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Modeling economic growth with tourism for small open economies

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Abstract

The purpose of the paper is to develop an economic growth model and analyze the impact of changes in tourists' income on the growth of tourism dependent small open economies. We use a general theoretical construct to answer the question of how the price elasticity of tourism demand, income elasticity of tourism demand, and the concentration in the service sector influence the economic development of small economies. One of the main results is that the policy planners in small open economies may consider specific policies to influence the strength of market competition. An ensuing effect of such policies is that the labor incomes will increase. The approach provides a microeconomic foundation for macroeconomic modeling which can be used for applied research, and the model can be easily extended to examine other dimensions of economic development.

1 | INTRODUCTION

International tourism grew by 5 percent in 2013 in terms of tourist arrivals, thus showing a record increase of 52 million people travelling the world over in a single year from its already achieved milestone of 1 billion tourists in 2012. The 2013 tourist arrival number is around 1,087 million and is projected to grow further. In terms of monetary contribution, international tourism receipts has reached US$1159 billion worldwide in the same year compared to US$1078 billion the previous year (World Tourism Organization [UNWTO], 2014).

Taking into account the contribution of tourism on GDP from the World Travel & Tourism Council (http://www.wttc.org/datagateway/) in 2013, countries which show high dependency of tourism include Seychelles (58 percent), Anguilla (59 percent), Antigua and Barbuda (60 percent), Aruba

(85 percent), Barbados (36 percent), Cook Islands (49 percent) former Dutch Antilles (48 percent), St. Lucia (37 percent), British Virgin Islands (85 percent), Fiji (38 percent), Macau (95 percent), Maldives (78 percent), and Vanuatu (51 percent).

The growth impact of tourism is magnified in the midst of temporary cross-border flows of people resulting in knowledge diffusion, innovation, and transfer (Andersen & Dalgaard, 2011; Hovhannisyan & Keller, 2015). Noting the huge impact of tourism, we develop an economic growth model for small countries whose economies depend largely on international tourism. The model can be considered an important tool to examine the impact of the changes in foreign income on the economic development of small economies which are largely dependent on tourism. Additionally, we investigate the role of price elasticity of demand, the market structure in the tourism sector, and the influence of land rents on savings and the balance of payments.

The literature so far have examined theoretical models of tourism (Brida, London, & Rojas, 2013; Chao, Hazari, Laffargue, Sgrò, & Yu, 2005; Schubert & Brida, 2008; among others) with lesser regard to small open economies. Small open economies face a number of constraints such as, limited amount of available land and in most cases, heavy reliance on a single (service) industry, among others, that affects its economic development. A lot of studies have examined the role of tourism using straight forward econometric estimations (cf. Brida & Pulina, 2010; Song, Dywer, Li, & Zheng, 2012 and the cited literature therein). Although such studies are useful in providing the magnitude and direction of influence of tourism on growth, a number of these studies lack the microeconomic foundation of macroeconomic model building and hence have limited scope for extension to other important dimensions related to tourism.

The model we present in the paper is an extension of Schubert, Brida, and Risso (2011) who attempt to overcome some of the limitations. Schubert et al. study the effects of foreign income growth on important economic variables of a small economy, which, like in our model, is fully specialized in tourism by using a simple AK production function. Thus, capital is the only productive factor in the model. They conclude that the growth of the output of the destination country is given by the income elasticity of demand times the growth in the output of the source country. While the demand for tourism is taken from Schubert et al., our model is based on the assumption that a composite tourism good is produced by the use of land and a number of intermediate services, where the latter are produced by labor and supplied in a market with monopolistic competition. Another difference is that we use an overlapping-generations (OLG) approach (Diamond, 1965) to model the consumer side of the domestic economy instead of using the continuous time approach (Cass, 1965; Koopmans, 1965) which in principle is a special case of an OLG model with perfect altruism in the sense of Barro (1974). Furthermore, our model complements a number of earlier studies in this direction such as: Brida et al. (2013), who analyze the role of human capital accumulation; Schubert and Brida (2008), who investigate in the dynamic effects of subsidies for the tourism industry; Chao, Hazari, and Yu (2010), who consider the outcomes of quotas and aid; Chao et al. (2005), who explore the role of tourism regarding job creation and capital accumulation; Hazari and Sgrò (1995) and Hazari and Kaur (1995), who examine the role of a monopoly in the non-traded goods sector on welfare and arrive at the result that a monopoly may lower the welfare of domestic residents; and Chao, Hazari, Laffargue, Sgrò, and Yu (2006), who investigate by using a specific factor model, among other things, the role of tourism with respect to the Dutch disease and welfare.

In these studies, the tourism good is characterized as a non-traded good. Moreover, except for Hazari and Sgrò (1995) and Hazari and Kaur (1995), all the other studies characterize the tourism sector as perfectly competitive; and except for Schubert et al. (2011), all other studies assume that both the tourists and locals consume this good. Because of these differences, it is difficult to compare the results of our study with the respective studies mentioned above.

In our case, we assume a monopolistic competition in the tourism sector and where the local residents do not consume this good. Subsequently, we note that the degree of market concentration in the tourism sector influences the income and welfare. The aim of the paper is to develop a growth model which is based on a service sector and in which the amount of land useful for tourism has an important consideration. We use an approach of Romer (1989, 1990) with insights from Dixit and Stiglitz (1977) and Ethier (1982). The remainder of the paper is organized as follows. In the next section, we introduce the model and derive the equilibrium values. Thereafter, we explore the role of competition in the tourism sector and how the government can influence the degree of competition by taxation and subsidies. In Section 4, we analyze the short-run and long-run effects induced by a change of income of the tourists and a change of the income growth rate of the tourists. Finally, we conclude.

