assumption that the characteristics are produced by destinations in fixed proportions. Indeed, the characteristics which one country is able to offer (here for example, cultural and natural attractions), depend on its tourism endowments. Those are largely determined by the natural conditions and the history of the country (its " natural and cultural inheritance"). The tourism endowments are "imposed" to the country, which thus doesn't have the possibility of modifying the specification of its product. Given this assumption, it is then reasonable to suppose that in the short run these endowments can be regarded as given (fixed).

Our objective is to identify the best alternative for the tourist, according to the determinants of his demand, while taking in account the initial geographical emplacement of the consumer with respect to the destinations. The demand for a combination of characteristics will result in the number of days spent on one or more tourism destinations.

4. THE MODEL

The approach used relates to the hedonic price models, in an adapted form for tourism. Generally one calls hedonic model, a model where the consumer's preferences are not defined

[3] Another characteristics classification that can be found in the literature makes the distinction between tourism attractions and facilities (Papatheodorou 2001)

over the goods, but over the attributes (characteristics) of these goods or the services (the hedonic factors). The issue of the hedonic analysis is to determine the relations between the attributes which characterize a good and its value for different agents, i.e. the relation between the good's price and its characteristics. The justification of the method is given by Lancaster (1966), who assumed that the households do not draw their utility from the goods themselves, but from the characteristics possessed by these goods. Thus, the agents attach value to the attributes of the goods and the observed prices are the results of these implicit valorisations.

The tourism good is a particular one, which enables the application of the hedonic analysis within a specific framework. In this case, the hedonic factors are represented by the different characteristics owned by the destinations. Moreover, the fact that the quantity of the consumed characteristics depends upon the duration of stay implies the use of the tourism prices (one day price of stay) in instead of the hedonic prices (price of the characteristics). The difference with a classical hedonic prices model is that in our case the budget constraint is over the goods space (tourism prices), while hedonic model budget constraint is over the characteristics space.

The consumer is supposed to maximize a complementary utility function defined relatively to the consumption of the cultural and natural characteristics, under budget and technological constraint (consumption – production functions of the characteristics by the goods):

$$\max_{d_1,d_2} U = \min\left(AZ_C, BZ_N\right) \qquad \text{s.c.} \quad \begin{aligned} & Z_C = \left[a_{C1}d_1^{\alpha} + a_{C2}d_2^{\alpha}\right]^{\frac{1}{\alpha}} \\ & Z_N = \left[a_{N1}d_1^{\alpha} + a_{N2}d_2^{\alpha}\right]^{\frac{1}{\alpha}} \\ & R \geq P_1 d_1 + P_2 d_2 \\ & a_{Cj}, a_{Nj}, d_j, P_j, R, A, B \geq 0 \end{aligned} \tag{3}$$

where:

- Z_C, Z_N represent the consumption of natural and cultural characteristics;

- *A*, *B* are parameters which retrace the consumer's preferences over each type of characteristics; they give the proportion in which the characteristics will be consumed;

- a_{Cj}, a_{Nj} are the tourism endowments (in natural and cultural characteristics) of the *j* destination;

- d_j is the length of stay in the « j » destination;

- α represent the degree of substitution between production factors of the characteristics ;

- R is the available income for holidays;

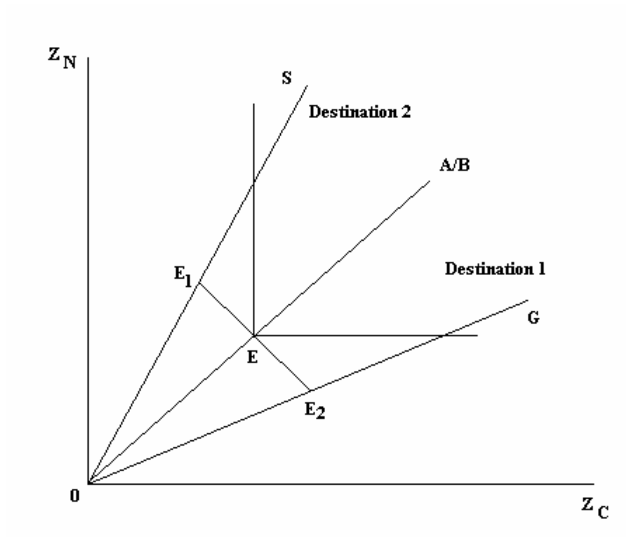
- P_j indicate the price of one day spent at the j destination.

We consider the tourism good as being produced by the presence of the consumer in a specific place and the two types of characteristics as being definable for each destination. Given these conditions, one can say that in a holiday the two attributes are jointly sought and consumed. Of course, different individuals will have different preferences over the attributes proportions. The tourist can give a more or less significant weight to the two elements (parameters A and B). Thus, for a consumer having a pronounced taste for the cultural characteristics, the weight of this kind of characteristics will be significantly more important compared to the natural's ones.

This complementary form of the function is justified particularly by the simultaneous and never perfectly dissociable existence of the two dimensions (the cultural and the natural ones) in tourism destinations. For example, the tourist cannot consume the cultural characteristics of a destination without enjoying the natural environment (climate, landscape). At the opposite to consume natural beauty one must pass by the social environment, the traditions, and the cultural specificities.

The tourist must make his choice between one of the two accessible destinations, also he can choose to visit the two destinations. His choice is made according to the preferences, the tourism prices, the tourism endowments and the available income for holidays. The CES form for the consumption – production function ensures a time decreasing marginal characteristic consumption function. Moreover, compared to usual modelling, the maximization of the utility does not take into account the absolute value of the characteristics produced by each destination (objective characteristics), but the value perceived by the tourist (subjective characteristics). This one results from the CES specification of the production - consumption function of the characteristics, more precisely from the introduction of the α parameter. On this issue, Rugg's model appears like a particular case, namely corresponding to $\alpha = 1$. The role of this α parameter will be developed in the discussions section. The following figure shows a usual graphic solution of this model:

Figure 2. Consumer Equilibrium



Given that the tourist has complementary preferences for the two types of characteristics, all the optimal solutions will be situated on the line of slope A/B.

