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Abstract: This paper examines whether the tourism-led growth hypothesis holds for the New Zealand economy. Using unit root tests, cointegration tests and vector error correction models, and annual data over the period 1972-2012 on international tourism expenditure, real gross domestic product (GDP) and the exchange rate for New Zealand, it finds that the tourism-led growth hypothesis holds for New Zealand. The long-run elasticity of real GDP with respect to international tourism expenditure is estimated to be 0.4, meaning that a 1% growth in tourism will result in a 0.4% growth of the NZ economy. This finding implies that the New Zealand Government's policy to promote New Zealand as a preferred tourism destination in the key international tourism markets may boost economic growth.

***Keywords*:** Tourism; Economic growth; Cointegration; Granger causality; Vector error correction model; New Zealand

***JEL classifications*:** C32, F14, L83

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1. Introduction

The international tourism industry is a trillion dollar industry. According to the United Nations World Tourism Organization (UNWTO), the number of international tourists reached 1.035 billion in 2012 and is expected to rise by between 3% and 4% in 2013 (UNWTO, 2013). These tourists are a significant source of demand for goods and services such as accommodation, transport, food, drinks, etc. In 2011, international tourists spent 1.2 trillion US dollars on tourism related goods and services (UNWTO, 2013). It is no wonder then that all trading nations of the world, including New Zealand (NZ), are very keen to have a share of the international tourism market to improve their economic welfare.

Tourism, including both domestic and international, is an important industry in NZ. In 2012, the tourism industry accounted for 7.7 percent of GDP and 9.5 percent of full-time equivalent employment of NZ. It is also New Zealand's largest export industry generating 18% of the country's export earnings in 2010 (Ministry of Business, Innovation and Employment, 2013). In 2012, 2.6 million international tourists visited the country and spent 9.6 billion NZ dollars on goods and services (Statistics New Zealand, 2013). International tourists visiting NZ come from a number of countries, but most of them by far are from Australia. Table 1 shows the source countries of these tourists. As can be seen from the table, about 45 percent of the visiting tourists in 2012 were from Australia followed by 8.5 percent from the UK. Australia, the UK, the USA and China jointly accounted for 66.4 percent of international tourists to NZ in 2012. It is recently reported by the New Zealand Herald (2013) that China has now overtaken the UK as the second largest source of international visitors to New Zealand. The main tourist attractions for foreign tourists in NZ are stunningly beautiful natural areas such as Milford Sound, Abel Tasman National Park or the Tongariro Alpine Crossing and tourism adventure activities such as bungee jumping or whale watching in natural settings.

Recognising the economic importance of international tourism expenditures, the NZ government spends millions of dollars on promoting NZ as a visitor destination in key overseas markets. In 2011/12, it spent 83.86 million dollars for this purpose and it intends to spend about the same amount of money in 2012/13 (The Treasury, 2013).

Table 1. Total international tourists visiting NZ by country of origin.

Year	2008	2009	2010	2011	2012
Australia	970 471	975 870	1116 887	1112 040	1168 316
UK	293 209	263 733	255 376	219 899	222 152
USA	222 757	196 655	196 452	189 958	184 056
China	124 323	113 465	100 520	129 564	160 268
Japan	116 489	96 824	79 619	85 383	65 052
South Korea	91 843	71 213	57 394	65 039	52 552
Germany	60 958	61 908	66 017	64 309	63 492
Canada	51 875	49 633	48 697	49 141	49 156
Others	554 633	560 251	566 019	579 425	645 816
Total	2486 558	2389 552	2486 981	2494 758	2610 860

Source: Statistics New Zealand (2013)

An extension of the export-led growth hypothesis (Giles and Williams, 2000) called the tourism-led growth hypothesis (TLGH) suggests that growth in tourism exports may foster economic growth due to a number of reasons. Firstly, growth in tourism exports both directly and indirectly increases demand for goods and services and thus leads to growth in GDP. Secondly, foreign exchange earned through tourism exports can be used to finance imports of capital goods and technology needed to improve the productivity of inputs and increase the productive capacity of the domestic economy. Thirdly, tourism exports create jobs; the higher level of employment in turn leads to further economic stimulus through the spending of workers. Finally, tourism may help economic growth by creating jobs for a section of the labour force that may find it hard to find jobs in other sectors. The tourism industry is labour intensive (Palmer, 1979) and relative to other sectors of an economy employs relatively more low-skilled labour, which typically has higher unemployment rates than other segments of the labour force (Lorde *et al.*, 2011).

