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TRANSPORT CAPITAL AS A DETERMINANT OF TOURISM DEVELOPMENT: A TIME SERIES APPROACH

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Little serious research has been undertaken into the significance of transport as a factor in destination development despite being acknowledged by many writers. The paper aims at identifying and quantifying the factors that made Mauritius attractive to tourists and also to more importantly to investigate the importance transportation capital in the overall destination's attractiveness. The novelty of this paper is that is extends a classical demand for international tourism function to include a proxy of public capital stock which has been decoupled into transport and non-transport infrastructure, and also uses co-integration analysis to model the determinants of tourism for a small island economy case. Results from the analysis show that transport capital stock of the country has been contributing positively of the number of tourist arrival in both short and long run. Tourism infrastructure is reported to be a more important ingredient than transport in the tourism equation. Non transport infrastructure, though having a positive sign, was however found to be insignificant. The study thus highlights the importance of transport capital in adding to the value of service and experience received by tourism.

Keywords: *Co-integration, Error Correction Model, Small Island Economy*

INTRODUCTION

Tourism is one the world's largest and fastest growing industry and accounts for more than 1/10 of global GDP, employment and capital formation (WTTC 2003). It plays an important role in (a) contributing to the growth of domestic industries that supply the tourism industry (e.g. transportation, agriculture, food processing, commercial fishing, construction among others), (b) the economic and technological development of nations by stimulating the development of basic infrastructure, (c) attracting foreign investment (especially in hotels) and facilitating transfer of technology. The comprehensive survey of literature

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from Sinclair (1998) confirms the positive and significant effect of tourism on a destination's economy.

Following the advent of sugar sector and the declining trends of the manufacturing sector, government has spare no efforts in promoting tourism to the second pillar of the economy in Mauritius during the past decade. It has surpassed Mauritius traditional exports and there has been a significant increase in the number of tourist arrivals and receipts are shown in table A1 in Appendix 1. Its increasing contribution to the Gross Domestic Product is also shown in the table.

It is often believed and cited (Robinson ,1976; Chew, 1987; Gunn, 1988; Inskeep, 1991; Martin & Witt, 1988; Naudee and Saayman, 2004 among others) that the infrastructure base of a country may be a determinant of the attractiveness of a tourism destination. In particular, transport infrastructure which provides the vital base for transportation services is believed to be an important element in this respect. Prideaux argued that should the ability of tourists to travel to preferred destinations is inhibited by inefficiencies in the transport system (including the internal transportation system), there is some likelihood that they might seek alternative destinations. Kaul (1985) also recognises the role of transport system as an essential component of successful tourism development. He stated that 'transport plays an important role in the successful creation and development of new attractions as well as the healthy growth of existing ones. Provision of suitable transport has transformed dead centers of tourist interest into active and prosperous places attracting multitudes of people'.

Although many writers acknowledge the need for efficient transport as an overall element in a successful program of tourism development, yet a scarce amount research has been undertaken into the significance of transport as a factor in destination development.

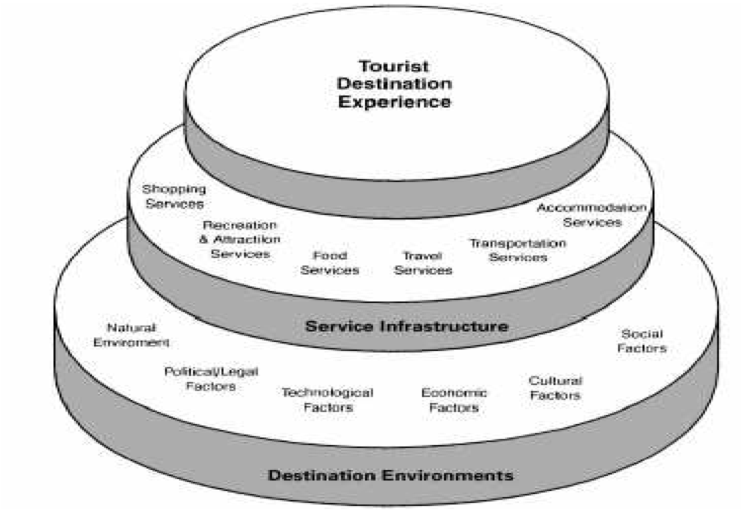
Given the importance of this sector to the economic growth of the country (see Durbarry 2002, 2004), the objective of the study is, in the first instance, to identify and quantify the factors that made the Mauritius attractive to tourists and also in the second instance to investigate the importance of transportation capital in the overall destination's attractiveness. The novelty of this paper is that is extends a classical demand for international tourism function to include transport and non transport public infrastructure and also uses co-integration and error correction model (ECM) to analyse tourist determinants.

The rest of the paper is as follows: section II deals with the theoretical underpinnings of the role of transport in a destination's attractiveness and also with a brief literature review of major studies in the area, Section III explains the model specification, data collection and discusses the empirical results. Section IV concludes and deals with some policy implications.

