Estimating the Impact of Tourism Development on Energy Consumption: The Case of Northern Cyprus

Turizm Gelişmesinin Enerji Tüketimi Üzerine Etkisini Öngörmek: Kuzey Kıbrıs örneği

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Abstract

This study investigates the long-term equilibrium relationship between international tourism and energy consumption (as proxied by oil and gas consumption) and the direction of causality among themselves in a small island, the Turkish Republic of Northern Cyprus (TRNC). Results reveal that energy consumption is in long-term relationship with international tourism development; international tourism has inelastic and positively significant impact on the growth of energy in the long-term period. Furthermore, energy consumption significantly converges to its long-term equilibrium level by 74.9 percent speed of adjustment every year as contributed by international tourism in Northern Cyprus. Finally, the results of the present study reveal that there is unidirectional causality that runs from international tourism development to the growth of energy consumption in the island. Thus, this major finding suggests that international tourism in Northern Cyprus is catalyst for energy growth in the long-term period.

JEL Classification: C22; C51; O41; O52.

***Keywords**: International Tourism, Energy, Bounds Test, Causality, Cyprus.*

Özet

Bu çalışma, küçük bir ada olan Kuzey Kıbrıs Türk Cumhuriyeti'nde, uluslarası turizm ile enerji tüketimi (petrol ve gaz tüketimi) arasındaki uzun dönemli denge ilişkisini ve bu ilişkinin yönünü tahmin etmeyi hedeflemektedir. Sonuçlar, enerji tüketiminin uluslararası turizm kalkınması ile uzun dönemli bir denge ilişkisi içerisinde olduğunu göstermektedir; uluslararası turizm esneklik katsayısı düşük fakat pozitif yönde enerji tüketimine istatistiki açıdan anlamlı bir uzun dönem etkisi yapmaktadır. Kuzey Kıbrıs'ta, enerji tüketimi uzun dönem denge seviyesine uluslararası turizm aracılığı ile 74.9 %'lük bir hızla yaklaşmaktadır. Son olarak, bu çalışmanın sonuçları, Kuzey Kıbrıs'ta uluslararası turizm'den enerji tüketimine doğru tek yönlü bir nedensellik olduğunu ortaya koymaktadır. Bu yüzden, bu çalışmanın başlıca bulgusu, Kuzey Kıbrıs'ta uluslararası turizm'in enerji tüketimi için uzun dönemde bir katalizor olduğu yönündedir.

JEL Sınıflandırması: C22; C51; O41; O52.

***Anahtar Kelimeler**: Uluslararası Turizm; Enerji; Limit Testi; Nedensellik; Kıbrıs.*

Introduction

In addition to investigating the relationship between international trade and economic growth that has been a popular topic in development economics, searching the relationship between international tourism and economic growth has also found considerable attention in the last two decades. Among these studies are Katircioglu (2010, 2009a, 2009b, 2009c), Cortés-Jiménez and Pulina (2010), (Gunduz and Hatemi-J, 2005), Oh (2005), Ongan and Demiroz (2005), Dristakis (2004), and Balaguer and Cantavella-Jorda (2002). There are various channels through which international trade (including services sector like tourism) expansion can contribute to economic growth (Omtor, 2008). However, investigation of the contribution of such channels deserves attention from researchers.

Growth in international tourism results in an increased demand for energy through various channels such as accommodation and transportation (Becan et al., 2003; Bekan et al., 2001; Gossling, 2002). In this respect, research on the nature of the relationship between tourism development and energy growth would be an interesting study area. There are lots of studies that focus on the relationship between real income growth and particular segments of energy sector in the existing literature as earliest as Kraft and Kraft (1978) ; among the others are Ouédraogo1 (2010), Wolde-Rafael (2009), Odhiambo (2009) , Apergis and Payne(2009), and Lee (2005). However, this cannot be said about the interaction between energy sector and particular segments of the economy. For example, there are few studies that focus on the energy consumption or on the patterns of energy use in the case of international tourism; among them are Tabatchnaia (1997), Gossing (2000) , Ceron and Dubois (2003), Becken and Simmons (2002), Becken et al. (2003), Trung and Kumar (2005), Warnken et al. (2004), Becken et al. (2003), and Nepal (2008).

