



UMR CNRS 6240 LISA

Working Paper TerRA n°03

13-04-2017



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in a tourism-based economy

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March 10, 2017

Abstract

Academic literature on the relationship between tourism and economic growth expands steadily. This literature supports the Tourism-Led Growth Hypothesis (TLG). Although it seems obvious that tourism-led growth is possible only if a destination does not experience stagnation in demand, no previous theoretical paper addresses the crucial issue of the compatibility between TLG and the potential occurrence of a stagnation phase in the destination.

The aim of this paper is to fill this gap and to provide a framework of tourism-led growth accounting for the possibility of rejuvenation strategies. A model of growth for a tourism-based economy is built following Romer (1986). Two theoretical results are obtained.

Provided some conditions are satisfied, it is possible to identify a market-segment compatible with sustained growth. A stagnating destination can switch to a new market segment for which the level of welfare is higher in the long-run.

The common practice that consists in upgrading the quality of supply

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to focus on new markets is supported as a suitable practice in order to achieve optimal welfare.

Conclusions of the model are tested with real data from two Spanish archipelagos, Canary and Balearic islands. Empirical results points to clear success of the reorientation strategy in the Balearics. The case of Canary islands is controversial since the reorientation strategy was not simultaneously implemented in the territory.

Keywords: tourism-led growth, learning-by-doing, market-segment, rejuvenation.

1 Introduction

According to WTTC (2015), in 2014, tourism related activities generate 3.1% of the global GDP and, accounting for the indirect effects of tourism, it amounts to 9.8% of GDP. Furthermore, while tourism industry experiences a growing trend for several decades, the forecasts for the next ten years are positive. By 2025, travel and tourism industry could represent 10.5% of global GDP with an expected average growth rate of 3.8% a year. In a context of global crisis and slow growth, a growing number of regions are interested in developing their tourism attractions.

Simultaneously, for almost twenty years, academic literature on the relationship between tourism and economic growth expands steadily. An important achievement of this literature is to support, theoretically and empirically, the so-called Tourism-Led Growth Hypothesis (Brida, Cortes-Jimenez & Pulina, 2016) according to which tourism development fosters economic growth. Nonetheless, tourism is a delicate industry and a relevant strand of literature stress the fact that a tourism destination is going to face sooner or later a stagnation of its tourism revenue (Butler, 1980; Moore & Whitehall, 2005).

A key issue of the tourism management literature is to identify strategies in order to rejuvenate a destination experiencing stagnation (Agarwal, 2002).

Although it seems obvious that tourism-led growth is possible only if a destination does not experience stagnation in demand, to the knowledge of the authors, no previous theoretical paper addresses the crucial issue of the compatibility between TLG and the potential occurrence of a stagnation phase in the destination.

The aim of this paper is to partly fill this gap and to provide a theoretical framework of tourism-led growth accounting for the possibility of rejuvenation

strategies. A model of endogenous growth for a tourism-based economy is built following the argument of Romer according to which the engine of growth is a *learning-by-doing effect* (Romer, 1986). Two important theoretical results are obtained.

First, provided some conditions are satisfied, it is possible for a destination to identify a particular segment of the global tourism market compatible with sustained growth. Second, a destination experiencing stagnation can switch to a new market segment for which the level of welfare is higher in the long-run.

The main contribution of this paper is to give theoretical support to the strategy of reorienting tourism supply toward more selected tourism markets in order to overcome stagnation. The common practice among mass tourism destination stakeholders that consists in upgrading the quality of their supply to focus on new market-segments is theoretically proven to be a suitable practice in order to achieve optimal welfare in a tourism-based economy.

Empirical investigations for Balearic islands validates the theoretical conclusions of the model. The case of Canary islands is a bit controversial since the reorientation strategy was not evenly implemented.

In Section 2, the background underlying this study is exposed. Section 3 describes the general theoretical model. Section 4 presents a specific version in order to illustrate some results. Section 5 develops an empirical investigation focusing on two Spanish archipelagos while section 6 discusses the main results and draws some conclusions.

2 The theoretical and empirical background

This section presents an overview of the literature on tourism, growth and development before emphasizing through some examples the fact that reorienting the supply of tourism to new market segments is a common rejuvenation strategy for stagnating mass tourism destinations.

2.1 The tourism-led growth hypothesis

Since 2002 and the seminal work of Balaguer & Cantavella-Jorda (2002) on Spain, a still growing number of papers emphasize the positive relationship between tourism and growth¹.

¹Interesting literature reviews on these empirical investigations can be found in Brida, Cortes-Jimenez & Pulina (2016) and Pablo-Romero & Molina (2013).

These studies tend to validate the hypothesis of tourism-led growth (TLG) according to which tourism development enhances growth performances of some regions. Brau, Lanza & Pigliaru (2007) establish that for the period 1980-2003, countries with an important share of tourism receipts on GDP have grown faster than the average². One could expect the positive impact of tourism on growth to be limited to countries or regions with some very specific attributes such as small size or insularity. Yet, in an important contribution, Paci & Marrocu (2014) show that tourism has a significant positive impact on the growth rate of a region in a sample of 179 European regions between 1999 and 2009. More recently, Hatemi-J, Gupta, Kasongo, Mboweni & Netshitenzhe (2016) show that some G7 countries such as France, Germany or the USA benefit from strong impact of tourism on growth.

Alongside these empirical findings, several authors proposed theoretical models in order to explain the mechanisms underlying the tourism-led growth process. The pioneering paper of Lanza & Pigliaru (1994) proposes a model in which the engine of growth is essentially the continuous improvement in the terms of trade of a country specialized in tourism. This result crucially depends on a set of assumptions related on the one hand to the difficulty of tourism countries to accumulate human capital and on the other hand on the low elasticity of substitution between tourism and other goods.

Nowak, Sahli & Cortés-Jiménes (2007) propose a different approach of the relationship between tourism and growth emphasizing the role of tourism receipts in financing capital goods imports. In this model, growth is imported from abroad since growth in the rest of the world increases tourism demand and enables tourism countries to grow. As already stated by Lanza & Pigliaru, improvement in the terms of trade is the key to rapid growth for a tourism destination. This model is empirically validated using data for Spain between 1960 and 2003. More recently, Schubert, Brida & Risso (2011) develop a AK type model with transitional dynamic for a small economy specialized in tourism. This model allows for landing and borrowing on international financial markets. It is shown that due to slow capital accumulation, a tourism boom induces both an increase in production and an increase in price. To sum up, this model confirms previous results in a broader framework including financial markets. The validity of this model is confirmed using data on Antigua and Barbuda over the period

²Figini & Vici (2010) have shown that this result is not consistent over time but remains valid for the period 1980-1990.

1970-2008³.

An interesting and unexpected feature of the literature on the tourism-led growth lies in its optimism. Although it is well known that tourism is a very competitive industry exposed to a lot of potential external shocks such as changes in consumers tastes, this issue is almost completely ignored in the TLG literature. Yet, Parrilla, Font & Nadal (2007) explain that despite tourism was the driving force of growth for Spanish islands such as the Balearic and the Canary, a slow down in the pace of growth is highly plausible in the years to come. This result is interesting since it stresses the possibility of stagnation of a tourism destination in the long run and then one has to ask how sustained growth could exist in a stagnating tourism region.

Parallel to the tourism led-growth literature, a number of paper dealt with the related question of the interaction between tourism, economic growth and the environment (Cerina, 2007; Gómez, Lozano & Rey-Maqueira, 2008; Giannoni, 2009; Marsiglio, 2015). In this strand of literature, two papers are of special interest for our study. Hernández & León (2007) present a theoretical model calibrated using data on Canary islands and show that interactions between tourism and the environment could explain destination lifecycle patterns and especially could reproduce the post-stagnation phases. Recently, Ouattara, Pérez-Barahona & Strobl (2016) empirically confirmed that in the case of the Caribbean a bidirectional causality exists between tourist arrivals and environmental degradation. This means that, as predicted by Hernández & León (2007), environmental degradation leads to the post-stagnation phase observed at mass tourism destinations.

2.2 Stagnation and market-segment targeting as a rejuvenation strategy

Some authors such as Plog (1974) have raised the issue of stagnation for a tourism destination. Yet, one has to acknowledge that the most influential among them is Butler (1980). In 1980, Butler proposes a theoretical framework to describe the evolution of a tourism destination. He argues that a tourism destination is characterized by a lifecycle including four main phases depicted in Figure 1:

- Exploration

³The reader could find an interesting model of tourism and growth in small islands in Stauvermann & Kumar (2016).