2 | THE MODEL

2.1 | The demand for tourism

We assume that a composite tourism good X^T, consists of all the goods and services consumed by tourists at their holiday destination. This composite good may consists of meals in restaurants, hotel stays, and transport at the holiday destination (Schubert et al., 2011; Song & Witt, 2000). The use of a composite good at a macroeconomic level implies that tourists must be homogenous with respect to the basket of goods and services they consume at the tourist destination. To make the model tractable, the demand function for the composite tourism good $X^{T,D}$ is given by:

$$X^{T,D}=\gamma\left(p^T\right)^{-\eta}\left(Y^F\right)^{\phi}. \tag{1}$$

The coefficient $\gamma>0$ is a shift parameter, which can depend on, among other things, climate, culture, safety, and governance of the tourist destination. For simplicity, we assume $\gamma=1$. The variable p^T represents the price of the tourism good, where we assume that the exchange rates are fixed. The variable Y^F represents the aggregate real income of the tourists. The exponent η represents the absolute value of the price elasticity of demand and the exponent ϕ represents the income elasticity of demand for tourism goods. The literature estimating the price and income elasticities (Croes & Vanegas, 2005; Dritsakis, 2004; Garín-Muñoz, 2004, 2006; Garín-Muñoz & Amaral, 2000; Greenidge, 2001; Kulendran & Witt, 2001; Lanza, Temple, & Urga, 2003; Li, Wong, Song, & Witt, 2006; Lim, 2004; Lim, McAleer, & Min, 2009, 2009; Mervar & Payne, 2007; Querfelli, 2008; Song, Kim, & Chang, 2010; Song, Romilly, & Liu, 2000; Song & Witt, 2003; Song, Witt, & Li, 2003; Song & Wong, 2003; Song, Wong, & Chon, 2003; Vanegas & Croes, 2000) agree that in most cases the income elasticity ϕ exceeds the absolute value of the price elasticity η. Additionally, the majority of the results show that the income elasticity exceeds one and the price elasticities lie in the range of zero and a value exceeding one. However, only three studies take small country destinations into consideration—Vanegas and Croes (2000) who estimate the elasticities of U.S. tourists in Aruba, Greenidge (2001) who estimate the price elasticity of British and Canadian tourists in Barbados, and Croes and Vanegas (2005) who use Barbados as tourism destination and estimate the elasticities of Dutch, U.S., and Venezuelan tourists. From these studies, we can derive the price elasticities of Dutch, British, Venezuelan, and the U.S. tourists are between 0.044 and 1.62.[1] Additionally, all three studies found values for the income elasticity greater than one. The fact that income elasticity is bigger than one raises some serious theoretical concerns because this is not an outcome of a representative agent approach. The reason is that

[1]Seetaram, Forsyth, and Dwyer (2016) raise serious concerns, if using the real exchange rate as price indicator is appropriate to estimate the price elasticity. They conclude that the real price elasticity is probably much higher than the respective estimations indicate.

the Gorman form of the indirect utility (Fisher, 1987) cannot provide an income elasticity exceeding one.

To assume an income elasticity exceeding one in a growth model is also problematic because this implies that in the very long run, the whole income of tourists will be spent on the tourism good. Such a long-run development seems unreasonable. However, if this happens for some reasons, then at least the income elasticity will become necessarily one because expenditures cannot grow faster than the income. One possible reason explaining why the estimated income elasticities may exceed one is when tourism becomes affordable for increasing number of citizens of the source countries. However, if the demand function strictly follows a microeconomic foundation or is consistent with a long-run growth process, then the income and price elasticity will take the value of one only. These assumptions imply that all individuals of the source countries have a homothetic utility function.

2.2 | The residents of the tourism destination

We begin with Diamond's (1965) OLG model in its canonical form to describe the consumption side of the economy. We assume that all land of the country is distributed equally and owned by its residents, and the country is populated only by national citizens.[2] Furthermore, we suppose a constant population and each generation consists of N individuals. In every period, there are two generations, a young one and an old one. Thus, the total population amounts to $2N$ adult individuals.[3] The members of the young generation supply their labor inelastically and save a part of their labor income and their land rent income. The members of the old generation do not work and live exclusively from the interest income which is a result of their savings from the previous period and from the land rent income. Thus, the underlying utility function U_t is a log-linear one:

$$U_t\left(c_t^1, c_{t+1}^2\right) = \ln c_t^1 + q \ln c_{t+1}^2. \tag{2}$$

The variables c_t^1 and c_{t+1}^2 reflect the consumption in the first and second period of life and the subscripts indicate the periods. The results do not change qualitatively if: (a) we use a quasiconcave and homothetic utility function which is continuous and twice differentiable; (b) the consumption in the second period of life is a normal good; and (c) the interest elasticity of savings is non-negative. The parameter $0 < q < 1$ is the subjective discount factor. The corresponding intertemporal budget constraint of an individual has the following form:

$$p_t^I c_t^1 + \frac{p_{t+1}^I c_{t+1}^2}{R_{t+1}} = w_t + \frac{p_{L^T,t+1} L^T}{2NR_{t+1}} + \frac{p_{L^T,t} L^T}{2N}. \tag{3}$$

The wage rate is given by w_t and the interest factor by R, where we assume without loss of generality that the depreciation rate of all capital goods is 100 percent. The interest rate is determined on the international capital market and assumed as constant over time. Additionally, we assume that all consumption goods are imported from abroad and the respective import prices are p_t^I and p_{t+1}^2. The variables $p_{L^T,t}$ and $p_{L^T,t+1}$ are the rental prices for a piece of land in period t and $t+1$, respectively. The variable L^T represents the land area of the country which is used for tourism activities. Thus, in every period, each adult individual receives a share, $1/2N$, of the total land rent. A representative agent maximizes her utility given her budget constraint. Because of the assumption that all individuals are identical, the

[2]In the South Pacific between 83 and 97 percent of the land is customary land owned by the indigenous population and is not traded (Boydell, 2010).