Having the importance of this issue, the present study investigates the empirical relationship between international tourism and energy consumption, in a small island, the Turkish Republic of Northern Cyprus (TRNC). The TRNC was established in 1983 in an already divided island, is not recognized by countries other than its mainland, Turkey, and has a population of well over 300,000, a 14,421.77 US$ per capita income (SPO, 2010) and is located in a strategic location in the Eastern Mediterranean. The TRNC does not have any foreign trade relationships with countries other than Turkey due to its political non-recognition. Therefore, international tourism and the emergence of the higher education sector are two major sources of foreign exchange for this small island state. When legalized gamling was forbidden in Turkey, large investors in the tourism and hotel industry started to establish large hotels (mainly five star hotels) with casinos in North Cyprus apart from 1990s. This led to a weekend gambling tourism in North Cyprus that attract considerable arrivals for gambling from the mainland Turkey during the weekends. On the other hand, once borders were opened between the north and the south sides of Cyprus in 2003, gambling tourism has attracted considerable visitors from Greek Cypriots as well. As a result of tremendous investments and expansion in the tourism and hotel industry of Northern Cyprus, it is, therefore, highly likely that it is resulted in an expansion in enegy sector. Research on this issue would be interesting for scholars.

To the best of author's knowledge till date, there is no empirical study investigating the relationship between international tourism and energy consumption. Thus, this study is the first of its kind that it investigates the long-term equilibrium relationship and direction of causality among them in the case of the TRNC.

International Tourism in North Cyprus

The services sector in North Cyprus was given priority basically as a result of the political problems. The 1980s became a transition period from the manufacturing industry to services with a focus on tourism. The tourism sector was also influenced from political problems over many years, so the

island couldn't manage to increase foreign tourist arrivals needed to stimulate significant growth in the economy. Tourists from abroad were targeted by allowing the opening of casinos on the island. Many casinos have been launched in North Cyprus, and attract tourists from Turkey and the south of Cyprus. Legalized gambling is prohibited in both Turkey and the south of Cyprus. There were 808,682 tourists visiting Northern Cyprus in 2010 of which 80 percent were from Turkey. Net tourism revenues constituted 9.69% percent of gross domestic product (GDP) in 2010. Total number of hotels and touristic establishments are 125 with a bed capacity of 13,500 and total number of casinos is nineteen as of 2012. It is planned to increase the number of casinos to thirty in the nearest future. It is estimated that about 200,000 foreigners visit Northern Cyprus for gambling purposes (http://www.kktceeb.com/index.php, 2012). Having these figures it is highly likely that growth in international tourism and hotels with casinos should result in energy growth in Northern Cyprus. Therefore, results of the present study will raise important policy lessons.

The paper proceeds as follows. The section etitled Theoretical setting, presents theoretical setting of empirical methodology; the section entiteled as Data, defines the data and the methodology of the study. The following section provides the results and discussions, and the paper concludes with the last section.

Theoretical Setting

Modeling

Starting point of the theoretical setting in the present study is that international tourist arrivals might be a determinant of energy proxy. On the other hand, real exchange rates were assumed to be an important determinant of international tourist arrivals (Katircioğlu, 2010, 2009a), which can be also assumed to be important determinant of energy for energy-importing countries. Therefore, real exchange rates will be added to empirical models in the present study in order to investigate the relationship between international tourism and energy sector. The following functional relationship, then, has been put forward in the present study:

(1)

$$E_t = f(T_t^{\beta_1} , RER_t^{\beta_2})$$

where E stands for energy proxy, T stands for international tourism proxy, and RER stands for real exchange rates. The functional relationship in equation (1) can be expressed in logarithmic form to capture the growth impacts:

(2)

$$\ln E_t = \beta_0 + \beta_1 \ln T_t + \beta_2 \ln RER_t + \varepsilon_t$$

where at period t, lnE is the natural log of energy proxy; lnT is the natural log of tourism proxy; lnRER is the natural log of real exchange rates; and ε is the error disturbance.

