A Harrodian Model that fits the Tourism-led Growth Hypothesis for Tourism-based Economies

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Abstract
The tourism-led growth hypothesis (TLGH) has been the subject of hundreds of investigations. However, most of these investigations have limited themselves to empirically verify a dynamic relationship between tourism receipts and economic activity, leaving aside the theoretical background or the baseline economic growth model on which the TLGH could be built. With this in mind, the authors present a multiplier-accelerator growth model and state that it is a good option to analyze the TLGH. This model fits the TLGH, since its long-run equilibrium positions are analogous to the TLGH. However, multiplier-accelerator growth models generally suffer from dynamic instability. Therefore, the authors propose a model with an investment function that, by relating the acceleration of investment just to the "permanent" increases in demand, is able to replicate the "relative stability" of growth of tourism-based economies.

Introduction

Inbound tourism is nowadays considered as an important catalyst of economic growth. The contribution of tourism to growth is such important that in the literature is common to talk of the tourism-led growth hypothesis (TLGH), a term coined by Balaguer and Cantavella-Jordá (2002). The TLGH refers to a situation in which tourism plays a vital role in the economic growth process (Tugcu 2014: 207). Hundreds of investigations have studied the validity of the TLGH (see Pablo-Romero and Molina, 2013; Brida *et al.*, 2016; and Li *et al.*, 2018, among others, for a detailed state of the art). In general, the *potential* of international tourism as a catalyst of economic development has long been recognized (see Menegaki *et al.*, 2020), and the TLGH finds empirical support in most studies (Brida *et al.*, 2016). What is more, the TLGH has arguably reached the status of Conventional Wisdom.

However, the literature on the TLGH lacks economic growth models that deal with a tourism-led regime in a logically consistent form. On the one hand, many of the articles testing the TLGH limit themselves to empirically verify whether there exists a dynamic relationship (i.e., cointegration and Granger-causality) between the evolution of inbound tourism and economic activity; while do not base their empirical identification strategy on a tourism-led growth model on which the TLGH could rely. On the other hand, the few articles that develop an economic growth model motorized by tourism activity rely exclusively on the neoclassical approach to economic growth (see Pigliaru and Lanza, 2000; Capó *et al.*, 2007; Brau *et al.*, 2007; Proença and Soukiazis, 2008; Figini and Vici, 2010; Di Liberto, 2013; Tang, 2013; Inchausti-Sintes, 2015, and Marti and Puertas, 2017, among others).

Neoclassical economic growth models, based on aggregate production functions, are supply-led. Thus, in these models tourism motorizes long-run growth if, according to the theory of comparative advantages, leads to a more efficient use of scarce resources. In this case, dynamic gains could also be generated, in the form of dynamic productivity gains from discipline and innovation effects of enhanced international competition and increasing returns to scale. Tourism can also lead long-run growth if it is capable to promote the accumulation of human capital (Grossman & Helpman, 1991), either by "using ideas or producing ideas" (Romer, 1992).

On the other hand, in this paper the authors argue that the TLGH, which is analogous to the export-led growth hypothesis (see Thirlwall and McCombie, 2004; Thirlwall, 2019; McCombie, 2019)[i], can also be coherently modelled in a demand-led growth framework. For the Sraffian Supermultiplier and New Kaleckian growth models, tourism demand is a component of autonomous demand, which ultimately determines the long-run growth path of the economy (see Serrano, 1995; Pariboni, 2016; Lavoie, 2016; Dejuán, 2017; Nah and Lavoie, 2019; Palley, 2019; and Perez-Montiel and Manera, 2019). Thus, demand-led growth theory posits that tourism demand and long-run economic growth are necessarily connected. Therefore, Keynesian (i.e., demand-led) growth models can be a useful tool to *directly* analyze how tourism affects economic growth.

Figini and Vici (2010) recognize that the TLGH can be approached through the standard Keynesian function by incorporating tourism receipts and considering it as an exogenous component of demand. However, according to these authors, this framework is merely static and does not allow to infer the long-term impact of tourism specialization (Figini and Vici, 2010: 789). Hence, the demand model can be further expanded by including tourism receipts, real tourism price and real GDP as endogenous variables and analyzing shocks on tourism demand function (Brida *et al.* 2016: 398).

Contrary to Figini and Vici (2010), the present study argues that it is possible to model the long-run relationship between inbound tourism and economic activity in a dynamic Keynesian framework. The

advantages of this are straightforward: (i) avoiding the logical inconsistences of supply-led growth models that were the subject of the Capital Controversies (see Kurz and Salvadori, 2003; Lazzarini 2011; Felipe and McCombie, 2014; and Dvoskin and Petri, 2017, among others); and (ii) including tourism receipts as an exogenous component of aggregate final demand, which allows to *directly* model the effects of it on output through multiplier and accelerating effects. In fact, most of the empirical literature on the TLGH (based on cointegration and Granger causality approaches) analyzes the *direct* relationship between tourism receipts and economic activity. Thus, these empirical works need to rely on an identification strategy based on a consistent long-run economic growth theory.