The lines OG, OS represent combinations of the characteristics produced by holidays spent in each destination. These lines have the following slopes:

- for Rugg :

$$Z_N = \frac{a_{N1}}{a_{C1}} Z_C \text{ for destination 1 with a slope: } \frac{a_{N1}}{a_{C1}}$$
$$Z_N = \frac{a_{N2}}{a_{C2}} Z_C \text{ for destination 2 with a slope: } \frac{a_{N2}}{a_{C2}} \quad (4)$$

- in our model

$$Z_N = \left(\frac{a_{N1}}{a_{C1}}\right)^{\frac{1}{\alpha}} Z_C \text{ for destination 1 with a slope:} \left(\frac{a_{N1}}{a_{C1}}\right)^{\frac{1}{\alpha}}$$
$$Z_N = \left(\frac{a_{N2}}{a_{C2}}\right)^{\frac{1}{\alpha}} Z_C \text{ for destination 2 with a slope: } \left(\frac{a_{N2}}{a_{C2}}\right)^{\frac{1}{\alpha}} \quad (5)$$

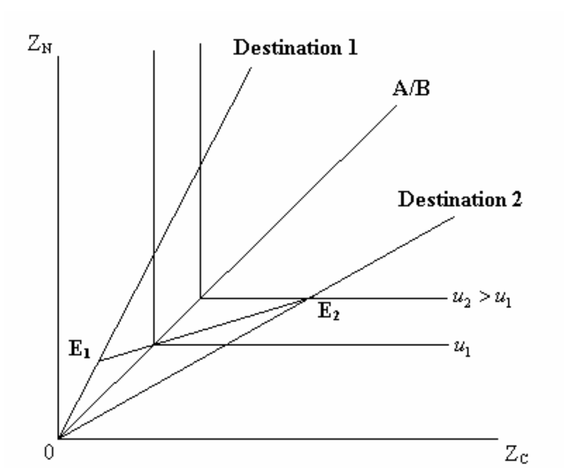
If in the usual models the durations of stay are determined by the objective characteristics endowments (4), however in our model these endowments (5) " are corrected " by the exponential 1/α Thus we can call the endowments $a_{ij}^{1/\alpha}$ subjective characteristics. In the present case, the determinants of the tourist choice are these subjective characteristics rather than the objective ones.

Before developing the model's results a condition of technical efficiency must be verified. The technical efficiency of the destinations is a necessary condition to ensure the rationality of the consumer (Lancaster, 1971 ; Giacomelli, 2006). Thus, we can avoid a situation where a destination proposes a bundle of characteristics (subjective in this case) dominated by another destination. Two cases of such dominated destination can be presented:

- for identical tourism prices, one destination offers less tourism endowments (cultural or natural) than the other ;
- for identical tourism endowments, one destination is more expensive than the other.

If one destination is efficiently dominated, the rational tourist will always choose to spend all his holidays in the other destination (the dominant one). Graphically this condition of technical efficiency results in a negative slope of the budget constraint line (the line segment E_1E_2). A positive slope of the budget constraint will determine a corner solution:

Figure 3 : Non-respect of the technical efficiency condition



Analytically the destination's non dominance condition is:

$$\frac{\dfrac{a_{C1}^{1/\alpha}}{P_1} - \dfrac{a_{C2}^{1/\alpha}}{P_2}}{\dfrac{a_{N1}^{1/\alpha}}{P_1} - \dfrac{a_{N2}^{1/\alpha}}{P_2}} < 0 \qquad (6)$$

According to this condition, if one unit of subjective cultural characteristic is more expensive in one destination, than one unit of natural characteristic must be less expensive. The relation (6) obviously depends on the characteristics endowments (real and perceived) and on the tourism price level.

By development, the inequality (6) becomes:

$$\left(\frac{a_{C1}}{a_{C2}}\right)^{\frac{1}{\alpha}} \lesseqgtr \frac{P_1}{P_2} \lesseqgtr \left(\frac{a_{N1}}{a_{N2}}\right)^{\frac{1}{\alpha}} \tag{7}$$

Or, in order to avoid a technical inefficiency situation, the relative tourism price must lie between the ratios of the subjective characteristics endowments of the two destinations. The order in the inequality is given by the value of the α parameter and the initial objective endowments.

Given this condition, we now can continue our formalisation with the analytical resolution of the model. The consumer's program gives the optimal solution if and only if the following identity is satisfied:

$$AZ_C = BZ_N$$

From this equality and using the budget constraint we can determine the tourism demands for each accessible destination:

$$d_1^* = d_1(P_1, P_2, R, \alpha, a_{ij}) = \frac{R}{P_1 + P_2 \dfrac{\left(\left(A/B\right)^{\alpha} a_{C1} - a_{N1}\right)^{\frac{1}{\alpha}}}{\left(a_{N2} - \left(A/B\right)^{\alpha} a_{C2}\right)^{\frac{1}{\alpha}}}} \tag{8}$$

$$d_2^* = d_2(P_2, P_1, R, \alpha, a_{ij}) = \frac{R}{P_1 \dfrac{\left(a_{N2} - \left(A/B\right)^{\alpha} a_{C2}\right)^{\frac{1}{\alpha}}}{\left(\left(A/B\right)^{\alpha} a_{C1} - a_{N1}\right)^{\frac{1}{\alpha}}} + P_2} \tag{9}$$

For simplification reasons we note $k=\dfrac{\left(\left(A/B\right)^{\alpha}a_{C1}-a_{N1}\right)^{\frac{1}{\alpha}}}{\left(a_{N2}-\left(A/B\right)^{\alpha}a_{C2}\right)^{\frac{1}{\alpha}}}$ which will permit us to rewrite the demand functions under the following simple form:

$$d_1^*=d_1(P_1,P_2,R,k)=\frac{R}{P_1+kP_2} \text{ and } d_2^*=d_2(P_1,P_2,R,k)=\frac{kR}{P_1+kP_2} \qquad (10)$$

The tourism demand functions obtained above have traditional forms derived from the complementary utility functions. In absence of transportation costs, these functions describe the demand (days spent in one destination) equally for the individual living in the country (destination) 1 or 2.