There is an assumption that the dependent variables in equation (2) may not immediately adjust to their long-term equilibrium levels following a change in any of their determinants [See also (Narayan, Narayan, 2005)]. Therefore, the speed of adjustment between the short-run and the long-term levels of real income can be captured by estimating the following error correction model:

(3)

$$\Delta \ln E_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln E_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln T_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln RER_{t-j} + \beta_4 \varepsilon_{t-1} + u_t$$

Where Δ represents a change in the E, T, and RER variables in equation (3); and εt-1 is the one period lagged error correction term (ECT), which is estimated from equation (2). The ECT in equation (3) shows how fast the disequilibrium between the short-run and the long-term values of dependent variable is eliminated each period. The expected sign of ECT is negative [See also (Gujarati, 2003)].

Data

The data used in this paper are annual figures covering the period 1977 – 2010 and the variables of the study are oil and gas consumptipon (Oil), international tourist arrivals (T), and real exchange rates (RER). Energy variable is proxied by oil and gas consumption (tons) in the present study in parallel to the works of previous literature studies (Apergis, 2010). Therefore, energy variable (E) defined in equation (1) will be proxied and replaced by oil and gas consumption (Oil). On the other hand, there are also several alternatives to measure tourism variables in the literature as also mentioned by Katircioglu (Katircioğlu, 2010, 2009a). These include tourism receipts, the number of nights spent by visitors from abroad and the number of international tourist arrivals. Tourism variable of the present study was proxied by the number of international tourists who visit Turkey and stay in the touristic establishments. Real exchange rates, on the other hand, were calculated by multiplying the value of Turkish Lira per US dollar and consumer price index (2005 = 100) of Northern Cyprus and then dividing it by the consumer price index (2005 = 100) of United States. Data were gathered from State Planning Organization of Northern Cyprus (SPO, 2010).

Unit Root Tests

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)2 Unit Root Tests are employed to test the integration level (Dickey & Fuller, 1981; Phillips & Perron, 1988). The PP procedures, which compute a residual variance that is robust to autocorrelation, are applied to test for unit roots as an alternative to ADF unit root test.

Bounds Tests to Level Relationships

To investigate long-term relationships between among the variables under consideration, the bounds test within the ARDL approach was adopted in the present study. This approach was developed by (Pesaran et al., 2001) and can be applied irrespective of the order of integration of the variables (irrespective of whether regressors are purely I (0), purely I (1) or mutually co-integrated). The ARDL approach for estimating level relationships in equation (1) involves estimating the following error correction model:

(4)

$$\Delta \ln E_t = a_{0_E} + \sum_{i=1}^{n} b_{i_E} \Delta \ln E_{t-i} + \sum_{i=0}^{n} c_{i_E} \Delta \ln T_{t-i} + \sum_{i=0}^{n} d_{i_E} \Delta \ln RER_{t-i}$$

$$+ \sigma_{1_E} \ln E_{t-i} + \sigma_{2_E} \ln T_{t-i} + \sigma_{3_E} \ln RER_{t-i} + \varepsilon_{E,t}$$

In equation (4), Δ is the difference operator and ct is serially independent random error with mean zero and a finite covariance matrix. Again, in equation (4), the F-test is used for investigating a (single) long-term relationship in the proposed models. In the case of a long-term relationship, the F-test indicates which variable should be normalized. In equation (4), the null hypothesis of no level relationship is H0: σ1= σ2 = σ3= 0 and the alternative hypothesis of a level relationship is H1: σ1= σ2 = σ3 = 0.