This paper proposes a multiplier-accelerator model that fits the TLGH and allows them to consistently and *directly* analyse the long-run equilibrium relationship between tourism receipts and economic growth. It can be particularly useful in terms of identification strategy for the empirical investigations on the TLGH. Since the authors propose a baseline model, they are aware of its numerous limitations and of its difficulties to predict with accuracy. However, the authors believe that their model can be considered as a useful benchmark approach to study the long-run relationship between tourism receipts and economic activity.

In the next section, the appropriateness of multiplier-accelerator models in a tourism-led growth approach is discussed. Afterwards, a stable and stabilizing multiplier-accelerator model is presented. In the last section, the authors present the conclusions and propose future lines of research.

Multiplier-accelerator models as a useful tool to model the Tourism-led growth Hypothesis
Demand-led growth models have their roots in the combination of the income multiplier with the accelerator of investment. Supply-led growth models, i.e., Solow (1955, 1957); Swan (1956); Arrow *et al.* (1961) Romer (1989), and Barro *et al.* (1992), among others, have also their roots in multiplier-accelerator models (see Pasinetti, 2000). However, for the reasons explained in the previous section, this study centres its attention in the demand-led growth approach.

The first economist who presaged the viability of the interaction between the income multiplier and the investment accelerator was Roy Harrod, a direct disciple of John Maynard Keynes, in 1933, followed soon by Ohlin (1934) and Lundberg (1937). However, a rigorous analysis of the multiplier-accelerator interaction emerged with the models of Roy Harrod (1939) and Paul Samuelson (1939) (Vercelli and Sordi, 2009: 1).

The investment accelerator is a theory of investment according to which investment depends exclusively on expected changes in effective demand. A priori, the investment accelerator mechanism appears as the perfect companion of the multiplier, both respond to the principle of effective demand and both help to understand the dynamics of modern capitalism (Dejuán, 2017:17). However, multiplier-accelerator models (hereinafter MA models) have not become consolidated in scientific research programs. Probably the main reason for this is that these models proved to be dynamically unstable.

In fact, *instability hangs over multiplier-accelerator models as the sword of Damocles* (Dejuán, 2017:370). The apparent intrinsic dynamic instability of MA models has for decades been the subject of numerous works aimed at tackling or eliminating it. But surely it has also turned out to be one of the main reasons why these models disappeared from the scene in the mid-1950s. However, in the 1990s, MA models were rescued by a group of Sraffian economists who were followers of the research line assigned to the surplus approach. In 1995, Franklin Serrano combined the Hicks' Supermultiplier (1950) with Sraffa's (1960) approach in order to develop an alternative theory of production and long-run accumulation.
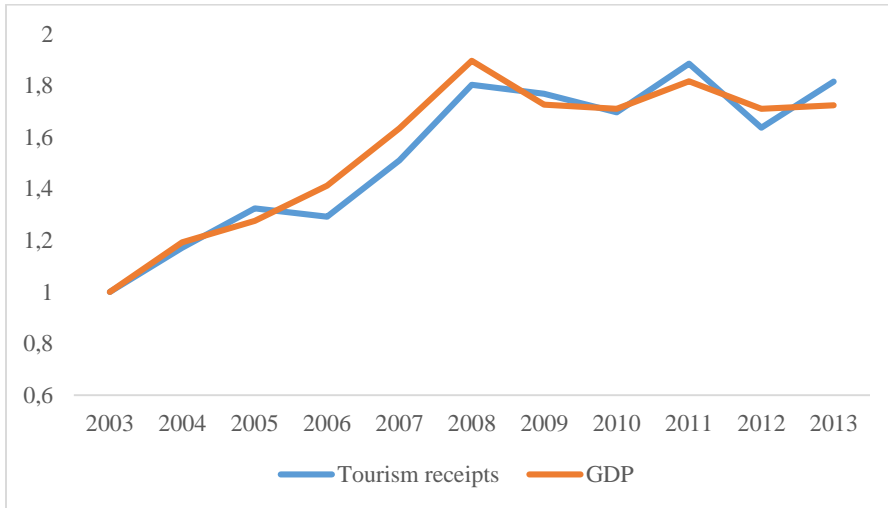
Serrano's main contribution is the inclusion, in a Harrodian framework, of non-capacity-generating autonomous expenditures that grow over time at a given, exogenous rate, γ. Autonomous demand, Z, is constituted by: *All those expenditures that are not financed by wage income generated by production decisions, nor affect (directly) the productive capacity of the economy* (Serrano, 1995: 71). Since the degree of productive capacity utilization, the marginal propensity to save and the technical coefficients are considered constant in the long-run (which implies an exogenous normal capacity utilization rate, exogenous income distribution, and Harrodian technical progress), the engine of long-run economic growth is the growth rate of non-capacity-generating autonomous demand (Pérez-Montiel and Manera, 2020b: 112) Thus, in the long run, effective demand determines normal productive capacity; while autonomous demand generates induced consumption, through the multiplier, and induced (capacity creating) investment, through the accelerator (Serrano, 1995: 67).