The tourism-led growth hypothesis that tourism growth boosts economic growth has recently attracted a great deal of attention from researchers. Studies have been conducted to see whether there is any empirical evidence to support the hypothesis. Attention has also been focussed on the nature of Granger (1969) causality between growth in tourism exports and economic growth. While some studies have found evidence in support of the hypothesis, others have failed to do so. Similarly, no consensus has emerged as to whether tourism exports Granger-cause economic growth or economic growth Granger-causes tourism exports. The published literature on TLGH does not contain, to the best of the present author’s knowledge, any evidence as to whether this hypothesis holds for the NZ economy. The present study aims to fill this gap in research in this area.

2. Literature Review

This section reviews some of the tourism studies that have used time-series data, cointegration and vector error correction models to examine whether TLGH holds. Research interest in the TLGH is relatively new and the literature is still growing.

Researchers differ in their choice of econometric models and variables to be included in the analyses. They also differ in terms of the sources of data, time period covered and the country or countries considered. So it is perhaps not surprising that they have reached different conclusions with respect to the relationship between tourism growth and economic growth.

A recent study by Georgantopoulos (2012) has found that there is a unidirectional causal relationship between tourism expenditure and real gross domestic product (RGDP) in Greece running from the former to the latter. This finding was made on the basis of annual time-series data on Greece's tourism receipts, RGDP and the real effective exchange rate for the period 1988-2011. The econometric model used is a vector error correction model (VECM). Other studies that discovered the same type of relationship between tourism exports and economic growth using data from other countries are Ghali (1976), Balaguer and Cantavella-Jorda (2002), Lanza *et al.* (2003), Eugenio-Martin, *et al.* (2004), Cortes-Jimenez and Artis (2005), Gunduz and Hatemi-J (2005), Brida *et al.* (2009) and Zortuk (2009). The opposite type of relationship between tourism exports and economic growth, that is, one running from economic growth to tourism, has recently been discovered by Lorde *et al.* (2011) for Barbados. These authors used quarterly data on long-stay international tourist arrivals, RGDP and the exchange rate between SDRs (Special Drawing Rights) and Barbados dollars for the period 1974-2004. The econometric model used was a VECM. The same type of relationship was found between tourism and economic growth by Narayan (2004) and Oh (2005) for Fiji and South Korea respectively. A bi-directional relationship has also been discovered by some researchers. Using time-series data from Greece for the period 1960-2000 and a VECM, Dritsakis (2004) found that tourism exports and economic growth mutually Granger-cause each other. Durbarry (2004) and Kim *et al.* (2006) have discovered the same type of relationship for Mauritius and Taiwan respectively.

Although the TLGH leads us to believe that the relationship between tourism exports and economic growth is unidirectional running from tourism exports to economic growth, empirical studies have discovered that other types are possible. Indeed, the possibility of economic growth Granger-causing international tourism growth can be defended for those countries where economic growth leads to growth in business tourism. The disagreement among studies as regards the direction of Granger causality between tourism exports and economic growth may have been the result of variation in the importance of tourism across countries, the use of different sets of variables and data sets pertaining to different time periods in different studies, and because the studies vary in terms of methodologies.

3. Data and Econometric Model

The key variables to consider in such an analysis are tourism exports and RGDP of an economy. Since both tourism exports and RGDP are linked to the exchange rates of currencies of trading nations, another variable one may want to consider is the exchange rate or rates. Since some of the authors of previous studies were forced to use proxies for these variables due to limitations on data availability, the same set of variables has not been used in all studies. All previous studies managed to use RGDP as a measure of economic activity as data on this variable are readily available from various national and global statistical agencies. Since data are not readily available on tourism exports or expenditures by tourists, different variables representing tourism activity were used by the authors of previous studies. Some authors used international tourist arrivals (for example, Kasimati (2011) and Lorde *et al.* (2011)) and some used tourism expenditures (for example, Dritsakis (2004), Brida *et al.* (2009) and Georgantopoulos (2012)). As to the exchange rate, Georgantopoulos (2012) used the real effective exchange rate series from the World Bank and Lorde *et al.* (2011) used the International Monetary Fund's exchange rate series between Barbados dollars and SDRs.

