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Stefan Franz Schubert and Juan Gabriel Brida

Free University of Bozen-Bolzano

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Stefan F. Schubert*

and

Juan G. Brida†

Free University of Bozen-Bolzano, Italy

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*Mail: Free University of Bozen-Bolzano, School of Economics and Management, Via Sernesi 1, I-39100 Bolzano, E-mail: StefanFranz.Schubert@unibz.it

†Mail: Free University of Bozen-Bolzano, School of Economics and Management, Via Sernesi 1, I-39100 Bolzano, E-Mail: JuanGabriel.Brida@unibz.it

The paper studies the dynamics of economic growth caused by an increase in the growth rate of tourism demand.

We develop a simple dynamic model of a small open economy, which is completely specialized in the production of tourism services (island economy model), populated by a large number of intertemporally optimizing agents, deriving utility from consuming an imported good. Tourism services are produced by means of a simple AK technology by using imported capital, its accumulation associated with adjustment costs. Moreover, the economy can lend or borrow at the international financial markets at the given world interest rate. Adjustments in the relative price of tourism services ensure market clearance for tourism services.

The long-run growth rate of the economy is tied to the growth rate in tourism demand. An increase in the latter increases thus the economy's long-run balanced growth rate. In contrast to the standard one-good small open economy endogenous growth model, where the economy is always on its balanced growth path, we show that there are transitional dynamics after an increase in the growth rate of tourism demand. In particular, the short-run growth rate of output rises gradually towards its higher long-run level, and the market price of tourism increases during transition. Thus, an increase in the growth of tourism demand, say, caused by higher economic growth abroad, leads to a boom in the small open economy and increasing terms of trade. Adjustments of the relative price of tourism services (i. e. the real exchange rate) can therefore not protect the economy from demand disturbances.

Keywords: tourism demand, growth, economic dynamics

1. Introduction

International tourism is one of the fastest growing industries, accounting for more than 10% of total international trade and almost half of total trade in services, and can be considered as one of the world's largest export earners. In many countries, foreign currency receipts from tourism exceeds currency receipts from all other sectors together. Thus, tourism, which is an alternative form of exports, contributes to the balance of payments through foreign exchange earnings and proceeds generated from tourism expansion.

Over the past decades, the importance of the tourism sector for the economy has been steadily increasing. International tourism is recognized to have a positive effect on the increase of long-run economic growth through different channels. First, tourism is a significant foreign exchange earner, allowing to pay for imported capital goods or basic inputs used in the production process. Second, tourism plays an important role in spurring investments in new infrastructure and competition between local firms and firms in other tourist countries. Third, tourism stimulates other economic industries by direct, indirect and induced effects. Fourth, tourism contributes to generate employment and to increase income. Fifth, tourism causes positive exploitation of economies of scale in national firms. Finally, tourism is an important factor of diffusion of technical knowledge, stimulation of research and development, and accumulation of human capital. These believes that tourism can promote or cause long-run economic growth it is known in the literature as the Tourism Led Growth Hypothesis (TLGH). This term was first introduced by Balaguer and Cantavella-Jordá (2002), but there are several previous studies of the TLGH, see Shan and Wilson (2001) and the references therein.

Tourism is the leading source of foreign exchange in at least one of three developing countries that have made it a priority sector, and this holds specially for small islands (see Durbarry (2004)). In fact, there are several examples of small islands that depend heavily on international tourism revenue and where the tourism sector has received strong support from the government (see Louca (2006)). The top 10 nations ranked according to the contribution of tourism to GDP are all small islands (see WTTC (2008)). Tourism has become a common development focus for many countries, and a large quantity of small tropical island economies reoriented their strategy of production from traditional export staples like sugar and bananas toward mass tourism development, related construction and financial services. It is not surprising that these microstates have chosen tourism as the engine of development because they suffer many limitations. These include lack of diversification because of resource scarcity, income volatility because of extreme openness and export concentration, small market size, and high transport costs. Mihalic (2002) shows several advantages of tourism as a development strategy compared to the export of goods and traditional services. Some of these advantages are (a) natural and socio-cultural attractiveness; (b) products produced locally can command a higher price sold locally to tourists than when exported, and (c) some perishable goods can only be sold to tourists in the domestic market.

As pointed out by Croes (2006), tourism provides advantages in overcoming the smallness of a country in three ways. First, it provides the volume to overcome insufficient market demand enabling greater efficiency and providing economies of scale for more goods and services which decreases the unit costs of production. Second, it increases competition by encouraging new entrants in the market place, which provides a positive impact on the price level of goods and services. Third, tourism, by providing scale and competition together with greater consumer choice and trade openness, can raise the standard of living and thus improve the quality of life in a small country.

Some empirical studies present strong evidence of a positive relationship between tourism and economic growth (see Durbarry (2004) for Mauritius, Louca (2006) for Cyprus, Noriko and Mototsugu (2007) for the Amami islands in Japan and Vanegas and Croes (2000, 2003) for Aruba). McElroy (2003, 2006) presents empirical evidence suggesting that successful tourism-driven small islands represent a special insular development case and an alternative to migration, remittances, aid and bureaucracy.