THEORETICAL UNDERPINNINGS

Gunn (1988) denotes the tourism product as a complex consumptive experience that results from a process where tourists use multiple of services (information, relative prices, transportation, accommodation, and attraction services) during the course of their visit. Other economic and political conditions and structural features are also important factor shaping many tourist experiences and contribute to the nature of the destination product. Murphy et al (2000) related this type of product to supply and a demand analysis and described how various components of the destination interact with travelers during their trip.

Figure 1. The tourist destination experience (Ritchie & Crouch, 2000)



Smith (1994) was among the first to acknowledge the role of service infrastructure in creating a product experience. He argued that 'service infrastructure is housed within the larger macro-environment or physical plant of the destination'. He stressed on the fact that the level, use, or lack of infrastructure and technology in a destination (for example transportation in general, water and power supply, use of computer technology and communications among others) are also visible and determining features that can enhanced the visitors' trip experience. Other authors subsequently supported his views (Choy 1992; Buharis 2000; Ritchie and Crouch 2000). They posited that tourists' overall impression develops their image of a destination after their visitation and that infrastructure may play an important role in that respect.

Crouch and Ritchie (2000) interestingly summarised (refer to figure 1 below) the various factors that together make a tourist destination experience attractive. They highlighted the importance the service infrastructure layer, which includes transport services, in tourist destination experience.

The tourist destination product is also better understood in the context of comparative and competitive advantage. Refer to figure 2, which is adapted from Crouch and Ritchie (1999), depicts a global picture of the determinants of a destination's competitiveness. The authors argued that factor conditions are important determinants of attractiveness as tourists travel to a destination to receive the destination experience. Every element has been categorised under core attraction and supporting elements.

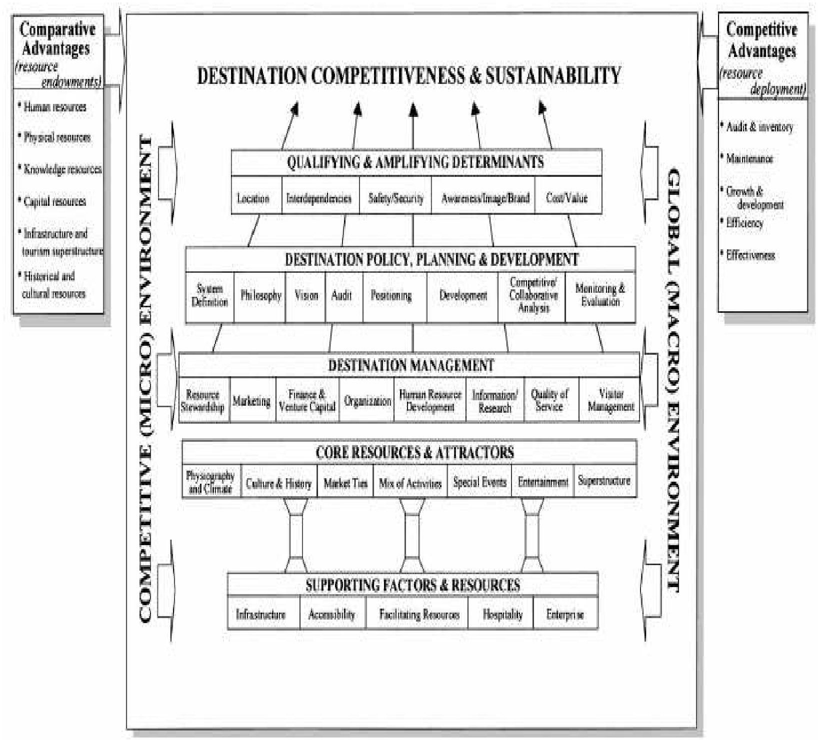
We focus on the supporting factors and resources component. The destination's general infrastructure services in this category in fact represent one of the most important factors. The tourism phenomenon relies heavily on public utilities and infrastructural support. Tourism planning and development would not be possible without roads, airports, harbors, electricity, sewage, and potable water. The infrastructural dimension is thus a necessary element for tourism development and the above factors are all basic elements for attracting visitors to a destination. Generally, infrastructure has not been included in empirical works as they are expected to be available at a destination and has not promoted as an attraction factor.

The role of transport systems in destination development

Prideaux (2000) defined the transport system relevant to tourism "as the operation of, and interaction between, transport modes, ways and terminals that support tourists into and out of destinations and also the provision of transport services within the destination". A good and attractive transportation system rests to a large extent on quality and availability of transportation infrastructures. These can be seen as comprising of international/domestic air services and international/domestic airport, land transport systems and routes and water transport infrastructures as well.

Transport plays a big part of the tourist equation. In fact the transport system is responsible for connecting tourism generating regions to tourism destination regions and providing transport within the tourism destination (to attraction, hotels, shopping etc). A destination should be easy to get to and easy to get around, particularly if the country is geographically dispersed.

