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Article

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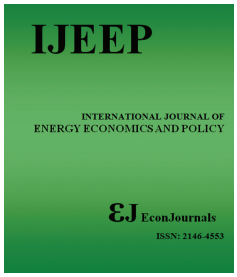

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The Impact of Tourism on Electricity Imports by Thailand from Lao People's Democratic Republic

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ABSTRACT

The objective of this research is to explain how Thai tourism affects the quantity of electricity imported by Thailand from Lao PDR. Data were quarterly data from 2000 to 2019 estimated with the autoregressive distributed lag procedure. The results show that all variables are cointegrated. For the long-run equilibrium, tourism and income factors have a positive effect on the quantity of electricity imports. In the short-run equilibrium, income, price, exchange rate and tourism factors will return to long-term equilibrium by approximately 16 percent in each time period. From the study results, the international tourism demand expansion of Thailand needs to supported by electricity imports from Lao PDR. Therefore, Thailand should focus on forecasting the number of international tourists coming to Thailand, which will allow an efficient use of the electricity reserves of Thailand in order to provide a sustainable supply of electrical energy.

Keywords: Electricity Import, Tourism, International Tourism
JEL Classifications: F1, Z3, Q4

1. INTRODUCTION

Thailand has the second largest economy of ASEAN countries. The country is also dependent on international trade because international trade is the heart of Thailand's economy, which means that success in the import and export markets can stimulate economic growth in the Thai economy. The Thai economy has expanded steadily with growth in many sectors. This growth affects the demand for energy in Thailand, which is continuously increasing. The Electricity Generating Authority of Thailand (2020a), reported the quantity of electricity used in Thailand from 2000 to 2019, and over this period, the demand for electrical energy increased every year.

The Electricity Generating Authority of Thailand (2020b) also reported the quantity of electricity produced in Thailand, which from 2000 to 2009 steadily increased, but not by much; however, between 2010 and 2019, there was a leap in production. This may be due to the growth of Thailand's economy. The agricultural, industrial and tourism sectors, in particular, have also grown in value. However, the increase in the quantity of electricity produced in the country is not enough to respond to electricity demand in Thailand. Hence, Thailand needs to import of electricity from foreign countries.

The quantity of electricity imported by Thailand from 2000 to 2019 was relatively stable as shown in Figure 1. Nevertheless, electricity imports increased from 2010 due to economic recovery resulting in higher economic growth. As a result, Thailand needed to import electricity from 2014 to support tourism activities that had grown significantly. In particular, the number of international tourists visiting Thailand in 2019 reached 40 million and over the period 2000-2019, the international tourist market of Thailand grew by more than 300 percent. For this reason, tourism plays an increasingly important role in economic growth (Nonthapot, 2019), but also leads to the need for increased electricity imports from Lao PDR, representing 92 percent of the total electricity imports of Thailand.

Figure 2 depicts the rising electricity imports of Thailand. This is because the domestic electricity power supply is not sufficient to respond to the needs of the country. In addition, Thai tourism has grown rapidly, forcing Thailand to import electricity from Lao PDR. However, there are still limitations in studying the factors that affect Thailand's electricity imports from Lao PDR especially in regard to the number of international tourists. Therefore, this issue needs to be studied. The results will provide guidelines for private agencies or related agencies to use as information in planning and decision-making on the use of electricity in various domestic activities in the future.

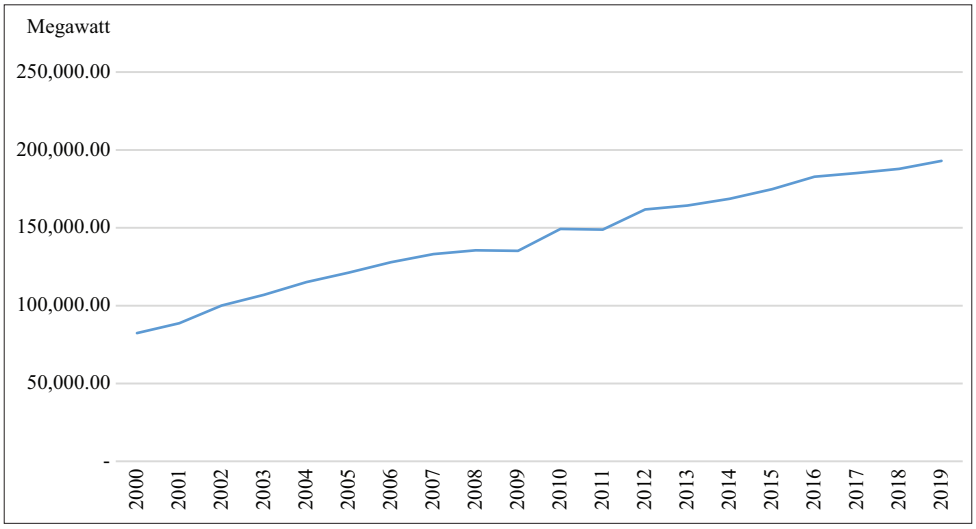
2. LITERATURE REVIEW

The study of the factors that affect electricity imports reveal that per capita income (Steenhof and Fulton, 2007) correlates with electricity production in China. Jordan's national income was also found to relate to the importing of electricity (Momani, 2013) and in sub-Saharan Africa (Michieka, 2015, and was in line with Ozoh and Abd-Rahman (2017). In addition, Dey and Tareque (2020), confirmed that GDP has a significant positive relationship with electricity usage in Bangladesh. Therefore, it can be said that revenue is a factor that influences the importing of electricity from other countries.