In light of the variables used in the previous studies, the present study uses the following three variables in the analysis of the relationship between tourism growth and economic growth: real GDP of NZ, international tourism expenditure in NZ and an index of exchange rates between the NZ dollar and currencies of its trading partners. Of the two measures of tourism activity used in previous studies, tourism expenditure is preferred as it contains more information being a product of the number of international tourist arrivals and their expenditure per capita and is more directly related to economic output measured by real GDP. As to the exchange rate, the IMF's series of SDRs per NZ dollar has been used, similar to Lorde *et al.* (2011). This series is used in preference to the World Bank's series used by Georgantopoulos (2012) because it has a longer span and allows the use of longer time series for the other two variables.

Data on real gross domestic product (*RGDP*) of New Zealand, real international tourism expenditures (*RTEXP*) received by NZ, and the exchange rate between NZ dollars and SDRs (*EXCH*) for the period 1972-2012 are collected from different sources. Data on *RGDP* have been obtained from Statistics New Zealand (2013). *RGDP* is measured in 1995/96 New Zealand dollars. International tourists' expenditures in NZ are obtained from two sources: the World Bank (2013) for the period 1972-1996 and Statistics New Zealand (2013) for the period 1997-2012. The international tourism expenditures data from the World Bank for the period 1972-1996 match those published by Statistics New Zealand in its various New Zealand Official Yearbooks. The initial series in current New Zealand dollars was expressed in constant 1999 New Zealand dollars using the CPI series published by Statistics New Zealand (2013). The series of the exchange rate between SDRs and NZ dollars is obtained from the International Monetary Fund (2013).

Annual data for the three variables have been used, which has the advantage of avoiding econometric problems caused by the presence of seasonality in higher frequency data. Descriptive statistics for the variables are presented in Table 2.

Table 2. Descriptive statistics for *RGDP*, *RTEXP* and *EXCH*.

Variable	*RGDP* (millions NZ $)	*RTEXP* (millions NZ $)	*EXCH* (SDRs per NZ $)
Mean	94 296.53	3846.96	0.5687
Maximum	142 820.00	9137.74	1.1644
Minimum	58 055.25	523.87	0.3304
SD	26 706.69	3001.41	0.2267

Following previous studies, the relationship between tourism growth and economic growth is investigated in the framework of a vector autoregressive (VAR) model. Given that annual time series data on three variables are used, the basic econometric model to be used to examine Granger causality among the variables is:

$$
\begin{aligned}
RGDP_t &= a_{10} + \sum_{i=1}^{p} a_{1i} RGDP_{t-i} + \sum_{i=1}^{p} b_{1i} RTEXP_{t-i} + \sum_{i=1}^{p} c_{1i} EXCH_{t-i} + u_{1t} \\
RTEXP_t &= a_{20} + \sum_{i=1}^{p} a_{2i} RGDP_{t-i} + \sum_{i=1}^{p} b_{2i} RTEXP_{t-i} + \sum_{i=1}^{p} c_{2i} EXCH_{t-i} + u_{2t} \\
EXCH_t &= a_{30} + \sum_{i=1}^{p} a_{3i} RGDP_{t-i} + \sum_{i=1}^{p} b_{3i} RTEXP_{t-i} + \sum_{i=1}^{p} c_{3i} EXCH_{t-i} + u_{3t}
\end{aligned} \qquad (1)
$$

where *RGDP* = real GDP, *RTEXP* = real international tourism expenditure and *EXCH* = SDRs per NZ dollar. This model, a VAR of lag length *p*, however, is valid if all three variables *RGDP*, *RTEXP* and *EXCH* are integrated of order zero, i.e., $I(0)$. If this condition is not met by the data, the model needs to be modified. If all time series are integrated of order *d*, i.e., *I*(*d*) and the three variables are not cointegrated, all the variables, both lagged and non-lagged, in Equation 1 must be differenced *d* times before being used in the estimation of the model parameters. In the event the variables are *I*(*d*) and cointegrated, an error correction term must be included in the model in addition to *d*th differenced variables. If the variables are *I*(1) and cointegrated, the appropriate model is a vector error correction model (VECM) as follows:

$$\begin{aligned}
\Delta RGDP_t &= a_{10} + \partial_1 ECT_{t-1} + \sum_{i=1}^{p-1} a_{1i}\Delta RGDP_{t-i} + \sum_{i=1}^{p-1} b_{1i}\Delta RTEXP_{t-i} + \sum_{i=1}^{p-1} c_{1i}\Delta EXCH_{t-i} + u_{1t} \\
\Delta RTEXP_t &= a_{20} + \partial_2 ECT_{t-1} + \sum_{i=1}^{p-1} a_{2i}\Delta RGDP_{t-i} + \sum_{i=1}^{p-1} b_{2i}\Delta RTEXP_{t-i} + \sum_{i=1}^{p-1} c_{2i}\Delta EXCH_{t-i} + u_{2t} \qquad (2) \\
\Delta EXCH_t &= a_{30} + \partial_3 ECT_{t-1} + \sum_{i=1}^{p-1} a_{3i}\Delta RGDP_{t-i} + \sum_{i=1}^{p-1} b_{3i}\Delta RTEXP_{t-i} + \sum_{i=1}^{p-1} c_{3i}\Delta EXCH_{t-i} + u_{3t}
\end{aligned}$$