If the two tourism demands are positive ($k > 0$), one can observe a negative direct and crossed price elasticity[4] of the demand. Due to the specifications of the model, even if the consumer can in some situations choose only one destination, the introduction of a complementarity between characteristics generally results in a certain degree of complementarity between destinations.

The k parameter represents the relative preference between destinations and equals the relative tourism demand:

$$k=\frac{d_2}{d_1}=\left(\frac{a_{C1}}{a_{C2}}\right)^{1/\alpha}\left[\frac{\left(A/B\right)^{\alpha}-\dfrac{a_{N1}}{a_{C1}}}{\dfrac{a_{N2}}{a_{C2}}-\left(A/B\right)^{\alpha}}\right]^{1/\alpha}$$

A negative value of k does not ensure simultaneous positive values for the two demands: for $k>-\dfrac{P_2}{P_1}\Leftrightarrow\ d_1>0$ and $d_2=0$ and the opposite for $k<-\dfrac{P_2}{P_1}\Leftrightarrow\ d_2>0$ and $d_1=0$. In this last case, the consumer's program leads us to corner solutions: therefore only one of the two destinations will be chosen. So, the necessary and sufficient condition for positive tourism demands is:

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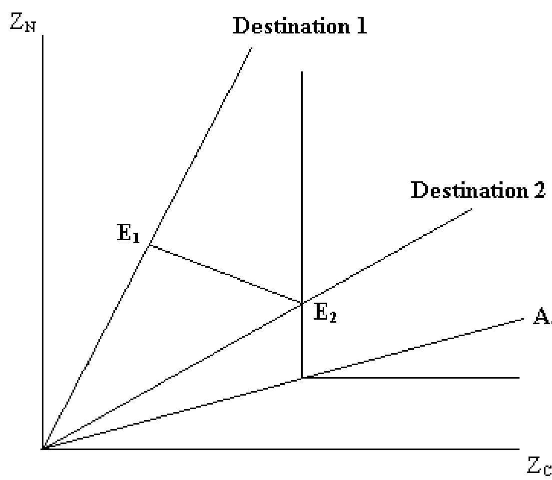
[4] $\varepsilon_{d_1,P_1}=-\dfrac{P_1}{P_1+kP_2}$, $\varepsilon_{d_2,P_2}=-\dfrac{kP_2}{P_1+kP_2}$, $\varepsilon_{d_1,P_2}=-\dfrac{kP_2}{P_1+kP_2}$ et $\varepsilon_{d_2,P_1}=-\dfrac{P_1}{P_1+kP_2}$

$$k > 0 \Leftrightarrow \left(\frac{a_{N1}}{a_{C1}} \right)^{1/\alpha} \lessgtr \left(\frac{A}{B} \right) \lessgtr \left(\frac{a_{N2}}{a_{C2}} \right)^{1/\alpha} \qquad (11)$$

We will further address this condition as the compatibility condition between the individual's preferences and the subjective characteristics bundle. Precisely, the relation (11) stipulates that the value of the relative cultural preferences of the consumer (A/B) must lie between the relative values of the perceived tourism endowments of the two destinations. As for the technical efficiency condition, the elements order in the inequality (11) is determined by the substitution rate α and by the initial characteristic endowments. This condition stipulates that, if the line of the optima of the consumer (of slope A/B) is not situated inside the characteristics opportunity set, the tourist will choose only one destination (corner solution):

Figure 4 : Non-respect of the preferences – destinations compatibility condition



The relations (7) and (11) represent the necessary conditions so that the tourist spends his holidays jointly in the two destinations. There is a complementarity between the two conditions: the technical efficiency condition takes is specified over the tourism prices, while the preferences - destinations compatibility condition is over the individual's preferences. Moreover, the two conditions are depending on the characteristics endowments of the two destinations.

A particular situation included in the preferences - destinations compatibility condition appears when the preferences line (slope A/B) coincides with one of the characteristics line segments: $\left(\frac{a_{N2}}{a_{C2}}\right)^{\frac{1}{\alpha}}=\frac{A}{B}$ or $\frac{A}{B}=\left(\frac{a_{N1}}{a_{C1}}\right)^{\frac{1}{\alpha}}$. In this case only one holiday destination will be chosen by the consumer.

Once the analytical duration demand functions calculated we can also find the consumer's demand for characteristics:

$$Z_N^*=\frac{R\left(A/B\right)\left(a_{N2}a_{C1}-a_{N1}a_{C2}\right)^{1/\alpha}}{P_2\left[\left(A/B\right)^{\alpha}a_{C1}-a_{N1}\right]^{1/\alpha}+P_1\left[a_{N2}-\left(A/B\right)a_{C2}\right]^{1/\alpha}}$$

$$Z_C^*=\frac{R\left(a_{N2}a_{C1}-a_{N1}a_{C2}\right)^{1/\alpha}}{P_2\left[\left(A/B\right)^{\alpha}a_{C1}-a_{N1}\right]^{1/\alpha}+P_1\left[a_{N2}-\left(A/B\right)a_{C2}\right]^{1/\alpha}}$$

Like expected, the relative demand for characteristics equals the A/B ratio, which is the optimality condition for the complementarity utility functions.

5. DISCUSSIONS

The discussions on this model will relate to three points. Initially, we compare our results with those obtained in a linear specification of the consumption – production function of the characteristics. After, an impact analysis of the degree of substituability/complementarity of this function is proposed. Lastly, we will introduce the transportation costs in the formalisation, which were neglected until now.

5.1. Comparison with Rugg's model results

For illustrative purposes, we also solved Rugg's model with the same specifications for the holiday's utility function, but by taking linear forms for the production functions of characteristics. The results obtained are as follows:

$$d_1^* = d_1(P_1, P_2, R, a_{ij}) = \frac{R\left(Ba_{N2} - Aa_{C2}\right)}{P_2\left(Aa_{C1} - Ba_{N1}\right) + P_1\left(Ba_{N2} - Aa_{C2}\right)}$$

(12)

$$d_2^* = d_2(P_1, P_2, R, a_{ij}) = \frac{R\left(Aa_{C1} - Ba_{N1}\right)}{P_2\left(Aa_{C1} - Ba_{N1}\right) + P_1\left(Ba_{N2} - Aa_{C2}\right)} \tag{13}$$

If we compare the solutions of the two models (6)-(7) and (12)-(13) one note that Rugg's model results are a particular case to our model an its corresponds to α =1.