- Development
- Stagnation
- Decline or Rejuvenation

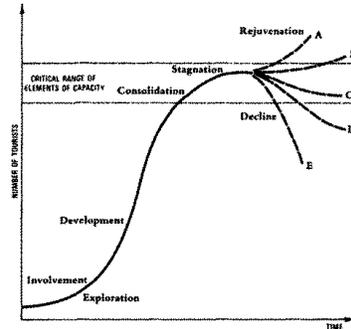


Figure 1: Hypothetical evolution of a tourist area. From Butler(1980)

Despite its deterministic nature and even if its applicability is questioned by several authors (Agarwal, 1997), this model remains very popular. It has generated a lot of research (for example Agarwal, 1994; Tooman, 1997; Lundtorp & Wanhill, 2001; Moore & Whitehall, 2005).

A key contribution of the literature on the destination lifecycle is to put light on the need for strategies in order to manage stagnation and post-stagnation phases of aging destinations. Numerous papers, and especially case studies, on the available strategies exist. For example, Morgan (1991) studies how private stakeholders of Majorca *"must now create products that reverse the negative lager-lout image Majorca has acquired"*. In the same spirit and among others, Priestley & Mundet (1998) or Knowles & Curtis (1999) propose case studies of Spanish and European aging mass tourism destinations.

A central lesson of this literature is summed up by Saarinen (2006) when he writes : *"during the final stagnation stage of the evolution model, or even before if new major products or marketing schemes have been introduced, the cycle can begin again, exhibit new (absolute) growth, or else a decline can set in"*.

The main issue for a destination facing the stagnation is basically to identify a new segment of customers (tourists) to attract after the reconstruction of the place image (Selby & Morgan 1996).

A number of successful rejuvenation experiences based on market-segment switching strategy can be found in the literature. As an illustration, Aguiló, Alegre &

Sard (2005) point out that the Balearic has experienced a new wave of success in the late 1990's after "*a considerable restructuring process directed at offering improved quality*" while Garay & Cànoves (2011) emphasize how Catalonia has succeeded in developing its attractiveness overtime by adapting its supply to evolutions in tourism trends.

In this respect, a destination of particular interest is the city of Benidorm in Spain studied by Claver-Cortés, Molina-Azorn & Pereira-Moliner (2007) and Ivars i Baidal, Rodríguez Sánchez & Vera Rebollo (2013). Ivars i Baidal, Rodríguez Sánchez & Vera Rebollo argue that this prototypical mass tourism destination does not fit the lifecycle model due to the complexity of its trajectory.

After reaching a low in the late 1980's, Benidorm has been able to recover from tourism recession by implementing a strategy of supply reorientation. The main components of its strategy are the creation of a tourism training center, the rehabilitation of some attractions and the conversion of low quality hotels to higher quality ones. This strategy resulted in a growth in the number of tourists and an increase in price of tourism related goods and services.

Such a strategy is one of the possible forms of what authors call a *market-segment targeting strategy* in the context of the present paper.

Indeed literature shows that cooperation between public and private sector is a key factor to success in rejuvenating strategies. It enables, for example, to reform the hotel sector of a mature destination. In 2000, a moratorium on the number of hotel beds has been introduced in the Canary islands. It was combined with a renovation program in order to improve quality of the tourist experience and change the destination image (Oreja, Parra-López & Yánes-Estèvez, 2008; Hernández-Martín, Álvarez Albelo & Padrón-Fumero, 2015). Domínguez-Mújica, González-Pèrez & Parreño-Castellano (2011) show how the municipality of Calvia in Mallorca implemented a repositioning strategy relying on new beds control and the organization of cultural events.

This paper stresses the fact that tourism-led growth theoretical models should account for the issue of stagnation and how to avoid it. The next section develops a model of endogenous growth inspired from Romer (1986). It shows that reorienting the tourism supply in the way Benidorm, the Balearic, Canary islands or Catalonia did is the correct way to overcome stagnation from a theoretical point of view.

3 The model

The model presented in this paper is based on the endogenous growth model with increasing returns developed by Romer (1986). This model asserts that a potential engine of long term growth lies in the existence of a "learning-by-doing" effect (Arrow, 1962) that enhances for free the productivity of capital. The point is that during the process of capital accumulation by individual firms costless knowledge is produced as a by-product. This unexpected accumulation of knowledge improves the productivity of capital and generates growth. We use a similar argument in the context of a tourism destination. The learning-by-doing effect already plays a key role in the tourism-led growth model developed by Lanza & Pigliaru (1994) or Lanza, Temple & Urga (2003).

The industry includes a big enough number of local competing firms (N) which offer the same product (e.g. Hotels, B&Bs). We assume that the supply of a given firm in the economy is $S = f(W, K, L; \bar{R})$, W is the aggregate level of knowledge in the economy, K represents the amount of capital of each identical firm, L is the unskilled labor assigned to the firm and \bar{R} represents the specific attractions of the destination. The last factor is assumed constant over time. Aggregate knowledge is assumed $W = \frac{N}{L} \cdot K$, which indicates that knowledge is proportional to the stock of capital, as in Romer (1986), and inversely proportional to the number of workers per firm. This assumption is not appropriate for any industry but fits the reality of the tourism industry. Several papers demonstrate that average workers qualification is very low in tourism (Santos & Varejao, 2007; Parrilla, Font & Nadal, 2007; Parrilla, Font & Nadal, 2015) The underlying idea in the specific expression of the aggregate knowledge above is that the learning-by-doing effect is higher in tourism when the number of workers per firm is relatively low. Our point is that unskilled workers need stronger interaction with nearby colleagues than skilled workers in order to benefit of the learning effect. The smaller the firm the easiest for a low skilled worker to gain experience.

For notational simplicity, we also consider the same number of consumers (tourists) than firms. Each firm produces with constant return-to-scale in inputs K and L . However, it presents non-decreasing return-to-scale if the aggregate knowledge is included as an input. That is,

$$f(\lambda W, \lambda K, \lambda L, \bar{R}) \geq f(W, \lambda K, \lambda L, \bar{R}) = \lambda f(W, K, L, \bar{R}), \forall \lambda > 1.$$

We consider that the destination exerts some monopoly over some part of the global demand of tourism, due to the uniqueness of the supply included in their specific attractions \bar{R} . Let $\eta \in (-\infty, -1)$ be the price-elasticity of demand, which is assumed constant. Therefore, the demand follows the equation $D = Bp^\eta$, where p is the relative price of the tourist product with respect to the productive capital. Parameter B denotes the rest of factors influencing on the demand, such as income in the origin country, tastes, etc. η indicates the market segment in which a given destination operates. When η is close to $-\infty$, the destination produces mass tourism since customers are highly price sensitives. As η is approaching -1 , the destination is focusing more and more on quality tourism. We consider these parameters constant in the model.

Market clearance is obtained by equating supply and demand, that is, $N \cdot S = N \cdot D$. Normalizing $\bar{R} = 1$, the equilibrium price is

$$p_e(W, K, L) = (B^{-1}f(W, K, L))^{1/\eta},$$

where the dependence on parameters has been omitted for the sake of notational simplicity. Therefore, the revenue obtained by each firm, $Y = p_e(\cdot)f(\cdot)$, follows the expression

$$Y(W, K, L) = B^{-1/\eta} (f(W, K, L))^{\eta+1/\eta}, \quad (1)$$

and the total income in the economy is $N \cdot Y$. The capital accumulation process in every firm is assumed to follow the standard neoclassical rule, so that :

$$\dot{K} = Y - C, \quad (2)$$

where $C(t)$ is the consumption of every firm at time t . The depreciation rate of capital is assumed to be null. The economy produces only tourism, capital and consumption goods are imported from abroad.