Conditional Error Correction Models

In the case of a level relationship, the conditional ECMs using the ARDL approach will be employed in this study in order to estimate equation (3). Additionally, as also suggested by Pesaran et al. (Pesaran et al., 2001), the time series properties of the key variables (E, T, and RER) in the conditional ECMs of the present study can be approximated by double-log EC (p) (error correction at p lag levels that might be different for each explanatory variable) models under the ARDL approach, augmented with appropriate deterministics such as intercepts and time trends. Then, the conditional ECM of interest using the ARDL approach can be written as:

(5)

$$\Delta \ln E_t = \Delta\beta_0 + \sum_{j=1}^{p-1} \phi_j \Delta \ln E_{t-i} + \sum_{i=1}^{k} \beta_{i_0} \Delta \ln T_t + \sum_{i=1}^{k} \sum_{j=1}^{q-1} \beta_j \Delta T_{i,t-j}$$

$$+ \sum_{i=1}^{k} \beta_{i_0} \Delta \ln RER_t + \sum_{i=1}^{k} \sum_{j=1}^{q-1} \beta_j \Delta RER_{i,t-j} + \varphi \Delta Z_t + \gamma(1,p) ECT_{t-1} + u_t$$

where ɸj, ßi, ßij, and φ are the coefficients for the short-run dynamics of the models' convergence to equilibrium. The coefficient of γ(1, p) denotes the speed of adjustment and is expected to be negative as mentioned before.

Conditional Granger Causality Tests

In the case of level relationships based on the bounds test, conditional Granger causality tests should be carried out under the ECM. By doing so, the short-run deviations of series from their longterm equilibrium path are also captured by including an error correction term [See also (Narayan & Smyth, 2004)]. Therefore, conditional error correction models for Granger causality in the present study can be specified as follows:

When level relationship exists, conditional Granger causality tests need to be carried out under error correction model (ECM). The short-run deviations of series from their long-run equilibrium path can be then captured by including an error correction term as presented below:

(6)

$$\Delta \ln Y_t = \alpha_0 + \varphi_{11}^p(L)\Delta \ln Y_t + \varphi_{12}^q(L)\Delta \ln X_t + \varphi_{13}^r(L)\Delta \ln Z_t + \delta ECT_{t-1} + u_{1t}$$

(7)

$$\Delta \ln X_t = \alpha_0 + \varphi_{21}^p(L)\Delta \ln X_t + \varphi_{22}^q(L)\Delta \ln Y_t + \varphi_{23}^r(L)\Delta \ln Z_t + \delta ECT_{t-1} + u_{2t}$$

Where

$$\varphi_{11}^p(L) = \sum_{i=1}^{P_{11}} \varphi_{11,i}^p L^i \quad \varphi_{12}^p(L) = \sum_{i=0}^{P_{12}} \varphi_{12,i}^p L^i \quad \varphi_{13}^p(L) = \sum_{i=0}^{P_{13}} \varphi_{13,i}^p L^i$$

$$\varphi_{21}^p(L) = \sum_{i=1}^{P_{21}} \varphi_{21,i}^p L^i \quad \varphi_{22}^p(L) = \sum_{i=0}^{P_{22}} \varphi_{22,i}^p L^i \quad \varphi_{23}^p(L) = \sum_{i=0}^{P_{23}} \varphi_{23,i}^p L^i$$

In equations (6) and (7), Δ denotes the difference operator and L denotes the lag operator where (L)ΔlnYt = ΔlnYt-1. ECTt-1 is one lagged error correction term from equation (2). Furthermore, μ1t and μ2t are error disturbances with mean zero and a finite covariance matrix. Finally, having statistically significant t ratios for ECTt-1 in equations (6) and (7) would meet conditions to have long-run causations while significant F ratios would denote short-run causations.

Results and Discussions

Table 1 gives ADF and PP unit root test results for the variables under consideration. Oil and gas consumption (lnOil) variable is stationary at its level according to the ADF test including trend but this is not confirmed by models without trend and by PP tests; therefore, lnOil is nonstationary at level but become stationary at first difference. The variable of tourist arrivals (lnT) is non-stationary at level but become stationary at first difference as confirmed by both ADF and PP tests. Finally, the general models of ADF and PP tests that include both trend and intercept suggest that real exchange rates in North Cyprus (lnRER) is stationary at level. Results of unit root tests, therefore, suggest that lnOil and lnT are integrated of order one, I (1) while lnRER is integrated of order zero, I (0) in the present study.