Figure 2. Destination competitiveness and sustainability (adapted from Crouch & Ritchie, 1999)



Moreover, improved transport infrastructure, particularly for the case of road and land transport, lead to reduced price of transport. In fact road capacity improvements such as more lanes and higher speed, improved reliability or via higher quality road surfacing causing less strain on vehicles parts, improved access to new destinations and attractions, improved safety (more overtaking lanes, wider road shoulders and improved signage) results in fuel economy and reduced wear and tear and reduced transit time of traffic in general. So these hard transport infrastructure investments will impact the price and quality of tourism travel experiences. In turn these improvements to the price and quality of using hard transport infrastructure can influence the choice of destination and travel mode.

Furthermore inhabitants of developed countries (which constitute the major part of tourist) are used to modern transport infrastructure that enables high quality service. These tourists prefer to maintain essentially the same comforts as home while traveling (Cohen, 1972; Mo, Howard and Havitz,[1] 1993). If the ability of tourists to travel to preferred destinations is inhibited by inefficiencies in the transport system such as uncompetitive prices or lengthy and uncomfortable journey, there is likelihood that they will seek alternative destinations.

Tourism resort has often been cited to be an important attractor of tourism, especially the high class segment of it. The best and renowned resorts definitely appeal to tourist and may prompt them to choose a destination in favour of a competitor. It is believed (see TTF, 2003; Prideaux, 2000) that for the best of resort, particularly internationally renowned resort, to set up such a mass investment or to expand investment, an adequate level of public infrastructure (together with other fiscal and other incentives) is essential in the country. If not available, it becomes necessary to install expensive backup systems[2]. These add to the capital and operating costs of tourism development and act as a tax on tourism and thus reduce the competitiveness of tourism business relative to other where infrastructure is in place.

From the foregoing discussion it is apparent that the role of transport is acknowledged as a prospective determinant in the attraction of tourism but to date, empirical study of the importance of transport on the tourism industry in general and the development of destinations has been particularly lacking.

Empirical evidences

Existing empirical researches in the field of the determinants of international tourism attractiveness have mainly been on a national basis and for developed countries cases. Moreover these were based either on survey analysis or by the estimation of an international demand for tourism equation using time series data. We review the main studies from which we draw an econometric framework to analyse the importance of public and particularly transport infrastructure as a determinant of tourist arrival.

Gearing et al (1974) offered one of the most comprehensive resource inventories in determining the attractiveness of a tourist destination by taking Turkey as a case study. They identified the following the list of attribute groups which were seen to be important namely natural factors, social factors, historical factors, recreational and shopping facilities, food and shelter. The authors also stressed on the infrastructure of the destination. Under this category feature highways and roads, water, electricity and gas, safety services, health services, communications and public transportation facilities. The category was also extended to tourism infrastructure including hotels, restaurants, vacation villages, bungalows, motels, camping facilities. Subsequently Ritchie and Zins (1978) and Ferrario (1979) among others also identified more or less the same factors which they found to contribute to the attractiveness of a tourism destination. Tang and Rochananond (1990) built on the significant factors affecting tourism as identified by Ritchie and Zins (1978) and also reported that infrastructure of a destination country was also ranked as an important element (with a mean score of 3.35).

More recently studies from Murphy, Pritchard, Smith (1995) for the case of Victoria (Canada), Braithwaite et al (1998) (In TTF 2003) for the case of Australia, Kozak and Rimmington (1999) for the case of Turkey, Kim et al (2000) for the case of Sun Lost City, South Africa and McElroy (2003) for the case of 51 islands also highlighted the importance of infrastructure, particularly government financed infrastructure, for a destination success.

The second type of studies performed in the field of the determinants of tourism was based on the estimation of an international tourism demand equation. Witt and Witt (1995) and Lim (1997) provide a comprehensive overview of the regression analysis, model specification, attributes and proxies. Among the most common independent variables used and reported to be important in the literature are income of origin country, cost of travel, relative prices, exchange rate, tourism infrastructure and level of development in home country among others. It is important to point out that the majority of studies have overwhelmingly concentrated on developed countries cases have inadequately investigated the time series properties of the data, particularly with respect to stationarity. One rare study in the African context feature Naude and Saayman (2004) who studied the determinants of tourist in the case of

African countries using panel data regression approach. Among the important factors they identified political stability, the relative cost of living, health, and hotel capacity. Though infrastructure has been analyzed in the study as a potential element and was found to be overall important however related exclusively to tourism infrastructure like hotels and restaurants.

We have hardly come across any study using co-integration and error correction econometric modeling and including public capital (except Kulendran (1996) who employed co-integration techniques only) as likely potential factors as part of the explanatory variables. Moreover studies on small island economies has been very scarce and empirical findings in the above context is believe to add valuable insights in the growing body of literature.

METHODOLOGY AND ANALYSIS

Model specification and data source

The study follows classical (see Witt and Witt 1995; Lim 1997) and more recent research (Nordstom 2002; Eilav and Eilav 2003; Naudee and Saayman 2004) in the area by specifying a demand function for international tourism, but extended the latter to include public capital stock of the country which has been segregated into transport and non transport. The function specified is thus as follows:

$TR = f\,(GDPH, GDPF, ROOM, XRAT, CPI, TRANS, NONTRANS)$ **(1)**

The dependent variable (TR), the total number of tourist arrivals per annum is the measure of demand for tourism to Mauritius. The data were available from the Central Statistical Office of the country.

