# On the economic rationality of fluctuations in tourism frequentation at nature-based destination: the case of Corsica seaside hotels

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2011

On the economic rationality of fluctuations in tourism frequentation at nature-based destination: the case of Corsica seaside hotels

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**Abstract**

The aim of this paper is to answer a simple question: Are fluctuations, and especially temporary slow-downs or decline, in frequentation always harmful for a tourism destination?

I propose a simple theoretical model for a nature-based destination, in which the willingness to pay (WTP) of a tourist for the destination depends on the environmental quality of the destination. I hypothesize that, at some points in time, there exists a rational economic incentive to experience a decrease in frequentation for a while in order to let the stock of natural assets regenerates since the fall in environmental quality is associated with a lower willingness to pay for the destination. Then I use a sample of 80 seaside hotels of Corsica to show that the WTP of tourists for a night-stay positively depends on environmental quality. Results indicate that a deterioration of the environmental quality of the destination would reduce the willingness to pay for a nigh-stay in Corsica of more than 25%.

It tends to confirm my initial hypothesis since if the environmental quality of Corsica falls rational hotel owner should ask for a limited and temporary slow-down in frequentation so that environmental quality and the WTP reach again a higher and more profitable level.

# Introduction

Although it is perceived as a potential levy of development by practitioners and by local and international institutions (Diamond, 1977), tourism is said to suffer of a structural weakness. This weakness is called fluctuations in the level of frequentation over-time inducing fluctuations in tourism receipts, employment, profitability of tourism facilities, etc.... [i]

The seminal work of Butler (1980) emphasized the famous destination lifecycle. To sum-up every tourism area experiences several phases of tourism development. After a take-off and a phase of rapid growth in frequentation, at some point frequentation reaches a peak and then, because of the combination of different factors, frequentation starts to decline.

This concept has generated a great amount of literature (see for example Oppemann, 1995, Agarwal, 1997, Tooman, 1997).

A major concern of both researchers and tourism practitioners is to find solutions in order to avoid the decline in frequentation and all the associated drawbacks. This is apparently rational since the typical reasoning of a tourism entrepreneur seems to be as follows. For a given level of the price of my product, a fall in frequentation means a fall of my receipts and by the way of my profits. And if it applies to a single entrepreneur of the destination, it should also apply to the destination as a whole.

Formally, a tourism entrepreneur behaves as a rational producer facing the static prototypical problem of profit maximization in a situation of perfect competition.

Furthermore, the law of supply insures that this optimal number of visitors $T^*$ increases if the market price of the product sold by the tourism firm is increasing.

That is to say that the lower the price that visitors have to pay in order to enjoy the product, the less the number of tourists that a firm is willing to host.

But this classical reasoning does not apply exactly this way in tourism. Tourism is a non-standard economic activity because:

1) $T$ is purely exogenous at the destination level, the number of tourists depends on tourists preferences and firms cannot decide if they are going to produce $T^*$, $T_{LOW} < T^*$ or $T_{HIGH} > T^*$.
2) The price of a journey is not simply set by the market at a given price $p$. The price of a tourist product depends on its characteristics, it means basically on its quality.

If the quality of the product falls, its price falls and as a result the number of tourists that maximizes the profit of the destination decreases from $T^*$ to $T^{**}$. The decrease in price creates an incentive for the destination to host less tourists than before.

From that point, the aim of this paper is to answer a simple question: Are fluctuations, and especially temporary decline, in frequentation always harmful for a tourism destination?

In a first section, I propose a simple model for a nature-based destination, in which the willingness to pay of tourists (WTP) for the destination depends on the stock of natural assets, and I hypothesize that there exists a rational economic incentive to experience a decrease in frequentation for a while in order to let the stock of natural assets regenerates. This is an idea already emphasized by Greiner et al. (2001) and Kort et al. (2002).

In a second section, I use a sample of 80 seaside hotels in Corsica to show that the WTP of tourists for a night-stay positively depends on environmental quality. Results indicate that a deterioration of the environmental quality of the destination would reduce the willingness to pay for a nigh-stay in Corsica of more than 25%.

Finally, I discuss the implications of these findings in the light of the theoretical model of the first section.

# Tourism receipts at nature-based destination

I consider a particular type of tourism destination characterized by the fact that its attractiveness relies on the existence of unique natural capital, i.e. fabulous landscapes, mountains, sea, beaches, etc...

In such a destination, the number visitors at any time period $t$ is exogenously given by $T_t$ .