[3]For simplicity, we ignore the childhood and assume that children make no own decisions and have no rights in their first period of life.

maximization of Equation (2) with respect to Equation (3) leads to the following optimal aggregate savings function S:

$$S_t = \frac{qw_tN}{(1+q)} + \left(\frac{qp_{L^T,t}}{(1+q)} - \frac{p_{L^T,t+1}}{(1+q)R}\right)\frac{L^T}{2}. \tag{4}$$

The aggregate savings function depends negatively on the rental price of land in the future and positively on the rental price of land in the present, the interest factor and wage income.

2.3 | The supply of the composite tourism good

Typically, the tourism sector consists of many firms offering mainly different services which are substitutable. Hence, it is reasonable to assume that the providers of tourism services in the market are characterized as monopolistic competition. We assume that the supply of land L^T, which is attractive for tourists like bathing beaches, is an important factor, and is limited in supply. Additionally, the supply of hotels and restaurants including related services are important considerations in our model. Here we define h_i as a service of type i and we assume that m different types of services are offered in a specific period. For simplicity and clarity, we consolidate this service sector as hotels. The production function of the composite tourism good has the following form:

$$X^{T,S} = A\left(L^T\right)^{\beta}\sum_{i=1}^{m} h_i^{1-\beta}, \tag{5}$$

where we assume that the production coefficient $A > 0$ and $1 > \beta > 0$. Furthermore, we assume the producers of the composite tourism good participate in a perfect competitive market. Thus, the factor prices p_i of the service goods and p_{L^T} the rental price for a piece of land are treated as given. The maximization problem of a representative firm is given by:

$$\max_{L^T,h_1,\ldots,h_m} p_T A\left(L^T\right)^{\beta}\sum_{i=1}^{m} h_i^{1-\beta} - p_{L^T}L^T - \sum_{i=1}^{m} p_i h_i. \tag{6}$$

The resulting $m+1$ first order conditions are as follows:

$$\beta p_T A\left(L^T\right)^{\beta-1}\sum_{i=1}^{m} h_i^{1-\beta} - p_{L^T} = 0. \tag{7}$$

$$(1-\beta)p_T A\left(L^T\right)^{\beta} h_i^{-\beta} - p_i = 0, \ \ \forall i = 1,\ldots,m. \tag{8}$$

From the latter m conditions, we can derive the inverse demand functions for all m service goods:

$$p_i(h_i) = (1-\beta)p_T A\left(L^T\right)^{\beta} h_i^{-\beta}, \ \ \forall i = 1,\ldots,m. \tag{9}$$

A hotel, which may offer restaurant meals and other services is a monopolist, and is confronted with constant marginal costs and fixed costs M. For example, the fixed cost reflects the construction costs of a hotel or building in which restaurants are located and equipment costs needed to supply the services. Additionally, the fixed costs do not only include what is usually incorporated in the term capital but also all costs incurred to set up a business-like licenses, registration fees, getting access to electricity, among other things.

For simplicity and without loss of generality, we can assume that the labor unit requirement of the service equals one and n_i represents the amount of labor time firm i has hired. Hence, the equality $h_i = n_i$ holds.

The representative hotel has to solve is the following maximization problem:

$$\max_{s_i} \; p_i(h_i)h_i - wn_i - RM, \tag{10}$$

where R represents the world interest factor, which is exogenous. Using the inverse demand function (Equation 7) and noting that the unit labor requirement is one, we get the following maximization problem:

$$\max_{s_i} \; (1-\beta)p_T A\left(L^T\right)^{\beta} h_i^{1-\beta} - wh_i - RM. \tag{11}$$

The resulting necessary condition for the profit maximization problem (Equation 11) is then:

$$(1-\beta)^2 p_T A\left(L^T\right)^{\beta} h_i^{-\beta} - w = 0. \tag{12}$$

Additionally, we note that all hotels are symmetric, and we assume a wage inelastic labor supply N with perfect competition in the labor market, and hence $n_i = \frac{N}{m}$ and from this it follows immediately, that $h_i = \frac{N}{m}$. From Equation (12) we can derive the wage rate:

$$w = (1-\beta)^2 p_T A m^{\beta} N^{-\beta}\left(L^T\right)^{\beta}. \tag{13}$$

The wage rate (Equation 13) related to the inverse demand function (Equation 9) is used to derive the price of a unit of hotel services:

$$p = \frac{w}{1-\beta} = (1-\beta)p_T A m^{\beta} N^{-\beta}\left(L^T\right)^{\beta}. \tag{14}$$

where $1/(1-\beta)$ is the mark-up price over the marginal cost. This means that the mark-up increases as β approaches one.

2.4 | The market equilibrium

Next, we determine the price of the composite tourism good p^T and its quantity X^T. For this purpose, we set the production function equal to the demand function for tourism (Equation 2) and get the equilibrium price as:

$$p_T = \left(Y^F\right)^{\frac{\phi}{\eta}}\left(A\left(L^T\right)^{\beta} N^{1-\beta} m^{\beta}\right)^{-\frac{1}{\eta}}. \tag{15}$$

Inserting the price of the tourism good into the equation of the wage rate (Equation 13) and the price of the service (Equation 14), we calculate the gross margin of the representative hotel Π_h:

$$\Pi_h = (1-\beta)\beta\left(Y^F\right)^{\frac{\phi}{\eta}} N^{-\frac{(\eta-1)(1-\beta)}{\eta}} m^{\frac{\beta(\eta-1)-\eta}{\eta}} (A)^{\frac{\eta-1}{\eta}}\left(L^T\right)^{\frac{\beta(\eta-1)}{\eta}}. \tag{16}$$