The link between the growth of the tourism industry and overall economic growth has attracted considerable interest from economic researchers, at both theoretical and empirical levels. The dominant view is that the tourism industry may require major investments in basic infrastructure such as transport, accommodation, water supply and health care. The seminal study of Sinclair (1998) points out that countries potentially benefit from increasing expenditures on tourism. Research in this topic is very recent and non-conclusive. Most of the papers are empirical studies investigating the TLGH for a particular country using econometric techniques like the Granger causality test or Johansen cointegration (see Balaguer and Cantavella-Jordá (2004), Cortéz-Jiménez and Pulina (2006), Dritsakis (2004), Gunduz and Hatemi-J (2005), Katircioglu (2009), Durbarry (2004), Louca (2006), Noriko and Mototsugu (2007), Oh (2005), Kim, Chen, and Jang (2006), Soukiazis and Proença (2008), and Shan and Wilson (2001)). The majority of this papers supports the TLGH. In a comprehensive study, Brau, Lanza, and Pigliaru (2007) found that for small countries specialization in tourism is beneficial for growth. An econometric study done by Lanza, Temple, and Urga (2003) suggests that growth of real incomes may be supported by specializing in tourism, as the terms of trade shift in favor of the specializing country.

Despite the arguments and believes presented in favor of the important impacts of tourism on economic growth, there are very few growth models including tourism as a sector and analyzing the impacts of changes in tourism growth on long-run economic growth. The following are some of the few exceptions:

Hazari and Sgro (1995) investigate the relationship between growth in tourism, capital accumulation, per capita consumption and the terms of trade in a dynamic setting. They show that an increase of the international demand for tourism produces a positive effect on long-run economic growth, and that in the small country case welfare necessarily increases with the growth in tourist consumption of non-traded goods. Hazari and Sgro (2004, ch. 12) use a Ramsey type model with tourism demand depending on tourism services' price and foreign income, where tourism revenues are exclusively used to buy foreign capital, and where the economy comprises two sectors, one producing a traded capital good and the other producing non-traded services, consumed by domestic residents and tourists. They show that tourism enables the host country to import growth from abroad. However, do not analyze any transitional dynamics, focussing solely on the steady state, where the price of tourism grows at a constant rate. Chao, Hazari, and Sgro (2005) examine the impact of tourism on welfare in a cash-in-advance economy showing that an expansion in tourism produces an increase in the price of the non-traded good. This gives rise to a terms-of-trade improvement. When the gain from the terms-of-trade improvement dominates (does not dominate) the loss from the consumption distortion, tourism is welfare-improving (welfare-reducing). Nowak, Sali, and Cortés-Jiménez (2007) provide a theoretical explanation of the tourism-led growth hypothesis. The key link are capital imports, financed with tourism earnings. However, they restrict their analysis solely on the balanced growth steady-state equilibrium. A recent paper by Chao, Hazari, Laffargue, Sgro, and Yu (2008) examines the effects of tourism on employment, capital accumulation and resident welfare for a small open economy with unemployment, showing that a tourism boom improves the terms of trade and increases employment, but lowers capital accumulation. This is due to shifts of resources between sectors; see also Schubert and Brida (2008). In Chao, Hazari, Laffargue, Sgro, and Yu (2006) the authors have demonstrated that an expansion of tourism may reduce the capital stock, thereby lowering welfare in a two-sector model with a capital-generating externality.

All these models abstract from the possibility of lending/borrowing abroad[1] and thus any current account dynamics by requiring that imports of foreign capital have to be immediately financed with tourism earnings. While this is a useful simplification in the process of modeling, it is of course a severe restriction. Moreover, most of the models so far concentrate on steady-state growth and abstract from transitional dynamics. The economy is thus always assumed to be on its balanced growth path. While this assumption has its merits and allows to address important issues in a tractable way, is is obviously implausible and inconsistent with the empirical evidence to convergence speeds[2] that suggest that economies spend most of their time adjusting to structural changes. In this paper, we overcome these two shortcomings. While our model is a variant of the class of tourism-led growth models, it allows for foreign borrowing (or lending) on the international financial market to finance investment and consumption expenditures, and addresses the empirically important issue of transitional dynamics.

To analyze the effects of an increase in economic growth abroad on a tourism country or region, we develop a simple model of a small open economy, which is completely specialized in the production of tourism services, using a simple AK technology. We explicitly incorporate the economy's current account and impose a solvency condition, ruling out Ponzi schemes of unsustainable development.

Because the economy is completely specialized, this model is often referred to as an "island economy". The assumption of complete specialization is of course an extreme one, but it allows us to use a one-sector model to highlight the dynamic effects of tourism growth and to keep the analysis as simple as possible. Despite its simplicity, our model is able to replicate the stylized facts reported above.

We find that in contrast to standard endogenous growth models of small open economies, our model shows transitional dynamics. Following an increase in the growth rate of foreign income, which translates in a faster growing demand for the economy's tourism services, investment in the tourism industry rises, thus raising the growth rates of the capital stock and of tourism output. However, the increase in the capital stock's and thus output's growth rate falls short of the increase in tourism demand's growth, calling for a gradually increasing price of tourism services to balance supply and demand. The terms of trade of the tourism country improve. The growing price in turn increases the return on capital and

[1] An exception is Schubert and Brida (2008).

[2] The benchmark speed of adjustment is around 2 - 3 % per annum (see Mankiw, Romer, and Weil (1992), Barro and Sala-i-Martin (1992), and others). Of course, these estimates have been challenged, but the consensus remains that the speed of adjustment may be somewhat higher than originally suggested, but probably less than 6 % per annum; see, e. g., Islam (1995) and Evans (1997).

boosts investment, speeding thus up economic growth in the island economy. Thus, the model is able to replicate the sluggish adjustment of tourism economies and increasing terms of trade to an increase in the growth rate of tourism demand.

