Energy Economics Letters
ISSN(e): 2308-2925
DOI: 10.55493/5049.v9i1.4464
Vol. 9, No. 1, 20-26.

URL: www.aessweb.com

FOREIGN AID AND TOURISM INDUCED ELECTRICITY CONSUMPTION IN THE TURKISH REPUBLIC OF NORTHERN CYPRUS

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Article History
Received: 4 February 2022
Revised: 14 March 2022
Accepted: 29 March 2022
Published: 7 April 2022

Keywords
ARDL
Causality
Cointegration
Electricity consumption
Foreign aid
Tourism.

JEL Classification:
C22; Q41; Q43.

ABSTRACT

The aim of this paper is to investigate the role of foreign aid and tourism in inducing electricity consumption in a tourism and a foreign aid dependent Turkish Republic of Northern Cyprus (TRNC) for the period 1977-2017. Applying the Autoregressive Distributive Lag (ARDL) approach to cointegration, we found that both foreign aid and tourism positively and significantly induce electricity consumption. Our results are robust to the Canonical Cointegrating Regression (CCR), the fully modified ordinary least squares (FMOLS) and the dynamic ordinary least squares (DOLS) long-run tests. We also found bidirectional causality between foreign aid and electricity consumption while unidirectional causality from tourism to electricity consumption. Both foreign aid and tourism induce electricity consumption indicating that they are both important sources of the growth of electricity consumption. However, since energy consumption is the main source of environmental degradation, the TRNC should develop an energy strategy that promotes environmental sustainability.

Contribution/ Originality: We believe that we have attempted to add to the debate between electricity consumption, tourism and foreign aid by highlighting that foreign aid and tourism revenue increase electricity consumption but this may have negative implications for environmental sustainability.

1. INTRODUCTION

Empirical evidence that investigates the role of foreign aid, tourism and energy consumption in the same framework is scanty. In fact as Rogner (2018) argues, energy has long been the stepchild of foreign development aid (Gomez-Echeverri, 2018; Rogner, 2018) where only few studies have been carried out. For instance, Dhungel (2014) for Nepal found that foreign aid increases electricity consumption while Amin and Murshed (2017) for Bangladesh did not find any causality between electricity consumption and foreign aid but Maruta and Banerjee (2021) found that energy aid has a significant positive effect on the energy efficiency of aid recipient countries.

The aim of this paper is to investigate the link between electricity consumption, foreign aid and tourism for the TRNC for the period 1977-2017. TRNC is a tourism and a foreign aid dependent entity. In 2017 TRNC attracted 1.734 million international tourist arrivals accounting for almost 5 times of its overall population and earned US$865 million net tourism revenues accounting for almost 23% of its GDP (TRNC State Planning Organization, 2018). TRNC is not only a tourism and a foreign aid dependent but TRNC almost entirely depends on single country, Turkey and is only recognised by Turkey. Empirical evidence that specifically investigates the relationship

between foreign aid, tourism and energy consumption in the same framework is conspicuous by its absence. We fill this gap by taking the TRNC as a case in point by applying the ARDL approach to cointegration due to Pesaran, Shin, and Smith (2001). And checking the robustness of our results by applying CCR, FMOLS and DOLS estimators. Additionally, causality is tested by using the vector error correction method.

2. METHODOLOGY AND DATA

Following Katircioglu, Feridun, and Kilinc (2014) after controlling for foreign aid and tourism, we model the relationship in Equation 1 for tourist arrivals and in Equation 2 for tourism receipts in the following models respectively:

$$ee_t = \alpha + \delta dum + \beta_1 ff + \beta_2 tt + \beta_3 oo + \beta_4 hh + \beta_5 xx + \varepsilon_t \quad (1)$$

$$ee_t = \pi + \theta dum + \omega_1 ff + \omega_2 rr + \omega_3 oo + \omega_4 hh + \omega_5 xx + \mu_t \quad (2)$$

Where ee_t is electricity consumption per capita, ff_t is real foreign aid per capita, tt_t is a number of tourist arrivals; oo_t is oil consumption per capita, hh_t human capital (enrolment ratio in higher education), xx_t real exchange rate and rr is tourism receipts. *dum* is a dummy variable that takes account for the three-year rehabilitation programme formulated to protect the financial sector between 2000 and 2002 (Cavusoglu, Ibrahim, & Ozdeser, 2019). As a result of this programme, the TRNC's economy showed a positive progress where the financial sector was strengthened to support the national economy (Cavusoglu et al., 2019). All variables except *dum* are in natural logarithms. All the data are from the TRNC State Planning Organization (2018).