This positive gross margin is necessary to cover the opportunity costs of the investments. Because of the fact that the number of employees is limited, we can determine the equilibrium number of hotels. The fixed costs consist of the construction costs plus sunk costs. The capital market equilibrium condition requires that the gross margin of the representative service firm divided by its investment costs M is equal to the international capital market interest factor, R as:

$$\frac{(1-\beta)\beta(Y^F)^{\frac{\phi}{\eta}} N^{\frac{(\eta-1)(1-\beta)}{\eta}} m^{\frac{\beta(\eta-1)-\eta}{\eta}} (A)^{\frac{\eta-1}{\eta}} (L^T)^{\frac{\beta(\eta-1)}{\eta}}}{M} = R. \tag{17}$$

Solving for the equilibrium number of hotels m^*, where we allow that m^* is any positive real number, we get:

$$m^{*}=\left[\left(\frac{(1-\beta)\beta}{RM}\right)^{\eta}N^{(\eta-1)(1-\beta)}(A)^{\eta-1}\left(L^{T}\right)^{\beta(\eta-1)}\left(Y^{F}\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{18}$$

where the exponent $\frac{1}{\beta(1-\eta)+\eta} > 0$. If the demand is price inelastic, the exponent exceeds one. Inserting the equilibrium number of hotels m^* in the respective Equations (13)–(15), (5) and (7), we determine the relevant equilibrium prices, quantities, and national income:

$$w^{*}=\left[\frac{(1-\beta)^{(2\eta+\beta(1-\eta))}(A)^{n-1}\left(\frac{\beta L^{T}}{RM}\right)^{\beta(\eta-1)}\left(Y^{F}\right)^{\phi}}{N}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{19}$$

$$p^{*}=\left[\frac{(1-\beta)^{\eta}(A)^{n-1}\left(\frac{\beta L^{T}}{RM}\right)^{\beta(\eta-1)}\left(Y^{F}\right)^{\phi}}{N}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{20}$$

$$h^{*}=n^{*}=\left[\frac{N(A)^{1-n}\left(L^{T}\right)^{\beta(1-\eta)}\left(\frac{RM}{\beta(1-\beta)}\right)^{\eta}}{(1-\beta)^{\eta}\left(Y^{F}\right)^{\phi}}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{21}$$

$$p_{T}^{*}=\left[\frac{(RM)^{\beta}\left(Y^{F}\right)^{\phi(1-\beta)}}{N^{1-\beta}A\left((1-\beta)\beta L^{T}\right)^{\beta}}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{22}$$

$$p_{L^{T}}^{*}=\left[\beta^{\eta}L^{T(2\beta(\eta-1)-\eta)}(A)^{n-1}\left(\frac{(1-\beta)}{RM}\right)^{\beta(\eta-1)}N^{(1-\beta)(\eta-1)}\left(Y^{F}\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{23}$$

$$X^{T*}=\left[(A)^{n}\left(\frac{(1-\beta)\beta L^{T}}{RM}\right)^{\beta\eta}N^{(1-\beta)\eta}\left(Y^{F}\right)^{\phi\beta}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{24}$$

To calculate the national income, we multiply the RHS of Equation (24) with the RHS of Equation 22 to obtain:

$$Y^{*}=p_{T}^{*}X^{T*}=\left[(A)^{\eta-1}\left(\frac{(1-\beta)\beta L^{T}}{RM}\right)^{\beta(\eta-1)}N^{(1-\beta)(\eta-1)}\left(Y^{F}\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}}. \tag{25}$$

This nominal GDP is split into three categories of incomes: (a) labor income, (b) income from land rents, and (c) capital income, where the income shares are constant. If we divide the total labor income, which equals the wage rate (Equation 21) times the number of workers N by the national income (Equation 25), we get the labor income share, which equals $(1-\beta)^2$. Dividing the total land income, which equals the rental price of land (Equation 23) times the amount of land by the national income (Eqaution 25) leads to a land income share of β. The aggregate income of the capital owners, which is the difference between the gross margin of a hotel minus the wage payments times the number of hotels, we get: $RMm^{*}=p^{*}h^{*}m^{*}-w^{*}N$. Dividing RHS of the latter equation by the national income gives the respective capital income share, which is equal to $\beta(1-\beta)$.

The parameter β, which is also the inverse of the elasticity of hotel demand equals the Lerner index, which is interpreted as an index for measuring the market performance.[4] A low value of the Lerner index indicates strong competition and leads, according to Equations (19) and (23), to relatively high wages and low land rents. The reason is that a low β indicates a low relative contribution to the tourism good and hence labor becomes implicitly relatively more important and hence relatively scarcer. However, because of the fact that β is a technological parameter, it cannot be influenced directly. Another way to measure the market structure is the application of the Herfindahl–Hirschman index defined as the squared sum of all market shares. If the value is nearly 0, we observe perfect competition, and if the value is 1, we observe a pure monopoly. In our model with m identical hotels, $HHI = \sum_{i=1}^{m} \left(\frac{1}{m}\right)^2 = \frac{1}{m}$. Because of the fact that the government determines the sunk costs to start-up a hotel and hence it influences the number of hotels (see Equation 18), a closer look at the effects caused through the sunk costs is therefore warranted.[5]

2.5 | The role competition

The fixed costs consist of the construction costs of the hotel, the necessary equipment and so on, which are not totally sunk, and the costs to start-up a hotel business which includes legal and contractual obligations.[6] The latter costs also include the opportunity costs of time to start-up business (procedures), the costs to get electricity, the costs of gathering information, and the costs for construction permits. As noted from the analysis above, the fixed costs have an important influence on the market outcome and the respective prices and quantities because the fixed costs determine the number of hotels operating in the market which in turn determines the respective quantities and prices. The *Doing Business* reports of the World Bank indicate the amount of these costs in different countries which are noted to be substantial in most islands countries.[7]

To derive the effects of an increase of the fixed costs on the national income of the small islands economy, we differentiate Equation (25) with respect to M:

$$\frac{\partial Y^*}{\partial M} = \frac{\beta(\eta-1)}{\beta(\eta-1)+\beta}\left(\frac{1}{M}\right) Y^* \lesseqgtr 0. \tag{26}$$

Obviously, the effect on the income is not unique and it depends on the price elasticity of demand for tourism. Additionally, we summarize the effects of an increase of fixed cost on other endogenous variables in Table 1.[8]

[4]The Lerner index is defined as $LI = \frac{p^* - \left(\sum_{i=1}^{m^*} \omega_i MC_i\right)}{p^*}$, where $\omega_i = \frac{p^* h_i}{\sum_{j=1}^{m^*} p^* h_j}$ and MC_i are the marginal cost of firm i. Because of the fact that here all hotels are identical the Lerner index degenerates to $LI = \frac{p^* - MC}{p^*} = \frac{p^* - w^*}{p^*} = \beta$.