where Δ is the difference operator and *ECT* is the error correction term. *ECT*, when not zero, represents the deviation from the long-run relationship or cointegrating relationship among the variables, that is, $ECT_t = RGDP_t - \beta_0 - \beta_1 RTEXP_t - \beta_2 EXCH_t$. If the lagged error correction term is not included in the model in Equation 2, it will suffer from the problem of specification error (Engle and Granger, 1987).

It follows from the above discussion that one must proceed carefully in choosing the correct model when time-series data on a set of related variables are being used. First, one must determine the order of integration of each variable. If all variables are *I*(0) or stationary, the model in Equation 1 is appropriate. In the event all variables are integrated of the same order, one should check whether the variables are cointegrated or moving together over time. A cointegrating relationship is equated with a long-run equilibrium relationship. If there is a deviation from the long-run relationship in the previous period, then the variables will tend to adjust themselves in the current period to return the relationship to the equilibrium state.

Engle and Granger (1987) demonstrate that the existence of a cointegrating relationship among the variables implies that there is causality among them in at least one direction. To reveal the direction of causality, further tests will be required.

4. Empirical Results and Analysis

Several tests are available to test for unit roots in a time series. The tests that have been used in this study are the Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller (1981), the Phillips and Perron (PP) test developed by Phillips and Perron (1988), the KPSS test developed by Kwiatkowski, *et al.* (1992) and the Elliot-Rothenberg-Stock DF-GLS (ERS DF-GLS) test developed by Elliot *et al.* (1996). For ADF, PP and ERS DF-GLS, the null hypothesis to be tested is that the time series in question is nonstationary or $I(1)$ while for the KPSS test the null hypothesis is that the series is stationary or I(0). Time-series data on *RGDP*, *RTEXP* and *EXCH* are plotted in Figure 1. All variables are trending and appear to be nonstationary in their levels. Judging by the plots, there are no structural breaks in the time series. In testing the order of integration of the variables, a linear time trend and a constant have been included in the equation. Results based on the four tests for unit roots are presented in Table 3. The lag selection in the ADF and ERS DF-GLS tests is based on the Akaike Information criterion. The PP and KPSS tests are based on the Bartlett Kernel with Newey-West bandwidth.

All four unit root tests are in agreement that both *RGDP* and *RTEXP* have a unit root in levels but their first differences are stationary. So both variables are integrated of order one, i.e., $I(1)$. As to the *EXCH* variable, ADF, PP and KPSS indicate that this variable is $I(1)$ while ERS DF-GLS indicates that it is $I(2)$. Since the majority of the tests indicate it is $I(1)$ we accept it as such. So all three variables are treated as $I(1)$.