Cointegration is carried out in Equation 3 by applying the following ARDL model:

$$\begin{aligned}\Delta ee_t = {} & \alpha + \theta dum \\ & + \sum_{i=1}^{k} \beta_1 \Delta ee_{t-i} + \sum_{i=0}^{m} \beta_2 \Delta ff_{t-i} + \sum_{i=0}^{n} \beta_3 \Delta tt_{t-i} + \sum_{i=0}^{p} \beta_4 \Delta oo_{t-i} \\ & + \sum_{i=0}^{q} \beta_5 \Delta hh_{t-i} + \sum_{i=0}^{r} \beta_6 \Delta rr_{t-i} + \delta_1 ee_{t-1} + \delta_2 ff_{t-1} + \delta_3 tt_{t-1} + \delta_4 oo_{t-1} + \delta_5 hh_{t-1} \\ & + \delta_6 rr_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

In Equation 3 tests for cointegration is carried out by using the *F*-test for the joint significance of the lagged values of the level variables where the null of no cointegration is defined by H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$ against the alternative that H_1: $\delta_1 \neq 0$, $\delta_2 \neq 0$, $\delta_3 \neq 0$, $\delta_4 \neq 0$, $\delta_5 \neq 0$, $\delta_6 \neq 0$. The *F*-statistic is nonstandard and it is tabulated in Pesaran et al. (2001). Δ is the first difference operator; β_1, β_2, β_3, β_4, β_5 and β_6 represent the short-run coefficient while δ_1, δ_2, δ_3, δ_4, δ_5, and δ_6 denote long-run coefficients and k, m, n, p, q and r are the lag length.

3. EMPIRICAL RESULTS

Our empirical strategy proceeds as follows: First, we test for unit root. Second, cointegration test is carried out by using the ARDL approach. Third, to ensure robustness we apply CCR, FMOLS and DOLS estimators. Fourth, we test the stability of the estimated elasticities using the CUSUM and CUSUMQ test. Fifth, we test for causality using a vector error correction method.

As a first step, we present unit root tests in Table 1, which shows that all the series are I(1).

3.1. Long-Run Test

Results of the cointegration tests show that the estimated *F*-statistic of 7.050 for model 1 and 5.607 for model 2 are greater than the upper bound critical values set by Pesaran et al. (2001)[1], indicating the presence of

[1]Optimum lag selection criteria and diagnostic tests were also carried out. Results available from the authors. Cointegration is also confirmed by the Bayer and Hanck test.

cointegration. The long-run tests are presented in Table 2. The Table shows a positive and statistically significant relationship between foreign aid and electricity consumption where a 1% increase in foreign aid increases electricity consumption between 0.074% and 0.077% in models 1 and 2 respectively. Our empirical evidence is robust to CCR, DOLS and FMOLS results.

Table 1. Unit root test.

Level Variables	Dickey-F	Zivot-Andrews			Dickey-F	Zivot-Andrews	
	Statistic	Statistic	Break date	First difference	Statistic	Statistic	Break date
ff	-2.186	-3.730	2006	Δff	-4.043***	-8.678***	1997
ee	-1.734	-4.280	1994	Δee	-3.002	-5.554**	1998
oo	-0.892	-4.846*	2006	Δoo	-2.901	-5.457**	1984
tt	-3.087	-3.880	1990	Δtt	-4.099***	-6.099***	1984
hh	-1.074	-3.005	1996	Δhh	-3.082	-5.727***	1984
xx	-1.889	-2.530	1997	Δxx	-3.211*	-6.230***	2006
rr	-2.112	-2.430	1988	Δrr	-3.674**	-5.805***	2002

Notes: ***, ** and * denote rejection of the null hypothesis of no unit root at 1%, 5% and 10% respectively. Δ is the first difference operator.