Serrano (1995) considered that the introduction of Z in a MA model is enough to tackle Harrodian instability. According to Serrano, dynamic stability is reached because the reaction of investment (through the accelerating effect) causes a reduction (increase) in the rate of growth of productive capacity greater (smaller) than the reduction (increase) in the growth rate of output. In sum, in face of unexpected changes, there is a constant tendency to re-establish the desired or normal level of productive capacity utilization (Perez-Montiel and Manera, 2020a: 223). Therefore, after a disturbance, the model is capable to endogenously return to the equilibrium position with normal capacity utilization, u_n.

The normal degree of capacity utilization, u_n, is that which, if attained, leaves companies satisfied with the use they are making of their productive capacity; i.e., the degree of capacity utilization that entrepreneurs had desired to achieve. In general, it is considered that normal production, Y^n, will be less than potential production (production using full capacity), Y^P, *since it is assumed that, under the pressure of competition, firms try to maintain margins of planned spare capacity to avoid the risk of losing market shares for not being able to supply their markets when they are booming* (Freitas and Serrano, 2015:4). In fact, in the long run, the degree of capacity utilization that companies tend to carry out is that which leaves them satisfied. This is empirically recognized by Corrado and Mattey (1997), Manera *et al.* (2019), and Gahn & González (2020), among others. However, Nikiforos (2016, 2020) states that capacity utilization is not stationary.

If one considers that tourism receipts evolves independently from output and, at the same time, it is not destined to increase productive capacity; then tourism receipts can be treated as a non-capacity-creating autonomous component of demand that drives long-run growth within an Sraffian Supermultiplier approach (see Serrano, 1995). Then, if for many countries tourism receipts can be considered as a component of autonomous demand, Z, it can be suggested that long-run economic growth is motorized by the evolution of tourism receipts. Thus, the TLGH can be developed through a Harrodian model that incorporates autonomous non-capacity creating expenditures.

In fact, many works suggest that tourism receipts act as locomotives of economic growth (see, for example, Husein and Kara, 2011; Chou, 2013; Pan *et al.*, 2014; Aslan, 2014; Tang and Tan, 2015; Ohlan, 2017, Sharif *et al.*, 2017; Sacco and Cassar, 2019; Mitra, 2019; Etokakpan *et al.*, 2019; and Manera *et al.*, 2020, among others). For example, as can be seen in Figure 1, in the Mediterranean basin, even in the countries with a less developed tourism sector, such as Morocco, Argelia, Tunisia and Greece, tourism receipts and GDP seem to evolve in step.

Note: The evolution of average tourism receipts and the average GDP of Morocco, Argelia, Tunisia and Greece. Data come from World Tourism Organization and national statistical offices. The data are provided in current US dollars.

Figure 1. Tourism receipts and GDP in the Mediterranean basin (2003=1).

With this in mind, in the next sections the authors present a tourism led-growth model under a Harrodian framework. The model has its roots in traditional MA models, however, the authors constructively criticize these models and the modern versions of them. Among other critics, it is suggested that: (i) the baseline model, despite being locally stable under certain parametric conditions, remains globally unstable; and (ii) although the baseline model presents an equilibrium with normal utilization rate that from the mathematical point of view can be locally asymptotically stable, when giving plausible values to the parameters, the stability of the equilibrium is much more troublesome. Thus, local stability is subject to periods of convergence that, according to what is observed in various recent empirical works on the TLGH, are excessively long.

With this in mind, in the next sections the authors present an alternative investment function that allows to deal with the mentioned problems, thereby making the tourism-led growth model compatible with empirical evidence while safeguarding dynamic stability.

The baseline MA model
In this section, the authors present a Harrodian tourism-led growth model that, by considering tourism receipts as autonomous expenditures, tries to deal with Harrodian instability, while safeguarding the tendency to a normal degree of capacity utilization in the long run.