The problem is to know what does the marginal receipt of tourism, the price of the journey\the willingness to pay[ii] of a tourist depends on.

Following Cerina (2007), I consider that the WTP of a tourist is given by a hedonic price function (Rosen, 1974). It means that the price that a given tourist is willing to pay for a journey depends on a set of characteristics of the destination.

On the one hand, I assume that the willingness to pay of a tourist depends on a vector of exogenous characteristics $X_t$ including different features of the destination such as the quality of accommodation, the number and the type of attractions available, etc....

On the other hand, the willingness to pay also positively depends on the environmental quality of the destination. At a given time t, the environmental quality is defined by the stock of available environmental assets of the destination $Q_t$.

I define the WTP of tourists at time t as the following hedonic price function:

$$p(X_t, Q_t)$$ [iii]

At each time $t$ for a given level of tourist $T_t$ there exists a unique equilibrium price $p(X_t, Q_t)$.

The stock of natural assets $Q_t$ is affected by two different processes. First, tourism frequentation generates an environmental damage, $\varphi(T_t)$, a pollution, leading to the decrease of the stock of natural assets ($\varphi'(T_t) > 0,\ \varphi''(T_t) > 0$).

Second, this stock of asset is governed by a natural growth process taking the form of a logistic function $r(Q_t)$ and there exists an amount of natural assets $\bar{Q}$ such that $r'(Q_t) > 0$ , $\forall Q_t < \bar{Q}$ , $r'(Q_t) < 0$ , $\forall Q_t > \bar{Q}$ and $r''(Q_t) < 0$ .

Insert figure 1 here

This type of function is of common use in bio-economics problems (Clark, 1990). It means that the regeneration capacity of the environment depends on the current stock of environmental assets. For a high stock of natural assets, the regeneration capacity is relatively low because the stock of natural assets cannot grow forever. Conversely, for a low stock of natural assets the regeneration capacity is relatively high since the stock of assets is far from its highest reachable value.

Putting all these elements together, I build an economic model describing the evolution over-time of tourism receipts of the destination.

Tourism receipts at time $t$ are given by:

$$R_t = p(X_t, Q_t)T_t$$

The evolution of the stock of natural assets is described by the following finite-difference equation:

$$Q_{t+1} - Q_t = r(Q_t) - \varphi(T_t)$$

The key feature of this model is the relation between the number of visitors, the stock of natural assets and the willingness to pay of the visitor for a journey in the destination.

When the number of visitors is high the stock of natural assets tends to decline *ceteris paribus*, due to an important environmental damage, leading to a decrease in the willingness to pay of each visitor.

It means that a high level of frequentation generates a loss of economic value of the destination since the willingness to pay is decreasing. Then the receipts of the tourism sector in the future may potentially decline even if the frequentation is constant or higher than before since the marginal receipt by tourist is lower.

Then it would be economically rational to observe a temporary decrease in frequentation since it alleviates the pressure on the ecosystem. Furthermore, it enables the regeneration of natural assets and thereby an increase in the willingness to pay and in tourism receipts in the future.

For illustrative purpose I implement a simulation of a specified version of this model[iv].

Insert figure 2 here

Considering that the number of tourists is constant over time, figure 2 shows that the profit is monotonically decreasing due to the fall in environmental assets as shown in figure 3.

Insert figure 3 here

In the next section, in order to give empirical support to my previous hypothesis, I present an econometric estimation of the WTP of tourists for a night-stay in seaside hotels of Corsica and I show that as stated before, the WTP is positively related to the environmental quality.

# The case of Corsica seaside hotels

There exists a large literature focusing on hotel industry the aim of whom is mainly to measure the efficiency of hotels (Barros, 2005) or to assess the impact of hotels characteristics on their price (Espinet *et al.*,2003).

The key feature of the model presented in the previous section is the positive relationship between the WTP of tourists for the destination and the level of environmental quality.

In this section, I focus on Corsica seaside hotels in order to estimate the WTP of tourists for a night-stay and check if the results give support to my previous assumption.

*The methodology and the data*

The product offered by a given hotel *H* consists of a set of attributes, which includes services (such as swimming pool, garden, television in the room), or characteristics (star category, number of rooms, etc):

$H_i = \left(k_{i1}, k_{i2,} k_{i3}, \dots \dots, k_{im}\right)$

where *i*=1....n is the hotel and $k_{iv}$(*v=1....m*) each of its attributes.