The key independent variables in the model are total tourism expenditures and relative tourism prices. We follow the literature (example Nordstom 2002; Naude and Saayman 2004) in using real Gross Domestic Product (GDP) per capita in countries of origin (weighted average) as proxy for total expenditures on tourism. Overseas travel (especially recreational) is expensive and regarded as a luxury good in which case the discretionary income of origin is important.

As for the case of relative prices (measured as CPI), we follow Eilat and Einav (2003) and Naudee and Saayman (2004) by using the CPI of a destination country adjusted by the $ exchange rate as a proxy for relative tourism prices. The inverse of it shows the many baskets of goods a tourist has to give up in his home country in order to buy a basket of goods in the destination country. This measure of relative prices captures changes in the real exchange rate over time as well as cross sectional variation in the cost of travel. Demand for overseas travel in a particular destination is expected to be negatively related to relative tourism prices as higher within the country and relatively higher cost of living would make most tourists less enthusiastic about the destination.

Exchange rates (XRAT) are often introduced into tourism demand models in addition to and separately from the relative price variable in an attempt to specifically examine the influence of nominal exchange rate on international tourism demand (see Martin & Witt 1988; Witt & Witt 1995) among others.

Urbanisation and development level of a destination country is consistent with more tourist arrivals, especially from developed countries (GHPH). Tourist might prefer more developed destinations or a minimum development level in choosing their destination. This is proxied by the income of the destination country. All the above three variables were obtained and constructed from the Penn World Table 6.1.

In case of tourism infrastructure, we follow the standard literature and use rooms (ROOM) available in the country as a measure for the capacity of the tourism sector. The more the room the more the capacity and more competitive that country's tourism sector (cheaper price as competition). Moreover a minimum is hotel accommodation size needed for a destination to reach its critical mass and also to convince airlines to establish routes (Naudee and Saayman, 2004). Data on the number of rooms were obtained from the Central Statistical Office of the country.

For the purpose of our analysis we have added two variables namely transport (TRANS) and non transport capital (NONTRAN) stock of the country to proxy for the level transport infrastructure (inclusive of air, land and water transport) and constructed using the Perpetual Inventory Methodology (PIM). Non transport is equivalent to total public capital minus transport capital. It encompasses other public capital such as communication, energy, waste water and defense among). The Penn World Table 6.1 provided the data for the construction of these forms of capital stock.

The study presented here is based on the small island of Mauritius over the year 1971- 2000.

Econometric modeling

The regression model of equation 1 can be written as:

$tr_i = \beta_0 + \beta_1 gdph_t + \beta_2 gdpf_t + \beta_3 xrat_t + \beta_4 cpi_t + \beta_5 room_t + \beta_6 trans_t + \beta_7 nontran_t + \varepsilon_t$ **(2)**.

The specification is of a log linear one and the small letters denotes the natural logarithm of the variables for ease of interpretation of parameters.

Tests of Stationarity

To investigate the data univariate properties and to determine the degree to which they are integrated, both the augmented Dickey-Fuller (ADF) (1979) and Phillips-Perron (PP) (1988) unit-roots tests have been employed and the results are shown in table 2. The tests in fact provide solid evidence and tend to suggest that that the series are non-stationary in levels but indeed stationary in first difference.

Table 1. Summary results of Unit Root Tests in level form: Dickey-Fuller and Phillips/Perron Test

Variables (in log)	Lag sele-ction	Aug. Dickey Fuller	Phillips Perron	Critical Value	Variable Type	Aug Dickey Fuller Time trend (t)	Critical Value	Variable Type
tr	0	+0.25	+0.64	-2.979	***I(1)***	-1.84	-3.594	***I(1)***
gdph	0	-1.322	-1.64	-2.979	***I(1)***	-1.331	-3.594	***I(1)***
gdpf	1	-0.196	-0.944	-2.979	***I(1)***	-2.4528	-3.594	***I(1)***
room	0	-0.294	-0.763	-2.979	***I(1)***	-1.38	-3.594	***I(1)***
xrat	1	-1.58	-1.953	-2.979	***I(1)***	-1.716	-3.594	***I(1)***
cpi	1	-1.51	-1.645	-2.979	***I(1)***	-2.44	-3.594	***I(1)***
trans	1	+1.15	+1.656	-2.979	***I(1)***	-1.43	-3.594	***I(1)***
nontran	1	-1.53	-1.286	-2.979	***I(1)***	-0.94	-3.594	***I(1)***

Table 2. Summary results of Unit Root Tests in first difference : D/F and Phillips/Perron Test