Induced and autonomous demand
In this baseline synthesis model, aggregate final demand, Y, is composed of consumption, C, and investment expenditures, I. Aggregate final demand is also composed of tourism receipts, which is treated as a variable that is non-capacity-generating autonomous demand, Z. The evolution of this variable is not mechanically linked to the evolution of output; then, Z grows over time at an exogenously given rate, γ. All other expenditures are considered to be induced by income. Thus, final aggregate demand, Y, is defined as:

$$Y_t = C_t + I_t + Z_t. \tag{1}$$

Therefore, consumption can be represented as follows:

$$C_t = (1 - s_w - m_w)(1 - \pi)Y_t + (1 - s_\pi - m_\pi)\pi Y_t. \qquad (2)$$

Income distribution and the propensity to import are exogenously determined by historical, structural, institutional and political factors. The parameter π represents the profit share, i.e., the weight of profits over total income, s_π is the marginal propensity to save of the capitalist class, and s_w is the marginal propensity to save out of wages. Thus, the aggregate marginal propensity to save of the community is $s = (1 - \pi)s_w + \pi s_\pi$. The parameters m_w and m_π represent the marginal propensity to import of the working class and that of the capitalist class, respectively. Then, the aggregate marginal propensity to import of the community is $m = (1 - \pi)m_w + \pi m_\pi$.

For the sake of simplicity, the public sector is not considered in the baseline synthesis model. However, it could be incorporated without qualitatively changing the conclusions of the research. Introducing the public sector would imply that the propensity to consume at home is $c = (1 - \tau)(1 - s - m)$, being τ the tax rate. On the other hand, according to the definition of autonomous demand of Serrano (1995), Cesaratto *et al.* (2003), Pariboni (2016), and Perez-Montiel and Manera (2020a) final public expenditure, G, can also be considered a component of autonomous demand. Other exports apart from tourism receipts, E, should also be included in Z. Thus, $Z = G + E + TE$, where G represents final public expenditure, E represents exports apart from tourism receipts, and TE represents tourism receipts; thus, $\gamma = g^G \cdot \frac{G}{Z} + g^E \cdot \frac{E}{Z} + g^{TE} \cdot \frac{TE}{Z}$, where g^x is the growth rate of x. In this paper the authors shall focus on the last item of Z in order to show some properties of the supermultiplier in tourism-based economies, in which, following Balaguer and Cantavella-Jordá (2002), TE structurally has a much bigger weight in Z than the rest of the variables and, thus, g^{TE} motorizes γ. For the sake of simplicity, Z isconsidered to be exclusively composed of TE.

The Induced Investment Function proposed by Amadeo (1986)
Induced (capacity-creating) investment depends on the stock of existing capital and the accumulation of capital that companies carry out in each period. The latter depends on the economic growth rate expected by the business environment, α. Allain (2015, 2019) and Lavoie (2016) consider that, in the long run, companies will modify their growth expectations when the effective utilization rate of installed capacity, u, does not coincide with the normal or desired one, u_n (this way of modelling investment was first proposed by Amadeo, 1986). Therefore, the investment function is given by:

$$I_t = [\alpha_t + \beta(u_t - u_n)]K_t, \qquad (3)$$

where K_t is the existing stock of capital in each period t. The parameter α_t represents the growth rate expected by firms in each period t, while β measures the reaction in investment that entrepreneurs carry out when u_t does not coincide with u_n. A similar investment function has been used in the works of Allain (2015) and Lavoie (2016). According to Allain (2015), the α parameter *can be understood as the average expectation of the secular rate of growth (subject to animal spirits), as perceived by the managers of firms* (Allain, 2015: 1354). Lavoie (2016: 177) considers that the parameter α can be associated to a whole series of determinants of investment such as technological change, the rate of profit, the profit share, monetary or credit conditions, the leverage ratio of companies, radical uncertainty, etc. When $u_t = u_n$, the capital accumulation rate, g_t^K, is equal to the sales growth rate that business forecasted:

$$g_t^K = \frac{I_t}{K_t} = \alpha_t \qquad \text{when } u_t = u_n. \qquad (4)$$

However, this is a long-run position. By equalizing g_t^K and g_t^S, and substituting $u_t = \frac{vY_t}{K_t}$, were v is the incremental capital output ratio (the amount of capital required to increase each unit of total output), the short-run equilibrium level for u, which does not coincide with u_n, is given by:

$$u_t = \vartheta v(\alpha_t - \beta u_n + z_t) \neq u_n, \tag{5}$$

where $\vartheta = (s + m - \beta v)^{-1}$ and $z_t = Z_t/K_t$. The growth rate of the economy in the short run is equal to the rate of capital accumulation, which is obtained by inserting (5) in (3) and dividing by K_t. Since $u \neq u_n$, g_t^K does not coincide with the growth rate expected by companies, α_t:

$$g_t^K = \vartheta((s + m)(\alpha_t - \beta u_n) + \beta v z_t) \neq \alpha_t. \tag{6}$$

