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A Good Policy of Sustainable Tourism

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Abstract

We consider an extensive form game to analyze the interdependence between environmental protection of resources, the activities related with the tourism and the behavior of a local population. We answer two questions: 1) Suppose that the central planner invest in tourist activities, has he incentives to do an aggressive propagandistic campaign to convince the tourist to come for the country? 2) How good is from the environmental point of view that the local inhabitants prefer to work in tourist activities? So we analyze the situation when it's possible to obtain a sustainable tourism in a country such that the tourism is the main economic activity.

Resumen

En este trabajo analizamos el comportamiento de una población de un lugar de interés turístico respecto al cuidado de la calidad ambiental o cultural de la región. El mantenimiento de dicha calidad, puede ser amenazada por la excesiva explotación de los recursos naturales por parte de la población local, que ven en la actividad turística una posibilidad de incrementar su bienestar y por los turistas que desean obtener el máximo disfrute de las atracciones del lugar. Intentamos contestar a dos preguntas, la primera de ellas es: ¿Hasta qué punto el planificador central tiene interés en desarrollar una campaña propagandística para aumentar la afluencia de turistas al lugar? La segunda es: ¿Hasta qué punto es bueno para la preservación del interés turístico de la región que los habitantes locales se comprometan con la actividad turística? En definitiva, analizamos la posibilidad de desarrollar la actividad turística como una actividad sustentable.

JEL Classification: C73, L83

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1. Introduction

The tourism as economic activity is a phenomenon that has come acquiring a growing presence in the international economic dynamics. For many nations and regions of the world the tourism constitutes one fundamental activity, generators of income, employment and development. But it's necessary to understand the character of the tourist activity and its relations with the environment, which will permit a harmonious contact between nature and tourism, such that the ecosystems doesn't suffer alterations where this activity is developing, and implying to face the present tourist needs without putting in risk the capacity of the future generations to attend its own needs. In this sense, Bramwell, B and Lane, B., (1993) mention that the sustainable tourism is an economic development model conceived to improve the quality of life for the local community, and to facilitate for the visitor a high-quality experience of the environment, which both the host community as the visitors depends. The sustainable tourism is related besides with a cultural aspect: it should protect the cultural identity of local community, through assuring a relation between the local community and the tourist.

Following this concept of sustainable tourism, in this paper we give through the game theory a model or explanatory game of the relationships among the main agents that has interactions in tourist activity. Thus, we present a tourism game in which a central planner (CP) must to choose between to invest or not in a tourist country. To invest is a very profitable decision if an important part of the flux of tourism that will arrive to the country in the high season chooses to stay for a long time, for instance a month, we denote by $0 < I$ the gross benefit of this decision in this case. In other case, it is to say if the main part of this flux choose to stay for a short time, for instance a week, then to invest has not profits other than those related with environmental protection aspects, we denote this by EP; where $0 < EP < I$; and including in this case, the CP can have immediate financial losses, the gross benefices in this case is $EP - CF < 0$. Where CF denotes the cost of the investment in infrastructure for a long time tourist season. The possibility that a large part of tourists choose to stay for a long time depends strongly on their beliefs about the election done by for the CP. The tourist has not a priori total information about this election. The degree of conviction that the tourists have about the politic followed for the CP is important to their election. We assume that their believes about the CP election can be raised by means a propagandist campaign developed for the CP, and then to increase the probability that the most important part of tourists choose to stay for a long time. We assume that the tourist beliefs that, with a probability equal to x, $0 \leq x \leq 1$ the CP made the investment. To raise these beliefs has a cost for the central planner, we assume that this cost is linear an equal to cx. In the case where the CP invests and the tourist came for a long time the profit is equal to $I - cx$. And if the tourist came for a short time the profit of the CP is equal to $EP - CF - cx$. Observe that not necessarily the CP is interested in to convince all the possible tourists to come to the country because depending on c if x is big enough then $I - cx < 0$.