Hence, the price of a night-stay in hotel *i* is given by the price hedonic function:

$$P_i = P\left(k_{i1}, k_{i2,} k_{i3}, \dots \dots, k_{im}\right)$$

This method has been used to study accommodation pricing in several papers in tourism literature investigating the effects of their attributes on hotel rates (Chen and Rothschild 2010, Abrate *et al.*, 2011).

I use a sample of 80 hotels from Corsica located in a range of 1 to 1000 meters of a beach.

The data on hotels characteristics is obtained through the website of the *Agence du tourisme de la Corse*, a local agency in charge of tourism promotion (www.visit-corsica.com).

I use the Peak-Season Rate in Euros of hotels (PSR) as the dependent variable while independent variables are distance from the hotel to the closest beach, number of rooms and several other characteristics such as star rating of the hotel or availability of cable TV in the room.

Table 1 below gives a complete list of the variables used in the study.

Insert table 1 here

If the data on hotels is quite easy to obtain, reliable data on environmental quality is hard to find. It has been impossible to find useful quantitative environmental data. Thus, I use the water quality index of beaches as a proxy for environmental quality.

The French ministry for social and sanitary affairs, in charge of the control of the bathing spots, uses a rating for water quality assessment. It ranges from *A*, for high quality water, to *D* for unusable water. *B* stands for medium quality water and *C* for polluted but usable water. None of the beaches in the sample is rated *C* or *D*.

Using data from the ministry web-site for Corsica bathing spots (http://corse.sante.gouv.fr), I define a dummy variable taking value 1 if the water quality index of the closest bathing spot of a given hotel is *A* for the three consecutive years 2007 to 2009 or 0 otherwise.

This is, in my opinion, the only method available given the data constraints that I face but this is not really satisfactory since in the theoretical model described earlier the environmental quality is not a dummy but a continuous variable.

*Models and results*

A key issue in estimating price hedonic function is to find the adequate functional forms.

That is why I define two different specifications of the model:

- model 1 is a linear OLS model
- model 2 is a log-linear OLS model

Insert table 2 here

Table 2 above gives the results of the estimation of model 1 and model 2. In both models, the t-ratios are corrected using the White method since a problem of heteroscedasticity arises.

Then, I computed the Variance Inflation Factor (VIF) in order to detect multicollinearity. Kennedy (1985) suggested that a model suffers of a serious multicollinearity problem when the VIF is greater than 10. In both specifications of the model, the highest VIF value is just above 3 meaning that multicollinearity is not a problem here.

Furthermore, I implemented a bootstrap procedure with 1000 replications and results are the same.

They indicate that the most important characteristics are the star rating, the high quality of the bathing spot and the availability of cable TV.

Since this is the key issue of this paper, I will focus on the impact of the WTP of the high quality of the bathing spot.

In the linear specification of the model, in which the $R^2$ is 80,18%, the fact for a hotel to be located close to a high quality bathing spot increases the price of a night-stay of 68.64€. To understand the important meaning of this result, the reader simply has to observe that this value is higher than 58.24€ that corresponds to the *ceteris paribus* increase associated with a three stars rating.

A similar result is obtained in the log-linear specification, in which the $R^2$ is 87,74%. In that case, the fact of being located close to a high quality bathing spot increases the WTP of tourists for a night-stay in a seaside hotel of Corsica of 26,87%[v]. It means that for the average hotel of the sample, the fact of being close to a high quality bathing spot would increase the WTP of tourists of about 42€.

The findings of this section confirm that the WTP of tourists for the tourism good positively depends on the environmental quality of the product that is the corner stone of the hypothesis expressed in the previous section.

# Discussion and conclusion

Let's rely on the empirical findings of the previous section. From the point of view of a Corsican hotel owner, it implies that a fall in the quality of the bathing spot located in the vicinity of the hotel would lower the price of a night-stay of 26,87%.

It means that in order to offset the fall in the WTP and preserve the level of receipt the frequentation of a hotel after a fall in water quality should increase of rather 27%.

It seems quite unsound.

Conversely, let's consider that at a given point in time t, the quality of a bathing spot located near to a hotel is high. If the owner knows that with a constant level of frequentation at time t+1 the fall in water quality is going to lower the price of a night-stay of 27%, he would try to avoid the fall in water quality.