The rest of the paper is structured as follows. The following section sets up the model of a small island economy and describes the economic framework. We then turn to the discussion of the macroeconomic equilibrium. The next section describes the dynamic properties of the equilibrium and discusses the economy's steady-state, followed by a detailed analysis of an increase in the growth rate of tourism demand. Finally, our main findings are summarized.

2. The model

The small open economy comprises a large number of identical households and competitive firms, which are completely specialized in the production of tourism services. Households supply a fixed amount of labor, $l = \bar{l}$, and consume an imported good. Firms produce tourism services, T, using capital, K, and labor, l, as factor inputs, using a simple AK technology, i. e., $T = AK$.[3] The imported good can be used for consumption, C, and investment, I, including installation costs, resulting in the investment cost function $\Phi(I,K)$. Both households and firms shall be represented by a representative household and a representative firm, respectively. The economy is small in the world financial markets, taking the world interest rate r as given.[4] However, tourism services produced in the economy are different from tourism services supplied elsewhere. Therefore, foreign demand Z for domestically produced tourism services is a decreasing function of the relative price of domestically produced tourism services in terms of the import good, p, i. e., the terms of trade of the domestic economy. Furthermore, Z increases with foreign's income, Y. For analytical purposes, we assume the following iso-elastic tourism demand function:

$$Z = \alpha Y^{\sigma} p^{-\varepsilon}$$

[3] The constant supply of labor of domestic households is contained in the A expression. The AK technology can be justified by referring to the replication argument. Of course, the use of more capital (hotels, resorts, etc.) will require more labor, too. As domestic residents supply labor at a fixed quantity, increasing labor demand will be met by employing foreign workers, as can be frequently observed in reality. To keep the model as simple as possible, one can think K as being broadly defined, including foreign labor supply. This too justifies assuming an AK technology. We also assume away externalities in production (which can also serve as a justification of the AK model), because they are not relevant for the issue at hand. For more on the AK technology, see, e. g., Turnovsky (2003).

[4] While this assumption may not be reasonable for some developing countries, it clearly holds for a region within a country, to which the model applies equally well.

where σ is the foreign income elasticity and ε the price elasticity of tourism demand, respectively.[5] α represents a demand shift parameter. Since the country is small, it cannot influence the rest of the world's income Y, but takes its evolution as given. World's income grows over time at the constant rate n according to $\dot{Y}/Y \equiv n$.[6]

Without loss of generality we can consolidate households and firms into a representative consumer-producer, called representative agent. The agent accumulates traded foreign bonds (assets), B, denoted in terms of the imported good, that pay the exogenously given world interest rate, r. The agent's flow budget constraint in terms of the foreign (imported) good is thus given by

$$\dot{B} = pAK - C - \Phi(I,K) + rB, \tag{1a}$$

Since the domestic economy is completely specialized in tourism production, both the consumption good and physical capital must be imported from abroad. Capital formation (investment) is associated with convex adjustment costs of the Hayashi (1982) type, expressed in terms of the foreign good, i. e.,

$$\Phi(I,K) = I\left(1 + \frac{h}{2}\frac{I}{K}\right) \tag{1b}$$

The linear homogeneity of the investment function in I and K is necessary to sustain an equilibrium of ongoing growth. Given the depreciation rate δ, which may be quite high as hotels and resorts require constant refurbishing, the change in the capital stock and investment are related by

$$\dot{K} = I - \delta K. \tag{1c}$$

The representative agent chooses the level of consumption of the imported good, C, the rates of investment, I, and of bond accumulation, to maximize his intertemporal utility function

$$W \equiv \int_0^\infty \frac{1}{\gamma} C^\gamma e^{-\beta t} dt, \quad -\infty < \gamma < 1, \tag{2}$$

[5]There is a lot of empirical evidence that the income elasticity of tourism demand is well above unity (see, e. g., Syriopoulos (1995), and Lanza, Temple, and Urga (2003), reporting income elasticities in the range between 1.75 and 7.36), and that the price elasticity is quite low (Lanza, Temple, and Urga (2003) derived price elasticities in the range between 1.03 and 1.82). See also the comparison of different studies on elasticities in Garín-Muños (2007).

[6]Time derivatives will be denoted by dots above the variable concerned, $\dot{x} \equiv \frac{dx}{dt}$.

subject to the constraints (1) and the historically given initial stocks of capital $K(0) = K_0$ and traded bonds $B(0) = B_0$. The instantaneous utility function is of the constant elasticity of substitution form, with elasticity $1/(1-\gamma)$. β is the rate of consumer time preference, taken to be constant. The Hamiltonian of the agent's optimization problem can be written as

$$H \equiv \frac{1}{\gamma}C^{\gamma} + \lambda\left[pAK - C - \Phi(I,K) + rB\right] + \zeta\left[I - \delta K\right]$$

where λ is the shadow value of wealth in the form of traded foreign bonds and can be interpreted as the marginal utility of wealth in the form of traded bonds, and ζ measures the shadow value of capital. Performing the optimization gives rise to the following optimality conditions:

$$C^{\gamma-1} = \lambda \tag{3a}$$

$$1 + h\frac{I}{K} = \frac{\zeta}{\lambda} \equiv q \tag{3b}$$

$$\beta - \frac{\dot{\lambda}}{\lambda} = r \tag{3c}$$

$$\frac{pA}{q} + \frac{\dot{q}}{q} + \frac{(q-1)^2}{2qh} - \delta = r \tag{3d}$$

together with the transversality conditions

$$\lim_{t\to\infty} \lambda B e^{-\beta t} \lim_{t\to\infty} \lambda q K e^{-\beta t} = 0. \tag{3e}$$