If the central planner does not invest, and the flux of tourists that arrive to the country for a long time is big, then the damage environmental can be important. For the central planner it can be beneficial does not to invest if he is absolutely sure that the tourists will arrive in their majority for a brief

stay. In this case the environment damages to would be little and it would not have losses by the little duration of the tourist season. On the other hand we assume that there exist local populations that can to choose to work in activities related with tourism or not. These people know the election made for the central planner. However they do not know the proportion of tourist that will arrive in the high season for a long time. If the flux of tourist that arrives for a long time is important the population prefers to work in tourist activities the most part of their time of work. This decision has an important roll to convince to the tourists to stay in the country for a long time. Therefore we consider an extensive game with perfect recall and imperfect information. For a characterization of this kind of games and some possible Nash equilibrium see (Van Damme, E., 1991).

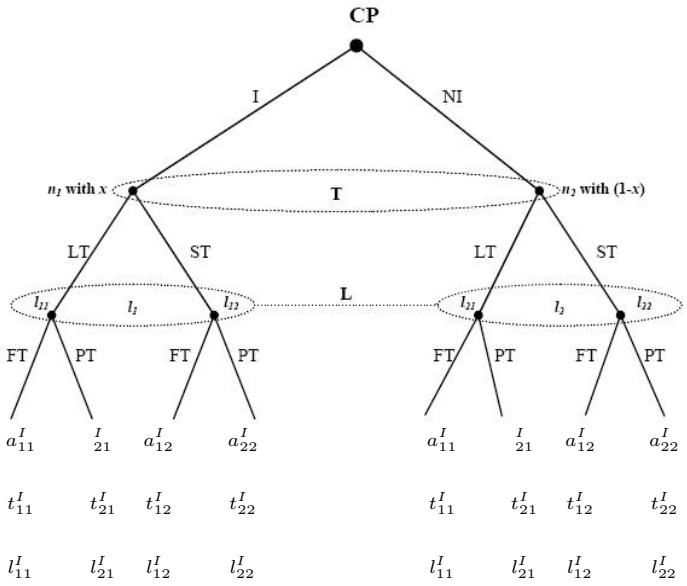
For our purposes this paper has the following parts. In section two we show a particularly example of a tourism game modeling the situation. Section three is devoted to analyze the Nash equilibrium of the tourism game. Section four the repeated game is shown, in which through the time a lost of the environment exists. Section five analyzes the discount factor and the future inside the sustainable tourism. Section six represents a numeric small example that makes an evaluation of the carried out theory. Finally we give some conclusions to obtain a good policy of sustainable tourism.

2. The Game

The model of an extensive game with imperfect information allows a player, when taking an action, to have only partial information about the actions taken previously. Hence we will model this game as an extensive form game with perfect recall and imperfect information. In particular, we refer to games in which at every point player remembers whatever he knew in the past as games with perfect recall.

According to this there are three players, the central planner (CP), the tourists (T) and the local inhabitants (L). The central planner chooses in the root of the tree between two pure strategies, to invest (I) or not to invest (NI). The second information set (denoted by $\mathbf{t}$) has two nodes ($\mathbf{n_1}$ and $\mathbf{n_2}$) and corresponds to the tourists. Tourists believe to stay in their node $\mathbf{n_1}$ with probability x and in the node $\mathbf{n_2}$ with probability $1-x$. The node $\mathbf{n_1}$ comes after the election to invest, and $\mathbf{n_2}$ comes after the election **NI**. This means that the tourist believes that with probability x the CP choose to invest. They have two pure strategies: stay for a long time (LT) or for a short time (ST). The thirst player are the local inhabitants, they have two information sets, l1 and l2 either with two nodes, l11 and l12 for the first one and the nodes l21, l22 for the second information set. l11 and l21 came after the decision LT; the nodes l12 and l22 comes after ST. Inhabitants have two pure strategies, to work full time in activities related with tourism, FT or work only partial time in these activities PT. A convenient representation of this game is shown in the next figure:

Figure



In this game CP carries out the first move, choosing I or NI. When the player **T**'s turn to move, and when doing so she is not informed whether player CP choose I or NI is a fact indicated in the figure by the dotted circle connecting the ends of the histories after which player T has to move for the second time, choosing an action LT or ST. The real numbers (a, t, l) under the terminal histories are the players' payoff.