5.2. Substituability and complementarity in the characteristics production

It is useful to note that in a CES production function the "α" parameter generally represents the degree of substitution between the production factors. In our case, the production factors of the natural and cultural characteristics are the days spent visiting the two destinations. Particularly, this parameter retraces the individual's preferences between the destinations, thus the tourists perception on the characteristics is taken into account in the choice modelling process. Thus, through the α parameter, compared to preceding modelling, one does not use the absolute, but the " subjective " value of the characteristics (the perception of the individuals on the characteristics).

The elasticity of substitution is $\sigma = 1/(1-\alpha)$. It measures the proportionate variation of the factors compared to the isoquant's slope variation, the output remaining constant. The values of α can lie between: α $\in (-\infty, 1]$ and by definition the values of the elasticity of substitution are $\sigma \in [0, +\infty)$. According to the respective value of α and σ one can distinguish three particular cases:

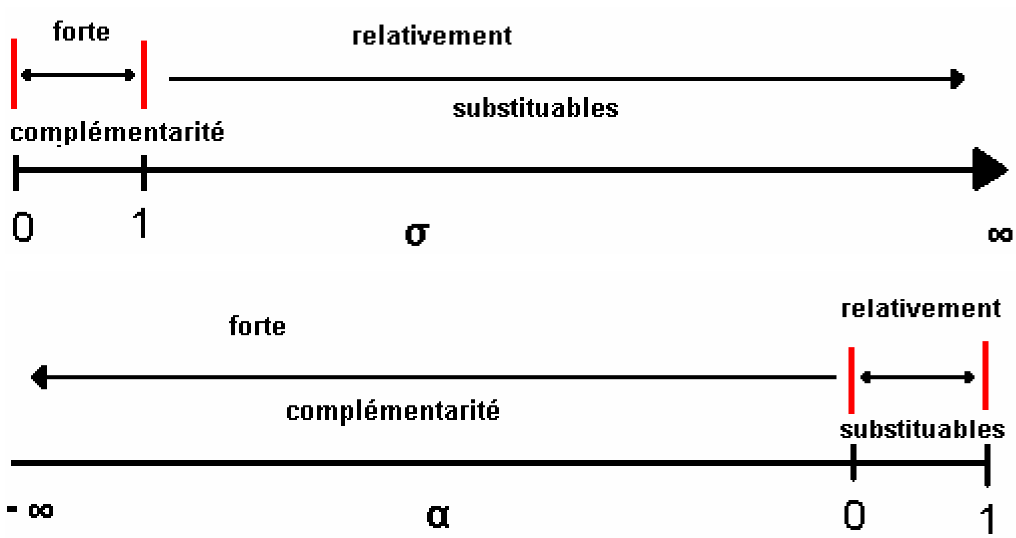
a) $\alpha = 1 \Rightarrow \sigma \to \infty \Rightarrow \text{perfect substituability}$, i.e. the elasticity of substitution between the two destinations characteristics is perfect. The two destinations are perfectly substitutable in the production - consumption function of the characteristics (the CES function takes linear specification form). One can find here the case usually treated in the literature.

b) $\alpha = 0 \Rightarrow \sigma = 1$ it is the case where the two destinations are relatively substitutable, the CES production function is not defined for this value of α (due to the division by 0), but if we study its isoquant we note that it behaves like one of a Cobb-Douglas production function;

c) $\alpha \to -\infty \Rightarrow \sigma = 0 \Rightarrow$ strict complementarity , the two destinations are perfectly complementary, the elasticity of substitution is zero and the CES production function takes the form of a complementary function (Leontief function);

The dynamics of these parameters and theirs impact on the relations between the two production factors (destinations) are illustrated in the following figure:

Figure 5. Dynamics of the α parameter and the elasticity of substitution

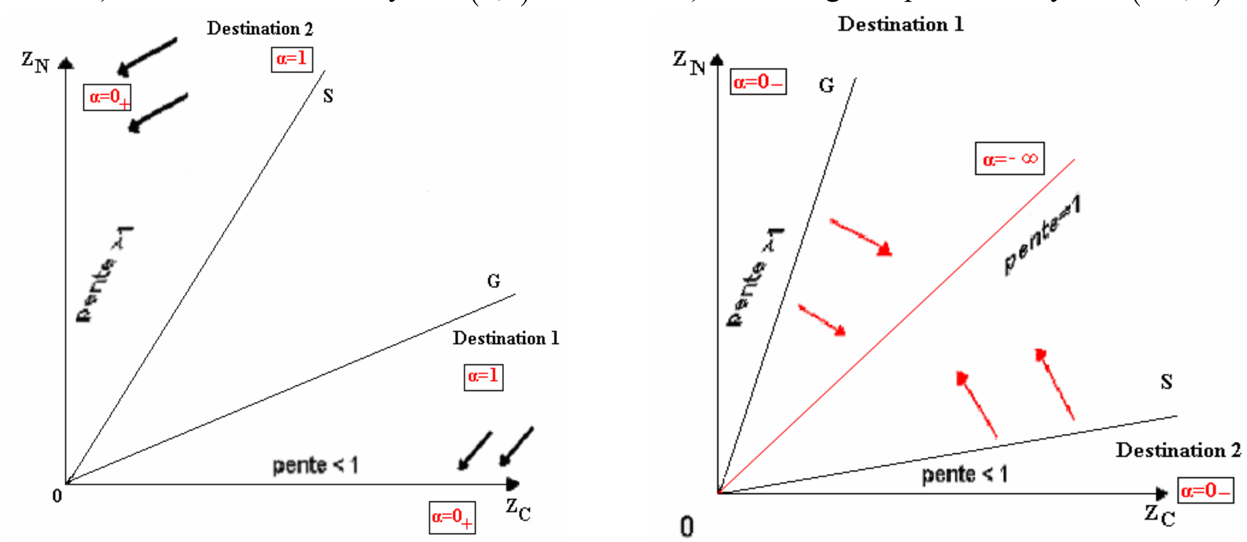


The diagrams presented here show the importance of the α parameter, the specification of this parameter in the model allows the description of a wide range of possible substitution situations between the characteristics produced and consumed in the days spent in the two destinations. One can go from relative substitutability $(\sigma \in (1,\infty)\ et\ \alpha \in (0,1))$ to strict complementarity $(\sigma \in (0,1)\ et\ \alpha \in (-\infty,0))$ between the specific characteristics of the two destinations.