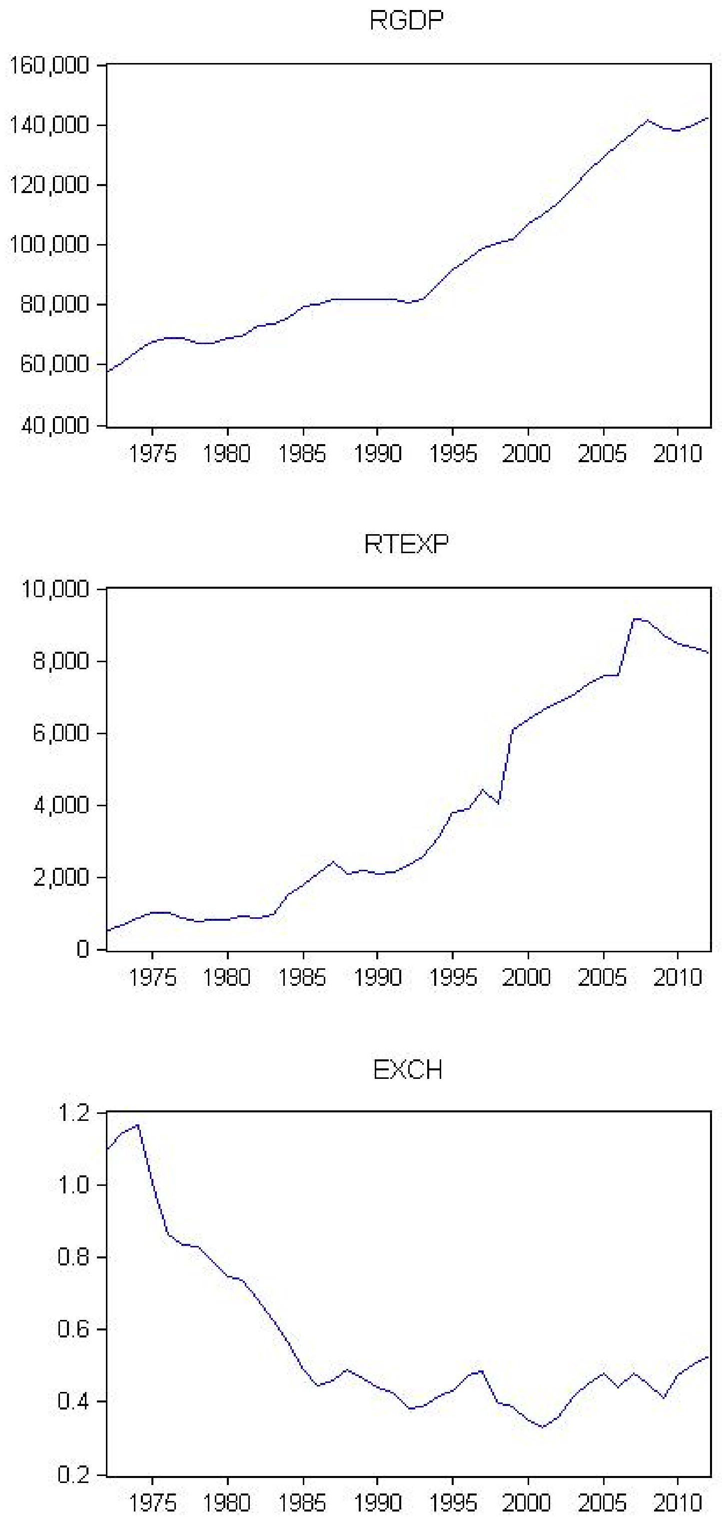

Figure 1. Graphs of *RGDP*, *RTEXP* and *EXCH* variables.

Table 3. Unit root tests.

Variables	ADF test	PP test	ERS DF-GLS test	KPSS test
RGDP	-1.6550 (1)	-1.2706 (3)	-1.5735 (1)	0.1846* (5)
Δ*RGDP*	-3.7610** (0)	-3.7321* (1)	-3.7082* (0)	0.0794 (2)
RTEXP	-1.9636 (0)	-1.9636 (0)	-1.6417 (0)	0.1724* (5)
Δ*RTEXP*	-6.5153** (0)	-6.5153** (0)	-6.6433** (0)	0.1225 (1)
EXCH	-1.3167 (5)	-0.2620 (15)	-1.6564 (8)	0.2065* (5)
Δ*EXCH*	-4.3444** (4)	-6.0091** (7)	-2.0013 (7)	0.1923 (14)

Notes: Numbers in parentheses are lag lengths in the ADF and ERS DF-GLS tests, and bandwidths in the PP and KPSS tests. Δ is the difference operator. ** indicates rejection of the null hypothesis at the 1% level. * indicates rejection at the 5% level.

The next step involves finding out whether *RGDP*, *RTEXP* and *EXCH* are cointegrated, i.e., whether there is a long-run equilibrium relationship(s) among these variables. The most popular approach to investigate whether a vector of variables are cointegrated or not is Johansen's (1988, 1991, 1995) maximum-likelihood system cointegration test. The first step in applying the Johansen's system cointegration test is to determine the optimal lag length of the underlying VAR, i.e., the value of *p* in the model in Equation 1. Here the procedure suggested by Enders (2004, pp. 358-359) has been followed. An unrestricted VAR model of lag length 4 $(=T^{1/3},\ T$ is sample size$)$ is initially estimated and then the lag length is gradually reduced. The Schwarz Information Criterion (SIC) indicated that the appropriate lag length to use is 2. This lag length is chosen to perform Johansen's system cointegration test. The test results are shown in Table 4.