However from the second set of information the game can be represented by means of two normal form games, one corresponding to the election I and the other to the election NI, we represented them by the matrices A^I and A^{NI} respectively:

Election I and Election NI

(1)

$A^l =$

	LT	ST
FT	$a^I_{11}, t^I_{11}, l^I_{11}$	$a^I_{12}, t^I_{12}, l^I_{12}$
PT	$a^I_{21}, t^I_{21}, l^I_{21}$	$a^I_{22}, t^I_{22}, l^I_{22}$

$A^{NI} =$

	LT	ST
FT	$a^{NI}_{11}, t^{NI}_{11}, l^{NI}_{11}$	$a^{NI}_{12}, t^{NI}_{12}, l^{NI}_{12}$
PT	$a^{NI}_{21}, t^{NI}_{21}, l^{NI}_{21}$	$a^{NI}_{22}, t^{NI}_{22}, l^{NI}_{22}$

Where the real numbers $a^i_{hk}, i \in \{I, NI\}, h, k \in \{1, 2\}$ represent the payoff to the CP corresponding to the different strategy profiles. Analogously, $\mathbf{t^i_{hk}}$

and $\mathbf{l^i_{hk}}$ represent the payoffs corresponding to the tourists and inhabitants respectively. The tourist assign probability $\mathbf{x}$ to play the game given by A^I and probability $\mathbf{1-x}$ to play the game given by A^{NI}.

So, given the strategies $(q, 1-q), 0 \leq q \leq 1$ and $(q', 1-q'), 0 \leq q' \leq 1$ followed for the inhabitants if the central planner did the investment (node l_1) or not (node l_2) respectively, the expected value that the tourists assign to the strategy LT is:

$$E_T(LT/(q,q')) = x[qt^I_{11} + (1-q)t^I_{21}] + (1-x)[q't^{NI}_{11} + (1-q')t^{NI}_{21}] \quad (2)$$

and the corresponding value for the strategy ST is

$$E_T(LST/(q,q')) = x[qt^I_{12} + (1-q)t^I_{22}] + (1-x)[q't^{NI}_{12} + (1-q')t^{NI}_{22}] \quad (3)$$

So, they choose LT if $E_T(LT/(q,q')) \geq E_T(ST/(q,q'))$ in other case they choose ST. It follows that this election depends on the values assigned to $\mathbf{x}$. So, the tourist will choose this strategy if and only if $x \geq x(q,q')$ where:

$$x(q,q') = \frac{\left(t^{NI}_{12} - t^{NI}_{11}\right) + \left(t^{NI}_{22} - t^{NI}_{12}\right)}{q\left(t^I_{11} - t^I_{12}\right) + (1-q)\left(t^I_{21} - t^I_{22}\right) - q'\left(t^{NI}_{11} - t^{NI}_{12}\right) + (1-q')\left(t^{NI}_{21} - t^{NI}_{22}\right)} \quad (4)$$

is the least value of $\mathbf{x}$ such that the tourist chooses LT. This value depends, in his turns, on the values of $\mathbf{q}$ and $\mathbf{q'}$.

The social planner prefers to do the investment in environmental preservation and that the tourists come to the country for a long time. He will do a propagandistic campaign if and only if the cost to obtain the level of credibility $\mathbf{x}$ such that the tourists choose this option, satisfy the inequality $E_{CP(I)} \geq E_{CP(NI)}$ where:

$$E_{CP}(I) = P_x(LT)\left[qa^I_{11} + (1-q)a^I_{21}\right] + P_x(ST)\left[qa^I_{12} + (1-q)a^I_{22}\right] - cx \quad (5)$$

$$E_{CP}(NI) = P_x(LT)\left[q'a^{NI}_{11} + (1-q')a^{NI}_{21}\right] + P_x(ST)\left[q'a^{NI}_{12} + (1-q')a^{NI}_{22}\right] \quad (6)$$

The symbol $P_x(LT)$ represents the probability that the tourist plays his strategy LT given that he believe that wit probability $\mathbf{x}$ the CP did the investment, $P_x(ST) = 1 - P_x(LT)$ these values could be positives if and only if $x = x(q,q')$ because only in this case that the tourists follow a mixed strategy make sense.