Variables (in log)	Lag selection	Aug. Dickey Fuller	Phillips Perron	Critical Value	Variable Type	Aug Dickey Fuller with time trend (t)	Critical Value	Variable Type
Δ tr	0	-5.07	-6.54	-2.98	***I(0)***	-4.96	-3.603	***I(0)***
Δ gdph	0	-5.03	-8.54	-2.98	***I(0)***	-5.29	-3.603	***I(0)***
Δ gdpf	0	-4.89	-5.34	-2.98	***I(0)***	-4.88	-3.603	***I(0)***
Δ room	0	-5.165	-6.34	-2.98	***I(0)***	-5.23	-3.603	***I(0)***
Δ xrat	0	-3.57	-7.45	-2.98	***I(0)***	-3.69	-3.603	***I(0)***
Δ cpi	0	-3.72	-4.32	-2.98	***I(0)***	-3.70	-3.603	***I(0)***
Δ trans	0	-7.16	-9.54	-2.98	***I(0)***	-4.71	-3.603	***I(0)***
Δ nontran	0	-4.93	-5.34	-2.98	***I(0)***	-5.74	-3.603	***I(0)***

Co-integration issues

Even when variables are non stationary but stationary in first difference they may still be co-integrated[3] (see Stock, 1987). A test for cointegration is undertaken using the Johansen procedure and the results are reported in the table below. The Schwarz Bayesian Criterion (SBC) was used to determine the optimal lag length of the VAR and this chose 1. Results of co-integration rank by Johansen procedure are reported in table 3. Evidence from both trace and maximal eigen-value tests suggests that there is at most a single co-integrating vector or analogously 2 independent common stochastic trends within the variables equation. At the 5% level, trace value and maximum eigen-value test both shows there is one co-integrating vector.

Table 3: Test result from Johansen procedure

	Null Hypothesis	Alternative Hypothesis	Test Statistic	Critical Value 5%	Critical Value 10%
Maximal eigenvalue of the stochastic matrix	*r=0*	*r=1*	176.27	54.17	51.26
	r<=1	*r=2*	44.93	48.57	45.75
	r<=2	*r=3*	31.81	42.67	39.90
	r<=3	*r=4*	19.74	37.07	34.16
	r<=4	*r=5*	15.23	31	28.32
	r<=5	*r=6*	10.23	24.35	22.26
	r<=6	*r=7*	10.03	18.3	16.28
	r<=7	*r=8*	1.16	11.54	9.75
Trace of the stochastic matrix	*r=0*	*r>=1*	309.44	174.88	168.23
	r<=1	*r>=2*	133.17	140.02	134.48
	r<=2	*r>=3*	88.23	109.18	104.27
	r<=3	*r>=4*	56.42	82.23	77.55
	r<=4	*r>=5*	36.67	58.93	55.01
	r<=5	*r>=6*	21.43	39.3	36.28
	r<=6	*r>=7*	11.24	23.83	21.23
	r<=7	*r=8*	1.16	11.54	9.75

Note: Johansen Maximum Likelihood procedure of the cointegrating regression *tr = (gdph,gdpf,room,cpi,xrat,,trans,nontran)*: number of co-integrating vectors(s) using the co-integration likelihood ratio

Theoretical derivation of the error correction model (ECM)

In what follows, since all the series have been proved to be I (1), we shall derive an Error Correction Model (ECM) of our demand for international tourism model. It has a number of useful properties and particularly provides us with a possible approach to deal with problems of non-stationary time series and spurious correlation. A major advantage of ECM is that it result in equations with first difference and hence stationary dependent variables but avoid the lost of valuable information on the long run relationship.

Recall equation:

$tr_i = \beta_0 + \beta_1 gdph_t + \beta_2 gdpf_t + \beta_3 xrat_t + \beta_4 cpi_t + \beta_5 room_t + \beta_6 trans_t + \beta_7 nontran_t + \varepsilon_t$ **(2)**.

where the lower case variables denotes the natural logarithmic of the variables.

If the explanatory variables were at all the times in equilibrium then clearly:

$tr_t = \beta_0 - \beta_1 gdph_t - \beta_2 gdpf_t - \beta_3 xrat_t - \beta_4\, cpi_t - \beta_5\, room_t - \beta_6\, tran_t - \beta_7\, nontran_t = 0$ **(3)**.

However there are many times when *tr* will not be at its equilibrium value relative to the explanatory variables and such times, the quantity $y = \beta_0 - \beta_1 gdph - \beta_2 gdpf - \beta_3 xrat - \beta_4\, cpi - \beta_5\, room - \beta_6\, tran - \beta_7\, nontran$ will be non-zero and will measure the extent of disequilibrium between *tr* and the explanatory variables. Such quantities are therefore known as disequilibrium errors.

Since the explanatory variables are not always in equilibrium we cannot observe the long run relationship (1) directly. We can only observe is a disequilibrium relationship involving lagged values of *tr* and the explanatory variables which in effect reduces to (1) whenever equilibrium happens to occur. We will denote the disequilibrium relationship by:

$tr_t = \beta_0 + \beta_1 gdph_t + \beta_2 gdpf_t + \beta_3 xrat_t + \beta_4\, cpi_t + \beta_5\, room_t + \beta_6\, trans_t + \beta_7\, nontran_t + \beta_8 gdph_{t-1} + \beta_9 gdpf_{t-1} + \beta_{10} xrat_{t-1} + \beta_{11} cpi_{t-1} + \beta_{12} room_{t-1} + \beta_{13} trans_{t-1} + \beta_{14} nontran_{t-1} + \alpha tr_{t-1} + u_t$ **(4)**.

where u_t is a disturbance term.