Both the λ_{trace} test and $\lambda_{\max}$ test indicate that there is only one co-integrating relationship among the three variables under study. This long-run equilibrium relationship among the three variables is presented in Table 4 as well. In presenting this long-run relationship, real GDP has been expressed as a function of international tourism expenditures and the exchange rate. This decision is based on the TLGH: growth in tourism exports Granger-causes economic growth. The estimates of the coefficients of *RTEXP* and *EXCH* are statistically significantly different from zero at the 1% level of significance and, therefore, imply that changes in *RTEXP* and *EXCH* affect NZ's real GDP. The sign of the estimated coefficient of *RTEXP* is positive which implies that growth in tourism exports will foster NZ's GDP growth. The long-run elasticity of real GDP with respect to tourism exports is estimated to be 0.4 at the mean values of the variables concerned. This estimate is similar to elasticities estimated by Georgantopoulos (2012) for Greece and by Lee and Chang (2008) for a panel of OECD and non-OECD countries. Georgantopoulos' (2012) estimate of the tourism export elasticity of real GDP for Greece is 0.54. Lee and Chang (2008) found that the tourism export elasticity of real GDP ranges from 0.13 to 0.36 for OECD countries and from 0.17 to 0.61 for non-OECD countries. The sign of the estimated coefficient of *EXCH* is negative. Since *EXCH* represents SDRs per NZ dollar, this negative sign implies that depreciation of the NZ dollar will boost economic growth of New Zealand. This finding is theoretically plausible as depreciation of the NZ dollar will boost NZ exports including tourism exports to other countries by making them relatively cheaper. Increases in exports will increase GDP. The long-run elasticity of NZ's real GDP with respect to *EXCH* is estimated to be -0.5 at the mean values of the variables. This elasticity estimate is similar to Georgantopoulos's (2012) estimate of -0.61 for Greece.

Table 4. Cointegration test results for *RGDP*, *RTEXP* and *EXCH*.			
Null hypothesis	Alternative hypothesis	Test statistic	P-value
λ_{trace} *test*			
$r = 0$	$r > 0$	47.1257**	0.0002
$r \le 1$	$r > 1$	13.0026	0.1147
$r \le 2$	$r > 2$	2.0341	0.1538
$\lambda_{\max}$ *test*			
$r = 0$	$r = 1$	34.1231**	0.0005
$r = 1$	$r = 2$	10.9685	0.1558
$r = 2$	$r = 3$	2.0341	0.1538

Co-integrating equation

$$RGDP_t = 101960.3 + \underset{(5.4590)}{9.7760^{**}} RTEXP_t - \underset{(-3.6313)}{81502.38^{**}} EXCH_t$$

Notes: Numbers in parentheses are *t*-values – underlying asymptotic standard errors corrected for degrees of freedom are calculated using the formula in Boswijk (1995). ** indicates significance at the 1% level.

The long-run relationship discussed above is based on the assumption that tourism exports and exchange rates Granger-cause GDP of a country. Is this assumption valid? Is TLGH supported by data for the NZ economy? To answer this question, a set of Granger causality tests needs to be conducted. Since the three variables being studied are *I*(1) and cointegrated of order (1,1), i.e., *C*(1,1), a VECM as described in Equation 2 is estimated. Diagnostic tests indicate that the residuals of the model are homoskedastic and nonautocorrelated. According to Granger (1969), a variable, say *RTEXP*, Granger-causes *RGDP* if the information in past and present values of *RTEXP* helps improve the forecasts of *RGDP*. In terms of the parameters of the model in Equation 2, *RTEXP* Granger-causes *RGDP* if the null hypothesis $H_0: b_{11} = b_{12} = \cdots = b_{1,p-1} = 0$ can be rejected in favour of the alternative hypothesis H_1: At least one of the b_{1i} 's is not zero.

When the variables in a system are nonstationary but cointegrated, there is an additional source of causation which is the deviation of the long-run relationship from its equilibrium in the previous year represented by ECT_{t-1} in the VECM in Equation 2. To distinguish between the two sources of causation, the former source is referred to as causation through short-run dynamics and the latter is referred to as causation through long-run dynamics. Whether a variable is Granger-caused by another through long-run dynamics is tested by testing for the statistical significance of the coefficient of ECT_{t-1} appearing in the equation for the variable itself. A variable, say *RGDP*, is Granger-caused in the nonstationary but cointegrated case by another variable, say *RTEXP*, if it is affected by the other through short-run dynamics or long-run dynamics or both.