So the tourists choose LT if and only if they assign a value given by

$$P_x(LT) \geq \frac{cx - qa^I_{12} + (q-1)a^I_{22} + q'a^{NI}_{12} - (q'-1)a^{NI}_{22}}{qa^I_{11} - qa^I_{12} + a^I_{21} - qa^I_{21} - a^{NI}_{21} - a^I_{22} + qa^I_{22} - (q'-1)a^{NI}_{22} - q'a^{NI}_{11} + q'a^{NI}_{12} + q'a^{NI}_{21}}. \quad (7)$$

This means that **x** must be sufficiently large like so that the tourists decide to come for a long time and sufficiently small like so that the cost of obtain this value does not surpass the benefits associated with this level of credibility.

On the other hand, tourist prefer goods services, this means that their decisions also depends on the election done by the settlers.

3. The Nash equilibria of the tourism game

Now we can obtain the values of q, q' and $P_x(LT)$ such that the strategy

$$S^*(x) = ((1,0);(P_x^*(LT), P_x^*(ST));(q^*, 1-q^*, q^{'*}, 1-q^{'*}))$$

is a Nash equilibrium. Note that the local inhabitants have complete information about the decision of the central planner, tourists have incomplete information about this decision and they make this believes from the propagandistic campaign developed for the central planner. So this equilibrium depends on the intensity of the campaign that the central planner be disposed to do.

The best scenario is that one in which the central planner invest, the population have an intense participation in the tourist activities, and the tourists came from a long time. The worst scenario, at least from the environmental point of view is those where the central planner choose does not to do the investment, and the tourists came for a long time. It can happen that the local population decides to work in such strong way in the activities related to the tourism, that even in case when the central planner does not make the investment, the tourists have interest in remaining in the place by a long period. These possibilities can be represented by means of the following payoffs:

Consider for the central planner the following payoffs in A^I and A^{NI} given in (1):

$$\begin{aligned} &a_{11}^I = I - cx, \quad a_{12}^I = EP - CF - cx, a_{21}^I = I - cx, a_{22}^I = EP - CF - cx, \\ &a_{11}^{NI} = -EP, \quad a_{12}^{NI} = 0, \quad a_{21}^{NI} = -EP, \quad a_{22}^{NI} = 0, \end{aligned} \tag{8}$$

the following relations between the payoffs for the tourists and for the local inhabitants are naturals:

$$\begin{aligned} &t_{11}^I > t_{12}^I, t_{21}^I > t_{22}^I; \\ &l_{11}^I > l_{12}^I, l_{11}^I > l_{21}^I, l_{12}^I < l_{22}^I, l_{21}^I > l_{22}^I. \\ &t_{11}^{NI} < t_{12}^I, t_{21}^{NI} < t_{22}^{NI}; \\ &l_{11}^{NI} < l_{12}^{NI}, l_{11}^{NI} > l_{21}^{NI}, l_{12}^{NI} < l_{22}^{NI}, l_{21}^{NI} < l_{22}^{NI}. \end{aligned} \tag{9}$$

It is possible to obtain values for q and q' such that the tourists prefer to came for a long time independently of the value of x, this happen if $q \geq \bar{q}$ and $q' \geq \bar{q}'$ where $\bar{q}$ and $\bar{q}'$ verify the equation $ET_x(LT) - ET_x(ST) = 0$.

This is the case if:

$$0 \leq \bar{q}' = \frac{t_{21}^{NI} - t_{22}^{NI}}{t_{11}^{NI} - t_{21}^{NI} - t_{12}^{NI} + t_{22}^{NI}} \leq 1$$

and

$$0 \leq \bar{q} = \frac{t_{21}^{NI} - 2t_{22}^{NI} + t_{12}^{NI}}{t_{11}^{I} - 2t_{21}^{I} + t_{22}^{I}} \leq 1$$

This means that if the settlers prefer to work hard, then the tourists can obtain a high level of pleasure independently of the action followed for the central planner. These are no necessarily good news, because if the central planner choose does not to invest and the tourists came for the country for a long time then the environmental can suffer damage.

In this case the local population can obtain profits in the short time and then to improve its social welfare however, this situation can revert in the long period, because if the central planner does not invest in environmental protection the welfare of the population can decrease with the lost in environmental quality.

If the Nash equilibrium has these characteristics, i.e. if $q^* > \bar{q}$ and $q^{'*} > \bar{q}'$, then it is Pareto dominated.