Equation (3a) equates the marginal utility of consumption of the imported good to the marginal utility of wealth in the form of foreign bonds. Equation (3b) gives rise to a Tobin q theory of investment. It equates the marginal cost of investment (new capital) to its market price, both expressed in terms of the foreign good.[7] Equations (3c) and (3d) are dynamic no-arbitrage conditions. They equate the rates of return on consumption and of investment in capital to the rate of return on bonds, i. e., the interest rate. The rate of return on capital comprises four elements: The first is the dividend yield (marginal value product of capital over its market price), the second the capital gain, the third reflects the fact that an

[7] Note that q is the ratio of the marginal utility of an additional unit of installed capital, γ, over the the marginal utility of traded bonds, λ, which can also be interpreted as the marginal cost of an additional unit of uninstalled capital, because one unit of uninstalled capital trades for one foreign bond.

additional benefit of a higher capital stock is to reduce the installation costs, which depend on (I/K), associated with new investment, whereas the forth represents a loss due to the depreciating capital stock.

Taking the time derivative of (3a) and combining with (3c) gives the consumption growth rate

$$\frac{\dot{C}}{C} = \frac{\beta - r}{\gamma - 1} \equiv \psi_C \tag{4a}$$

which is solely determined by the preference parameters β and γ and the world interest rate r. The agent's consumption evolves therefore according to

$$C(t) = C(0)e^{\psi_C} \tag{4b}$$

where the initial rate of consumption $C(0)$ is to be endogenously determined in macroeconomic equilibrium.

3. Macroeconomic equilibrium

The macroeconomic equilibrium of this intertemporal general equilibrium model is defined to be a situation in which all the planned supply and demand functions are derived from optimization behavior, the economy is continually in equilibrium, and all anticipated variables are correctly forecasted. We will call this concept a "perfect foresight equilibrium".[8] In particular, macroeconomic equilibrium requires the market for domestically produced tourism services to be continuously cleared, that is

$$AK = \alpha Y^{\sigma} p^{-\varepsilon} \tag{5}$$

what is guaranteed by proper adjustments of the relative price p.

The equilibrium dynamics of the capital stock follow from (1c) and (3b) as

$$\frac{\dot{K}}{K} = \frac{I}{K} - \delta = \frac{q-1}{h} - \delta$$

[8] See, e. g., Brock and Turnovsky (1981), p. 180.

Continuous goods market clearance (see (5)) implies

$$\frac{\dot{K}}{K} = \sigma\frac{\dot{Y}}{Y} - \varepsilon\frac{\dot{p}}{p}$$

Hence, the capital stock evolves according to

$$\frac{\dot{K}}{K} = \frac{q-1}{h} - \delta = \sigma\frac{\dot{Y}}{Y} - \varepsilon\frac{\dot{p}}{p} \tag{6}$$

which can be solved for the rate of change in the relative price p. Thus, equations (6) and (3d) give the following equilibrium dynamics for the relative price p and the market price of installed capital, q:

$$\frac{\dot{p}}{p} = \frac{1}{\varepsilon}\left(\sigma n + \delta - \frac{q-1}{h}\right) \tag{7a}$$

$$\frac{\dot{q}}{q} = r + \delta - \frac{pA}{q} - \frac{(q-1)^2}{2qh} \tag{7b}$$

where we have made use of the fact that $\dot{Y}/Y \equiv n$. System (7) implies constant steady-state values for p and q, hence the steady-state growth rate of the capital stock is

$$\frac{\dot{\tilde{K}}}{\tilde{K}} = \sigma n$$

The linearized version of system (7) is

$$\begin{pmatrix} \dot{q} \\ \dot{p} \end{pmatrix} = \begin{pmatrix} (r-\sigma n) & -A \\ -\frac{\tilde{p}}{\varepsilon h} & 0 \end{pmatrix} \begin{pmatrix} q-\tilde{q} \\ p-\tilde{p} \end{pmatrix} \tag{8}$$

Because the determinant of the matrix in (8) is negative, the system has one negative and one positive eigenvalue, denoted by $\mu_1 < 0$ and $\mu_2 > 0$, and is therefore saddle-path stable. The stable root μ_1 is the economy's speed of convergence during transition to steady state. The eigenvalues satisfy $\mu_1 + \mu_2 =$

$r - \sigma n > 0$.[9] The stable solutions for the relative price, p, and the market price of capital, q, are:[10]

$$p(t) - \tilde{p} = (p_0 - \tilde{p})\, e^{\mu_1 t} \tag{9a}$$

$$q(t) - \tilde{q} = \frac{A}{r - \sigma n - \mu_1}\,(p_0 - \tilde{p})\, e^{\mu_1 t} \tag{9b}$$

from which the stable saddle-path

$$q(t) - \tilde{q} = \frac{A}{r - \sigma n - \mu_1}\,(p(t) - \tilde{p}) \tag{10}$$

follows. It is a positively sloped line in (p,q)-space.