We define $k = \frac{K}{L}$, $y = \frac{Y}{L}$ and $c = \frac{C}{L}$ the capital, income and consumption *per capita* of every firm. We also assume a constant growth rate of the pop-

ulation and consequently of the labour assigned to the firm ($\dot{L} = nL$). Then, using equation (2) and the constant return-to-scale property of the production function in inputs K and L , we have,

$$\dot{k} = y - c - nk, \quad (3)$$

The existence of a social planner is assumed, whose objective is to choose the amount of yearly consumption of workers in every firm to optimize their aggregate discounted utility in the long term. The aggregate level of knowledge is endogenous, that is, the social planner includes the aggregate level of knowledge $W = Nk$ in the optimization problem⁴. We define $F(k) \equiv f(Nk, k, 1)$ the production function in the economy when knowledge is internalized. Since all firms are identical, the social optimization problem (*SP*) can be stated for a representative firm, that is :

$$\begin{aligned} (SP) : \quad & \max_{c \geq 0} \int_0^{\infty} u(c) e^{-\rho t} e^{nt} dt \\ & s.t. \quad \dot{k} = B^{-1/\eta} (F(k))^{\eta+1/\eta} - c - nk \\ & \quad \quad k(0) = k_0 \geq 0. \end{aligned} \quad (4)$$

Function $u(c)$ is a twice differentiable increasing and concave function and represents the utility of consumption. A constant and greater than one intertemporal elasticity of substitution $\sigma = -u_{cc}c/u_c > 1$ is assumed. The population growth is included in the optimization function as well, while ρ represents the discount rate of future consumption. We assume $\rho > n$. The optimization problem includes only one state and one control variable, so the solution is directly obtained by applying the Pontryagin's maximum principle (Leonard & Van Long 1992). The current value hamiltonian of problem (SP) is

$$H = u(c) + \lambda \left(B^{-1/\eta} (F(k))^{\eta+1/\eta} - c - nk \right),$$

where λ represents the current value Lagrange multiplier. As usual, the necessary conditions for c is that the marginal utility of consumption is identical to the valuation of one unit of additional capital, that is, $u_c = \lambda$. The trajectory of λ follows the equation $\dot{\lambda} = \rho\lambda - \lambda \frac{d}{dk} B^{-1/\eta} (F(k))^{\eta+1/\eta}$. Therefore, the Euler

⁴Romer (1986) also solves the competitive equilibrium case, which considers no intervention in the economy, so every firm optimizes its discounted utility taking the accumulated knowledge exogenous. The optimal welfare solution of this problem lies below the social optimum case. The competitive equilibrium case is not analyzed here since it does not add anything new to the original analysis of Romer (1986).

equation for this economy adopts the form⁵:

$$\frac{\dot{c}}{c} = \frac{1}{\sigma} (y_k - \rho) = \frac{1}{\sigma} \left(B^{-1/\eta} \frac{\eta + 1}{\eta} (F(k))^{1/\eta} F_k - \rho \right). \quad (5)$$

The optimal trajectory of consumption and capital *per capita* are the solutions of the Euler equation and the capital accumulation process that satisfy the boundary ($k(0) = k_0 \geq 0$) and transversality condition $\lim_{t \rightarrow \infty} \lambda(t)k(t)e^{-\rho t} = 0$. The following proposition gives conditions for the existence of solution of problem (SP)

Proposition 1 *Given problem (SP), let us assume the following conditions over the production function:*

- i) F is a continuously differentiable and strictly increasing function in k with $\lim_{k \rightarrow 0^+} F(k) = 0$, $\lim_{k \rightarrow \infty} F(k) = \infty$ and satisfies $F_{kk} + (F_k)^2 \frac{1}{\eta} F^{-1} < 0$ or equal zero everywhere.*

In case that the last condition in i) is satisfied strictly, two conditions are added,

- ii) $\lim_{k \rightarrow \infty} \frac{F(k)}{k^{\frac{\eta}{\eta+1}}} = M \geq 0$.*
- iii) $\lim_{k \rightarrow 0^+} \frac{F_k(k)}{F^{-1/\eta}(k)} > B^{1/\eta} \frac{\eta}{\eta+1} \rho$.*

Then, there exists an optimal solution $(k^(t), c^*(t))$ for problem (SP). If $M \leq B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$, the optimal solution converges to a stationary state (k_e, c_e) . In other case, the solution $(k^*(t), c^*(t))$ grows indefinitely.*

Proof. Initially, let us assume that condition i) is satisfied with equality for all $k \geq 0$. Therefore $y_{kk} = B^{-1/\eta} \frac{\eta+1}{\eta} \left(F_{kk} F^{\frac{1}{\eta}} + (F_k)^2 \frac{1}{\eta} F^{\frac{1}{\eta}-1} \right) = 0$. Hence $y = B^{-1/\eta} (F(k))^{\eta+1/\eta}$ is linear, so $F(k) = A^{\frac{\eta}{\eta+1}} B^{\frac{1}{\eta+1}} k^{\frac{\eta}{\eta+1}}$, with $A > 0$. Condition ii) is satisfied with $M = A^{\frac{\eta}{\eta+1}} B^{\frac{1}{\eta+1}}$. The optimal solution of problem (SP) follows the trajectory defined by the following differential equations:

$$\begin{aligned} \frac{\dot{c}}{c} &= \frac{1}{\sigma} (A - \rho), \\ \dot{k} &= (A - n)k - c. \end{aligned} \quad (6)$$

The system replies the one obtained from the AK model with constant returns to capital (Barro & Sali-I-Martin, 2004). The optimal paths of capital and consumption are:

$$k(t) = k_0 e^{\frac{A-\rho}{\sigma} t}, \quad c(t) = c_0 e^{\frac{A-\rho}{\sigma} t},$$

⁵Notation $F_k = \frac{d}{dk} F(k)$, as usual.

with $c_0 = \left(\frac{(\sigma-1)A+\rho}{\sigma} - n\right)k_0$. The stationary state is $(k_e, c_e) = (0, 0)$. The proposition follows directly since $M < B^{\frac{1}{\eta+1}}\rho^{\frac{\eta}{\eta+1}} \Leftrightarrow A < \rho$.

Now, let us assume that the last condition in i) is not satisfied with equality. Therefore, y is strictly increasing, concave and nonlinear. We divide the proof in two parts:

a) Assume that $M < B^{\frac{1}{\eta+1}}\rho^{\frac{\eta}{\eta+1}}$. Given the definition of revenue function and condition ii), we have $\lim_{k \rightarrow \infty} y_k = B^{-\frac{1}{\eta}}M^{\frac{\eta+1}{\eta}} < \rho$. Condition iii) implies that $\lim_{k \rightarrow 0^+} y_k > \rho$. So given that the function y_k is differentiable and monotonous, there exists a unique point $k_e \in (0, +\infty) : y_k(k_e) = \rho$. Therefore, (k_e, c_e) is one equilibrium point of the system (3) and (5). The other equilibrium point is $(0, 0)$. The local characterization of the equilibrium points is given by the Jacobian matrix of the system, which is,

$$J(k, c) = \begin{pmatrix} y_k & -1 \\ cy_{kk}/\sigma & (y_k - \rho)/\sigma \end{pmatrix}.$$

Substituting (k_e, c_e) in the Jacobian matrix, we have $\det J(k_e, c_e) = \frac{c_e}{\sigma} y_{kk}(k_e) < 0$. In this case, (k_e, c_e) is a saddle point. Thus, there exists a one-dimensional stable manifold of (k_e, c_e) defined by two trajectories converging to this steady state. These are the optimal trajectories for the problem (SP). Figure 2 shows the phase diagram of the system. From the Poincaré-Bendixon theorem and the disposition of flows in Figure 2, the trajectory converging to the saddle point with $k < k_e$ converges to $(0, 0)$ when $t \rightarrow -\infty$. Therefore, assuming an initial capital $k_0 < k_e$, the optimal consumption and capital path is increasing until reaching the steady state, where growth stops.

b) Assume that $M \geq B^{\frac{1}{\eta+1}}\rho^{\frac{\eta}{\eta+1}}$. First, we define the following variables: $z = y/k$, $w = c/k$ and the parameter $A = B^{-\frac{1}{\eta}}M^{\frac{\eta+1}{\eta}}$, which is not lower than ρ given the previous assumption. After some calculations, the system (3) and (5) is transformed into:

$$\begin{aligned} \frac{\dot{z}}{z} &= \left(\frac{y_k}{z} - 1\right)(z - w - n), \\ \frac{\dot{w}}{w} &= \frac{1}{\sigma}(y_k - \rho) - (z - w - n). \end{aligned} \quad (7)$$

This system is not autonomous from k , since y_k depends specifically on k . Nevertheless, a local analysis can be done. In particular, there are several potential equilibrium points of system (7), such as $(0, 0)$, $(y_k(k^1), 0)$, $\left(y_k(k^1), \frac{(\sigma-1)y_k(k^1)+\rho}{\sigma} - n\right)$, with $k^1 \geq 0$ such that $y_k(k^1) = \frac{y(k^1)}{k^1}$. However, using condition ii), $\lim_{k \rightarrow \infty} \frac{y(k)}{k} =$

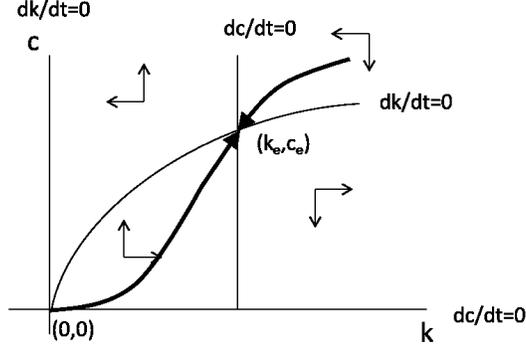


Figure 2: Phase diagram for system (3) and (5) in case $y_{kk} < 0$ and $M < B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$. There exists only one saddle point (k_e, c_e) . Since $\rho > n$, the equilibrium point is located in the increasing phase of isocline $dk/dt = 0$.