Results from various Granger causality tests are presented in Table 5. The first thing to note is that the coefficient of *ECT* is statistically significantly different from zero only in the third equation in Equation 2. This outcome implies that if the long-run equilibrium relationship among *RGDP*, *RTEXP* and *EXCH* is disturbed by changes in any of these three variables, only *EXCH* adjusts to restore the equilibrium relationship. Note that Georgantopoulos (2012) found for Greece that *EXCH* and *RTEXP*, but not *RGDP*, adjust to restore the long-run equilibrium relationship among the three variables after any disturbance.

We can also see from Table 5 that real GDP is Granger-caused by real international tourism expenditure, but real international tourism expenditure is not Granger-caused by real GDP. This finding justifies normalizing the cointegrating vector on *RGDP* earlier, i.e., writing *RGDP* as a function of *RTEXP* in the long-run relationship in Table 4. It should be noted that NZ's tourism exports Granger-causes its real GDP solely through short-run dynamics. Unlike the findings of Narayan (2004), Oh (2005) and Lorde *et al.* (2011), the causal relationship between the two variables is unidirectional from international tourism expenditure to GDP. This finding is in agreement with those of Ghali (1976), Balaguer and Cantavella-Jorda (2002), Lanza *et al.* (2003), Eugenio-Martin *et al.* (2004), Cortes-Jimenez and Artis (2005), Gunduz and Hatemi-J (2005), Brida *et al.* (2009), Zortuk (2009) and Georgantopoulos (2012). The finding of a unidirectional causal relationship from NZ's tourism exports to its real GDP supports the TLGH. The causal relationship between *RGDP* and *EXCH* is bidirectional. While *EXCH* Granger-causes *RGDP* through short-run dynamics, *RGDP* Granger-causes *EXCH* through long-run dynamics. As to the nature of the causal relationship between *RTEXP* and *EXCH*, it is unidirectional from *RTEXP* to *EXCH*. *RTEXP* Granger-causes *EXCH* through both short-run and long-run dynamics.

Table 5. Granger causality tests based on Wald χ^2 statistics.

	Sources of causation						
Dependent variable	Short-run			Long-run	Short-run plus long-run		
	$\Delta RGDP$	$\Delta RTEXP$	$\Delta EXCH$	ECT	$\Delta RGDP + ECT$	$\Delta RTEXP + ECT$	$\Delta EXCH + ECT$
$\Delta RGDP$	-	7.965** (0.005)	5.881* (0.015)	0.015 (0.904)	-	8.698* (0.013)	6.454* (0.040)
$\Delta RTEXP$	2.417 (0.120)	-	1.983 (0.159)	1.751 (0.186)	4.426 (0.109)	-	2.984 (0.225)
$\Delta EXCH$	0.731 (0.389)	6.130* (0.013)	-	19.600** (0.000)	19.962** (0.000)	21.589** (0.000)	-

Notes: Figures in parentheses are *p*-values.
** indicates statistical significance of the test statistic at the 1% level.
* indicates statistical significance at the 5% level.

The discussion above implies that a one-off change in *RTEXP* at the present time will significantly affect the future values of *RGDP*, but a one-off change in *RGDP* will not have any significant effect on the future values of *RTEXP*. To see whether this is the case an impulse response analysis is conducted. Figure 2 shows graphs of impulse response functions of all variables in the system: *RGDP*, *RTEXP* and *EXCH*. An impulse response function of a variable shows changes in the future values of the variable in response to an impulse in the innovation of itself or another variable occurring at the present. To make impulse responses of the variables independent of their ordering, innovations have been orthogonalized using the method suggested by Pesaran and Shin (1998). As expected, it can be seen from the topmost panel of Figure 2 that an impulse in the innovation of *RTEXP* positively and significantly affects the future values of *RGDP*. On the other hand, an impulse in the innovation of *RGDP* does not significantly affect *RTEXP*, judging by the closeness of the impulse response function of *RTEXP* with respect to *RGDP* to the zero line in the middle panel of Figure 2. This observation is in accord with the findings of the VECM with respect to the causal relationship between *RGDP* and *RTEXP*. The impulse response functions in Figure 2 also confirm the other findings of the VECM: *EXCH* is Granger-caused by *RGDP* and *RTEXP*, *RGDP* is Granger-caused by *EXCH* and *RTEXP* is not Granger-caused by *EXCH*.