4. The repeated game

When the peoples play a normal form game in a repeated way, such that they do not know the moment of the end of their interaction, the situation can be modeled as an infinitely repeated game. In these cases it is possible to support by means of rational strategies news payoff such that are rationally impossible to obtain in one shot games or even in infinitely many repeated games. These games capture the idea that the behavior of each player has effect in the future behavior of the others, and phenomena like cooperation, revenge, and threats appear.

Suppose that the losses in environmental protection are related with the time that the tourists remain in the country, with the quantity of tourists in the country and with the politic followed by the central planer and the intensity that local inhabitants choose to work in tourists activities. Suppose that this interaction between tourists, central planner and local inhabitants is modeled by means of the before analyzed game (the stage game) which is repeated (infinitely) in each tourist season. We symbolize the losses in environmental quality, in time $t = 0, 1. \ldots$ by $LE_{i,j,t}; i \in \{I, NI\}; j \in \{LT, ST\}$ suppose that the CP has a discount factor δ. The central planner must now decide how often invests if the looses in environmental quality must be discounted of his benefits. For instance consider the strategy s for the central planner, he invests in time zero, and does not invest again until $t = T$ so, the benefit until T are represented by:

$$\pi_{CP}(s) = (I - cx) - LE_{I,j,0} - \sum_{t=1}^{T-1} (\delta)^t LE_{NI,j,t} + (\delta)^t [(I - cx) - LE_{I,j,T}].$$

depending on the strategy followed for the tourists. The strategy followed by the tourist depends on the degree of satisfaction obtained in the country and this depends on the policy of investment followed by the central planner and on the degree of participation of the local inhabitants in the tourist activities. The best response for the central planner, depends on the tourists election and on his discount factor.

How often the CP, need to invest in environmental protection depends on the intensity of the tourist activities. In this way, if the planner already made his election on the strategy of the investment in environmental protection, it will have to coordinate with the local population so that they develop a degree of activity coincident with the central objective. The intensive use of the tourist resources, without a concordant policy of investment, can imply the definitive loss of these goods for all future. The degree of activity related to the tourist activities developed by the local population can be interpreted in terms of time or prices to that the local inhabitants rent their houses to the tourists. Corresponding to a each degree of activity, a time destined to let on hire the houses for the tourists or a different rent for the same time.

5. The discounting factor and the future

The models of infinitely repeated games capture a situation in which players repeatedly engage in a strategy game . In this kind of games it is possible to obtain as result of a Nash equilibrium strategy high payoffs which are not result of any rational strategy in finite repeated games. However to support such outcomes each player must be deterred from deviating by being punished in the cases when he deviated. In some cases this punishment implies that the punisher is himself punished by his action, or in some cases when the game involve public goods as environmental quality, punish can implies losses in the social welfare so, the CP must be able to implement a politic to convince the deviant to follows the best social action, with the minimal cost of punishment possible.

Assume that the discounting factor δ of the CP, is coincident with the expected discount factor of the whole society. Suppose that local inhabitants have a discounting factor δ_l less than the social discount factor (they are myope). In this case the local inhabitants can have interest in to deviate from an initial agreement between local inhabitants and the CP on the intensity of the tourist resource utilization. The CP must to punishes this deviation for instance decreasing the level $\mathbf{x}$ of the propagandistic campaign, in other case losses on environmental provoked by the intensive utilization of the tourist resource can be never recovered. For instance, suppose that with the objective to preserve the natural resource the CP and the local inhabitants to agree in to do not and intensive utilization of this resources. The CP agree in to invest in environmental protection and local inhabitant agree in to work in tourist activity only partially. Suppose that however, in time T the local inhabitant choose to deviate of this agreement and decide to work full time in tourist activities. The CP can punish this deviation of the local inhabitant choosing the action not invest from the time in which the local inhabitants deviate and for all the future, (this kind of strategy are called a trigger strategy), if and only if the discounting factor of the local inhabitants is no so small. To see this note that if the local inhabitants do no deviate their profit are:

$$\pi_L(I, PT) = \sum_{t=0}^{\infty} \delta_l^t l_{21t}^I = l_{21t}^I \frac{1}{1+\delta_l}. \tag{10}$$