$\lim_{k \rightarrow \infty} y_k = A \geq \rho$. Since y_k is strictly decreasing, the only possible equilibrium point of system (7) is given by assuming $k \rightarrow \infty$, so the system is transformed into

$$\begin{aligned} \frac{\dot{z}}{z} &= \left(\frac{A}{z} - 1\right)(z - w - n), \\ \frac{\dot{w}}{w} &= \frac{1}{\sigma}(A - \rho) - (z - w - n). \end{aligned} \quad (8)$$

There are three possible equilibrium points of this system compatible with the definition of z and w , those are $(z_e^0, w_e^0) = (0, 0)$, $(z_e^1, w_e^1) = (A, 0)$ and $(z_e^2, w_e^2) = \left(A, \frac{(\sigma-1)A+\rho}{\sigma} - n\right)$. The characterization of these equilibrium points in the system (7) is given by the jacobian matrix, which is

$$\begin{aligned} J(z_e^0, w_e^0) &= \begin{pmatrix} A+n & 0 \\ -A & \frac{A-\rho}{\sigma} + n \end{pmatrix}, \\ J(z_e^1, w_e^1) &= \begin{pmatrix} -A+n & 0 \\ 0 & -\frac{A(\sigma-1)+\rho}{\sigma} + n \end{pmatrix}. \\ J(z_e^2, w_e^2) &= \begin{pmatrix} -\frac{A-\rho}{\sigma} & 0 \\ -w_e^2 & w_e^2 \end{pmatrix}, \end{aligned}$$

Given the signs of the eigenvalues in the jacobian matrix, steady-state (z_e^0, w_e^0) is a source and (z_e^1, w_e^1) a sink. Note that $A \geq \rho > n$ and $w_e^2 > 0$, since $\sigma > 1$. Then, if $A > \rho$, (z_e^2, w_e^2) is a saddle point since $\det(J(z_e^2, w_e^2)) = -\frac{A-\rho}{\sigma} w_e^2 < 0$. If $A = \rho$, (z_e^2, w_e^2) presents a bifurcation point and multiple steady-states in the line $z = w + n$ appear. In this case, given an initial capital k_0 , it is always

possible to find an initial optimal consumption c_0 where permanently constant capital and consumption are achieved.

Figure 3 shows the phase diagram of system (8). The isocline $\dot{z} = 0$ is a line parallel to the bisector of the first quadrant and the vertical lines $z = A$ and $z = 0$. The isocline $\dot{w} = 0$ is represented by the horizontal axis $w = 0$ and the line $w = z - (A - \rho)/\sigma - n$. We have that the slope of the isocline in (z_e^2, w_e^2) is $\partial w/\partial z|_{z=z_e} = 1$. According to this phase diagram, if $A > \rho$ there exists only one path converging to the equilibrium point (z_e^2, w_e^2) from $z > z_e$. Thus, given an initial capital $k_0 \geq 0$, there exists only one c_0 such that $(z_0, w_0) = (y(k_0)/k_0, c_0/k_0)$ converges to this path.

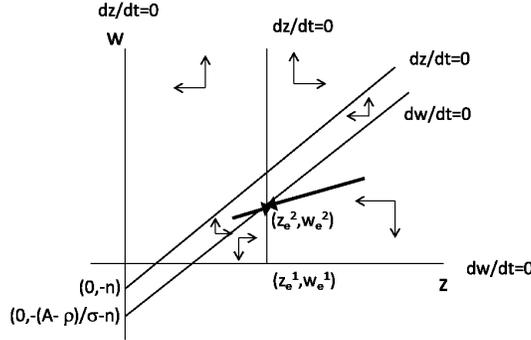


Figure 3: Phase diagram for system (8) (case $y_{kk} < 0$ and $M > B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$). The optimal trajectory is represented in bold arrow. In case $M = B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$, the two parallel growing lines of isoclines $dz/dt = 0$ and $dw/dt = 0$ converge into one.

The proof ends by showing that this trajectory verifies the transversality condition for system (5) and (3). In the steady state (z_e^2, w_e^2) , the system can be rewritten as

$$\begin{aligned} \frac{\dot{c}}{c} &= \frac{1}{\sigma} (A - \rho), \\ \dot{k} &= (A - n)k - c. \end{aligned} \quad (9)$$

The solution of this system is $(c(t), k(t)) = \left(\bar{c} e^{\frac{1}{\sigma}(A-\rho)t}, e^{(A-n)t} \left(\bar{k} - \bar{c} \int_0^t e^{-\frac{(1-\sigma)A+n\sigma-\rho}{\sigma}s} ds \right) \right)$, for certain values \bar{c}, \bar{k} . Since $c(t)/k(t) = w(t) \rightarrow w_e$, necessarily $\bar{c} = \frac{(\sigma-1)A+n\sigma-\rho}{\sigma} \bar{k}$. Given that $\lambda(t) = c^{-\sigma}(t)$, we have,

$$\lim_{t \rightarrow \infty} e^{-\rho t} \lambda(t) k(t) = \lim_{t \rightarrow \infty} \bar{c}^{-\sigma} \bar{k} e^{\frac{(1-\sigma)A-\rho}{\sigma}t} = 0.$$

Therefore, above the bifurcation point ($A > \rho$), the path converging to the

saddle point (z_e^2, w_e^2) is the optimal solution of the problem. This path approximates in the long term to a permanent positive growth rate of consumption and capital. ■

Remark 1. Conditions i), ii) and iii) play the role of Inada conditions for a general production function $G(k)$ used in neoclassical endogenous growth models, adapted to this context where the production is substituted by revenues, which are dependent on the equilibrium price in a competitive market. In particular, condition i) implies that revenues *per capita* $y(k)$ is continuously differentiable, strictly increasing and concave with $y(0) = 0$. Condition ii) substitutes the asymptotic Inada condition of the marginal production ($\lim_{k \rightarrow \infty} G_k = 0$) by other less restrictive on revenues *per capita*, $\lim_{k \rightarrow \infty} y_k = B^{-\frac{1}{\eta}} M$, with $M \geq 0$. Finally, condition iii) means that $\lim_{k \rightarrow 0^+} y_k > \rho$, which also relaxes the Inada condition of the marginal production ($\lim_{k \rightarrow 0^+} G_k = +\infty$).

Remark 2. Condition ii) indicates that the production function $F(k)$ behaves like function $Mk^{\frac{\eta}{\eta+1}}$ when $k \rightarrow \infty$. In this case, the proposition implies that growth in the long term is only possible if $M > B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$. Therefore, production functions presenting returns to scale larger than one but lower than $\frac{\eta}{\eta+1} > 1$ are not sufficient to assure increasing growth rates of consumption in the local economy. Function $\frac{\eta}{\eta+1}$ is increasing in the interval of price elasticities $(-\infty, -1)$ (see Figure 5). Therefore, the more inelastic with respect to price the demand is, the more productive the tourism economy should be in order to maintain positive consumption growth.

Remark 3. Assuming that the latter condition in i) is satisfied strictly (i.e. $y_{kk} < 0$) and $M < B^{\frac{1}{\eta+1}} \rho^{\frac{\eta}{\eta+1}}$, the change in some of the conditions of the industry can affect the steady state (k_e, c_e) . In particular, given the equilibrium condition,

$$y_k(k_e) = B^{-1/\eta} \frac{\eta+1}{\eta} F_k(k_e) F^{1/\eta}(k_e) = \rho,$$

let us define $\psi(B, \eta) = B^{-1/\eta} \frac{\eta+1}{\eta} F_k(k_e) F^{1/\eta}(k_e)$. Hence, the influence of changes in the demand factors B on the steady state can be deduced applying the Implicit Function theorem. After some simplifications, it follows that

$$\frac{\partial k_e}{\partial B} = \frac{-\psi_B}{\psi_{k_e}} = \frac{1/\eta B^{-1}}{\frac{F_{kk}(k_e)}{F_k(k_e)} + \frac{1}{\eta} F^{-1}(k_e) F_k(k_e)} > 0,$$

The effect on the steady state of consumption follows the same direction. Given

the equilibrium condition, $c_e = y(k_e) - nk_e$,

$$\frac{\partial c_e}{\partial B} = (y_k(k_e) - n) \frac{\partial k_e}{\partial B} = (\rho - n) \frac{\partial k_e}{\partial B} > 0,$$

since $\rho > n$. Therefore, an increase in demand factors, such as the income in the origin country, originates an increase in the steady state of consumption in the host country, as expected. Parameter B may also include other factors attracting the demand, such as natural resources. Figure 4 illustrates the hypothetical case of local consumption evolution in a tourism based economy. Given a specific development, the tourist destination achieves a phase where tourist income increases at a low rate and consequently local welfare stagnates. According to the sign of the derivative above, the tourism destination can be rejuvenated and present a phase of positive consumption growth rates by utilizing new attractions of the destination. These results are in line with most of the empirical and theoretical applications in the literature and reviewed in section 2.