The problem with (4) is that it is an equation in the levels of variables that are likely to be non-stationary. However this can be re-arranged and re-parametrised as follows: Subtracting tr_{t-1} from either side yields:

$tr - tr_{t-1} = \beta_0 + \beta_1 gdph_t + \beta_2 gdpf_t + \beta_3 xrat_t + \beta_4\, cpi_t + \beta_5\, room_t + \beta_6\, trans_t + \beta_7\, nontran_t + \beta_8 gdph_{t-1} + \beta_9 gdpf_{t-1} + \beta_{10} xrat_{t-1} + \beta_{11} cpi_{t-1} + \beta_{12} room_{t-1} + \beta_{13} trans_{t-1} + \beta_{14}\, nontrans_{t-1} + (\alpha tr_{t-1} - tr_{t-1}) + u_t$ **(5)**.

Also, $\Delta tr_t = \beta_0 + \beta_1\, \Delta gdph_t + \beta_2\, \Delta gdpf_t + \beta_3 \Delta xrat_t + \beta_4 \Delta\, cpi_t + \beta_5 \Delta\, room_t + \Delta\, \beta_6\, tran_t + \Delta\, \beta_7\, nontran_t + (\beta_1 + \beta_8)\, gdph_{t-1} + (\beta_2 + \beta_9) gdpf_{t-1} + (\beta_3 + \beta_{10})\, xrat_{t-1} + (\beta_4 + \beta_{11})cpi_{t-1} + (\beta_5 + \beta_{12})room_{t-1} + (\beta_6 + \beta_{13})trans_{t-1} + (\beta_7 + \beta_{14})nontran_{t-1} - (1-\alpha)tr_{t-1} + u_t$ **(6)**.

Further re-parameterising, we obtain:

$\Delta tr_t = \beta_0 + \beta_1\, \Delta gdph_t + \beta_2\, \Delta gdpf_t + \beta_3 \Delta xrat_t + \beta_4 \Delta\, cpi_t + \beta_5 \Delta\, room_t + \Delta\, \beta_6\, tran_t + \Delta\, \beta_7\, nontran_t - (1-\alpha)(\, tr_{t-1} - \gamma_2\, gdph_{t-1} + \gamma_3\, gdpf_{t-1} + \gamma_4\, xrat_{t-1} + \gamma_5\, cpi_{t-1} + \gamma_6\, room_{t-1} + \gamma_7\, tran_{t-1} + \gamma_8\, nontran_{t-1} +\, u_t$ **(7)**.

And again re-parameterising:

$\Delta tr_t = \beta_1 \Delta gdph_t + \beta_2 \Delta gdpf_t + \beta_3 \Delta xrat_t + \beta_4 \Delta cpi_t + \beta_5 \Delta room_t + \Delta \beta_6 tran_t + \Delta \beta_7 nontran_t - (1-\alpha)(tr_{t-1} - \gamma_1 - \gamma_2 gdph_{t-1} + \gamma_3 gdpf_{t-1} + \gamma_4 xrat_{t-1} + \gamma_5 cpi_{t-1} + \gamma_6 room_{t-1} + \gamma_7 tran_{t-1} + \gamma_8 nontran_{t-1}) + u_t$ **(8)**.

Where $\gamma_1 = \beta_0/(1-\alpha)$; $\gamma_2 = (\beta_1 + \beta_8)/(1-\alpha)$; $\gamma_3 = (\beta_2 + \beta_9)/(1-\alpha)$; $\gamma_4 = (\beta_3 + \beta_{10})/(1-\alpha)$; $\gamma_5 = (\beta_4 + \beta_{11})/(1-\alpha)$; $\gamma_6 = (\beta_5 + \beta_{12})/(1-\alpha)$; $\gamma_7 = (\beta_6 + \beta_{13})/(1-\alpha)$; $\gamma_8 = (\beta_7 + \beta_{14})/(1-\alpha)$

Equation 8 is just another way of writing the disequilibrium relationship (4). However it gives very appealing interpretation. It can be regarded as stating that changes in *tr* depend on changes in the explanatory variables and on the term in the square brackets which is the disequilibrium error from the previous period. This makes sound sense since it implies that the lower (higher) is *tr* compared with its equilibrium value relative to the explanatory variable, the greater (smaller) will be the immediate rise in *tr*. The value of *tr* is thus being corrected for the previous disequilibrium error. Although (3) can be derived from 1 without referring to the long run relationship, it clearly makes sense to give it an error correction interpretation and regard the new parameters γ_1, γ_2, γ_3 γ_4 γ_5 γ_6, γ_7 and γ_8 as parameters in a long-run relationship like (1). Notice that α and hence $1-\alpha$ determine the extent to which the disequilibrium in period t-1 is 'made up for' in period t.