Unit root tests have provided mixed results for the variables of this study; therefore, bounds tests will be employed to investigate the long-term equilibrium relationship between oil/gas consumption and international tourist arrivals within the ARDL approach as suggested by (Pesaran et. al 2001). It is important to note that in order to proceed with the bounds tests, dependent variable needs to be integrated of order one[3]. Critical values for F *statistics* for small samples are presented in Table 2 as taken from (Narayan, 2005). Table 3 gives the results of the bounds test for level relationships in two separate models. These models are under three different scenarios as suggested by (Pesaran, et al., 2001: 295-296), which are with restricted deterministic trends (FIV), with unrestricted deterministic trends (FV) and without deterministic trends (FIII). Intercepts in these scenarios are all unrestricted.[4]

Table 1. ADF and PP Tests for Unit Root

Statistics (Level)	lnOil	lag	lnT	lag	lnRER	lag
τ_T (ADF)	-4.056**	(1)	-2.374	(0)	-3.965**	(5)
τ_μ (ADF)	-0.217	(0)	-0.228	(0)	-1.813	(1)
τ (ADF)	3.359	(0)	2.465	(0)	-0.571	(1)
τ_T (PP)	-2.475	(4)	-2.516	(1)	-3.167*	(4)
τ_μ (PP)	-0.203	(5)	-0.289	(1)	-1.512	(4)
τ (PP)	3.525	(6)	2.298	(1)	0.232	(5)
Statistics (First Difference)	ΔlnOil	lag	ΔlnT		ΔlnRER	lag
τ_T (ADF)	-3.718**	(0)	-4.643*	(0)	-5.546*	(0)
τ_μ (ADF)	-3.783*	(0)	-4.723*	(0)	-4.966*	(0)
τ (ADF)	-3.148*	(0)	-4.130*	(0)	-5.133*	(0)
τ_T (PP)	-3.358***	(11)	-4.592*	(3)	-4.515*	(3)
τ_μ (PP)	-3.460**	(12)	-4.676*	(3)	-4.806*	(2)
τ (PP)	-3.128*	(3)	-4.123*	(2)	-5.030*	(1)

Note:Oil represents oil and gas consumption; T represents total number of tourist arrivals to Northern Cyprus; RER is real exchange rates. All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models. *, ** and *** denote rejection of the null hypothesis at the 1 percent, 5 percent and 10 percent levels respectively. Tests for unit roots have been carried out in E-VIEWS 7.2. These notes have been adapted from (Katircioglu, 2010).

Table 2. Critical Values for ARDL Approach

	0.10		0.05		0.01	
k = 2	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F_{IV}	3.698	4.420	4.433	5.245	6.328	7.408
F_V	4.517	5.480	5.457	6.570	7.643	9.063
F_{III}	3.393	4.410	4.183	5.333	6.140	7.607
t_V	-3.130	-3.630	-3.410	-3.950	-3.960	-4.530
t_{III}	-2.570	-3.210	-2.860	-3.530	-3.430	-4.100

Source: Narayan[37] for F-statistics and Pesaran et. al [35] for t-ratios.
Notes: (1) k is the number of regressors for dependent variable in the ARDL models, F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. (2) t_V and tIII are the t ratios for testing $\sigma_{1E} = 0$ in equation (4) respectively with and without deterministic linear trends. These notes have been adapted from (Katircioglu, 2010).