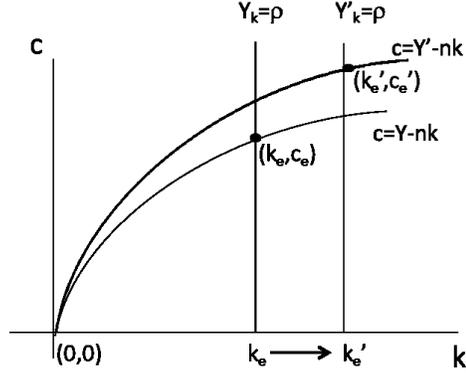


Figure 4: Effect of utilizing new attractions in the destination $B' > B$. The initial stationary solution (k_e, c_e) moves to (k'_e, c'_e) .

Accordingly, the influence of the price elasticity of the demand on the steady state is given by

$$\frac{\partial k_e}{\partial \eta} = \frac{-\psi_\eta}{\psi_{k_e}} = \frac{1/\eta^2 \left(\ln \frac{B}{F(k_e)} \right) - \frac{1}{\eta(\eta+1)}}{\frac{F_{kk}(k_e)}{F_k(k_e)} + \frac{1}{\eta} F^{-1}(k_e) F_k(k_e)}.$$

Since the denominator is strictly negative, we have after some simplifications

that

$$\partial k_e / \partial \eta > 0 (\partial c_e / \partial \eta > 0) \iff B > F(k_e) e^{\frac{\eta}{\eta+1}}.$$

Therefore, a destination can extend positive growth rates of consumption for the local society by reorienting the tourist product to more selected market segments (η increasing) if the other factors incentivizing the demand are larger than the actual production times a correction factor $e^{\frac{\eta}{\eta+1}}$. Let us observe this condition if the destination starts from a situation of pure mass tourism ($\eta \rightarrow -\infty$). In this case, if $B > eF(k_{e,-\infty})$, with $k_{e,-\infty} < +\infty$ the steady state for the case $\eta \rightarrow -\infty$, a strategy to re-orient the tourist product to a more selected market segment will increase the long-term income *per capita*. If the price elasticity of the tourist demand in the destination is proximate to $\eta \rightarrow -1$, that is, the highest price insensitive tourism demand, the revenue *per capita* y is constant (see equation 1) and therefore the steady state of the capital and consumption *per capita* is null. Therefore, it is never optimal to re-structure the tourist product to the tourism segment with the highest insensitive to price. The optimum market segment, that is, the one between pure mass tourism and highest selected tourism where the destination obtains the larger steady state of consumption in the long run, depends on the specification of the production function in the economy.

4 Example of production function

In this section we present an example of the general model above by specifying the production function $f(W, K, L)$ in the economy. Conditions of Proposition 1 will be written in terms of the specific functions and the question of existence of an optimum market segment will be answered.

Firstly, let us assume a Cobb-Douglas technology in the tourism-based economy, that is,

$$f(W, K, L) = AW^\epsilon K^{\alpha(\eta)} L^{1-\alpha(\eta)}, \quad (10)$$

where A is the technological coefficient, $0 < \epsilon < 1$ is the productivity of the aggregate knowledge and $\alpha(\eta)$ is the share of capital in the production function of the economy. The latter depends on the price elasticity of demand, that is, the supply of the tourist product depends on the specific market segment visiting the destination. In general, it is assumed that $0 \leq \alpha(\eta) \leq 1$ and is differentiable and increasing for all $\eta \in (-\infty, -1)$, so the closer the market

segment to the case of pure mass tourism ($\eta \rightarrow -\infty$) is, the lower is the share of capital (knowledge) in the composition of the product.

Following the hypothesis of the social optimum case, aggregate knowledge is assumed to be internalized in the production function ($W = Nk$, with $k = \frac{K}{L}$). So, $F(k) = f(Nk, k, 1) = AN^\epsilon k^{\alpha(\eta)+\epsilon}$ and the revenue *per capita* for each firm is given by the equation

$$y = B^{-\frac{1}{\eta}} A^{\frac{\eta+1}{\eta}} N^{\epsilon \frac{\eta+1}{\eta}} k^{h(\eta)},$$

with $h(\eta) = (\epsilon + \alpha(\eta)) \frac{\eta+1}{\eta}$. Condition i) in Proposition 1 is verified if and only if $h(\eta) \leq 1$. In case of $h(\eta) = 1$, the revenue function is type *AK*, already analyzed in the proof of Proposition 1.

Let us consider $h(\eta) < 1$. In this case, condition ii) and iii) in Proposition 1 are satisfied directly with $M = 0$ ($\lim_{k \rightarrow \infty} \frac{F(k)}{k^{\eta+1}} = 0$ and $\lim_{k \rightarrow 0+} \frac{F_k(k)}{F^{-1/\eta}(k)} = +\infty$). Therefore, there exists an optimal path $(k^*(t), c^*(t))$ for problem (SP), which converges to a stationary state (k_e, c_e) . This steady state for the capital is defined by the following equation,

$$k_e^{h(\eta)-1} = B^{\frac{1}{\eta}} A^{-\frac{\eta+1}{\eta}} N^{-\epsilon \frac{\eta+1}{\eta}} \frac{\rho}{h(\eta)}. \quad (11)$$

The influence of some new factors can be analyzed. For example, larger number of firms and consumers (N) in the economy enhances the steady state of capital and consumption, since

$$\frac{\partial k_e}{\partial N} = -\frac{\epsilon}{N} \frac{\eta+1}{\eta} \frac{k_e}{h(\eta)-1} > 0.$$

Similar effect is obtained by augmenting the technological coefficient A , as expected. The following proposition gives the general conditions for obtaining a positive influence of the parameter representing the market segment (η) over the steady state of consumption.

Proposition 2 *Let us assume problem (SP) with a production function (10), $h(\eta) < 1, \forall \eta < -1$ and $B > AN^\epsilon > \frac{\rho}{\epsilon}$. Then, there exists a market segment $\hat{\eta} \ll -1$ such that $\frac{\partial k_e}{\partial \eta} > 0$ and $\frac{\partial c_e}{\partial \eta} > 0, \forall \eta < \hat{\eta}$. In other words, a destination initially oriented to a market segment with price elasticity $\eta < \hat{\eta}$ can obtain larger steady state of consumption by reorienting the supply to a more selected market segment.*

Proof. Proving that $\frac{\partial k_e}{\partial \eta} > 0$ is enough, since $\frac{\partial c_e}{\partial \eta}$ is positively related to $\frac{\partial k_e}{\partial \eta}$

(see Remark 2). We note $k_{e,\bar{\eta}}$, with $\bar{\eta} \in (-\infty, -1)$ or $\bar{\eta} = -\infty$ to the equilibrium point k_e in case of $\eta = \bar{\eta}$. Initially, we will show that $k_{e,-\infty} > 1$. Diverging $\eta \rightarrow -\infty$ in equation (11), we have

$$k_{e,-\infty}^{\epsilon + \alpha_{-\infty} - 1} = \frac{\rho}{AN^\epsilon(\epsilon + \alpha_{-\infty})},$$

where $\alpha_{-\infty} = \lim_{\eta \rightarrow -\infty} \alpha(\eta) \geq 0$. Then, $k_{e,-\infty} > 1 \Leftrightarrow AN^\epsilon(\epsilon + \alpha_{-\infty}) > \rho$, which is trivially satisfied from the conditions on the parameters. Therefore, given a value of the parameter sufficiently low, $\eta_1 \ll -1$, it follows that $k_{e,\eta} > 1, \forall \eta < \eta_1$. Now, applying the Implicit Function Theorem, we derivate both sides of the equation (11) with respect to η . After some calculations, we have

$$(h(\eta) - 1) \frac{\partial k_e / \partial \eta}{k_e} = \frac{1}{\eta^2} \ln \frac{AN^\epsilon}{B} - \frac{h'(\eta)}{h(\eta)} - h'(\eta) \ln(k_e).$$

From the definition of $h(\eta)$, it easily follows that $\exists \eta_2 \in (-\infty, -1)$ for which $h'(\eta) > 0, \forall \eta < \eta_2$. Then, defining $\hat{\eta} = \min\{\eta_1, \eta_2\}$, all terms on the right hand side of the equation above are negative $\forall \eta < \hat{\eta}$. Since $h(\eta) < 1, \forall \eta < -1$, the thesis of the proposition is obtained. ■

Remark 4. Let us discuss the conditions on parameters in Proposition 2. Condition $AN^\epsilon > \frac{\rho}{\epsilon}$ is fulfilled assuming high enough number of firms. The other condition can be interpreted as follows. Let us assume a destination in the stagnation phase and initially oriented to a market segment close to pure mass tourism ($\eta \ll -1$). Then, local stakeholders can enhance production and local consumption by reorienting the product to a market segment with higher price elasticity if the endowments of resources or other non-price factors influencing tourism demand are larger than the technological and accumulated knowledge multiplier ($B > AN^\epsilon$). In other words, high enough provision of non-price factors influencing tourism demand are essential to enhance social welfare in a tourism-based economy.