Because along the equilibrium balanced growth path $\tilde{K}$ and $\alpha\tilde{Y}^{\sigma}\tilde{p}^{-\varepsilon}$ (tourism demand) grow at rate σn, it is useful to define the "scale-adjusted" variables

$$k \equiv \frac{K}{Y^{\sigma}}, \quad c \equiv \frac{C}{Y^{\sigma}}, \quad b \equiv \frac{B}{Y^{\sigma}}$$

Written in scale-adjusted form, the dynamics for the capital stock are

$$\dot{k} = \left(\frac{q-1}{h} - \delta - \sigma n\right) k \tag{11}$$

Linearizing around the steady state and using (9b) results in

$$\dot{k} = \frac{\tilde{k}}{h}\,(q - \tilde{q}) = \frac{\tilde{k}A}{h(r - \sigma n - \mu_1)}\,(p_0 - \tilde{p})\, e^{\mu_1 t}$$

Thus, k evolves according to

$$k(t) = \tilde{k} + \frac{\tilde{k}A}{\mu_1 h(r - \sigma n - \mu_1)}\,(p_0 - \tilde{p})\, e^{\mu_1 t} \tag{12}$$

[9]Note that the transversality condition $\lim_{t\to\infty} \lambda q K e^{-\beta t} = 0$ requires $r > \sigma n$.

[10]Note that because of goods market clearance (equation (5)) $p(0)$ cannot change upon a change in the growth rate of foreign income, which leaves the time $t = 0$ level of demand constant. Hence, $p(0) = p_0$ is historically given. In contrast, the market price of installed capital, q, is free to jump upon arrival of new information.

The agent's flow budget constraint (1a), i. e., the current account, becomes

$$\dot{b} = (r - \sigma n)b + \left(pA - \frac{q^2 - 1}{2h}\right)k - c \tag{13}$$

Linearizing around steady state, solving and invoking the transversality conditions gives the stable evolution for scale-adjusted bonds b (see the appendix) and the initial level of scale-adjusted consumption $c(0)$

$$b(t) = \frac{L}{\mu_1 - r + \sigma n} e^{\mu_1 t} - \frac{c(0)}{\psi_C - r} e^{(\psi_C - \sigma n)t} - \frac{M}{r - \sigma n} \tag{14a}$$

$$c(0) = (r - \psi_C)\left(b(0) + \frac{L}{r - \sigma n - \mu_1} + \frac{M}{r - \sigma n}\right) \tag{14b}$$

(14b) is effectively the economy's intertemporal budget constraint and reflects the present value of resources available for initial consumption after the investment needs along the transitional path have been met. The term $M/(r - \sigma n)$ reflects the resources available for consumption if the economy were to reach the new steady state instantaneously, while $L/(r - \sigma n - \mu_1)$ reflects an adjustment due to the fact that the new steady state is reached only gradually. We observe from (14a) that traded bonds are subject to transitional dynamics, in the sense that their growth rate $\dot{b}/b$ varies through time. There are two cases. First, if $\psi_C < \sigma n$, $b \to -M/(r - \sigma n)$ so that asymptotically bonds $B(t)$ grow at the same rate as capital, σn. Second, if $\psi_C > \sigma n$, the scale-adjusted stock of traded bonds grows at the rate $\psi_C - \sigma n$, with the aggregate stock of traded bonds, B, growing at the rate ψ_C. Which case is relevant depends critically upon the size of the consumer rate of time preference relative to the rate of return on investment opportunities, among other parameters.[11]

Finally, we turn to the growth rate of the capital stock,

$$\frac{\dot{K}}{K} \equiv \psi_K = \sigma n - \frac{\dot{p}}{p} = \frac{q - 1}{h} - \delta$$

Linearizing around the steady state, using the stable solution (9b) for q, we obtain

$$\psi_K = \tilde{\psi}_K + \frac{A}{h(r - \sigma n - \mu_1)} [p_0 - \tilde{p}] e^{\mu_1 t} \tag{15}$$

[11]This issue is discussed in detail in Turnovsky (1996).

with $\tilde{\psi}_K = \sigma n$. Thus we have $\text{sgn}(\psi_K - \tilde{\psi}_K) = \text{sgn}\,[p_0 - \tilde{p}]$. If the initial relative price p_0 falls below its steady-state level, the growth rate of the capital stock during transition is lower than along the steady-state balanced growth path.

4. Analysis of an increase in foreign income growth

Steady state changes

Since our model assumes perfect foresight, the dynamic evolution of the economy and hence the transitional adjustment is determined in part by agents' expectations of the ultimate steady-state. It is therefore convenient to start our analysis with the investigation of the long-run steady-state effects of an increase in the growth rate of foreign income, $\dot{Y}/Y \equiv n$.The balanced growth rate of the capital stock (and thus of tourism production, $\tilde{\psi}_T$) changes according to

$$\frac{d\tilde{\psi}_K}{dn} = \sigma > 0 \tag{16a}$$

whereas the consumption growth rate ψ_C remains constant.