According to α parameter dynamics, in figure 6 one can see the evolution of the characteristics space accessible to the consumer. We take as reference the case $\alpha = 1$, in this situation the objective and perceived characteristics coincide (Figure 6.a). The characteristics produced by the destinations correspond to rays OG respectively OS. The tourist can make his choice in the space delimited by these lines. The economic interpretation of $\alpha = 1$ is the perfect substitutability in the production – consumption function. In this particular case, only quantitative determinants influence the tourist choice: price, transportation cost, income, objective endowments.

Figure 6. Illustration of the α parameter role

a) relative substituability $\alpha \in (0,1)$ b) increasing complementarity $\alpha \in (-\infty, 0)$



If α diminish to zero (imperfect substituability between characteristics), the segment lines of subjective characteristics will move towards the axes and confound with them for α=+ε (with limit ε =0). Therefore the result is a widened characteristics space accessible to the consumer.

For $\alpha \in (-\infty, 0)$ there is a relative complementarity between the characteristics of the two destinations, with an extreme situation of perfect complementarity for (α =- ∞). The impact of the α parameter on the characteristic space accessible to the tourist is illustrated in the figure 6.b. For α=-ε (with limit ε =0) the lines of the subjective characteristics coincide with the axes, but there are two types of impact to be identified: one over the destinations axes OG, OS and another with regard to the characteristics space accessible to the tourist (individual's characteristics opportunity set).

However a rather unexpected graphical result is obtained, an " inversion " the two destinations rays position, namely the inversion of the axes corresponding to the two destinations (OG, OS) in the characteristics space $(Z_N, 0, Z_C)$. Given that α retrace the nature of individual's preferences between the destinations, one supposes that this particular situation is the result of the switch that occurs from a relative substitutability to a relative complementarity between the two destinations characteristics.

We observe a rather symmetrical evolution of the individual's characteristics opportunity set compared to the former case (switch from a perfect substitutability to a relative substitutability). Indeed, for α=-ε there is the choice space the largest possible, the rays OG, OS are identified with the axes Z_N, Z_C.

The evolution of the parameter towards -∞ determines the contraction of this space up to the point where for α = -∞ the choice of the tourist is reduced to only one line of slope 1. In this case, even in the presence of considerable transportation costs, either the consumer will choose the two destinations, or he will stay at home. On the figure corresponding to this case, the consumer characteristics space is reduced to a line OG = OS. Thus, all optimal bundle selected on this line, will determine the tourist to visit the two destinations.

The following table synthesizes the tourism demand according to the value of α parameter:

Value of α	**Demand for destination 1**	**Demand for destination 2**
α=1	$d_1 = \dfrac{R}{P_1 + P_2 \dfrac{a_{N1} - \left(B/A\right) a_{C1}}{\left(B/A\right) a_{C2} - a_{N2}}}$	$d_2 = \dfrac{R}{P_1 \dfrac{\left(B/A\right) a_{C2} - a_{N2}}{a_{N1} - \left(B/A\right) a_{C1}} + P_2}$
α=0	Undetermined	Undetermined
α=-1	$d_1 = \dfrac{R}{P_2 \dfrac{a_{C2} - a_{N2}\left(B/A\right)}{\left(B/A\right) a_{N1} - a_{C1}} + P_1}$	$d_2 = \dfrac{R}{P_2 + P_1 \dfrac{a_{N1}\left(B/A\right) - a_{C1}}{a_{C2} - a_{N2}\left(B/A\right)}}$
α=-∞	$d_1 = \dfrac{R}{P_1 + P_2}$	$d_2 = \dfrac{R}{P_1 + P_2}$

6. INTRODUCTION OF TRANSPORTATION COSTS

6.1. Framework and objectives

In this section we consider a particular case, by supposing that the tourist resides in one of the two countries. This assumption is useful for the future developments of the model that we consider aiming to give a theoretical explanation to the observed Intra Industry Trade in the tourism sector. It is also specified, that in the following developments the technical efficiency and compatibility preferences – destinations conditions are verified.

The consumer's program can be written in the following form:

$$\begin{aligned} &\max_{d_1,d_2} U = \min\left(AZ_C, BZ_N\right) \\ &s.c. \qquad Z_C = \left[a_{C1}d_1^{\alpha} + a_{C2}d_2^{\alpha}\right]^{\frac{1}{\alpha}} \\ &\qquad\qquad Z_N = \left[a_{N1}d_1^{\alpha} + a_{N2}d_2^{\alpha}\right]^{\frac{1}{\alpha}} \\ &\qquad\qquad R = P_1 d_1 + P_2 d_2 + t_1 T_1 + t_2 T_2 + t_{12} T_{12} \end{aligned} \tag{14}$$

For a better identification of the transportation costs impact, we use a specific approach to the discrete choice analysis. The transportation costs are introduced into the budget constraint with three new elements:

$$t_1 T_1 + t_2 T_2 + t_{12} T_{12} \tag{15}$$

- T_1, T_2 represent the transportation costs between the geographical initial emplacement of the tourist and the first, respectively the second destination ;
- T_{12} is the transportation cost between the two destinations.
- t_1, t_2, t_{12} are vectors with elements {0, 1, 2} depending upon whether the corresponding transportation link is or is not used by the tourist. For example, if the tourist visits the two destinations we obtain : $t_1 = t_2 = t_{12} = 1$