The proposition and remark above suggest that can exist a market segment between pure mass tourism ($\eta \rightarrow -\infty$) and the highest selected tourism ($\eta \rightarrow -1$) where the destination achieves an optimum steady state of consumption in the long run. To illustrate it, we present a case assuming a specific function for the elasticity of capital in the production function, which is,

$$\alpha(\eta) = -a \left(\frac{\eta + 1}{\eta} \right)^\gamma + 1, \text{ with } 1 < \gamma \text{ and } 0 < a < 1.$$

This is a differentiable and increasing function for $\eta < -1$, where $\lim_{\eta \rightarrow -\infty} \alpha(\eta) = 1 - a > 0$ and $\lim_{\eta \rightarrow -1} \alpha(\eta) = 1$. Figure 5 shows the graph of $\alpha(\eta) + \epsilon$ and function $t(\eta) = \frac{\eta}{\eta+1}$ for specific values of the parameters a and γ . The productivity of the accumulated knowledge is fixed to $\epsilon = 0.1$. By definition, function $h(\eta) = (\alpha(\eta) + \epsilon) (t(\eta))^{-1}$. So, since function $\alpha(\eta) + \epsilon$ is located below $t(\eta)$, $\forall \eta \in (-\infty, -1)$, condition $h(\eta) < 1$ is given. The higher the value of ϵ is, the closer the two functions in Figure 5 are. Eventually, the two functions overlap in a point η^o for a high enough ϵ and then $h(\eta^o) = 1$.

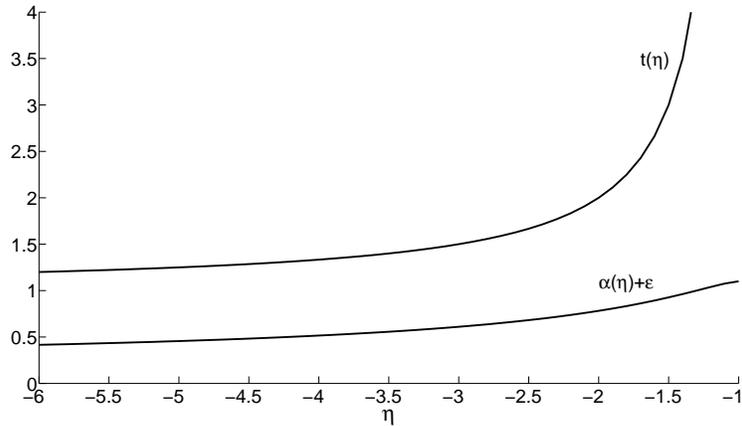


Figure 5: Representation of functions $\alpha(\eta) + \epsilon$ and $t(\eta) = \frac{\eta}{\eta+1}$. Since $\alpha(\eta) + \epsilon < t(\eta)$, $h(\eta) < 1$. Parameter values: $a = 0.9$, $\gamma = 1.5$, $\epsilon = 0.1$.

Figure 6 shows the optimal path $(k^*(t), c^*(t))$ for problem (SP), given the parameter values for Figure 5 and other theoretical values for the rest (baseline case). All conditions in Proposition 2 are satisfied with this specification. Since $h(\eta) < 1$, the optimal path converges to a stationary state (k_e, c_e) . Other optimal trajectories were obtained assuming a percentage variation of certain parameters, such as the technology coefficient (A), demand factors (B) and number of firms and consumers in the destination (N). The numerical results confirm the analytical findings, showing the positive effect of an increase in these parameters on the stationary capital and consumption in the long term.

The effect of the price elasticity of demand on the optimum steady state is illustrated in Figure 7. As it can be observed in this Figure, the highest levels of consumption in the steady state can be achieved by focusing the tourist product to a market segment with a particular price elasticity η^* . The long-term local

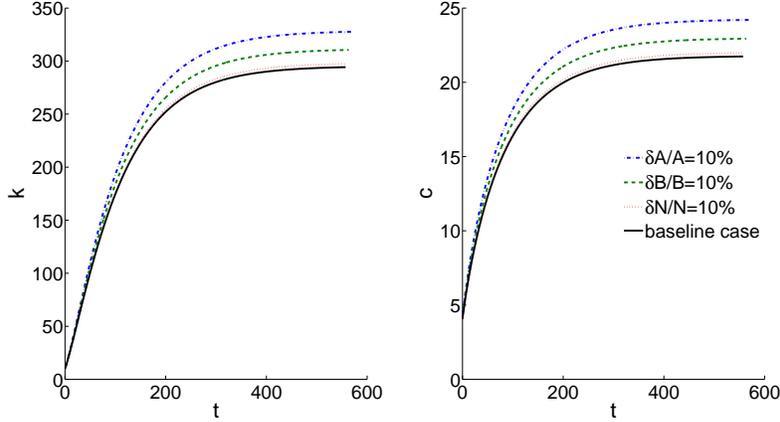


Figure 6: Optimal paths for capital and consumption in problem (SP) assuming technology (10). In addition to the baseline case, three trajectories are represented assuming percentage increase in technology coefficient (A), non-price demand factors (B) and number of firms (N). Baseline case parameters: $B=10$; $A=1$; $N=1$; $\rho=0.03$; $\sigma=3$; $\epsilon=0.1$; $n=0$; $a=0.9$; $\gamma=1.5$; $k_0=10$. $\delta P/P = 10\%$ means a 10% increase in value of parameter P , with $P = B, A$ and N .

consumption obtained by re-directing the supply to other segments is lower. It is noteworthy that the market segment with the most inelastic demand ($\eta = -1$) is not the optimal segment in terms of local welfare, as it was already shown in the analytical results.

Finally, Figure 8 shows the effect of the productivity of the aggregate knowledge (ϵ) on the optimum price elasticity η^* . There is a trade-off between these parameters. The optimum market segment is deviated to less selective market segment (lower price elasticities) if the productivity of the aggregate knowledge is higher. Hypothetically, permanent growth in capital and consumption can be achieved if the effect of the aggregate knowledge on productivity is high enough. This would occur when the two curves in Figure 5 approximate each other until reaching a tangent point η^o between $\alpha(\eta) + \epsilon$ and $t(\eta)$. In this case, $h(\eta^o) = 1$ and we are in an AK -type growth model. This situation is shown by the dotted vertical line in Figure 8.

This particular example shows that a tourism-based economy can present an optimum market segment (in terms of local welfare) which is located between pure mass tourism and highest price insensitive tourism. If the destination is initially specialized in a certain market segment, local stakeholders can reorient

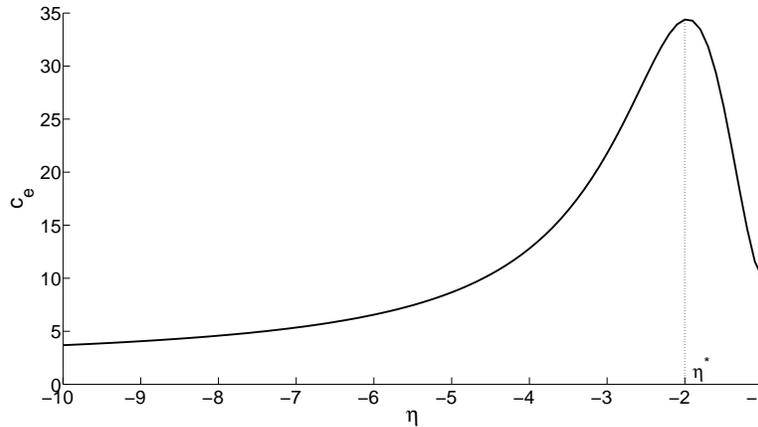


Figure 7: Optimum steady state of consumption for problem (SP) assuming technology (8) for a range of values of the price elasticity η . The maximum optimum steady state of consumption is achieved in η^* . Baseline case parameters.

the tourist product in order to be closer to this optimum segment. Long term growth is also possible in the economy if the aggregate knowledge derived by a learning-by-doing process exists and its effect is high enough.