Table 2. Long-run and short-run coefficients, dependent variable ee.

A. Long-run coefficients

Model 1 (tourist arrival)					Model 2 (tourism revenue)				
Variable	ARDL	DOLS	FMOLS	CCR	Variable	ARDL	DOLS	FMOLS	CCR
ff	0.077**	0.166***	0.133***	0.143***	ff	0.074***	0.054	0.052**	0.054*
tt	0.271***	0.359***	0.325***	0.335***	rr	0.083***	0.071**	0.089***	0.086***
hh	0.099*	0.020	0.028	0.022	hh	0.025	0.021	0.012	0.005
oo	0.152**	0.061	0.151	0.131	oo	0.287***	0.181**	0.246***	0.245***
xx	-0.005***	0.003	-0.001	-0.001	xx	-0.003	0.007	-0.003	-0.002
dum	0.086**	-0.011	0.073	0.073	dum	0.005	-0.097	0.056	0.045
constant	2.355*	1.415**	1.488***	1.440***	constant	4.728***	5.558*	0.027***	5.222***

Notes: ***, ** and * denote statistically significant levels at 1%, 5% and 10% respectively.

As shown in Table 2, we also found a positive and statistically significant relationship between tourism and electricity consumption where a 1% increase in tourism increases electricity consumption between 0.083% and 0.271%. The evidence is robust to the other long-run estimates showing that tourism has far a greater impact on electricity consumption than foreign aid. Oil consumption was also positively and significantly related to electricity consumption, where a 1% increase in oil consumption leads between 0.152% and 0.287% increase in electricity consumption. After tourism, oil consumption seems to be the second most important factor in the determining electricity consumption.

Figure 1a and Figure 1b show that all the models are stable as the CUSUM the CUSUMSQ tests remain within the 5% critical bounds suggesting no structural instability.

3.2. Causality Test

We estimated three types of Granger causality tests: (1) short-run causality by applying the joint *F*- test (Wald test) to each of the independent lagged variables; (2) long-run causality by testing the significance of the coefficient of the error correction term (ect_{t-1}) and (3) strong causality test by applying the Wald joint *F* test to both the lagged independent variables and the error correction term (ect_{t-1}). The results of these three tests are presented in Table 3 and they show that all the coefficients of the $ect_{(t-1)}$ term are statistically significant in the electricity equation. This shows that there is a long-run unidirectional causality from foreign aid, tourism, human capital, real exchange rate and oil consumption to electricity consumption.

As can be seen from Table 3A there is a short-run bidirectional Granger causality between foreign aid (Δff) and electricity consumption (Δee) in both models. We also found a short-run unidirectional causality from tourist

revenues (Δrr) to electricity consumption but not from tourist arrivals (Δtt) to electricity consumption. However, the strong causality tests depicted in Table 3B show a unidirectional causality from both tourism revenues and tourist arrivals to electricity consumption, similar to the finding of Katircioglu et al. (2014).