If the local inhabitants deviate and chose $D = (PT, \ldots, PT, FT, \ldots)$ this means plays the action PT until $t = T-1$, and $FT$for all $t \geq T$ and the CP punishes

choosing: $PT = (I, \ldots I, I, NI, \ldots)$ i.e. he plays I until $t = T$ and NI for all $t \geq T + 1$ then the profits for the settlers will be:

$$\pi_l(P, D) = \sum_{t=0}^{T-1} \delta_l^t l_{21t}^I + \delta^T l_{11T}^I + \sum_{t=T+1}^{\infty} \delta_l^t l_{11t}^{NI}. \tag{11}$$

Suppose now that $l^I ijt = l_{ij}^I$ and $l^{NI} ijt = l_{ij}^{NI}$: So this action is a punishment for the local inhabitants if and only if $\pi(I, PT) = \pi(P, D)$, equivalently if and only if

$$\delta_l \geq \frac{l_{11}^I - l_{21}^I}{l_{11}^I - l_{11}^{NI}}.$$

In this case is better for the local inhabitants do not deviate.

However if for to deterred the deviation it is necessary to repeat the punishment for a long time (like in the case of a trigger strategy) it can imply big loses in social welfare. Strategies like trigger strategies imply a punitive action forever, and then to punish can be a non credible threat. Fortunately there exist convincing strategies no so harsh, such that the necessary time of the punishment is decreasing with the discount factor of the players. The best strategies are those that render all possible deviation unprofitable, this means that the strategy implement a perfect subgame equilibrium. Some punitive strategies are not subgame perfect, because they are supported in no credible threat. Recall that a strategy profile is a subgame perfect equilibrium of the δ-discounted infinitely repeated game if and only if no player can gain by deviating in a single period after any history, see [Osborne, M.J.; Rubinstein, A.]. This type of strategies implies the best policy of protection of the environmental quality. So to implement a strategy coincident with a subgame perfect equilibrium is a true challenge for the CP, and it is a problem of interest when some player are myope, this type of player can obtain profits in the short time that are opposite to the social welfare, so is the social interest to deterred this deviation. To do this the CP, would be able to find a strategy such that punishes the deviant in each time, such that it implies the minimal environmental damage possible. The result of this strategy must be the socially wished result. The perfect folk theorem shows that if the discounting factor of the players is not very small, it is possible to build an strategy such that the equilibrium path consists of the repetition of a single (strictly) enforceable outcome, and the punishment to the deviant is not to harsh like the trigger strategy, it is enough to punish only for a finite number of periods, so the environmental damage is the minimal possible. In these cases the threat is credible. In terms of our problem the central planer can punish a myope behavior of the local population decreasing the investment in propagandistic campaign, this means social losses because the flux of tourists that arrive to the country decreases, but is better en terms of environmental protection if previously the central planner does not did the sufficient investment in environmental protection.

In terms of the folk theorems this means that, if there exists a $0 < \delta < 1$, such that $1 > \delta > \delta$, where δ is the discounting factor of the local inhabitants, then for each collection of strictly enforceable outcomes a^* there exists an

strategy that is a perfect Nash equilibrium, such that the generates the path $a_t = a^*$ for all $\mathbf{t}$, (Osborne, M.J.; Rubinstein, A.). This strategy is supported by the possibility that have the central planner to punish the local inhabitants if they look for a possible immediate profit and they think to deviate.

6. A numerical example

In this section we show an illustration of the theory by means of a numeric brief example that will correspond to give the results in that CP really makes the investment, this is, the corresponding value of x, this is between zero and one, so we generates a coherent such numeric matrix of payments. Considering the inequalities of (9), the corresponding payments are given by:

$A^I =$

	LT	ST
FT	4,3,3	2,2,1
PT	4,2,2.5	2,1.5,2

and $A^{NI} =$

	LT	ST
FT	-5,1/2,2	0,1,3
PT	-5,1/2,1	0,2/3,4

With these payments, we obtain the probabilities with which a worker decides to work full time in tourist activities, this is:

$$\bar{q}' = \frac{t_{21}^{NI} - t_{22}^{NI}}{t_{11}^{NI} - t_{21}^{NI} - t_{12}^{NI} + t_{22}^{NI}} = \frac{1}{2}$$

and,

$$\bar{q} = \frac{t_{21}^{NI} - 2t_{22}^{NI} + t_{12}^{NI}}{t_{11}^{I} - 2t_{21}^{I} + t_{22}^{I}} = \frac{1}{3}.$$