The optimal levels for the tourism demand for the two destinations are obtained after solving the consumer's program:

$$d_1^* = \frac{\left(R - t_1T_1 - t_2T_2 - t_{12}T_{12}\right)\left(B^{\alpha}a_{N2} - A^{\alpha}a_{C2}\right)^{\frac{1}{\alpha}}}{P_2\left(A^{\alpha}a_{C1} - B^{\alpha}a_{N1}\right)^{\frac{1}{\alpha}} + P_1\left(B^{\alpha}a_{N2} - A^{\alpha}a_{C2}\right)^{\frac{1}{\alpha}}} = \frac{R - t_1T_1 - t_2T_2 - t_{12}T_{12}}{P_1 + kP_2} \tag{16}$$

$$d_2^* = \frac{\left(R - t_1T_1 - t_2T_2 - t_{12}T_{12}\right)\left(A^{\alpha}a_{C1} - B^{\alpha}a_{N1}\right)^{\frac{1}{\alpha}}}{P_2\left(A^{\alpha}a_{C1} - B^{\alpha}a_{N1}\right)^{\frac{1}{\alpha}} + P_1\left(B^{\alpha}a_{N2} - A^{\alpha}a_{C2}\right)^{\frac{1}{\alpha}}} = \frac{(R - t_1T_1 - t_2T_2 - t_{12}T_{12})k}{P_1 + kP_2} \tag{17}$$

$$d_1^*, d_2^* = f(P_1, P_2, R, \alpha, T, a_{ij})$$

Like a general tendency, compared to the demand functions obtained in the model without transportation costs (8)-(9), the introduction these costs causes a reduction of the characteristics space accessible to the tourist and has no effect on the role played by the α parameter.

The introduction of the transportation costs is a significant stage, because the demand functions thus obtained for different types of holiday will allow the calculation of the corresponding indirect utilities:

$$V_j = v_j(P_1, P_2, R, \alpha, a_{ij}, T_{j,} d_1^*, d_2^*)$$

- « j » is a vector the elements of which are corresponding to the different holidays scenarios ;

Then, by considering the choice of the tour among those available, the tourist will choose the tour " J " which will provide him the maximum of utility, such as:

$$U_J^* = \max_j V_j$$

This type of approach is derived from the discrete choice analysis and used in particular in the economics of the transportation to determine the choice of a transportation mode[5]. It also makes it possible to clearly surpass the limit mentioned by Quandt with regard to the application of the traditional consumer's theory to tourism, i.e. the fact that the tourist should consume a little of each tourism good.

Using this kind of approach in this model we intend to highlight the analytical conditions for which the tourist's choice relates to one or more destinations. The core issue on this section is the identification of a threshold value for the transportation costs between alternate destinations. The whole analysis will be built around it. Precisely, this threshold will correspond to the value of the alternate transportation cost for which the tourist is indifferent between the choice of one or several holiday destinations.

6.2. Application and results

[5] Moshe Ben Akiva and Lerman (1985) « Discrete choice analysis : theory and application to travel demand » Cambridge (Mass.) : MIT Press

In order to apply this approach to our model we start by giving the analytical expression of the indirect utilities derived from holidays spent in only one destination (1 or 2) or from visiting both destinations.

$$V_1 = \min\left(Aa_{C1}^{1/\alpha}\frac{R-2T_1}{P_1}, Ba_{N1}^{1/\alpha}\frac{R-2T_1}{P_1} \right)$$
$$V_2 = \min\left(Aa_{C2}^{1/\alpha}\frac{R-2T_2}{P_2}, Ba_{N2}^{1/\alpha}\frac{R-2T_2}{P_2} \right) \tag{18}$$

We note that $V_1^1 = Aa_{C1}^{1/\alpha}\frac{R-2T_1}{P_1}$, $V_1^2 = Ba_{N1}^{1/\alpha}\frac{R-2T_1}{P_1}$, $V_2^1 = Aa_{C2}^{1/\alpha}\frac{R-2T_2}{P_2}$, $V_2^2 = Ba_{N2}^{1/\alpha}\frac{R-2T_2}{P_2}$.

Thus the indirect utility of the holidays in destination 1 is given by the minimum between V_1^1 and V_1^2, symmetrically V_2 will be the minimum between V_2^1 and V_2^2. The resulting indirect utility from holidays spent in the two destinations can be written under the following form:

$$\begin{aligned} V_{12} &= \frac{A\left(R-T_1-T_2-T_{12}\right)}{P_1+kP_2}\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha} \\ &= \frac{AB(R-T_1-T_2-T_{12})\left(a_{C1}a_{N2}+a_{C2}a_{N1}\right)^{1/\alpha}}{P_1(B^{\alpha}a_{N2}-A^{\alpha}a_{C2})^{1/\alpha}+P_2(A^{\alpha}a_{C1}-B^{\alpha}a_{N1})^{1/\alpha}} \end{aligned} \tag{19}$$

One can observe that in the above relations the indirect utilities directly depend on the tourism prices of the two destinations, on the transportation costs, on the tourism endowments and on the consumer's preferences. From an analytical point of view, all these determinants are difficult to handle in order to identify with certainty on one hand the minima between V_1^1 and V_1^2 and on the other hand the minima between V_2^1 and V_2^2. For this reason and given the objective to find a threshold value for the transportation costs between alternate destinations, we propose an analysis on the basis of the four following conditions (T_{12}).Therefore predictions can be made upon the choice of one or several tourism destinations.

$$V_{12} \geq V_1^1 \Leftrightarrow T_{12} \leq (R-T_1)\left[1-\frac{a_{C1}^{1/\alpha}\left(P_1+kP_2\right)}{\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_1}\right]+T_1\frac{a_{C1}^{1/\alpha}\left(P_1+kP_2\right)}{\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_1}-T_2 \tag{20a}$$

$$V_{12} \geq V_1^2 \Leftrightarrow T_{12} \leq (R-T_1)\left[1-\frac{Ba_{N1}^{1/\alpha}\left(P_1+kP_2\right)}{A\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_1}\right]+T_1\frac{Ba_{N1}^{1/\alpha}\left(P_1+kP_2\right)}{A\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_1}-T_2 \tag{21a}$$

$$V_{12} \geq V_2^1 \Leftrightarrow T_{12} \leq (R-T_2)\left[1-\frac{a_{C2}^{1/\alpha}\left(P_1+kP_2\right)}{\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_2}\right]+T_2\frac{a_{C2}^{1/\alpha}\left(P_1+kP_2\right)}{\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_2}-T_1 \qquad (22a)$$

$$V_{12} \geq V_2^2 \Leftrightarrow T_{12} \leq (R-T_2)\left[1-\frac{Ba_{N2}^{1/\alpha}\left(P_1+kP_2\right)}{A\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_2}\right]+T_2\frac{Ba_{N2}^{1/\alpha}\left(P_1+kP_2\right)}{A\left(a_{C1}+a_{C2}k^{\alpha}\right)^{1/\alpha}P_2}-T_1 \qquad (23a)$$

The first two conditions compare the indirect utility derived from visiting the two destinations (V_{12}) with the indirect utility derived from visiting only the first destination (V_1).