Table 3. The Bounds Test for Level Relationships

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion
						H_0
F_{Oil} (lnOil / lnT, lnRER)						Rejected
p = 2*	6.445c	8.594c	-5.017c	8.982c	-5.180c	
3	5.538c	7.383c	-4.672c	7.459c	-4.727c	
4	3.081a	4.034a	-2.774a	4.381b	-3.557c	
5	3.227a	4.245a	-2.606a	4.319b	-2.730b	
F_T (lnT / lnOil, lnRER)						Accepted
p = 2*	1.852a	2.454a	-2.593a	1.653a	-2.184a	
3	3.049a	3.962a	-3.236b	2.768a	-2.809b	
4	2.212a	2.895a	-2.830a	2.635a	-2.766b	
5	1.680a	2.118a	-1.929a	1.659a	-2.062a	

Note: Schwartz Criteria (SC) was used to select the number of lags required in the bounds test. p shows lag levels and * denotes optimum lag selection in each model as suggested by the SC. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing $\sigma_{1E} = 0$ in equation (4) respectively with and without deterministic linear trend. a indicates that the statistic lies below the lower bound, b that it falls within the lower and upper bounds, and c that it lies above the upper bound. These notes have been adapted from (Katircioglu, 2010).

Results in Table 3 suggest that the application of the bounds F-test using the ARDL modeling approach suggest level relationship only in the first model where oil/gas consumption is dependent variable and tourist arrivals and real exchange rates are regressors. This is because the null hypothesis of H0: $\sigma_{1E} = \sigma_{2E} = \sigma_{3E} = 0$ in equation (4) can be rejected according to all three scenarios of bounds tests. Therefore, this is to conclude that oil/gas consumption in Northern Cyprus is in level (longterm) relationship with its regressors (tourism and real exchange rates). The results from the application of the bounds t-test in the first ARDL model where lnOil is dependent variable do allow for the imposition of the trend restrictions in the models since there are t-ratios that are statistically significant [See (Pesaran et al., 2001: 312)].

Having level relationship in equation (1) allows for the adoption of the ARDL approach to estimate the level coefficients as also discussed by Pesaran and Shin (1999) and formulated in equation (2) of the present study. The resulting estimates of level coefficients under the ARDL specification (lags: 2, 2, 0) in equation (2) are presented below: Oil/Gas Consumption –International Tourism Relationship in equation (3):

$$\ln Oil_t = \underset{(0.000)}{0.398} (\ln T_t) + \underset{(0.044)}{0.016} (\ln RER_t) + \underset{(0.000)}{6.234} + \hat{u}_t$$

Where ût is error correction term and p-values are given in the parantheses. The estimated parameters of lnT and intercept are statistically significant at the 0.01 level while the coefficient of lnRER is statistically significant at the 0.05 level. Resutls show that tourism growth has inelastic but statistically significant and positive impact on oil/gas consumption (0.398), which suggests that one percent change in tourist arrivals would lead to a change in oil/gas consumption in North Cyprus by 0.398 percent in the same direction.

In the next stage, the conditional ECM regression associated with the above level relationship should be estimated. Results of ECM regression is provided in Table 4.

The ECT term for equation5 where lnOil is dependent variable is high (-0.749), statistically significant and negative . This implies that lnOil (oil/gas consumption) converges to its long-term equilibrium level by 74.9 percent by the contribution of international tourism. Intercept and short term coefficients except that of real exchange rates are also statistically siginificant as can be seen from Table 4.

As a final step, the direction of causality can now be searched within the conditional Granger causality tests under the ARDL mechanism for the short term and long term periods. F-statistics for short-run causations and t-statistics of ECTs for longterm causations are presented in Table 5 as estimated from equation (6).

Results in Table 5 reveal undirectional causality in the long-term that runs from tourism growth to oil/gas consumption; this is because t-statistics of the model when lnOil is dependent variable is statistically significant while the other t-statistics are not. Results in Table 5 do not suggest any causality in the short term since F-statistics are not statistically significant in any model. It is concluded that growth in international tourism is catalyst for the growth of oil/gas consumption in the long-term of the Turkish Cypriot economy.