[5]Implicitly, Rodenburg (1980), Kontogeorgopoulos (1998), and Andriotis (2002) investigate a similar question empirically by examining the economic effects caused by the scale of hotels on local welfare. Their results can be interpreted in the direction that more small scale hotels are preferable than large scale hotels.

[6]A list of possible procedures and obligations of a start-up is given in Djankov, La Porta, Lopez de Silanes, and Shleifer (2002, p. 11).

[7]See http://www.doingbusiness.org/ For example, in Fiji it costs 1692 percent of the GDP per capita (2016) to get electricity, which is of course much less than the 2125 percent in 2010. Or registering the real estate property of a warehouse in Vanuatu costs 8 percent of its value.

[8]The signs can be easily derived by differentiation of Equations (19)–(24).

TABLE 1 Effects on the variables caused by increase of fixed costs

	m^*	p^*	w^*	h^*	Π_h^*	$p_{L^T}^*$	p_T^*	X^{T*}	Y^*
$\eta>1$	↓	↓	↓	↑	↑	↓	↑	↓	↓
$\eta=1$	↓	–	–	↑	↑	–	↑	↓	–
$\eta<1$	↓	↑	↑	↑	↑	↑	↑	↓	↑

Notes. "↓," "↑," and "−" indicates "decrease", "increase," and 'no change," respectively.
Source. Authors' own estimation.

Independent of the price elasticity of demand for tourism, the increase of the fixed costs leads to a decrease of number of hotels, an increase of quantity of services per hotel and an increase of the gross margins of the hotels. These outcomes are not surprising. However, the price elasticity of demand determines if the national income and the factor prices—the wages and the rental price of land—will decline or rise. In the case of an elastic demand for tourism, the national income, and thus the wages and the rental price of land will decline if the fixed costs increase. If the price elasticity of demand for tourism is inelastic, the reverse holds. The results show, the price elasticity of demand is of huge importance in policy making.

Proposition 1. *If the price elasticity of demand for tourism is elastic, an increase of the fixed costs of tourism services will lead to a fall of national income and the factor prices for labor and land. If the price elasticity is inelastic, the reverse holds.*

From Proposition 1, we can derive the paradoxical result that the higher the administrative costs incurred to start-up a hotel, the higher is the income and welfare of the island economy given the demand for tourism is price inelastic.[9] Usually, according to Djankov, La Porta, Lopez de Silanes, and Shleifer (2002), fees are charged for starting up a business because: first, the intention is to protect incumbents in the market (Peltzman, 1976; Stigler, 1971; Tullock, 1967); second, the intention is to create rents for politicians and bureaucrats (De Soto, 1989; McChesney, 1987; Shleifer & Vishny, 1993, 1998); and third, the intention is to prevent market failures (Pigou, 1938). While the former two intentions are in general criticized as a sign of policy failure, the latter is welcomed because it prevents market failures, which otherwise would create greater welfare losses. However, the general recommendation derived from economic theory and proposed by the World Bank and Organization for Economic Cooperation and Development is to reduce these transaction costs to the most efficient level. In contrast to this recommendation, we get the result that increasing the transaction costs enhances the welfare of the islanders as long as the demand for tourism is price inelastic.

Conversely, if the demand for tourism is price elastic, the effect of increasing sunk costs lead to the opposite results. Thus, a subsidy to lower the start-up costs can be justified. To investigate the question if a subsidy is justified, we apply a simple tax-subsidy mechanism. We introduce a tax rate τ, which is a subsidy if its value is negative. The government taxes the fixed costs investment and from the view of an investors, this is given by $M(1+\tau)$. Additionally, in the case of a tax the government generates a tax revenue of $\tau R m^* M$ and in the case of a subsidy, the islanders have to pay a tax.[10]

[9]It must be noted that because of the iso-elastic demand function tourists are willing to pay every price; they only reduce the quantity demanded accordingly. This is of course not very realistic, what does not mean that the derived results are not correct for some price range using a more realistic demand function.

[10]Implicitly we assume for simplicity that government collects the tax at the beginning of the period, invests the tax revenue until the end of the period at the world market interest factor R and then it distributes tax revenue including interest equally to the citizens.

The modified national income becomes:

$$(Y^* + \tau R m^* M) = \left[(A)^{\eta-1} \left(\frac{(1-\beta)\beta L^T}{M(1+\tau)} \right)^{\beta(\eta-1)} N^{(1-\beta)(\eta-1)} \left(Y^F\right)^{\phi} \right]^{\frac{1}{\beta(1-\eta)+\eta}} + \tau R m^* M, \tag{27}$$

where $\tau > -1$.