It has been established that V_1 returns the minima between V_1^1 and V_1^2, thus the respect of one of the two conditions is sufficient to obtain a higher indirect utility from visiting the two destinations rather than only the first one. Therefore, one can affirm that in this case the tourist will not choose solely the first destination for his holidays: his alternatives now becomes spending its holidays in the two destinations or only in the second one. Symmetrically the last two conditions (22a, 23a) compare the indirect utility obtained by holidays in the two destinations (V_{12}) with the indirect utility derived from visiting only the second destination (V_2). The respect of one of the two conditions modifies the choice alternatives of the tourist. He must now decide if he is to spend the holidays either visiting only the first destination or both.

Following this reasoning, the holiday scenario including two destinations will be chosen if the conditions {(20a) or (21a) } and {(22a) or (23a) } are verified. In order to refine this analysis, five figure cases can be develop starting from the above assertion.

i) All the four conditions are verified and thus the indirect utility obtained by visiting the two destinations is higher than the indirect utilities derived from the visit of only one destination. This case results in a transportation cost between alternate destinations (T_{12}) weak enough to determine the tourist to choose the two destinations for the holiday.

ii) Three conditions out of four are verified. In this case the tourist choice is identical to that resulting from the precedent situation.

iii) Two conditions out of four are verified. Two results are possible in this case: the one destination holiday scenario either the two destinations holiday scenario.

- if and only if the conditions (20a) and (21a) are respected, then the tourist's choice will relate to the second destination;

- if and only if the conditions (22a) and (23a) are respected, then the first destination will be chosen ;
- if and only if one of the conditions (20a) and (21a) and one of the conditions (22a) and (23a) are verified, then the tourist will spend his holidays in the two destinations.

iv) Only one condition out of four is verified. The first destination will be chosen if one of the (22a) and (23a) conditions is true; symmetrically the choice will relate to the second destination if one of the (20a) et (21a) conditions is verified.

v) No condition is verified. In this case one can affirm that the tourist will spend his holidays in only one destination. However the exact destination cannot be identified without knowing the minimum between: V_1^1, V_1^2, V_2^1, V_2^2.

Given the previous analysis and supposing equality in the relations (20a), (21a), (22a), (23a), we find four values for T_{12} : T_{12a}, T_{12b}, T_{12c}, T_{12d}. Thus a threshold of indifference for $T_{12seuil}$can be calculated : $T_{12seuil} = \min\left\{\max\left(T_{12a}, T_{12b}\right), \max\left(T_{12c}, T_{12d}\right)\right\}$. The element $\max\left(T_{12a}, T_{12b}\right)$ returns the maximum value of T_{12} which makes the tourist indifferent between visiting only the first and visiting both destinations. Symmetrically the element $\max\left(T_{12c}, T_{12d}\right)$ returns the maximum value of T_{12} which makes the tourist indifferent between visiting only the second destination and visiting them both. The value of $T_{12seuil}$ is determined as the minimum between these two transportation costs.

One has to mention that to ensure positive values for $T_{12seuil}$, the specification of the following relations is necessary:

$$\frac{R - T_1 - T_2}{R - 2T_1} \geq \frac{P_1 + kP_2}{P_1} \frac{a_{C1}^{1/\alpha}}{(a_{C1} + a_{C2}k^{\alpha})^{1/\alpha}} \tag{20b}$$

$$\frac{R - T_1 - T_2}{R - 2T_1} \geq \frac{P_1 + kP_2}{P_1} \frac{a_{N1}^{1/\alpha}}{(a_{C1} + a_{C2}k^{\alpha})^{1/\alpha}} \frac{B}{A} \tag{21b}$$

$$\frac{R - T_1 - T_2}{R - 2T_2} \geq \frac{P_1 + kP_2}{P_2} \frac{a_{C2}^{1/\alpha}}{(a_{C1} + a_{C2}k^{\alpha})^{1/\alpha}} \tag{22b}$$

$$\frac{R-T_1-T_2}{R-2T_2} \geq \frac{P_1+kP_2}{P_2} \frac{a_{N2}^{1/\alpha}}{(a_{C1}+a_{C2}k^{\alpha})^{1/\alpha}} \frac{B}{A} \tag{23b}$$

The objective is to determine a positive threshold for $T_{12seuil}$ related to which the tourist is indifferent between one or two destinations. For that it is enough to verify one of the (20b) or (21b) conditions and one of the (22b) and (23b) conditions.

Given the conditions for positive value of $T_{12seuil}$ one can affirm that: any value of the transportation cost between alternate destinations lower than the threshold $T_{12} \in [0, T_{12seuil}]$ will determine the tourist to spend his holidays in the two destinations. Thus a threshold effect was highlighted and it shows, unlike the usual models, that a choice of the multi - destinations holidays scenario is possible. This kind of choice is optimal, even in the presence of positive transportation costs, provided that they are below a calculable threshold.

6.3. Analysis of the transportation costs threshold determinants

A detailed analysis of this threshold's determinants could prove to be useful for a better understanding of the complexity of the tourist choice of a destination. To this end we consider the relations (20a), (21a), (22a), (23a), while supposing equality in each one of them. It is observed that the right term of each inequality is composed by three elements. These elements enable us to identify the determinants of the consumer's choice between one or more destinations. The probability of having a two destinations holiday is stronger if the $T_{12seuil}$ value is bigger.