An ECM makes use of any long-run information about the levels of variables that is contained in the data. An ECM such as 3 involves a parametrisation which clearly distinguishes between long-run and short-run effects. We can observe that the parameters which appear in the disequilibrium error term are the long-run parameters. The coefficients of Δ explanatory variables βs, are clearly short term parameters, measuring the immediate impact effect on y of a change in the explanatory variable.

So the equation to regress is equation 8. There are two ways in which the final preferred ECM can be estimated. Engle and Granger (1987) proposed a two-step procedure for the estimation of the above equation. Wickens and Breusch (1988) developed an alternative approach. They shown that while the properties of the short-run parameters are identical to those in the two-step procedures estimators, this does not appear to be the case for the estimators of the long-run parameters. There is evidence that the small sample bias is smaller for these latter estimators than it is with the two-step procedure. Since our sample is not a large one (30 annual observations), the second approach is preferred[2].

The authors suggested applying OLS to (3) directly and hence to estimate both short and long run parameters together. Consider equation 8 again that is,

$\Delta tr_t = \beta_1\, \Delta gdph_t + \beta_2\, \Delta gdp_t f + \beta_3 \Delta xrat_t + \beta_4 \Delta\, cpi_t + \beta_5 \Delta\, room_t + \Delta\, \beta_6\, tran_t + \Delta\, \beta_7\, nontran_t - (1-\alpha)(\, tr_{t-1} - \gamma_1 - \gamma_2\, gdph_{t-1} + \gamma_3\, gdpf_{t-1} + \gamma_4\, xrat_{t-1} + \gamma_5\, cpi_{t-1} + \gamma_6\, room_{t-1} + \gamma_7\, tran_{t-1} + \gamma_8\, nontran_{t-1}) + u_t$

The equation can be can be rewritten as:

$\Delta tr_t = \beta_0 + \beta_1\, \Delta gdph_t + \beta_2\, \Delta gdpf_t + \beta_3 \Delta xrat\,_t + \beta_4 \Delta\, cpi_t + \beta_5 \Delta\, room_t + \Delta\, \beta_6\, trans_t + \Delta\, \beta_7\, nontran_t - (1-\alpha) tr_{t-1} + (1-\alpha)\gamma_2\, gdph_{t-1} + (1-\alpha)\, \gamma_3 gdpf_{t-1} + (1-\alpha)\, \gamma_4 xrat_{t-1} + (1-\alpha)\, \gamma_5\, cpi_{t-1} + (1-\alpha)\, \gamma_6\, room_{t-1} + (1-\alpha)\ \ \gamma_6\, trans + (1-\alpha)\, \gamma_7\, nontran + u_t$

Where $\gamma_1 = \beta_0/(1-\alpha)$; $\gamma_2 = (\beta_1 + \beta_8)/(1-\alpha)$; $\gamma_3 = (\beta_2 + \beta_9)/(1-\alpha)$; $\gamma_4 = (\beta_3 + \beta_{10})/(1-\alpha)$; $\gamma_5 = (\beta_4 + \beta_{11})/(1-\alpha)$; $\gamma_6 = (\beta_5 + \beta_{12})/(1-\alpha)$; $\gamma_7 = (\beta_6 + \beta_{13})/(1-\alpha)$; $\gamma_8 = (\beta_7 + \beta_{14})/(1-\alpha)$

The estimates of the long run parameter γ_2, γ_3, γ_4, γ_5, γ_6, γ_7 and γ_8 can then be obtained from the ratio of the estimated coefficients of $gdph_{t-1}$, $gdpf_{t-1}$, $gdpf_{t-1}$, $xrat_{t-1}$, cpi_{t-1}, $room_{t-1}$, $trans_{t-1}$, $nontran_{t-1}$ and tr_{t-1}. Similarly we can get estimate of γ_1. The data presented at table 4 are obtained when running equation 9 using our time series data.

Table 4. OLS results of the unrestricted regression in difference. Dependent Variable: tr (number of tourist arrivals)

Regressor	Coefficient	*t*-ratio
β_0	-1.17	5.03
$\Delta gdph$	0.427	1.23
$\Delta gdpf$	0.934	4.71
$\Delta xrat$	-0.498	-2.94
Δcpi	-0.344	-2.33
$\Delta room$	0.252	1.78
$\Delta trans$	0.127	3.85
$\Delta nontran$	0.087	1.08
tr_{t-1}	-0.801	-2.73
$gdph_{t-1}$	0.436	1.91
$gdpf_{t-1}$	0.952	1.94
$xrat_{t-1}$	-0.221	-2.32
cpi_{t-1}	-0.587	-2.12
$room_{t-1}$	0.257	1.73
$trans_{t-1}$	0.139	1.99
$nontran_{t-1}$	0.106	1.24
R^2	0.79	

The results also pass all diagnosis test of serial correlation (DW = 2.12 and Lagrange multiplier test of residual serial correlation), Heteroscedasticity (based on the regression of squared residuals on

squared fitted values) and R square of 0.79 is reported. The respective long run parameters were subsequently calculated to be:
$\gamma_{1\ (constant)} = -1.46$; $\gamma_{2(gdph)} = 0.545$; $\gamma_{3(gdpf)} = 1.19$; $\gamma_{4(xrate)} = 0.321$; $\gamma_{5(cpi)} = 0.733$; $\gamma_{6(room)} = 0.276$; $\gamma_{7(trans)} = 0.173$; $\gamma_{8\ (nontrans)} = 0.132$