Obviously, this decision crucially depends on the level of time preference of the hotel owner but let's consider a simple example. At time t, a hotel has a level of sales of 1 million Euros. With constant frequentation, the sales one year later after the fall in bathing spot quality would be about 730.000€. Now assume that at time t, the hotel experiences a fall in frequentation of 15% so that the value of the sales is 850.000€ but due to the lower environmental pressure on the bathing spot, the WTP remains the same at t+1, and meanwhile t+1 the value of the sales is 1 million Euros again.

If the rate of time preference of the owner is nil, he obviously prefers the situation in which the frequentation falls of 15% at time t since total sales for these two years amount at 1.850.000€ against 1.730.000€ in the alternative case.

The point is that the rate of time preference of the hotel owner is positive and probably quite high. But simple calculation shows that in the previous example a rational hotel owner would prefer a constant frequentation associated with a fall in the WTP of tourists if and only if its rate of time preference is higher than 13.5%.

Thus relying on the case of Corsican hotel owners, it is possible to state that provided the elasticity of the WTP of tourists with respect to the environmental quality is high enough and the rate of time preference of the firm owners is low enough, then it could be economically rational to accept temporary slow-downs in frequentation in order to preserve a high WTP for the future.

# References

Abrate, G., Capriello A., Fraquelli G. (2011), "When quality signals talk: Evidence from the Turin hotel industry", *Tourism Management*, Vol. 32, pp. 912-921

Agarwal, S.(1997), "The resort cycle and seaside tourism: an assessment of its applicability and validity", *Tourism Management* Vol. 18, pp. 65-73.

Barros, C.P. (2005), "Measuring efficiency in the hotel Industry: An illustrative example", *Annals of Tourism Research*, Vol. 32(2), pp. 456-477.

Barros, C. P. and Machado, L. P. (2009), "The length of stay in tourism", *Annals of Tourism Research*, 37(3), pp. 692-706.

Butler, R. (1980), "The concept of a tourist area cycle of evolution: implications for the management of natural reserves", *Canadian Geographer*, 24, 5.12.

Cerina, F. (2007), "Tourism specialization and environmental sustainability in a dynamic economy", *Tourism economics* 13, 552.583.

Chen C.F, Rothschild R. (2010), "An application of hedonic pricing analysis to the case of hotel rooms in Taipei", *Tourism Economics*, 16(3), pp. 685-694

Clark, C. W.: 1990, *Mathematical Bioeconomics The optimal management of renewable resources*, Wiley-Interscience.

Diamond, J. (1977), "Tourism's role in economic development: the case reexamined", *Economic development and cultural change* 25(3), 539.553.

Espinet, J.M., Saez, M., Coenders, G., and Fluvia, M. (2003), "Effect on prices of the attributes of holiday hotels: a hedonic prices approach", *Tourism Economics*, Vol 9, pp 165–177.

Greiner, A., Feichtinger, G., Haunschmied, J. L., Kort, P. M. and Hartl, R. F. (2001), "Optimal periodic development of a pollution generating tourism industry", *European Journal of Operational Research* 134, pp. 582-591.

Kennedy, P. (1985), *A Guide to Econometrics,* MIT Press, Cambridge, MA.

Kort, P. M., Greiner, A., Feichtinger, G., Haunshmied, J. L., Novak, A. and Hartl, R.F. (2002), "Environmental effects of tourism industry investments: an inter-temporal trade-off", *Optimal control applications and methods* 23, pp. 1-19.

Oppermann, M. (1995), "Travel life cycle", *Annals of tourism research*, 22(3), pp. 535.552.

Rosen, S (1974), "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", *The Journal of Political Economy*, 82(1), pp. 34-55.

Tooman, L. A. (1997), Applications of the life-cycle model in tourism, *Annals of Tourism Research* 24(1), pp. 214-234.