Since the relative price of tourism remains constant in steady state, equation (6) immediately gives the steady state value of the market price of capital

$$\tilde{q} = 1 + h(\sigma n + \delta)$$

Hence, the steady-state change of q is

$$\frac{d\tilde{q}}{dn} = h\sigma > 0 \tag{16b}$$

Differentiating the no-arbitrage condition (3d) at steady state, using (16b), the steady-state change of the relative price of tourism immediately follows as

$$\frac{d\tilde{p}}{dn} = \frac{h\sigma}{A}(r - \sigma n) > 0 \tag{16c}$$

The intuition about these steady-state changes is straightforward: An increase in tourism demand growth leads to an equal increase in steady-state tourism production growth, requiring an equal increase in the balanced growth rate of the capital stock, too, because $\psi_T = \psi_K$. In turn, a faster growing capital stock requires an increase in the market price of installed capital, $\tilde{q}$. Finally, a permanently booming tourism demand leads to a higher relative price $\tilde{p}$ of tourism production, i. e., to an improvement of the economy's terms of trade. The reason for this can be found in the transitional dynamics and is described below.

As can be seen from the steady-state changes, the effects of a change in foreign income growth n on the small island economy are the more pronounced the higher the income elasticity of tourism demand σ. On the other hand, the price elasticity ε does not affect the steady state, but the speed of convergence, μ_1. It can be shown that an increase in price elasticity ε lowers the speed of convergence.[12]

Impact effects

Having described the long-run effects of higher tourism demand growth, we turn to the short-run (impact) effects.

Since the capital stock K_0 and hence tourism production is historically given and because only the growth rate n changes, but not the level of Y, the impact effect on tourism production as well as on the price of tourism is zero, i. e.,

$$\frac{dT(0)}{dn} = \frac{dK(0)}{dn} = \frac{dp(0)}{dn} = 0 \tag{17a}$$

But the expectation of a higher long-run price of tourism services increases the expected future dividend yield, resulting in an increase in the market price of installed capital, as for investors the capital stock becomes more valuable. This can be seen by differentiating equation (9b) at time 0, inserting the steady-state changes and simplifying

$$\frac{dq(0)}{dn} = \frac{d\tilde{q}}{dn} - \frac{A}{r - \sigma n - \mu_1}\frac{d\tilde{p}}{dn} = -\mu_1 h\sigma > 0 \tag{17b}$$

Note that this initial reaction is entirely forward-looking, as it depends on the new steady-state of the economy. The adjustment of q at time $t = 0$ ensures no-arbitrage between capital and traded bonds thereafter. Equation (9a) implies that the relative price of tourism will rise over time, as $\dot{p}(0) > 0$. Since q increases, investment expenditures and thus capital accumulation both rise. The impact on the capital

[12]To see this, consider the characteristic equation of (8), $\mu^2 - \mu(r - \sigma n) - A\tilde{p}/(\varepsilon h) = 0$, from which it follows $d\mu_1/d\varepsilon = -A\tilde{p}/[\varepsilon^2 h(2\mu_1 - (r - \sigma n))] > 0$, where $\mu_1 < 0$. Hence μ_1 becomes smaller in absolute terms.

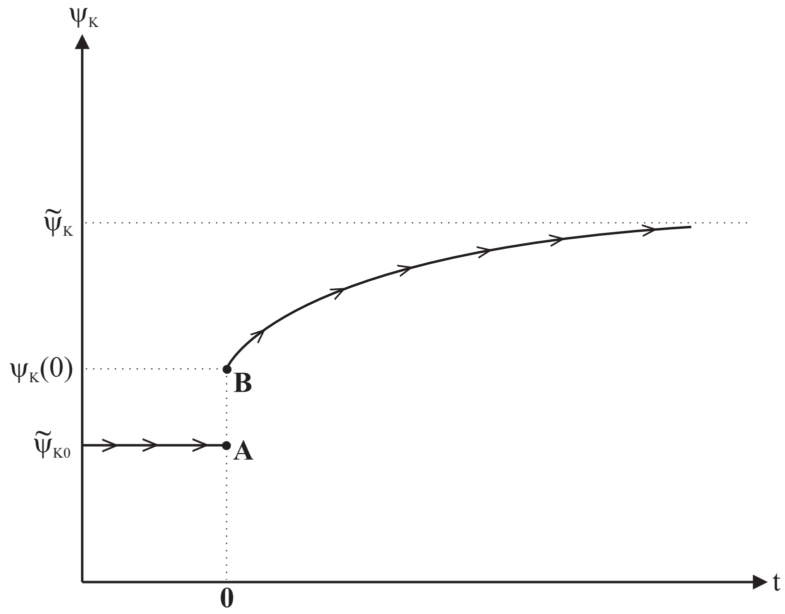

Figure 1: Growth rate of capital stock

stock's (and thus tourism production's) growth rate can be derived from equation (15)

$$\frac{d\psi_K(0)}{dn} = \frac{d\psi_T(0)}{dn} = \frac{d\tilde{\psi}_K}{dn} - \frac{A}{h(r-\sigma n-\mu_1)}\frac{d\tilde{p}}{dn} = -\frac{\sigma\mu_1}{r-\sigma n-\mu_1} > 0 \tag{17c}$$

The initial response of scale-adjusted consumption $c(0)$ follows from (14b), and is given by

$$\frac{dc(0)}{dn} = (r-\psi_C)\left[\frac{1}{r-\sigma n-\mu_1}\frac{dL}{dn} + \frac{1}{r-\sigma n}\frac{dM}{dn}\right] \tag{17d}$$

The effect of an increase in the growth rate of foreign income on initial consumption is ambiguous and depends upon the net effect of the overall resources after investment needs have been met.