Table 4. The ARDL Error Correction Model of Energy Consumption and Tourism in North Cyprus

Regressor	Coefficient	Standard Error	p-value
$\hat{u}_{t-1}$	-0.749	0.146	0.000
$\Delta lnOil_{t-1}$	0.607	0.161	0.000
ΔlnT	0.285	0.062	0.000
ΔlnT_{t-1}	-0.242	0.087	0.010
$\Delta lnRER$	0.000	0.018	0.996
Intercept	0.021	0.016	0.205
Adj. R^2= 0.728, S.E. of Regr. = 0.041, AIC = -3.337, SBC = -3.063, F-stat. = 17.667, F-prob. = 0.000, D-W stat. = 2.443			

Note: Dependent Variable: Oil and Gas Consumption (Oil) Lag Structure: (2, 2, 0)

Table 5. Results of Conditional Granger Causality Tests

F-statistics [probability values]				
Dependent Variable	$\Delta lnOil_t$	ΔlnT_t	$\Delta lnRER_t$	t-stat (prob) for ECT_{t-1}
$\Delta lnOil_t$	-	1.645 [0.227]	0.504 [0.767]	-2.020*** [0.068]
ΔlnT_t	0.474 [0.787]	-	0.479 [0.784]	-0.530 [0.606]
ΔlnRERt	0.424 [0.822]	1.713 [0.212]	-	0.233 [0.819]

Panel (a):
Conditional Granger Causality between Oil and Gas Consumption and International Tourism

Note: *** denotes the rejection of null hypothesis at alpha 0.10 level.

Conclusion

This paper empirically investigated the longterm equilibrium relationship and the direction of causality between international tourism growth and energy consumption (namely oil and gas consumption) in North Cyprus, which is a small island but has a non-recognized state. The results of the present study are of interest to both scholars and policy makers. Legalized gamling was restricted in the mainland Turkey and border neighbour, South Cyprus, but was allowed and launched in North Cyprus in the last two decades. There has been done considerable investments in the hotels of North Cyprus with casinos. About 25 percent of total tourist arrivals visit Northern Cyprus for gambling purposes. Justification of doing this research is that energy consumption is likely to be affected from this expansion in the tourism and hotel industry of the island. Furthermore, this study is the first of its kind in the relevant literature to investigate the interaction between international tourism and energy sector to the best of the author's knowledge.

Results of the present study reveal that long-term equilibrium relationship exists between international tourism growth and energy growth in this small island when energy is dependent variable. The long-term impact of tourism growth on the growth of oil and gas consumption in North Cyprus is inelastic, but statistically significant and positive. The short term coefficients of international tourism are also statistically significant and inelastic. Finally, results from the conditional Granger causality tests under the ARDL approach suggest undirectional causality that runs from tourism growth to the growth of oil and gas consumption in North Cyprus; therefore, it can be inferred that tourism development in this small island is catalyst for the growth of energy consumption in the long-term period. The study did not find any long-term relationship and causality from energy growth to tourism growth.

The major source of income in the TRNC is that provided by Turkey in the form of aid packages on annual basis and is foreign exchange earnings generated from international tourism. The establishment of large hotels (mainly five star) with casinos in North Cyprus has led to income and employment generation since the 1990s. This resulted in extra energy capacity as well. The authorities should be aware of the fact that growth in international tourism and hence energy would lead to a growth in real income (in the economy) but on the other hand would also lead to environmental pollution. Results of this study reveal that tourism growth is likely to lead to the growth of energy consumption which would also lead to higher pollution level and higher carbon dioxide emissions. It is evident that establishment of hotels and touristic places (specially in the natural lands and premises) would result in environmental degradation and pollution in a small island like Cyprus. Therefore, environmental conservation policies should be well-balanced with macroeconomic targets since these policies on the other hand are likely to restrict economic growth rate.

Notes

1. (Ouédraogo 2010) also presents a brief review of literature in the "eld.
2. PP approach allows for the presence of unknown forms of autocorrelation with a structural break in the time series and conditional heteroscedasticity in the error term.
3. Please see Pesaran et al. 2001.
4. For detailed information, please refer to Pesaran et al. 2001, pp. 295-296.
5. ECT terms should be negative by expect tion.

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