| Variable | Description |
|---|---|
| PSR | Peak Season Rate in Euros for a standard nigh-stay in double room for double use |
| LPSR | Natural logarithm of PSR |
| Dist_Beach | Distance from the hotel to the closest beach in meters |
| L Dist_Beach | Natural logarithm of Dist_Beach |
| ONE | Dummy with value 1 if the hotel quality rating is 1 star |
| TWO | Dummy with value 1 if the hotel quality rating is 2 stars |
| THREE | Dummy with value 1 if the hotel quality rating is 3 stars |
| LUX | Dummy with value 1 if the hotel quality rating is 4/5 stars |
| HQUALITY | Dummy with value 1 if the closest bathing spot has a high quality water |
| SWIM | Dummy with value 1 if the hotel has a swimming pool |
| REST | Dummy with value 1 if the hotel has a restaurant |
| BAR | Dummy with value 1 if the hotel has a bar |
| GARDEN | Dummy with value 1 if the hotel has a garden |
| PARK | Dummy with value 1 if the hotel has a car parking |
| BALCONY | Dummy with value 1 if hotel rooms have a large balcony |
| SPA | Dummy with value 1 if a spa is available in the hotel |
| CLIM | Dummy with value 1 if rooms are acclimatized |
| TV | Dummy with value 1 if rooms are equipped with a TV |
| CABLE | Dummy with value 1 if hotel rooms receive cable TV |
| PHONE | Dummy with value 1 if rooms are equipped with a phone |
| HAIR | Dummy with value 1 if rooms are equipped with a hairdryer |
| SAFE | Dummy with value 1 if rooms are equipped with a safe |

| | |
|---|---|
| MINIBAR | Dummy with value 1 if rooms are equipped with a mini-bar |
| WIFI | Dummy with value 1 if rooms are equipped with WI-FI |
| DGLAZ | Dummy with value 1 if rooms are equipped with double-glazing |

Table 1: Complete list of variables

| Independent variable[1] | Model 1: PSR(€) | Model 2: LPSR(€) |
|---|---|---|
| Dist_Beach | 0.029 (0.76) | - |
| L Dist_Beach | - | -0.027 (-1.04) |
| TWO | 55.407** (2.08) | 0.215** (2.36) |
| THREE | 58.241*** (2.61) | 0.303*** (3.23) |
| LUX | 423.66*** (5.36) | 1.160*** (7.44) |
| HQUALITY | 68.641** (2.36) | 0.238*** (2.95) |
| SWIM | -10.754 (0.85) | 0.167 (1.62) |
| REST | 46.322** (2.03) | 0.118 (1.56) |
| BAR | -22.656 (-0.97) | -0.158 (-1.90) |
| GARDEN | -7.447 (-0.26) | -0.031 (-0.33) |
| PARK | 39.775 (1.33) | 0.142* (1.67) |
| BALCONY | 20.625 (0.85) | 0.017 (1.56) |
| SPA | 98.301** (2.10) | 0.293*** (3.05) |
| ACLIM | 52.662*** (2.63) | 0.199*** (2.60) |
| TV | -21.505 (-0.86) | -0.126 (-1.40) |
| CABLE | 35.967* (1.89) | 0.249*** (3.10) |
| PHONE | -15.501 (-0.64) | -0.063 (-0.84) |

[1] Note: *p<0.1 **p<0.05 ***p<0.01

| | | |
|---|---|---|
| HAIR | -0.798 (-0.04) | -0.037 (-0.43) |
| SAFE | 32.918 (1.26) | 0.210** (2.01) |
| MINIBAR | -22.565 (-0.97) | -0.002 (-0.02) |
| WIFI | -4.862 (-0.19) | 0.020 (0.20) |
| DGLAZ | -67.892** (-2.14) | -0.223** (-2.29) |
| $R^2$ | 0.8018 | 0.8774 |

Table 2: Hedonic price functions for seaside Hotel rooms in Corsica

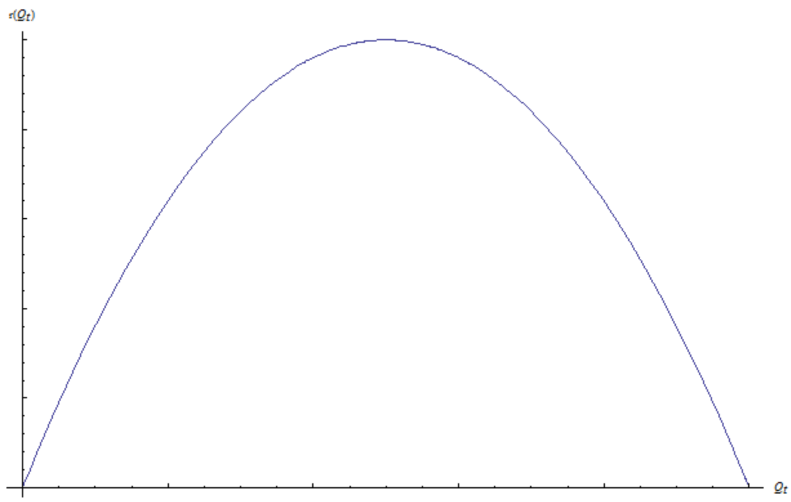


Figure 1: Regeneration of the environmental quality as a function of the stock of natural assets