The value of $\bar{q}$ means that workers will be in charge of full time in tourist activities with a bigger probability or equal to $1/3$ if there is a tourist investment policy that it has carried out by the central planner. But when it didn't have the investment, with a probability of $1/2$ the workers will be in charge of full time in tourist activities.

On the other hand, as we saw in section 2, the tourists play to take vacations for a long time if and only if $x \geq x(q, q')$, this way considering (4) of the section 2 and with the obtained values $\bar{q}$ and $\bar{q}'$, we can obtain the probability that the tourists assign to that central planner decides to invest, this is $x(\bar{q}, \bar{q}') = 0.22$ so they play its strategy LT. Also considering (7), the probability that the tourists play LT since they believe with probability $x(\bar{q}, \bar{q}') = 0.22$ that CP made the investment is $P_x(LT) = \frac{0.22c-2}{7}$. It will depend on the costs incurred in the propagandistic campaign. In this numerical example, the costs of the propagandistic campaign, c, will be bigger at 10 and smaller than 45, this way, the value of x assures that the tourists choose to make vacations for a long season. Also, this confirms that while a propagandistic campaign of tourism is high then CP has security that tourists arrive for a long period, if $c \approx 45$ this implies that $P_x(LT) \approx 1$.

On the other hand, to sustain the agreement, explained in section 5, between CP and the local inhabitants on to invest and to work partially

respectively, CP can punish the deviation that the local inhabitants carries out in some period of the time, if and only if $\delta_l \geq \frac{l_{11}^I - l_{21}^I}{l_{11}^I - l_{11}^{NI}} = \frac{1}{2}$, that which implies that the better for the local inhabitants is not to deviate.

7. Conclusions

The Game Theory is a suitable tool to analyze the utilization of tourist resources, because this utilization is made by different human groups with interest in conflict, and the result of this joint activity depends on the behavior of each one, but no one has the control of the conflictive situation.

In some cases an excessive utilization of natural resources can be the result of the behavior followed for tourist and local inhabitants, but this behavior can be myope, in the sense that the exhaustion of the natural resource implies future and irreparable looses in social welfare. Game theory shows that the central planner can prevent this situation and to avoid it choosing a rational strategy which implies a credible threat, in this case do not make publicity on the advantages of the place for the tourists. So in each season for the local inhabitants is profitable to dedicate a part of their time in other activities, so this combination of strategies entails a diminution of the tourist flow. The possibility of obtain this social optima as a perfect subgame Nash equilibrium is a conclusion of the folk theorem see Fudenberg, D. and J. Tirole (1991).

We have analyzed the interdependency between the decisions that take the main agents of a tourist community. The best situation is given when the central planner invests in an environmental protection policy, the tourists arrive for a long time (for example a month of holidays), and the settlers participate in the tourist economic activity. Therefore, we show that the best response for each player (CP, T, L) offers a result as Nash equilibrium that is presented under the perspective of a sustainable tourism, so, it is the best aggregate response in a tourist country.

The central planner, by means of an environmental protection policy, should assure in the tourism a planning and to negotiate of sustainable form, with owed consideration to the protection and adequate economic use of the social and natural environment for the reception zones. The investment should have solid information, studies and diverse opinions on the tourism nature and its effects in the cultural and human traditions before and during the development, especially as for the local population, so that this can participate and to influence in the development direction and alleviate its effects more harmful so much in own as collective interest. It should be stimulated to the local population and should be expected that her take the initiative in planning and development with the aid of government, firms and other next financial interests. They should be carried out economic, social, and environmental analysis integrated, doing emphasis in the different types of tourist development and in the forms in which these types would be able to insert with the ways of traditional life and the environmental factors. The key of a sustainable tourism is to negotiate with efficacy the cultural and natural approach, with the object of contributing benefits to the society and to increase the interest of the visitors.

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