Maximizing the national income with respect to the tax/subsidy rate, we get as a FOC:

$$\frac{\partial Y^*}{\partial \tau} + \frac{\partial m^*}{\partial \tau} \tau R M + R m^* M = 0. \tag{28}$$

Solving Equation (28), we get:

$$\tau^* = \frac{\left[(\eta-1)\beta^{\frac{\eta-(2\eta-1)\beta}{\beta(1-\eta)+\eta}} (1-\beta)^{\frac{-\beta\eta}{\beta(1-\eta)+\eta}} + (\eta-1)\beta^{\frac{-\beta\eta}{\beta(1-\eta)+\eta}} (1-\beta)^{\frac{-\beta-\eta}{\beta(1-\eta)+\eta}} - \eta((1-\beta)\beta)^{\frac{-\beta\eta}{\beta(1-\eta)+\eta}} \right]}{(\eta-1)\beta \left[((1-\beta)\beta)^{\frac{-\beta\eta}{\beta(1-\eta)+\eta}} + ((1-\beta)\beta)^{\frac{-\beta-\eta}{\beta(1-\eta)+\eta}} \right]}. \tag{29}$$

We have to note that τ^* represents a local minimum if $\eta < 1$. In this case, the national income is maximized if the monopoly case is reached. If the demand for tourism is elastic, then τ^* represents a global maximum. Furthermore, two cases can be considered. If $\eta > \frac{1+(1-\beta)\beta}{(2-\beta)\beta}$, then τ^* is an optimal subsidy; and if the opposite holds, then τ^* is an optimal tax. This result is not different from those represented in Table 1 because of the fact that the subsidy must be financed by a tax which in turn lowers the national income. Therefore, the demand for tourism must be sufficiently elastic for it to make sense, from the view of the island countries, to follow the recommendations of the World Bank or OECD. Otherwise, it is more preferable to reduce the number of hotels and thus the level of competition by putting a tax and collecting the tax revenue. We summarize our results in Proposition 2.

Proposition 2. *The government can increase the national income by taxing (subsidizing) the fixed cost investment in the tourism sector. If the demand for tourism is price inelastic, a tax on fixed investments is recommended. If the demand is price elastic, the taxation of fixed investment is only recommended as long as* $\eta < \frac{1+(1-\beta)\beta}{(2-\beta)\beta}$, *otherwise it is recommended that fixed investments are subsidized.*[11]

It must be noted that these considerations do not imply that a government intervention is justified by an efficiency argument. The government intervention is justified only from the view of the national welfare of the island economy and the resulting deadweight losses are mainly borne by the tourists. Nevertheless, it is clear that the price elasticity of demand for tourism is an important consideration for government interventions.

3 | GROWTH OF DEMAND FOR TOURISM

Obviously, the national income is driven by demand of tourism and as long as the economy has free access to the world capital market, all necessary investments can be realized. To derive the growth rate of the national income, we assume that the foreign income grow with a rate of g_f. Using Equation (25), the resulting growth factor of the national income $1+g$ becomes:

[11]In Equation (27) we have applied a lump-sum tax, in reality it is recommended to tax the land rents, because then welfare losses caused by taxation are avoided. This conclusion can be justified with the considerations of Richter (1994) and Richter and Wellisch (1996).

$$1+g=\left(1+g_f\right)^{\frac{\phi}{\beta(1-\eta)+\eta}}. \tag{30}$$

Proposition 3. *The growth rate of a small open country exceeds the growth rate of a source country of the tourists, if $\phi > \beta(1-\eta)+\eta$. If the price and income elasticity is one, the growth rate of both countries is equal. If $\phi > \eta$, the small open economy grows faster than the economy of the source country of the tourists.*

Subsequently, the growth rate of the small (destination) country to exceed the growth rate of the source country is dependent on the price elasticity of demand and income elasticity.

Proposition 4. *The growth rate of a small open country increases if the elasticity of income rise, the price elasticity declines and the production elasticity of land strives to zero.*

While the labor and rent income grow proportionally to the aggregate economy, the growth factor of the price of tourism and the quantity of the tourism good differs from the growth factor in the small open economy. Hence:

$$1+\widehat{p_T^*}=\left(1+g_f\right)^{\frac{(1-\beta)\phi}{\beta(1-\eta)+\eta}}, \tag{31}$$

and

$$1+\widehat{X^{T*}}=\left(1+g_f\right)^{\frac{\beta\phi}{\beta(1-\eta)+\eta}}. \tag{32}$$

Notably, the growth rate of the price exceeds the growth rate of the quantity if the production elasticity β is less than 0.5. Additionally, we determine the national savings by using Equation (4), the labor income share $(1-\beta)^2$, the land income share β, and the knowledge that land rents grow with the same rate as the national income. We get:

$$S_t^*=\frac{Y_t^*}{(1+q)}\left(q(1-\beta)^2+\frac{1}{2}\left(q-\frac{1+g}{R}\right)\beta\right)=\frac{Y_t^*}{(1+q)}\left(q(1-\beta)^2+\frac{1}{2}\left(q-\frac{\left(1+g_f\right)^{\frac{\phi}{\beta(1-\eta)+\eta}}}{R}\right)\beta\right). \tag{33}$$

Accordingly, the average propensity to save s becomes:

$$s=\frac{1}{(1+q)}\left(q(1-\beta)^2+\frac{1}{2}\left(q-\frac{\left(1+g_f\right)^{\frac{\phi}{\beta(1-\eta)+\eta}}}{R}\right)\beta\right) \tag{34}$$

It is plausible for the propensity to save to become negative because the outcome is crucially dependent on the relationship between the growth factor of the source country's income, interest factor and the subjective discount factor. Hence, the savings propensity becomes negative if the ratio of the growth factor and the interest factor exceeds the subjective discount factor, and the production elasticity of land is relatively huge. Intuitively, if the income and the growth of the income from land are sufficiently high, the citizens of the island country do not have any need to save. In the extreme case, if the individuals' income from land is growing faster than the interest on debt, they borrow money from abroad to finance consumption in the first period of life.