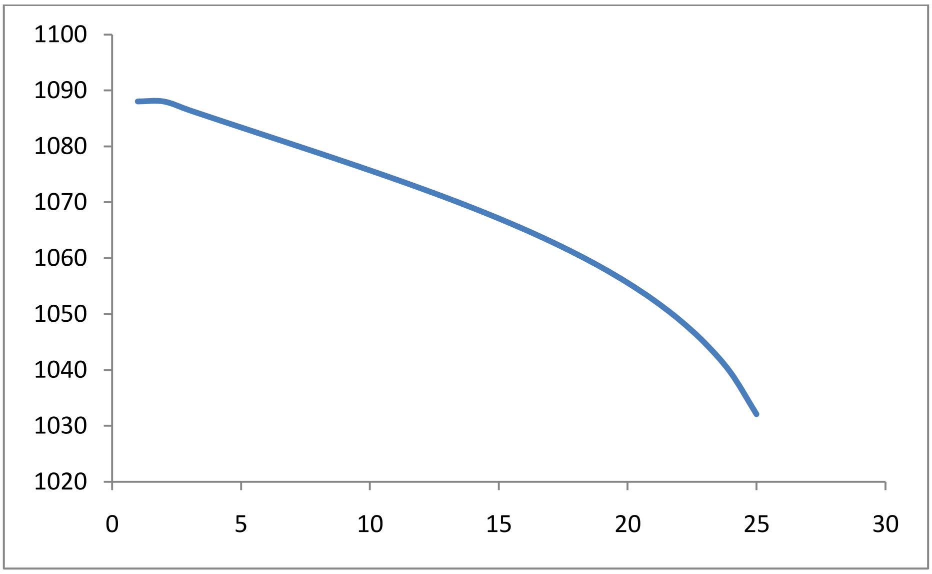


Figure 2: Receipts of the destination with a constant number of visitors over-time

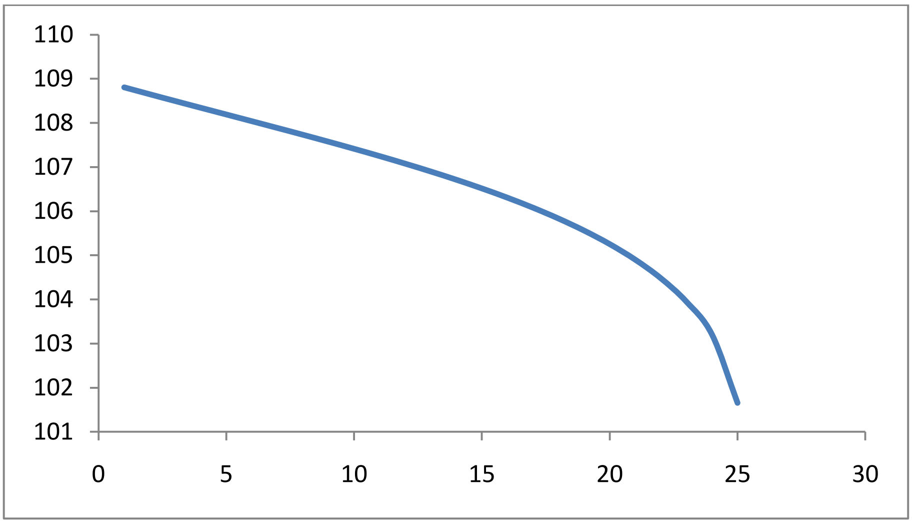


Figure 3: WTP of a tourist with a constant number of visitors over-time

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[i] One should distinguish between two kinds of fluctuations. Long-term fluctuations associated with the destination lifecycle and short run fluctuations, the so-called seasonality. In this paper, I focus on long-run fluctuations.

[ii] In this paper I assume that the length of stay of each tourist is the same but we know that it depends on the characteristics of the destination (Barros & Machado, 2009).

[iii] The willingness to pay is assumed to be increasing with respect to $Q_t$.

[iv] Figures 1 and 2 are obtained by simulating the following specification of the model assuming that at each time $T_t = 10$ and $Q_0 = 500$:

$$R_t = \left(100 + {Q_t}^{0.35}\right)T_t$$

$$Q_{t+1} - Q_t = 0.05\frac{(500 - Q_t)}{500} - 0.5{T_t}^2$$

[v] $(e^{0.238}-1)\%$