Dynamic transition

We now turn to the transitional dynamics of the economy. Since the increase in foreign income growth does not affect the consumption growth rate ψ_C, after its impact level response consumption continues to grow at the same rate as before the shock emerged. However, as equation (15) reveals, the growth rate of the capital stock, although its increase on impact, is lower than in the new steady state. Thus, higher foreign income growth transmits slowly to the economy. The time path of the growth rate of the capital stock, ψ_K, is shown in figure 1. After its initial upward jump from point A to point B, it approaches the new balanced growth rate $\tilde{\psi}_K$ monotonically from below.

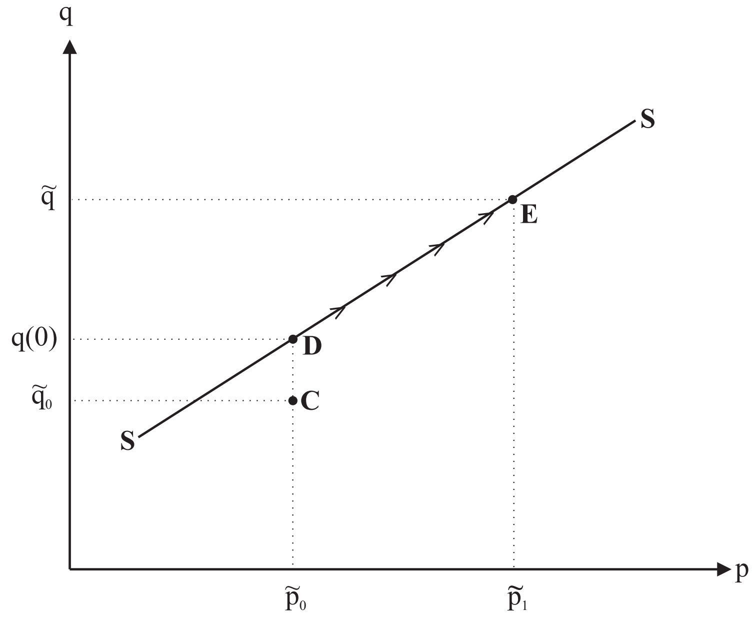

Figure 2: Dynamics of p and q

Because the capital stock and thus production of tourism services grow at a rate lower than the growth rate of demand induced by foreign income growth($\psi_K(t) = \psi_T(t) < \sigma n$), goods market clearance requires the price of tourism services and thus the terms of trade to increase over time to maintain tourism demand on the level of tourism production. The gradually rising relative price of tourism services follows formally from (9a). In light of equation (6), the growing price of tourism services introduces a drag on the capital growth rate. As p rises over time, the value of the marginal product of capital in terms of the foreign good, pA, increases, making capital more attractive and thus raising its market price q. In turn, the gradually increasing q raises investment expenditures and speeds up the growth rate of the capital stock and hence of tourism production. As thus tourism production growth becomes higher over time, the gap between ψ_T and σn becomes smaller, slowing down the growth rate of the relative price of tourism services, $\dot{p}/p$, to keep tourism demand in line with supply. These dynamic adjustments are illustrated in figure 2. At time 0, when n rises, the market price of installed capital, q, jumps from the original steady state, point C, up to point D, located the new saddle-path *SS*. From thereon, the economy moves along *SS*, with gradually increasing prices q and p. Eventually, the small island economy settles down at the new steady steady state, point E, where all transitional adjustments are completed and the economy grows with rate $\tilde{\psi}_K = \sigma n$ along its balanced growth path.

It is worth investigating the reason why the small island economy, producing tourism services, shows transitional dynamics, which stands in sharp contrast to the standard endogenous growth small open economy model, see, e. g., Turnovsky (1996), in which the economy is always on its balanced growth path. To understand why there are transitional dynamics in our model, suppose on the contrary that the economy instantaneously grows at its new balanced growth rate, implying thus via goods market clearance a constant and unchanged relative price of tourism services, $p = p_0$. For a higher growth rate of capital to be attractive, a higher market price of installed capital is required. But without transitional dynamics, q would be always at steady state. Thus, given the constancy of the tourism price p, the no-arbitrage condition (3d) would be violated, and the resulting situation would not be an equilibrium. In other words, without an increasing price p, the return on capital would not change, and investors would not have an incentive to increase the investment rate, which would be necessary to support faster growth. Hence, because goods market clearance requires that on impact the relative price of tourism services, p, cannot change, but the economy must ultimately reach its new balanced growth path, transitional dynamics necessarily emerge. Intuitively, it takes time to meet an increase in the growth rate of tourism demand, because it is costly to rise the speed at which tourism facilities are constructed. Therefore, a booming tourism demand will lead to transitional dynamics, where higher production growth is accompanied by price increases (terms of trade improvements), as one can observe in reality.

Note also that adjustments in the relative price of tourism services, p, are not able to isolate the economy from foreign income growth changes. This would require p to grow at rate $(\sigma/\varepsilon)n$, to keep tourism demand growth in line with the (given) growth in tourism production. But then, because of ongoing changes in p, the marginal value product of capital pA changes, thus, given unchanged capital stock growth and hence a constant q, violating again the no-arbitrage condition for capital. Hence, contrary to conventional wisdom, a flexible relative price (real exchange rate) is not able to protect the island economy from changes in foreign growth, as long as they show up in changes in tourism demand growth.