When γ and g_t^K do not coincide, z_t varies according to the following differential equation:

$$\dot{z} = z_t(\gamma - g_t^K). \tag{7}$$

On the other hand, in the long run firms will modify their growth expectations, α_t, when the capacity utilization rate does not match the normal or desired one, and will do so according to the following differential equation:

$$\dot{\alpha} = \mu(u_t - u_n), \tag{8}$$

where μ is a strictly positive parameter according to which companies adapt their growth expectations based on the differences between the growth rate expected by them and the effective one or on the difference between the expected degree of capacity utilization and the effective one.
The general results of this long-run equilibrium are:

$$u_t^e = u_n, \tag{9}$$

$$\alpha_t^e = g_t^K = \gamma, \tag{10}$$

$$z_t^e = (s + m)\frac{u_n}{v} - \gamma, \tag{11}$$

$$Y_t^e = \frac{Z_t}{s + m - \frac{v\gamma}{u_n}}, \tag{12}$$

where $\left(s + m - \frac{v\gamma}{u_n}\right)^{-1}$ is the Supermultiplier of Serrano (1995). In an empirical analysis, the long-run equilibrium output, proxied by the variable gross domestic product (GDP), could be represented by the aggregate demand side in the following way:

$$
\begin{aligned}
GDP_t &= Z_t + C_t + I_t - M_t, \\
GDP_t &= Z_t + (1 - s) \cdot GDP_t + \frac{v\gamma}{u_n} \cdot GDP_t - m \cdot GDP_t, \\
GDP_t &= \frac{Z_t}{s + m - \frac{v\gamma}{u_n}}
\end{aligned}
\tag{13}
$$

Let's recall also that it would be necessary to take into account changes in inventories, as well as considering possible statistical discrepancy between expenditure side and output side of GDP_t, for $Z_t/\left(s - \frac{v\gamma}{u_n} + m\right)$ to be statistically equal to GDP_t in the long-run equilibrium.

Note that this model fits the empirical studies on the TLGH. Despite many works only test short-run Granger-causality between tourism receipts and output and do not even consider the existence of cointegration (see Tugcu, 2014; Dogru & Bulut, 2018; and Akadiri *et al.*, 2018, among others), the validity of the TLGH relies on the existence of cointegration and long-run Granger-causality running unidirectionally from Z to Y (see Balaguer and Cantavella-Jordá, 2002; Paramati *et al.*, 2017; Dogan & Aslan, 2017, and Gül and Özer, 2018, among others). Being s_π, π, v, and u_n exogenous parameters that are expected to remain stable in the long run, this model states that the growth rate of output coincides with (and is motorized by) γ in the long run. Thus, this is analogous to the hypothesis of the "strong version" of the TLGH: (i) the existence of cointegration between Y and Z; and (ii) long-run causality running unidirectionally from Z to Y.

Imposing the equilibrium condition $\dot{z} = \dot{\alpha} = 0$ in the system (7)-(8), the equilibrium has two possible solutions, one with $z_t^e = 0$ and another one with $z_t^e = (s + m)\frac{u_n}{v} - \gamma$. The long-run equilibrium with $z_t^e = 0$ reproduces purely Harrodian results and is dynamically unstable. Authors return to this point and argue that the existence of the Harrodian equilibrium in the long term has more serious analytical and empirical consequences than some authors seem to consider.

On the other hand, the non-Harrodian equilibrium, with $g_t^K = \gamma$, and therefore with $z_t^e = (s + m)\frac{u_n}{v} - \gamma$, is locally asymptotically stable if certain parametric conditions are met. The local stability condition of the system (7)-(12) is as follows:

$$(s + m)u_n > v(\gamma + \mu/\beta). \tag{14}$$

$v\gamma/u_n$ can be interpreted as the marginal propensity to invest in the long run, so the dynamic stability of the long-run equilibrium requires the marginal propensity to save to be greater than the long-run propensity to invest plus the parameter $v\mu/\beta u_n$. This result implies that μ/β must be small enough for the system to be dynamically stable. To our knowledge, this is a reasonable assumption from the point of view of any economic theory; however, a very small value of μ/β means a very slow convergence towards the long-run equilibrium.

Dynamic (in)stability of the model with the investment function of Amadeo (1986)
In the introduction the authors have exposed that *Stability is the touchstone of any multiplier-accelerator model* (Dejuán, 2017: 15). In the first section, it was suggested that important advances, mainly inspired by Serrano (1995) and Allain (2015), have been made in terms of providing these models with mechanisms that make them (potentially) stable. However, as pointed out by Dejuán (2017), despite being mathematically correct, these mechanisms are not at all reassuring. Allain (2015) warns that the proposed solution to the problem of Harrodian instability should be taken with caution: *As a consequence, it is not possible to formulate an univocal conclusion. The best that can be said is that there is some room, depending on the parameter values, for the system to converge toward its long run equilibrium* (Allain, 2015: 1364-65).