5. Conclusion

This paper examines whether there is empirical evidence in the NZ economy to support the TLGH. The NZ tourism industry is important for the economy. The Government of NZ actively pursues a tourism policy to boost international tourist numbers in the country. Some of the initiatives taken by the government to increase tourist numbers are publicizing NZ’s ‘100% pure and green’ image in international tourism markets through various media, bringing international events into the country, simplifying visa processes for high-value tourists and establishing direct air links to important tourist points. The findings of this study have important implications for the tourism policy of the government in that they examine whether the government's initiatives in attracting more tourists are good for the economy.

Three variables are included in the present analysis: real GDP, real international tourism expenditure and the exchange rate. These variables are found to be $I(1)$ meaning that they are nonstationary in their levels but stationary in their first differences. Johansen's maximum likelihood system cointegration test indicates that the three variables are cointegrated even though they are nonstationary. These properties of the variables imply a VECM as a data generating process. A number of Granger causality tests involving the estimates of the parameters of a VECM are performed. The key finding of this paper is that there is a unidirectional causality between *RGDP* and *RTEXP* running from the latter to the former. This result implies that while international tourism expenditure in NZ Granger-causes real GDP, international tourism expenditure in NZ is not Granger-caused by real GDP. This finding lends support to the tourism-led growth hypothesis. Since *RTEXP* causes *RGDP*, it is valid to express the latter as a function of the former. The cointegrating relationship among the three variables then suggests that the long-run elasticity of real GDP with respect to international tourism expenditure in NZ is 0.4 at the mean values of the variables concerned. Other findings of the study are that the causal relationship between *RTEXP* and *EXCH* is also unidirectional running from *RTEXP* to *EXCH* and the causal relationship between *RGDP* and *EXCH* is bidirectional.

Since the TLGH holds for NZ, increases in international tourism expenditures are good for NZ economic growth. If the NZ government's initiatives successfully increase international tourist arrivals in NZ, higher demand for NZ produced goods and services, higher level of employment and a boost for economic growth can be expected. However, it should be noted that tourism activities have the potential to create some undesirable environmental and ecological outcomes such as pollution, congestion, despoilment of the environment, loss in biodiversity, etc. It is also possible that in promoting tourism disproportionately other sectors of the economy may be neglected.

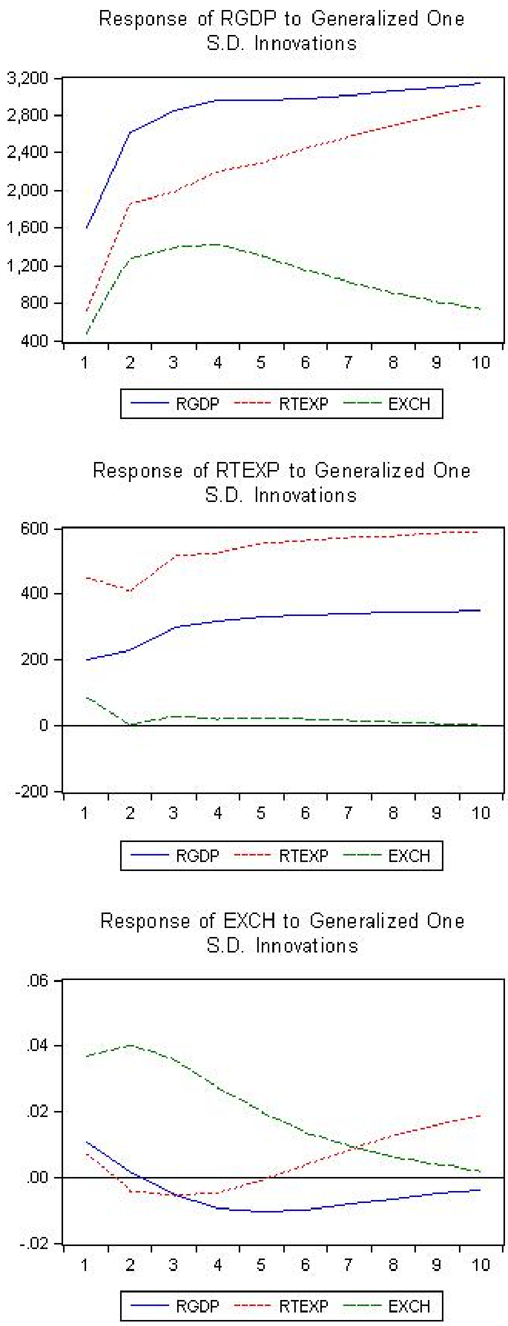

Figure 2. Graphs of impulse response functions of *RGDP*, *RTEXP* and *EXCH*.

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