We can thus summarize that our simple model is able to support the tourism led growth hypothesis (TLGH). Ongoing growth in tourism demand enables the small island economy to grow, too, as the revenues from higher future exports of tourism services relax the economy's intertemporal budget constraint. The small country can thus increase it's investments, resulting in a faster growing capital stock, which in turn raises tourism service production. The model also confirms the theoretical and empirical findings of earlier papers (cited in the introduction, e. g., Lanza, Temple, and Urga (2003)) that the country's terms of trade increase during transition.

5. Conclusion

In this paper we studied the effects of an increase in foreign income growth, translating in an increase in the growth rate of tourism demand, on economic key variables of a small island economy that is completely specialized in the production tourism services by means of an AK technology. We found that an increase in the growth rate of foreign income initiates transitional dynamics, as the economy cannot (i) immediately move along its new balanced growth rate and (ii) be isolated from the rest of the world's developments via proper price adjustments. The increase in foreign income growth, leading to a boom in tourism demand, is met by a higher rate of capital accumulation and thus tourism production and a gradually increasing price of tourism services (i. e., the terms of trade), to keep demand in line with supply. The increasing price of tourism services makes investments into tourism production more attractive, speeding thus up its growth rate. Hence, as time passes, the island economy experiences a phase of increasing growth. Eventually, it reaches its new balanced growth path, where prices remain constant and the economy's growth rate is proportional to the growth rate in foreign.

Despite the simplicity of the model, it highlights the dynamic effects and the transmission of changes in growth abroad and replicates some stylized facts. It thus can serve as a starting point for more sophisticated models, in which e. g., a second (industrial) sector to the tourism sector may be added.

Of course, it will be important to contrast the model with data, that is to test if growth in tourism demand really causes economic growth in a small island economy. While this is an interesting topic on its own, it is beyond the scope of this paper and left for further research.

A. Appendix

A.1. Solution of $b(t)$

Linearizing (13) around a hypothetical steady-state, noting that $\dot{\tilde{b}} = 0$, we get

$$\dot{b} - (r - \sigma n)(b - \tilde{b}) = A\tilde{k}(p - \tilde{p}) - \left(\tilde{p}A - \frac{\tilde{q}^2 - 1}{2h}\right)(k - \tilde{k}) - \frac{\tilde{q}\tilde{k}}{h}(q - \tilde{q}) - (c - \tilde{c}) \tag{A.1}$$

Using $c(t) = c(0)\exp[(\psi_C - \sigma n)t]$, the stable solutions for k, equation (12) and q, equation (9b), and the definition of the steady-state of b,

$$-(r-\sigma n)\tilde{b} = \left(\tilde{p}A - \frac{\tilde{q}^2 - 1}{2h}\right)\tilde{k} - \tilde{c},$$

(A.1) can be written as

$$\dot{b} - (r-\sigma n)b = Le^{\mu_1 t} - c(0)e^{(\psi_C - \sigma n)t} + M \tag{A.2}$$

L and M are defined as

$$L \equiv \left[A\tilde{k} + \left(\tilde{p}A - \frac{\tilde{q}^2-1}{2h} + \mu_1\tilde{q}\right)\frac{\varepsilon\tilde{k}}{\tilde{p}}\right](p_0 - \tilde{p}) \tag{A.3}$$

$$M \equiv \left[\tilde{p}A - \frac{\tilde{q}^2-1}{2h}\right]\tilde{k} \tag{A.4}$$

where for notational convenience we have made use of the fact that from the system's eigenvectors it follows that

$$-\frac{\mu_1\varepsilon h}{\tilde{p}} = \frac{A}{r-\sigma n-\mu_1} > 0$$

L denotes the difference between output and investment costs along the stable saddle path. M measures the difference between steady-state production and steady-state investment costs.

Multiplying (A.2) by the integrating factor $e^{-(r-\sigma n)t}$, and performing the integration yields

$$\begin{aligned} b(t) = &\left[b_0 - \frac{L}{\mu_1 - r + \sigma n} + \frac{c(0)}{\psi_C - r} + \frac{M}{r-\sigma n}\right]e^{(r-\sigma n)t} \\ &+ \frac{L}{\mu_1 - r+\sigma n}e^{\mu_1 t} - \frac{c(0)}{\psi_C - r}e^{(\psi_C - \sigma n)t} - \frac{M}{r-\sigma n} \end{aligned} \tag{A.5}$$

The transversality condition for B, $\lim_{t\to\infty}\lambda Be^{-\beta t} = 0$, can be rewritten as $Y_0^{\sigma}\lambda(0)\lim_{t\to\infty} b(t)e^{(\sigma n - r)t} = 0$. Inserting (A.5), this is met if

$$b_0 - \frac{L}{\mu_1 - r+\sigma n} + \frac{c(0)}{\psi_C - r} + \frac{M}{r-\sigma n} = 0 \tag{A.6}$$

$$\psi_C < r. \tag{A.7}$$

(A.6) is the economy's intertemporal budget constraint and determines $c(0)$ and thus $\lambda(0)$. (A.7) introduces an upper bound on $\psi_C \equiv \frac{r-\beta}{1-\gamma}$ and can be rewritten as $\gamma < \frac{\beta}{r}$, and defines thus an upper bound on the intertemporal elasticity of substitution $1/(1-\gamma)$. Hence, the solution of b consistent with long-run solvency becomes

$$b(t) = \frac{L}{\mu_1 - r + \sigma n} e^{\mu_1 t} - \frac{c(0)}{\psi_C - r} e^{(\psi_C - \sigma n)t} - \frac{M}{r - \sigma n}. \tag{A.8}$$

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