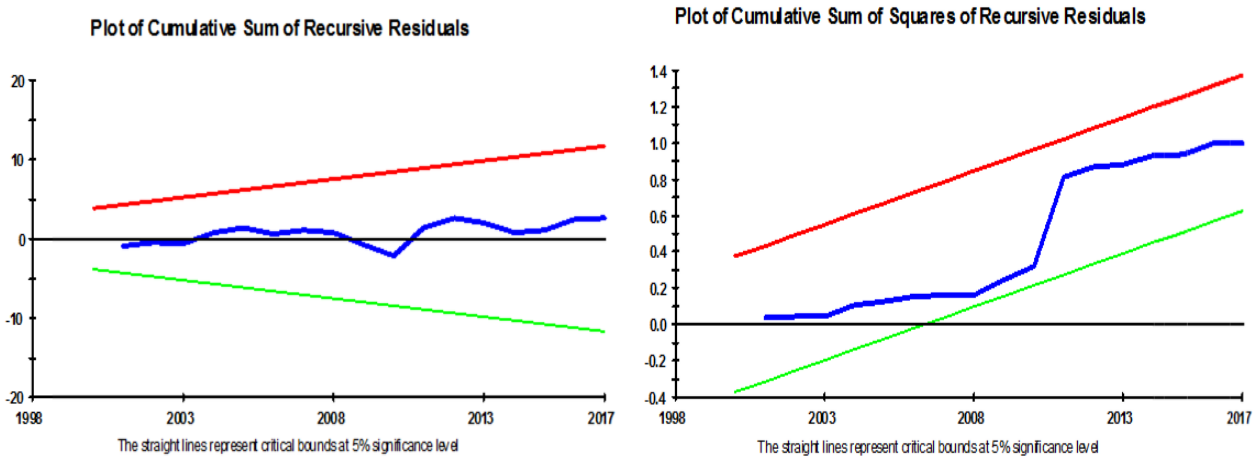

Figure 1a. Stability test for model 1 with tourist arrivals.

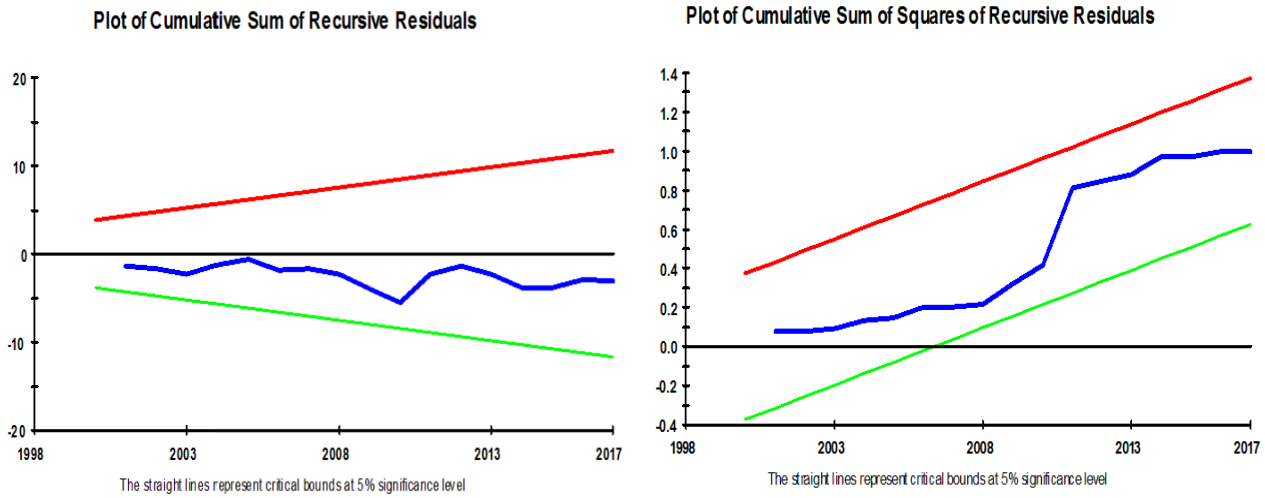

Figure 1b. Stability test for model 2 with tourism revenue.

Table 3A also shows that there is a short-run bidirectional causality between electricity consumption and oil consumption (Δoo) when tourism is proxied by tourist arrivals (Model 1) but no causality when tourism is proxied by tourism revvenues (Model 2). However, the strong causality test (Δoo+ecm) in Table 3B shows a unidirectional causality from oil consumption to electricity consumption in both models. All the strong joint causality results show that there is at least a unidirectional causality from all the variables to electricity consumption. Foreign aid, tourism, oil consumption, human capital and real exchange rate cause electricity consumption in the TRNC. These results may sound good for electricity consumption but increases in electricity consumption may have a negative impact on environmental sustainability (see Katircioglu, Saqib, Katircioglu, Kilinc, and Gul (2020)).

Table 3A. Short-run causality test.