A first criticism that this study makes about this way of dealing with Harrodian instability is that the long-run equilibrium of the (7)-(12) system with $z_t^e > 0$ and $\alpha_t^e = g_t^K = \gamma$ does not only depend on the

parameter values, but also on the initial conditions, since this is not a globally stable equilibrium. This equilibrium would be globally stable if any trajectory generated from any initial condition z_0 and α_0 converged to it. But this is not the case due to the existence of the Harrodian equilibrium, since a globally stable equilibrium, apart from being asymptotically stable, must be necessarily unique.

In fact, there is another equilibrium in the (7)-(12) system (the one with $z_t^e = 0$ and $\alpha_t^e = g_t^K = (s + m)u_n/v$). This is the purely Harrodian equilibrium. An equilibrium X^e is stable if for any sufficiently close initial state X_0, the associated trajectory $\{X_t\}$ exists and remains close to X^e, that is, for any $\varepsilon > 0$, there exists $\delta(\varepsilon) > 0$ such that if $\|X_0 - X^e\| < \delta(\varepsilon)$, then $\|X_0 - X^e\| < \varepsilon$ for all t. However, the Harrodian equilibrium is not locally asymptotically stable, since local stability requires that the associated trajectory $\{X_t\}$ with initial condition X_0 sufficiently close to X^e converges to X^e, that is, asymptotical stability implies that there exists $\delta > 0$ such that if $\|X_0 - X^e\| < \delta$, then $\lim_{t\to\infty} X_t = X^e$. Although the Harrodian equilibrium is not asymptotically stable, it does exist and must be analytically considered, since it makes the global stability of the model impossible.

Therefore, the (7) -(12) system lacks the necessary specification to ensure that the model *always* converges towards the non-Harrodian equilibrium. Small perturbations around the non-Harrodian equilibrium decay and the trajectory generated by the system returns to it; but if perturbations are large and X_t moves far enough from X^e, the system is unable to return to the non-Harrodian equilibrium and becomes dynamically unstable (even in the case where the parametric conditions allow the non-Harrodian equilibrium to be asymptotically stable). Therefore, from the analytical point of view, these models propose a solution to local Harrodian instability, but not to global Harrodian instability.

The second criticism that this study makes about the model with the investment function of Amadeo (1986) stands on its empirical viability. In order to find out which is the shortest possible period of time that this model may require to converge to the non-Harrodian equilibrium after a change in γ, the authors generate algorithms to identify the combination of values of all the parameters with which they obtain the shortest possible time that this model needs to converge to the non-Harrodian equilibrium after a perturbation in γ. If a value of s no lower than 20% is fixed, which is what is found in empirical reality, the simulator does not find any combination of values that after a different perturbations in γ reaches equilibrium in less than 100 years.

Therefore, although the model has mechanisms that allow it to guarantee the asymptotic stability of the non-Harrodian equilibrium, for certain empirically pertinent values of the parameters it needs hundreds or even thousands of years to converge. Thus, even though the model is dynamically stable in terms of logical time, it cannot be considered stable in terms of real time. Additionally, the excessively low range of values of $\frac{(s+m)}{v}$ obtained in all the results of the simulation imply an excessively high range of values of the supermultiplier. This problem persists even if equilibria given by a considerably higher range of values of γ and v are chosen (See Portella-Carbó and Dejuán, 2019 for a recent state of the art of empirical findings on multipliers and supermultipliers). This paper concludes, therefore, that the conditions of asymptotic stability of the non-Harrodian equilibrium presented by the (7)-(12) system are correct from the mathematical point of view, but difficult to connect (even approximately) with empirical work.

An accelerator-investment function that distinguishes between permanent and transitory increases in demand

This section presents an investment function that leads to a stable and stabilizing MA model, immune to the problems analysed in the previous sections. Induced final consumption and imports are represented in the same way. The initial level of "permanent" autonomous demand, i.e., tourism inbounds, and its expected rate of growth γ, also taken as given, i.e., $Z_t = Z_0 e^{\gamma t}$.