5 Empirical analysis

In this section, we test the general results of the model with some examples from the real world. Specifically, the cases of Canary and Balearic Islands, Spain, have been selected. These archipelagos, located in Southern Europe, have specialized in tourism since the 1960's and have experienced several phases of development along these last decades. They initially specialized in massive tourism until being consolidated as a mature destination in the middle of the nineties. Since then, the regions have maintained and even increased the affluence of tourists by applying several rejuvenation and restructuring policies (Aguiló, Alegre & Sard 2005, Oreja, Parra-López & Yánes-Estèvez 2008, Medina-Munõz, Medina-Munõz & Sánchez-Medina 2016). The 2008 global economic crisis have particularly influenced this export-oriented economies, which suffered a sharp decrease in tourist arrivals in the following years and consequently in income *per capita*, with a longer effect. Nevertheless, the income *per capita* has started to recover since 2013.

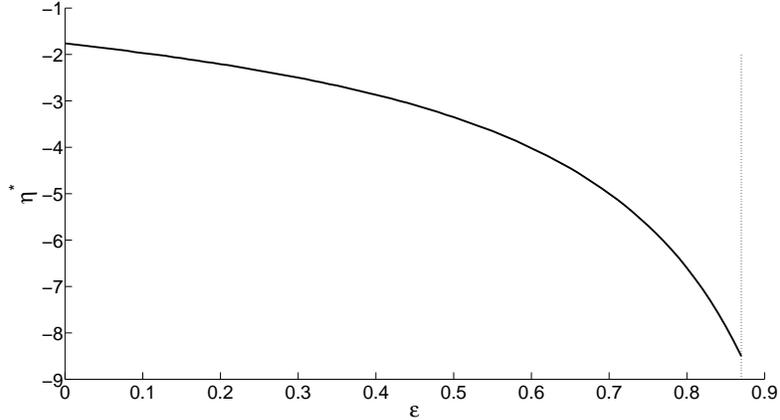


Figure 8: Relationship between the productivity of aggregate knowledge ϵ and the optimum price elasticity η^* . The dotted vertical line shows the value of ϵ where an optimal permanent growth of capital and consumption is obtained. Baseline case parameters.

5.1 Econometric model

One of the main conclusions extracted from the theoretical model is that a tourism-based economy can enhance economic growth by re-orienting the tourist product to other market-segment. To empirically test this result, we proceed by estimating the model

$$\log(y_t/y_{t-1}) = (1 - e^{-\beta}) \log(y_e) - (1 - e^{-\beta}) \log(y_{t-1}) + u_t. \quad (12)$$

This model is derived from the log-linearized version of the equations (3) and (5) and production function (10) following the same procedure in Barro & Sala-i-Martin (2004, chapter 2). The details can be found in Appendix A. Variable y_t is the income *per capita* in the economy at time t and $u_t \sim N(0, \sigma_u)$ includes the random disturbances in the economy, which we assume with a constant variance. Parameter y_e is the income *per capita* in the long term (steady-state), while β is one of the eigenvalues of the log-linear system in the steady-state and depends on the model parameters. It is also called speed of convergence and shows how close the empirical trajectory of the income *per capita* is to the steady-state. The larger the value of β , the closer to the steady-state the income *per capita* is.

Several exogenous factors may influence the growth rate y_t/y_{t-1} . Some of

them can be identified and included in the model above in order to obtain a more accurate fit. For example, these are the oil price, which influences on tourist demand, or the interest rate in the regions, which may influence on tourist supply. These factors are included in the vector X_t . Thus, model (12) is modified to

$$\log(y_t/y_{t-1}) = (1 - e^{-\beta}) \log(y_e) - (1 - e^{-\beta}) \log(y_{t-1}) + \varphi X_t + u_t. \quad (13)$$

The vector φ represents the effect of the exogenous factors X_t on the growth rate of the income *per capita*.

We estimate models (12) and (13) in the chosen regions, predetermining three different periods along the tourism development. These periods represent three different phases of the tourism development. We hypothesize that the destination have re-oriented the product to different market-segment between the first two periods. The latter period includes the post-crisis phase. We expect different estimations of the income *per capita* in the long term y_e and the speed of convergence β in each one of the time periods in every region. A higher value of y_e in a subsequent period would mean that the income *per capita* at the steady state has increased, what points to the success of the re-orientation policies implemented at that time.

5.2 Data

Data for the income *per capita* in Canary and Balearic Islands were got from the Spanish Statistical Institute (ine.es), which publishes regional accounting data starting from the eighties. The income *per capita* data are written in 2010 prices. Illinois crude oil prices in US dollar, inflation adjusted to 2016, were used as regressor in the model as well, extracted from the web page inflationdata.com. The official lending interest rates in Spain, used as other explanatory variable, was extracted from the Bank of Spain database (bde.es).

5.3 Results

Figure 9 depicts the time path of GDP *per capita* for Balearic and Canary Islands. In both trajectories, we can observe, in general, three phases. The first phase corresponds to the period 1980-1995, where a moderate growth is observed. The second (1996-2007) starts with a steeper growth which is dampened in the last years. Finally, the third is 2008-2015, which reflects the effect

of the global crisis.

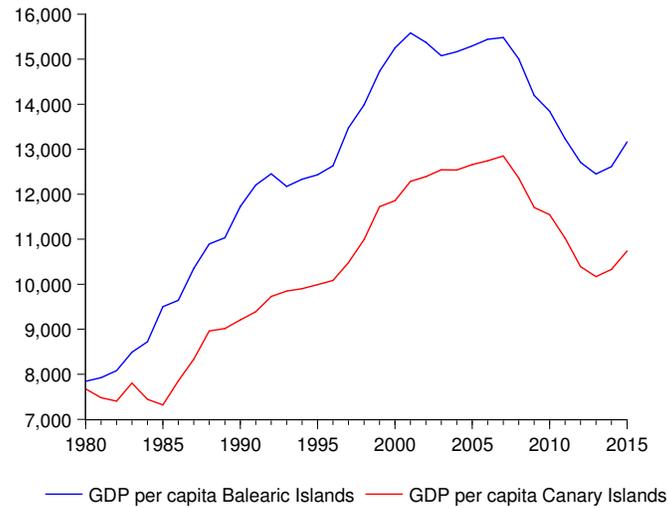


Figure 9: Time paths for GDP *per capita* (euros in 2010 prices) in Balearic and Canary Islands from 1980 to 2015.

Table 1 shows some descriptive statistics for GDP *per capita* growth rates for Balearic and Canary Islands, respectively. Basically, they are mean, median, maximum and minimum values of growth rates but also standard deviation, skewness and kurtosis coefficients, the Jarque-Bera test for normality of variable, and the number of total observations we used. Both rates are obtained as continuous growth rates by dividing the logarithm of GDP *per capita* in year t by logarithm of GDP *per capita* in year $t - 1$, and then it is multiplied by 100. Main results indicate that the annual mean is 1.48% and 0.96% for Balearic and Canary Islands, respectively, and both variables are normally distributed in terms of the Jarque-Bera test (p-value=0.81 and 0.78, respectively).

Table 1. Descriptive statistics for the period 1980-2015 in Balearic (BI) and Canary Islands (CI).

	GDP <i>per capita</i> growth rate (BI)	GDP <i>per capita</i> growth rate (CI)
Mean	1.4795	0.9592
Median	1.3414	0.9379
Maximum	8.5545	7.2882
Minimum	-5.5449	-5.8970
Std. Dev.	3.4096	3.4891
Skewness	-0.0800	-0.1270
Kurtosis	2.4954	2.4741
Jarque-Bera	0.4086	0.4973
Probability	0.8152	0.7798
Observations	35	35

We employ nonlinear least squares (NLS) method to estimate the nonlinear equations (12) and (13) because it has no closed form solutions and must be estimated using iterative methods. We begin the nonlinear estimation by taking derivatives of the objective function with respect to the parameters, evaluated at these values (i.e, Gauss-Newton/ Berndt, Hall, Hall and Hausman (BHHH) or Marquardt). If these derivatives are not well behaved, the algorithm may be unable to proceed. Also, Newey-West HAC standard errors and covariance are used.

Taking into account the existence of several phases (related to structural changes) during the analyzed period, we estimate the nonlinear model for three periods: 1986-1995, 1996-2007 and 2008-2015 for Balearic Islands and 1986-2000, 2001-2007 and 2008-2015 for Canary Islands. These periods are determined from two milestones in the regional economies. The first one (1996 in Balearic Islands and 2001 in Canary Islands) dates approximately the year when several re-orientation policies started to be implemented. These dates are based on previous studies on tourism development in the regions (Aguiló et al. 2005, Oreja et al. 2008). The second one (2008) is the date of the outbreak of global crisis which strongly affect the economy in the two regions. We estimate parameters in each period by including dummies. The effect of the period 1980-1985 is assumed null given the slow/moderate growth rate of the income *per capita*, as observed in Figure 9.