Model 1								Model 2							
Variables	short-run causality						long-run	Variables	short-run causality						long-run
	Δee	Δff	Δtt	Δoo	Δhh	Δxx	$ecmt_{(t-1)}$		Δee	Δff	Δrr	Δoo	Δhh	Δxx	$ecmt_{(t-1)}$
Δee	-	5.686**	2.23	3.232**	7.213***	0.695	-0.990***	Δee	-	3.112*	3.032**	0.066	5.000**	1.08	-0.920***
Δff	5.021***	-	1.084	0.005	1.191	0.779	2.670**	Δff	3.359*	-	0.065	0.111	0.231	0.064	1.971
Δtt	0.628	0.325	-	5.814**	0.476	1.881	1.020**	Δrr	1.729	0.600	-	10.127***	0.663	5.343**	1.645
Δoo	3.721*	0.434	5.126**	-	0.568	3.660*	0.068	Δoo	0.489	0.876	9.18***	-	2.756	6.818***	-0.299
Δhh	0.995	0.200	2.949*	7.008***	-	1.827	-14.089	Δhh	2.994*	0.034	0.473	2.831*	-	1.330	1.421*
Δxx	3.816**	0.011	0.086	0.564	1.734	-	1.454***	Δxx	1.620	0.088	4.970**	10.952***	2.066	-	-16.857*

Note: Δ is first difference operator. ***, ** and * denote statistically significant levels at 1%, 5% and 10% respectively.

Table 3B. Strong joint causality test, dependent variable.

Model 1							Model 2						
Variables	Δee+ecm	Δff+ecm	Δtt+ecm	Δoo+ecm	Δhh+ecm	Δxx+ecm	variables	Δee+ecm	Δff+ecm	Δrr+ecm	Δoo+ecm	Δhh+ecm	Δxx+ecm
Δee	-	8.747***	8.188***	9.212***	8.612***	8.448***	Δee	-	11.401***	10.956***	11.613***	11.386***	11.306***
Δff	3.424**	-	2.734*	2.718*	2.770*	2.719*	Δff	1.789	-	1.643	1.412	1.168	1.151
Δtt	2.781*	2.656*	-	6.802***	3.081*	2.906*	Δrr	2.432	3.227*	-	7.573***	2.462*	4.368**
Δoo	2.394	0.219	3.373**	-	0.620	2.163	Δoo	2.020	1.230	4.565**	-	1.405	3.440**
Δhh	1.303	1.304	2.120	5.415***	-	1.442	Δhh	3.210*	3.554**	3.208*	4.404**	-	3.415**
Δxx	6.022***	6.507***	6.451***	6.886***	6.218***	-	Δxx	1.583	1.791	3.178*	6.410***	1.837	-

Note: Δ is first difference operator. ***, ** and * denote statistically significant levels at 1%, 5% and 10% respectively.

4. CONCLUSION AND POLICY IMPLICATIONS

This paper investigated the role of foreign aid and tourism as determinants of electricity consumption in the TRNC for the period 1977-2017.

We found a positive and a statistically significant relationship between foreign aid and electricity consumption on the other hand and a positive and statistically significant relationship between tourism and electricity consumption on the other. Granger causality results also show that there is a bidirectional Granger causality between foreign aid and electricity consumption and unidirectional Granger-causality from tourism to electricity consumption. The evidence indicates that both foreign aid and tourism induce electricity consumption in the TRNC.

While this may seem beneficial to the growth of the electricity sector, it must be remembered that the double dependence of the electricity sector on both foreign aid and especially on the tourist sector, can have several negative ramifications for the environmental quality of the TRNC. While tourism generates badly needed resources for the development of the electricity sector, increased demand for imported oil may increase the demand for non-renewable energy dependency.

This in turn can contribute to environmental degradation. Since oil is the main source of energy in the TRNC, tourism growth can exacerbate environmental degradation and expose TRNC to the vagaries of imported energy dependency. It is therefore important that the TRNC should diversify its energy sources and reduce its energy import dependency by exploiting other eco-friendly energy sources such as solar, wind and natural gas, which TRNC seems to be endowed. TRNC should use foreign aid and tourism revenues for generating clean energy and also for fighting the harmful effects of rising atmospheric pollution. As to future research, the combined impact of foreign aid and tourism on CO2 emissions can be investigated.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study.

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