The investment function also responds to the accelerator principle, but the authors introduce small methodological differences that will carry important effects on the stability of the model. According to the acceleration principle, business investment is defined by the difference between the level of capital that companies consider they will need in the future (KR_{t+1}) minus the installed capital in the current period, KI_t. α is the expected rate of growth of permanent aggregate demand, D_t, the key variable in the Keynesian system, according to Eatwell (1983). Thus, KR_{t+1} reflects the amount of capital necessary to meet efficiently the expected increases in permanent demand:

$$I_t \equiv KR_{t+1} - KI_t = vD_t(1 + \alpha) - KI_t$$

(15)

$$I_t \equiv \alpha vD_t + [vD_t - KI_t] \equiv \alpha vD_t + [KR_t - KI_t] = I_t^* + I_t'$$

Total final investment in period t is split in two parts. The first part (I_t^*) captures the long-period equilibrium investment that obeys to the proper accelerator principle. The second part (I_t') refers to the adjustment of the level of capacity that is required when growth expectations change. I_t^* is v times the expected increase in *permanent* demand, to which output adjusts according to the Keynesian principle of effective demand. v stands for the optimal or desired capital/output ratio; it implies that installed capacity is used at its normal level (v/u_n in the previous sections), that following the Sraffian tradition the authors normalize at unity ($u_n = 1$). Keynes (1936, ch. 12) focused on the subjective determinants (the *animal spirits of entrepreneurs*); this study emphasizes the objective factors related to the potential growth of the sectors that in each epoch play as locomotives of growth. In this model, tourism receipts act as locomotive of economic growth. If tourism receipts grows at γ for a long time, the flow of new orders arriving to firms will suggest them to revise their expectations upwards. After a time, α will coincide with γ.

Notice that such dynamics does not imply perfect foresight of entrepreneurs. Firms simply act prudently in order to maximize profits in the long-run. According to Adam Smith, "prudence" is the key virtue of entrepreneurs (Smith, 1790 (1976), ch. 6). In our case, after an unexpected increase in demand, firms adjust to it by raising the rate of capacity utilization, u. If overutilization ($u > 1$) persists for several months, entrepreneurs interpret that this is not a seasonal fluctuation, but a durable change attributable, for instance, to the abolition of tariffs or a long wave of prosperity in the rest of the world. Then they adjust capacity to fill the gap between required and installed capacity: $I_t' = KR_t - KI_t$. If overutilization persists despite the increase in the level of capital, firms will suspect that the increase in demand is permanent. At this moment, they will start rising their growth expectations. The process is supposed to stop when $\alpha = \gamma, KR = KI, u = 1$.

The equilibrium level of output at a given period t can be presented in different ways:

$$Y_t \equiv C_t^* + I_t^* + Z_t^* + Z_t' = (c - m)Y_t^* + I_t^* + Z_t^* + Z_t'$$ (16a)

$$Y_t = \mu(h \cdot Y_t^* + Z_t^* + Z_t'),$$

where $I^* \equiv h \cdot Y_t^* = \alpha \cdot KR_t$ and Z_t' includes $I_t' = KR_t - KI_t$ (16b)

$$Y_t = SM \cdot Z_t^* + \mu \cdot Z_t'$$ (16c)

$$Y_t^* = SM \cdot Z_t^*$$ (16d)

In the first Equation (16a), induced consumption is referred to the normal (full capacity) income; $(c - m)$ is the propensity to consume at home. Induced – expansionary investment is the full capacity income times $h = v \cdot \alpha$. The variable Z_t^* refers to the expected level of permanent autonomous demand. Z_t' refers to the transient autonomous demand that includes the adjustment of capacity required after a change in the rate of growth.

Equation (16b) presents output as a multiple of all the elements of demand that do not depend on current income. Note that autonomous demand in a broad sense includes induced-expansionary investment. It should be computed according to the accelerator principle, i.e. as a multiple of the current "required" capacity.

Equation (16c) divides the economy in two parts, which follow different dynamics. The first part is governed by the Supermultiplier, $SM = 1/(1 - c + m - h)$, and describes the long period path of equilibrium at normal capacity (see Equation (16d)). The second part produces for transient demand (Z_t') and is governed by the traditional multiplier, $\mu = 1/(1 - c + m)$. A part of Z_t' is the machinery that has to be produced during period t in order to adjust capacity to the new growth pattern foreseen at the beginning of the period: $I'_t = KR_t - KI_t$. The production of these machines will have the typical multiplier effects on consumption; not the accelerator effect on investment, since firms realize that this is a transient demand.

This system is dynamically stable. After any shock it recovers its long period equilibrium path in a plausible span of time. Dynamic stability is guaranteed since h does not depend directly on the ups and downs of current capacity utilization. It is only modified when firms adapt their growth expectations to the new autonomous trend in tourism receipts. There are no variables that accelerate each other.

The Supermultiplier is also a "stabilizing" mechanism because in the process of adjustment, the structure of demand, production and capital changes endogenously. Even the warranted rate of growth adjusts via h. The same happens with the level and structure of savings. In the process of producing Z and I, a similar amount of savings is generated. The share of savings that finance productive investment adjusts to h. The requirements for a stable solution in this MA model are straightforward; they coincide with the conditions for the viability of the system. The multiplier requires simply that $c < 1$. The supermultiplier requires that $c + h < 1$. The maximum rate of growth of the autonomous trend (implicit in h) turns out to be: $\hat{\gamma} \leq (1 - c)/v$. A final, important, comment. The authors are not claiming that capitalism is a stable system; they simply try to discharge the MA mechanism of the charge of inherent instability. The instability usually lies in the multiplicand, i.e. in the variations of the autonomous rate of growth (in this case, the rate of growth of tourism receipts).