Proposition 5. *If the growth rate of tourists' income in the source country increases, the average savings propensity in the island economy declines.*

Differentiation of Equation (34) with respect to the foreign growth rate yields:

$$\frac{\partial s}{\partial g_f}=-\left(\frac{\beta}{2(1+q)}\right)\left(\frac{\phi}{\beta(1-\eta)+\eta}\right)\frac{(1+g_f)^{\frac{\phi}{\beta(1-\eta)+\eta}}}{(1+g_f)R}<0. \tag{35}$$

Although it is shown that land property always lowers the savings (Stauvermann, 2002) for small island countries, Proposition 5 is somewhat more unsettling because of the associated risk of interest rate changes and strong dependency on land rents. Proposition 5 also partly explains the huge dependency of many small island countries on foreign aid for their economic survival.

In the next step, we examine the impacts on the balance of payments or better net capital imports. The necessary investments $I_{t+1}=Mm^*_{t+1}$ are given by the equilibrium number of firms (Equation 18) times the fixed costs to set up a service firm in the following period. Hence, we get:

$$I_{t+1}=\left[M^{\beta(\eta-1)}\left(\frac{(1-\beta)\beta}{R}\right)^{\eta}N^{(\eta-1)(1-\beta)}(A)^{\eta-1}\left(L^T\right)^{\beta(\eta-1)}\left((1+g_f)Y^F\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}} \tag{36}$$

The net capital imports defined as $CI_{t+1}=I_{t+1}-S^*_t$ are equal to:

$$CI_{t+1}=\left\{\left[M^{\beta(\eta-1)}\left(\frac{(1-\beta)\beta}{R}\right)^{\eta}\left((1+g_f)\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}}-s\left(\frac{(1-\beta)\beta}{RM}\right)^{\frac{\beta(\eta-1)}{\beta(1-\eta)+\eta}}\right\}Y^*\left(\frac{RM}{(1-\beta)\beta}\right)^{\frac{\beta(\eta-1)}{\beta(1-\eta)+\eta}} \tag{37}$$

It is not uncommon for a small country to import in each period an increasing amount of capital from abroad. This situation becomes worse if the growth rate of the source country of tourists increases because the net imports increases. That is:

$$\frac{\partial CI_{t+1}}{\partial g_f}=\left\{\frac{\frac{\phi}{\beta(1-\eta)+\eta}\left[M^{\beta(\eta-1)}\left(\frac{(1-\beta)\beta}{R}\right)^{\eta}\left((1+g_f)\right)^{\phi}\right]^{\frac{1}{\beta(1-\eta)+\eta}}}{1+g_f}-\frac{\partial s}{\partial g_f}\left(\frac{(1-\beta)\beta}{RM}\right)^{\frac{\beta(\eta-1)}{\beta(1-\eta)+\eta}}\right\}$$

$$\times Y^*\left(\frac{RM}{(1-\beta)\beta}\right)^{\frac{\beta(\eta-1)}{\beta(1-\eta)+\eta}}>0. \tag{38}$$

Proposition 6. *If the growth rate of the source country of the tourists increases, the net capital imports of the island economy will also increase.*

The implication of Proposition 6 is not surprising to state the least. It is commonplace to note that a huge part of the tourism businesses in the small island countries are owned by foreigners and many small island economies realize a trade balance deficit. From a viewpoint of efficiency, it is neither a problem that all households are indebted in their first period of life nor that nearly all capital is imported. However, in reality, this may cause political problems and in a world with imperfect capital markets, the solvency of a country is taken into question and will increase the risk premium added on the interest rate of risk-free investment.

Additionally, if the demand for tourism is unexpectedly negatively affected in some way, the small country will be in huge economic distress because the land rents will decrease immediately. The old generation will not have income or be in position to service the interest and debt.

4 | SHORT RUN, MEDIUM RUN, AND LONG RUN EFFECTS OF A FOREIGN INCOME CHANGE

We differentiate between short run, medium run, and long-run effects caused by the incomes of tourists. Here we distinguish between the effects caused by one-time level effects of the foreign income and hence the demand for the tourism good, and the effects caused by permanent changes of foreign income indicated by a change of the corresponding growth rate and the growth rate of demand for tourism. A one-time demand effect causes in the short run only price adjustments while in the medium run, we expect the capital endowments to adjust. However, these adjustments do not influence the long run developments. The latter is only affected if the growth rate of demand will change.

Next, we analyze the effects on the endogenous variables caused by a 1 percent increase of foreign income Y^F, which is a 1 percent increase of the tourists' income growth factor. We distinguish the short run as a situation where the adjustments of the number of firms are not possible and medium run where the number of firms can be adjusted according to the changes in demand behavior.

We begin with the assumption that the number of hotels m is fixed and hence only price changes can be expected. We consider Equation (15) and calculate the corresponding price elasticity with respect to the foreign income:

$$\left.\frac{\partial p^T}{\partial Y^F}\frac{Y^F}{p^T}\right|_{dm=0} = \frac{\phi}{\eta} > 0. \tag{39}$$

As expected, the price of the tourism good rises as a consequence of an increase of the foreign income, and consequently the terms of trade are improved. However, the magnitude of the effect depends on the income and price elasticity of demand. The price is increasing with rising income elasticity and with a price elasticity converging to zero. The effect of the subsequent price increase influences also the land rent, the price of the services, and the wages if the factor prices are sufficiently flexible enough. However, from Equation (16) we can derive that the gross margins of the hotels increase and hence they earn an internal interest rate which exceeds the world-market interest rate. This latter effect attracts new investments over time and therefore the number of hotels will increase until these extra profits vanish.

To calculate the elasticity of the number of firms with respect to foreign income, we use Equation 18 to obtain:

$$\frac{\partial m^*}{\partial Y^F}\frac{Y^F}{m^*} = \frac{\phi}{\beta(1-\eta)+\eta} > 0. \tag{40}$$

This elasticity will decrease if the production elasticity of land converges to one. The same holds when the price elasticity increases. With a rising income elasticity, the magnitude of the elasticity of the number of firms with respect to tourists' income increases.