Nonlinear estimates of model (12) by using Marquardt algorithm and Newey-

West HAC standard errors and covariance are showed in Table 2. In general, convergence is achieved after few iterations. This table shows the parameter estimates corresponding to $\log(y_e)$ and β , but also some relevant statistics such as R^2 , the maximum value of log likelihood function, information criteria such as Akaike (AIC) and Schwarz Bayesian (BIC), and Durbin-Watson statistic.

Table 2. Nonlinear least squares estimates for parameters of model (12).

	Balearic Islands			Canary Islands		
	1986-1995	1996-2007	2008-2015	1986-2000	2001-2007	2008-2015
$\log(y_e)$	9.4706 [0.00]	9.6680 [0.00]	9.4456 [0.00]	10.0678 [0.00]	9.4565 [0.00]	9.2431 [0.00]
β	0.2081 [0.00]	0.2379 [0.00]	0.3115 [0.02]	0.0318 [0.59]	0.5100 [0.00]	0.3037 [0.0]
R^2	0.5805			0.4767		
Log likelihood	84.2956			79.6216		
AIC	-4.4740			-4.2069		
BIC	-4.2074			-3.9403		
Durbin-Watson stat	1.5151			1.7393		
Observations	35			35		

Note: Between brackets appears p-value.

Interpretation of these results indicates that parameter $\log(y_e)$ is statistically significant at 1% significant level. Regarding β , it is, in general, statistically significant at 5%, with the exception of the period 1986-2000 for Canary Islands.

Model (13) was also estimated by including the effect of oil price and lending interest rates. Again, the model was non-linearly estimated by using Marquardt algorithm and Newey-West HAC standard errors. The most consistent results were obtained including exclusively the oil price and are shown in Table 3. The R^2 and information criteria have improved by the inclusion of this regressor.

Table 3. Nonlinear least squares estimates for parameters of model (13) including Illinois crude oil prices effect (φ).

	Balearic Islands			Canary Islands		
	1986-1995	1996-2007	2008-2015	1986-2000	2001-2007	2008-2015
$\log(y_e)$	6.4512 [0.01]	9.8457 [0.00]	10.2853 [0.00]	11.6252 [0.00]	9.3168 [0.00]	10.1710 [0.00]
β	0.08553 [0.13]	0.2049 [0.12]	0.2709 [0.01]	0.1145 [0.17]	1.2315 [0.00]	0.2568 [0.00]
φ	0.0753 [0.00]	-0.0085 [0.55]	-0.0462 [0.14]	-0.0694 [0.03]	0.02335 [0.00]	-0.0489 [0.08]
R^2	0.6581			0.6076		
Log likelihood	87.8763			84.6588		
AIC	-4.5072			-4.3234		
BIC	-4.1073			-3.9234		
Durbin-Watson stat	1.7545			1.9875		
Observations	35			35		

Note: Between brackets appears p-value.

Parameter $\log(y_e)$ is statistically significant at 5% in all periods and presents different behavior in the two regions. In the Balearic Islands, it increases in the second period and newly in the third period. These results show that the re-orientation policies implemented in this archipelago in the last decades have succeeded, producing an enhancement of the long-term income *per capita*. The effect of the oil price is negligible in the last two periods analyzed.

In the case of the Canary Islands, the estimated long-term income *per capita* decreases in the second period and increases in the third one. These results indicate that policies laid down in the Canaries during the turn of the century to rejuvenate the tourist product and attract new market segments have not

been translated to a higher future income *per capita* for the population. Several reasons may have influenced these results. First, the moratorium of new touristic constructions since 2000 excepting few specific cases stopped the supply growth and consequently affect the tourist affluence. Second, rejuvenation policies were not uniformly implemented across the islands and differences in the supply quality are observed along the first decade of the century (Santana-Jiménez & Hernández 2011). The value of β decreases in the last period, which shows that the distance to the steady-state is larger nowadays than in the previous period, due mainly to the irruption of the crash and the consequent decreases in the income *per capita* in the following years (see Figure 9). The effect of the oil price is significant at 5% in all periods although with alternate signs.

6 Discussion and conclusion

A model of endogenous economic growth in which the engine of growth is a learning-by-doing effect has been developed in the context of a tourism-based economy.

This framework is appropriate to study the impact on tourism production of the market-segment in which the destination is involved. The study of this theoretical model has shown that, provided some technical conditions are fulfilled, it is possible for a destination to identify a market segment associated with sustained growth in the long run.

Furthermore, the model also supports the idea that switching from a market-segment to another one enables a destination facing stagnation to increase its long run level of consumption and hence of welfare.

Nowak, Sahli & Cortés-Jiménes (2007) and Schubert, Brida & Risso (2011) highlighted how growth could be imported from abroad using tourism. This paper completes these findings by showing that if a destination experiences stagnation, it is possible to reorient the supply to a new market segment as a strategy to enhance economic growth. For the first time, a single framework encompasses the necessary components for understanding how tourism can generate growth but also how to avoid stagnation by operating a switch in market segment.

Furthermore, it gives theoretical support to managerial practices of real world mass tourism stakeholders. In fact, the model basically states that a suitable solution to escape stagnation is to reorient the tourism supply of the destination toward a new and more selective market-segment.

Due to its peculiarities, the case of the Canary islands provides results that are not conclusive. But empirical findings in the case of the Balearic islands clearly validate our theoretical results regarding the effect of the reorientation strategy on the long term income *per capita*. Further research are needed in order to improve the theoretical framework and extend the empirical validation of the model. A possible theoretical extension could be the inclusion of some environmental effects in order to account for differences between green tourism destinations on the one hand and traditional destinations on the other hand.

7 Appendix A

In this appendix we derive the empirical equation (12) following the same procedure than Barro & Sali-I-Martin(2004, chapter 2). We start from the logarithmic version of the system (3) and (5), assuming a Cobb-Douglas production function (10). Thus, we have $y = Hk^{h(\eta)}$, where $H = B^{-\frac{1}{\eta}} A^{\frac{\eta+1}{\eta}} N^{\frac{\eta+1}{\eta}}$. The system is

$$\begin{aligned} \frac{d[\log(k)]}{dt} &= He^{-(1-h(\eta))\log(k)} - e^{-\log(c/k)} - n, \\ \frac{d[\log(c)]}{dt} &= \frac{1}{\sigma} \left(h(\eta)He^{-(1-h(\eta))\log(k)} - \rho \right). \end{aligned} \quad (14)$$

Now, we calculate the solution of the linearized system around the steady state $(\log(k_e), \log(c_e))$. The Jacobian matrix is

$$J(\log(k_e), \log(c_e)) = \begin{pmatrix} \rho - n & n - \frac{\rho}{h(\eta)} \\ -(1-h(\eta))\frac{\rho}{\sigma} & 0 \end{pmatrix}. \quad (15)$$

As shown in the proof of Proposition 1, the matrix has a negative determinant and therefore the steady state $(\log(k_e), \log(c_e))$ is a saddle point. The solution for $k(t)$ of the linearized system is

$$\log(k(t)) = \log(k_e) + K_1 e^{\lambda_1(t-t_0)} + K_2 e^{\lambda_2(t-t_0)}, \quad (16)$$

where λ_1, λ_2 are the eigenvalues of the Jacobian matrix (15) and K_1, K_2 are constants. One of the eigenvalues is positive (say λ_1) and the other is negative. Since the optimal solution converges to the steady state, necessarily $K_1 = 0$ in the optimal trajectory. The other constant K_2 is determined from the initial

condition. Taking the initial time $t_0 = t - 1$, we have that

$$K_2 = \log(k(t-1)) - \log(k_e).$$

Substituting K_2 , $t_0 = t-1$, $K_1 = 0$ in system (16), and identifying $\beta = -\lambda_2 > 0$, we have the following relationship,

$$\log(k(t)) = (1 - e^{-\beta}) \log(k_e) + e^{-\beta} \log(k(t-1)).$$

Since $\log(y) = \log(H) + h(\eta)\log(k)$, we get directly that

$$\log(y_t) = (1 - e^{-\beta}) \log(y_e) + e^{-\beta} \log(y_{t-1}),$$

where we note $y_t \equiv y(t), \forall t > 0$. Subtracting $\log(y_{t-1})$ in both terms, we get to the empirical equation (12),

$$\log(y_t/y_{t-1}) = (1 - e^{-\beta}) \log(y_e) - (1 - e^{-\beta}) \log(y_{t-1}).$$

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