As expected, we can identify the positive effect[6] of the income in each of the four identities: i.e. a positive variation of the income determines a positive variation of $T_{12seuil}$ therefore a stronger probability that multi – destination holidays being selected.

With regard to the direct transportation costs (between the place of origin and the destination) we can identify two types of impacts on $T_{12seuil}$ a positive and a negative one. When comparing the indirect utility resulting from the visit of the two destinations (V_{12}) with the indirect utility of only one destination, the specific transportation cost to this destination has simultaneously a negative and positive impact. A positive variation of the transportation cost to the destination increases the attractivity of the second destination (the positive impact). On the

[6] This is true for the relations which respect the conditions of a positive value for T_{12}, namely (20b), (21b), (22b), (23b).

other hand a rise of this cost decreases the available budget and it can even determine the tourist to visit only the second destination (the negative effect) [7]. As expected, the transportation cost of the second destination will have a negative impact on the threshold's value: an increase in this cost decreases the attractivity of the second destination for the tourist.

The impact of the tourism prices on the threshold value of the transportation costs between alternate destinations is different according to relations. If we take a look at the first two conditions which compare V_{12} to V_1 (the indirect utility of the first destination) one can conclude that P_1 has an positive effect over the possibility of visiting the two destinations, whereas P_2 has a negative effect provided that $T_1 \leq R/2$. The effects are opposite if the transportation cost T_1 is greater than half of the available budget.

To conclude one can say that the objective of this last section was to develop an analysis of the role played by the transportation costs the choice behaviour of the tourist. It has been establish that these costs are constraining for multi – destinations holidays only starting from a certain threshold. Moreover, this threshold value is directly determined by the tourism prices, income, consumer's preferences, tourism endowments (the objective and the subjective ones). Thus, a refinement of the analysis of these determinants impact of on the tourist choice combined with the role played by the transportation costs is proposed.

7. CONCLUSIONS

This paper studies the international tourism demand, from a microeconomic point of view. The contribution we propose is in particular the assumption of imperfect substituability between the characteristics of the different tourism destinations, in opposition to usual theoretical models.

The new elements included into the analysis allow for a better formulation of the tourism demand and a finer comprehension of the tourist behaviour. Thus, a complex framework is proposed to highlight the" package " nature of the tourism good, its various dimensions and the

[7] For example, for the relation (20a) the negative effect is predominant if the following condition is satisfied: $\frac{a_{C1}^{1/\alpha}}{(a_{C1} + a_{C2}k^{\alpha})^{1/\alpha}} < \frac{1}{2}\frac{P_1}{P_1 + kP_2}$. If the relative characteristics of the first destination are too small related to the relative prices, the tourist will choose to visit only the second destination

consumer's preferences. Due to the introduction of a variable degree of substitution between the characteristics produced in different countries, the analysis is refined, permitting to integrate a more varied range of the possible choices.

The introduction of a production-consumption function of tourism characteristics implies a significant change in the apprehension of the tourist behaviour. Thus, its choice does not depend centrally upon the real characteristics endowments of the different destinations, rather than on the consumer's perception over these characteristics. Therefore, we noted that the use of a CES production function makes it possible to highlight the effect of the substitutability degree between characteristics over the individual's " perception " of the objective characteristics and finally over the consumer's optimal decision.

The objective and subjective characteristics coincides only for $\alpha = 1$ synonym of a perfect substituability (the usual case). An imperfect substitutability determines a widening of the characteristics space accessible to the individual (the individual's characteristics opportunity set). Even more surprising, is the fact that graphically for negative values of the α parameter (imperfect complementarity), there is an inversion on the characteristics endowments perception of the tourist. Finally, when α value approaches towards $-\infty$, the characteristics space that is accessible to the individual is narrowed until becoming a line.

Another significant result resides in the fact that the tourist will choose to visit the two destinations only if two conditions are verified (necessary conditions). The first one, called technical efficiency condition takes account of the characteristics endowments and the tourism prices of the destinations. According to this condition, a rational individual will not choose a destination which proposes a subjective characteristics level smaller than the tourism prices. The second condition, which one baptized preferences – destinations compatibility condition, shows that only one destination will be chosen for the holidays, if the relative preferences of the individual over the characteristics is not located inside the characteristics space. Our result confirms Rugg's implicit assumption on this issue.

Finally, the formalization of the transportation costs into the model, particularly those between alternate destinations, contributes to the refinement of the tourist's choice analysis, especially regarding the role played by its determinants. The usual models tend to affirm that in the presence of the positive transportation costs between alternate destinations, visiting only one destination for as long as possible is the optimal solution for the tourist (Rugg 1972). Compared to this result, our model highlights the fact that the choice of a multi – destination holiday can be optimal in the presence of these transportation costs, provided that they are below a certain value (threshold effect). Thus, the identification of a threshold value for the transportation costs is a central result of this paper. This allows predictions of the tourist's choice between holidays spent in one or multiple destinations. The factors influencing the value of the threshold are the same as the determinants of the tourism demand: prices, consumer's preferences, tourism endowments, direct costs of transportation. The description of the double impact (positive and negative) of certain factors (direct costs of transportation and tourism prices) allows for a complex apprehension of the choice process.

A limit of this model is that the decision of having a two destinations holiday may be in part the result of an indirect degree of complementarity in tourism demand functions: negative crossed price elasticity. Precisely, the introduction of a complementarity of the preferences over the two types of characteristics results in a complementarity between destinations. This limit can be exceeded by using another utility function specification (CES, for example). Such formalization would make it possible to highlight the fact that intra trade tourism exchanges observed in statistics can be explained by something more than only the complementarity between the destinations.

The static nature of the model can be also specified among the model's limits. However this one does not prevent the introduction of a new destination and thus the revaluation of the situation, once this new destination is accessible to the tourist. The nature of formalization, namely the form of the production and utility functions and the discrete choice analysis enables us to study various possible cases (the emergence of a new destination or the decline of another).

Another limit that one can mention to this model is it's the theoretical dominant and thus, the fact that it was not empirically tested. The application of the econometric tests to the model is one of the priorities for future research.

The principal extension to this model that we consider is the study of the impact of these tourism demand determinants upon the specialization of the economies leading to inter or intra industry trade in the tourism sector.

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