Moreover, as a consequence of the increase of the number of firms, the equilibrium price and the quantity of the tourism good will increase as noted in Equations (41) and (42), respectively:

$$\frac{\partial p_T^*}{\partial Y^F}\frac{Y^F}{p_T^*} = \frac{\phi(1-\beta)}{\beta(1-\eta)+\eta} > 0, \tag{41}$$

and

$$\frac{\partial X^{T*}}{\partial Y^F}\frac{Y^F}{X^{T*}} = \frac{\phi\beta}{\beta(1-\eta)+\eta} > 0. \tag{42}$$

Noting that wages and prices are proportionally dependent on the parameter β and that the unit labor requirement in the service sector is assumed to be one, we can conclude that the prices of the services and the wage rates adjust proportionally to a higher level while the output and employment of each hotel declines. Additionally, as noted from Equation (42), the terms of trade improves:

$$\frac{\partial h^*}{\partial Y^F}\frac{Y^F}{h^*}=-\frac{\phi}{\beta(1-\eta)+\eta}<0. \tag{43}$$

To determine the prices of the hotel services, we differentiate Equation (20) and obtain:

$$\frac{\partial p^*}{\partial Y^F}\frac{Y^F}{p^*}=\frac{\phi}{\beta(1-\eta)+\eta}>0. \tag{44}$$

We note that land rents also increase.

However, if we compare the increase of the price of the tourism good without a change in the number of firms (Equation 38) and with a change in the number of firms (Eqaution 40), then we can state that the former increase more than the latter.

$$\left.\frac{\partial p^T}{\partial Y^F}\frac{Y^F}{p^T}\right|_{dm=0}-\frac{\partial p_T^*}{\partial Y^F}\frac{Y^F}{p_T^*}=\frac{\phi\beta}{\eta(\beta(1-\eta)+\eta)}>0. \tag{45}$$

This implies that in the very short run, the price increase is relatively strong and will be weakened later by additional investments in the short run. If the growth rate of the tourists' incomes remains unchanged, the increase in demand will lead only to a level effect but no growth effect. The long run effects are characterized by an increase of the growth rate of the foreign incomes. The elasticity of the growth factor of income of a small economy $G=1+g$ with respect to growth factor of the foreign income $G_f=1+g_f$ is:

$$\frac{\partial G}{\partial G_f}\frac{G_f}{G}=\frac{\phi}{\beta(1-\eta)+\eta}>0. \tag{46}$$

This result differs from Schubert et al. (2011) who assume perfect competition in the hotel sector and obtain implicitly the result that the elasticity of the island's growth factor caused by the growth factor of the tourists' income is equal to the income elasticity of demand.

The elasticity of the growth rate of the price and the elasticity of the growth rate of the quantity, with respect to the growth factor of tourists' income is given in Eqautions (47) and (48), respectively, as:

$$\frac{\partial \widehat{p_T^*}}{\partial G_f}\frac{G_f}{\widehat{p_T^*}}=\frac{(1-\beta)\phi}{\beta(1-\eta)+\eta}>0 \tag{47}$$

and

$$\frac{\partial \widehat{X^{T*}}}{\partial G_f}\frac{G_f}{\widehat{X^{T*}}}=\frac{\beta\phi}{\beta(1-\eta)+\eta}>0. \tag{48}$$

Both elasticities are positive and once again the magnitude of the elasticities depends on the production elasticity of land. The price increase of the tourism good also implies an improvement of terms of trade. While the above results of Eqautions (46), (47), and (48) qualitatively coincide with the results of Schubert et al. (2011), the quantitative differences are mainly an outcome of the differences in the assumptions.

5 | CONCLUSIONS

The aim of the paper was to develop an economic model for small open countries whose economy depends strongly on the income from the tourism sector. In some respect, the model developed presents some new insights and substantially differ from the earlier studies in the literature. One distinguishing feature is that we have introduced a service sector in which the production is mainly dependent on labor. The models in the literature are mainly derived from trade theory models with non-tradable goods where tourism is a good of the latter type. In addition to assuming those services as non-tradable in our model, we have applied the Dixit–Stiglitz approach to define a composite tourism good which consists of many services, land, and fixed investments. To make the analysis simple and shed light on the development of tourism, we avoided adding further sectors in the economy model although this can be done as further extensions. In fact, by adding others sectors such as agriculture, fishery, and light industry, we suspect the results derived in the paper will weaken but will still hold.

Based on the derived Propositions 1 and 2, we note that while a small country cannot influence the income and price elasticity directly, it has the opportunity to influence the number of hotels through market regulation or taxation. For example, to lower the number of restaurants, the government can guarantee that the quality of locally produced food fulfills well-defined quality and hygiene standards. The government can also guarantee for other related services, a well-defined safety standards. Additionally, the government can influence the incomes and wages of the islanders by influencing the costs to start-up a tourism business. However, because of the fact that the desired policy measures and their impacts depend strongly on the price elasticity of demand, precise knowledge of the latter is warranted. Subsequently, as a first important policy input, it is recommended that better and more detailed statistics of the tourism industry is generated so that reliable and informative tourism demand models are estimated. Moreover, although land property (ownership) is highly sensitive and a political device in many small island countries thus limiting its use in the policy analysis, we have shown that it can have negative impact on the savings and balance of payments and therefore pose considerable danger to the sustainability of the tourism industry and the economic progress.

With our model, we were able to answer the question of how the price elasticity of demand, the income elasticity of tourists and the elasticity of substitution in the service sector influences the economic development of small open economies. Finally, our model provides a microeconomic foundation for macroeconomic modeling which can be useful in applied economic modeling, and the model presented here can be easily extended to capture other aspects of economic growth such as the role of land, property laws, capital controls, tax policies, and public infrastructure. Additionally, the model can be extended to comparative dynamic analysis, where the economic development of the source countries can be considered comprehensively to explain the tourism demand behavior and subsequently derive economic consequences for the small island countries.[12]

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