Conclusions and Future Lines of Research
With the aim of modelling the tourism-led growth hypothesis (TLGH), this study has proposed a demand-led growth model of Harrodian inspiration. It is widely known that Harrodian models are subject to potential dynamic instability. However, the inclusion of tourism receipts as autonomous

expenditures that do not generate productive capacity and grow at an exogenously given rate is a great step forward in dealing with such instability.

In the model presented, the growth rates of capital and autonomous demand (tourism receipts) coincide in the long-run equilibrium, while they may be different during the adjustment towards it. It is the evolution of tourism receipts that determines the rate of capital accumulation in the long run. It is the investment share that determines the saving ratio. Faced with a change in the rate of growth of tourism receipts, the adjustment mechanism towards the equilibrium of the model takes place through changes in the composition of output.

Given the dynamic causal links between tourism and economic growth, explicitly modelling them becomes necessary and useful for academicians and policy makers. Thus, the TLGH needs to rely on a plausible identification strategy grounded in a theory of economic growth. Due to problems of logical inconsistency related to the notion of capital (see Felipe and McCombie, 2014 and Dvoskin and Petri, 2017, among others), neoclassical growth models are not capable of offering the solid identification strategy that the empirical works on the TLGH require. With this in mind, in this paper the authors present a Harrodian model that consistently fits with the numerous empirical studies that detect a long-term equilibrium relationship between inbound tourism expenditure and economic growth, together with long-run Granger-causality running unidirectionally from the former to the latter.

On the other hand, the present research suggests that current multiplier-accelerator models are not entirely reassuring as an analytical tool to replicate what happens in tourism-based economies. The main difficulties are, again, related to the dynamic stability of the model. Therefore, an alternative investment function for the baseline model is proposed. The distinction between permanent and transient demand allows separating the main economic system governed by the supermultiplier, which tries to meet efficiently (at normal capacity) the expected increases in permanent autonomous demand (tourism receipts in the simplified version of the model) and the auxiliary system governed by the multiplier, which is in charge of adjusting capacity to the level required by the new path of growth. Thus, the authors present a multiplier-accelerator model that is a stable and stabilizing mechanism.

It must be highlighted that the baseline model developed, in which, for the sake of simplicity, tourism receipts is the only component of autonomous demand, is not suitable to test the TLGH for every region in every situation. Our baseline model is particularly useful to test the TLGH in small tourism-based economies. For example, the contribution of tourism to the balance of payment, calculated as a percentage of total exports, is particularly high for small islands (Brida *et al.* 2016 and Sacco and Cassar, 2019). Thus, Schubert *et al* (2011) state that in the top 10 nations according to the contribution of tourism to economic activity one finds highly tourism-specialized small islands. For these cases, the baseline model developed fits very well, since long-run economic growth is mainly motorized by tourism activity. However, for more developed and diversified economies, the model needs to consider the evolution of other autonomous components of final demand to coherently test the TLGH. In this case, empirical investigations must consider in their identification strategy other sources of autonomous demand as control variables, such as exports, government expenditure, research and development expenditures, residential investment, etc. As explained, our model can also consistently fit this identification strategy.

A final, important, comment is in order. The authors do not suggest that the model is completely exempt from analytical difficulties and totally able to predict with accuracy. Pedagogically, the model provides an accessible and coherent story on how expenditures originating in the household, government or foreign sectors can stabilize as well as drive growth processes. However, the baseline

model does not consider explicit financial relations and constraints. Due to financial restrictions, certain values of the Z/Y and I/Y ratios may be unaffordable and require the introduction of non-linearities *a la* Hicks (1950). Nor should be forgotten that under the apparent exogeneity of tourism receipts (Z) there are hidden distributional and financial effects that would be convenient to endogenise by using *Stock Flow Consistent Models* techniques. In the empirical sphere, stock and flow variables can be jointly treated by modern vector auto regression (VAR) and autoregressive distributed lag (ARDL) techniques. This said, what the authors propose in this paper is a benchmark approach in which all these considerations can be taken into account by researches and policy makers. This would allow to analyse the relationship between tourism receipts and economic activity through different methodologies (stock-flow consistent techniques, input-output analysis, agent-based models, etc.) within a consistent demand-led growth framework.

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[i] "As in the export-led growth hypothesis, a tourism-led growth hypothesis would postulate the existence of various arguments for which *tourism would become a main determinant of overall long-run economic growth*" [emphasis added] (Balaguer and Cantavella-Jordá, 2002:878)