The results from the analysis shows that transport infrastructure can be seen to indeed be an important element of the tourism equation thus confirming the theoretical discussions. In fact there is a positive contribution of transport capital both in the short run (0.127) and in the long run as well (0.17). This would mean that a one percent increase in transport capital of the country will lead to a 0.17 percent increase in the number of tourist arrival in the country. It should be noted that non public transportation capital, though having a positive sign, has an insignificant effect in both runs. Tourism infrastructure is reported to impact positively on tourist arrival and is judged to be a more important element than transport infrastructure. The other variables in the model seem to have all the expected signs and are significant. In particular, the long run coefficient of 1.19 for the foreign income is slightly more than reported in the literature and may indicate that Mauritius is seen as a more luxury destination in the market. Relative prices and exchange are found to negatively impact on the attractiveness of Mauritius as a destination. The negative and significant adjusted CPI indicates the tourists are relatively price sensitive. It is however estimated to be less than in the literature which reported that the price elasticity often fall with the range of unitary (Crouch (1995)) thus meaning that tourists might be less price sensitive. The positive and significant coefficient of domestic income, used as an indicator for development, suggests that a higher level of development is consistent with more tourist arrival.

SUMMARY AND POLICY IMPLICATIONS

Although many writers acknowledge the need for efficient transport as an overall element in a successful program of tourism development little serious research has been undertaken to shed light on the hypothesis. The link between transport capital and tourism arrival has been analysed using co-integration analysis and an error correction framework for the small island state of Mauritius. Results from the analysis show that transport capital stock of the country has been contributing positively of the number of tourist arrival during our period of study in both short and long run. Moreover tourism infrastructure is also seen to be an important ingredient, and maybe more important than transport, in the tourism equation. Non transport infrastructure, though having a positive sign, was however found to be insignificant. The study thus highlights the importance of all means of transport infrastructure in adding to the value of service and experience received by tourism and surely helps to form an enhanced total experience of the area destination visited.

It is recommended that government refrains itself in undergoing drastic cuts, particularly in transport capital expenditure, in times of budget constraint. In fact this has been a practice for most country including Mauritius. It is believed that the government would be better off in taking advantage of World Bank's and other international institutions infrastructural and developmental loans instead of capital expenditure cuts from the budget. Moreover government needs to take immediate action to formulate and adopt a long term vision and spell out integrated transport policies involving all stake holders. Broad participation of different interest groups, particularly from the tourism sector and consumers is essential for the effectiveness of such planning. The case of private financing and joint public/private financing arrangements should be less ambiguous so long there is addition to the country's stock of transport capital, no matter who is financing it. Government should ensure that the private sector have sufficient incentive to invest in transport capital and in its services as well.

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ENDNOTES

1. The exception of course being the enablement inherent in the host/guest relationship (see Smith, 1977; more recently, Sherlock, 2001) and the development of the tourist infrastructure (see Seaton, 1994; more recently, Eisinger, 2000, 2003)
2. Mo, Howard and Havitz (1993) using survey methodology found that that tourist gave much importance to the preference to travel to countries where they have the same infrastructures as in their country.
3. The Engle Granger Approach was also performed involved regressing the following regression namely $\Delta tr_t = \beta_1\ \Delta gdph_t + \beta_2\ \Delta gdpf + \beta_3 \Delta xrat + \beta_4 \Delta\ cpi + \beta_5 \Delta\ room + \Delta\ \beta_6\ trans + \Delta\ \beta_7\ nontran - (1-\alpha)\ e_{t-1} + u_t$. Interestingly the results obtained did not differ significantly as compared to the preferred approach.
4. For example in Samoa, it is necessary for operators to install expensive surge protection equipment to guard against power variations. In Kiribati, electric provision is so unreliable that backups are necessary (TTF 2003). In

Vanuatu, electricity while reliable is so expensive that power and water costs account foe 12-15% to standard room rate.

5. In fact it can be shown that in a case of co-integrated non-stationary series, ordinary least squares (OLS) estimates of the co-integration vector are consistent and more importantly converge on their true parameter values much faster than in the stationary case.

Appendix A. Some key figures about the Mauritian Tourism Sector

	1980	1990	1997	1998	1999	2000	2001	2002	2003
Population of MUS	1060000	1080000	1147000	1159730	1174400	1186140	1189000	1190344	1195433
No. Hotels	43	75	87	90	92	95	95	95	97
Hotel Rooms	2101	4603	6668	6809	7267	8255	8657	9024	9647
Tourist arrival	115080	291550	536125	558195	578085	656543	660318	681648	702018
Tourism Rcpt (million)	7500	9207	10068	11890	14668	14234	18166	18238	19397
Tourism Receipts (% of GDP)	6%	10%	12%	13%	13%	14%	15%	16%	17%

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