Based on electricity imports, (Steenhof and Fulton, 2007), found that the factors affecting electricity demand in Athens, Greece and London was gross domestic product (GDP), and the exchange rate had an effect on electricity imports. In addition, the energy price was one of the factors that affect the demand for electricity imports by Jordan (Steenhof and Fulton, 2007).

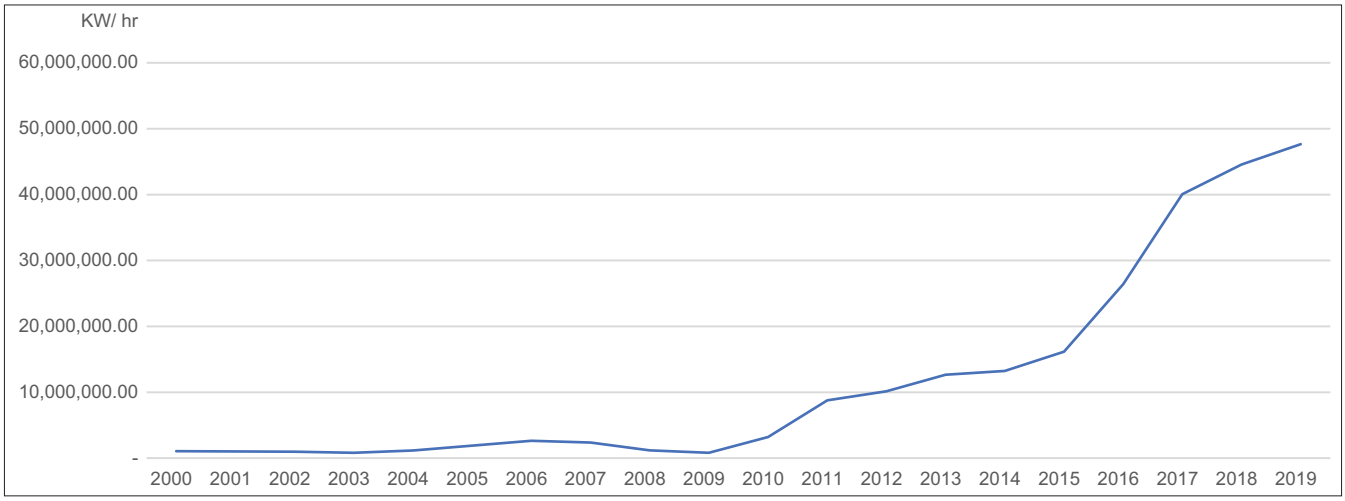
Nadal and Bakhat (2009), explained the contribution of tourism to electricity consumption in the Balearic Islands (Spain) and employed tourism as an independent variable. Moreover, Pablo-Romero et al. (2019) explained that tourism is a major economic activity and that in nine European countries energy consumption is increasing. The results revealed that tourism was related to energy

Figure 1: Electricity using of Thailand



Source: Electricity Generating Authority of Thailand (2020a)

Figure 2: The quantity of electricity imports by Thailand



Source: Electricity Generating Authority of Thailand (2020c)

consumption. Therefore, the main factor of electricity import is domestic supply (as a country that generates enough doesn't need to import it) and the secondary factors are the strength of the economy, the rate of growth in demand (as supply cannot be stepped up to meet the increase in demand), the level of tourism (especially in Thailand because tourism is a large electricity user and there is a significant number of tourists) and the cost of imports/exchange rate should be studied.

3. DATA AND METHODOLOGY

3.1. Data

This research employs secondary quarterly data from 2000 -2019 and included the following: (1) Quantity of electricity imports from Lao PDR to Thailand (Im) and the price of Thailand's electricity (EPPO) from the Energy Policy and Planning office (2) disposable income (DI) from the office of the National Economic and Social Development Council (3) Foreign Exchange Rate (Ex) from the Bank of Thailand (Baht/USD) and (4) the number of international tourist arrivals in Thailand (Tour) from the Ministry of Tourism and Sport of Thailand. The original model is presented as a natural logarithm as shown in equation 1.

$$\ln \mathrm{Im}_t = \alpha_0 + \alpha_1 \ln \mathrm{DI}_t + \alpha_2 \ln \mathrm{Ex}_t + \alpha_3 \ln \mathrm{Price}_t + \alpha_4 \ln \mathrm{Tour}_t + \nu_t \quad (1)$$

3.2. Cointegration Test by Autoregressive Distributed Lag (ARDL)

In regard to the long-term relationship, all variables from the time series data were tested by unit root and by using the co-integration process of the ARDL. The ARDL cointegration was presented by Pesaran et al. (2001). From equation (1) adapted into equation (2) with the error correction model (UECM) as the marginal changes (such as $\Delta \mathrm{Ex}_t = \mathrm{Ex}_t - \mathrm{Ex}_{t-1}$) with the lag − 1 difference operator.

$$\begin{aligned}\ln \mathrm{IM}_t &= \beta_0 + \beta_1 \ln \mathrm{Im}_{t-1} + \beta_2 \ln \mathrm{DI}_{t-1} + \beta_3 \ln \mathrm{Ex}_{t-1} + \beta_4 \ln \mathrm{Price}_{t-1} \\ &+ \beta_5 \ln \mathrm{Tour}_{t-1} + \sum_{j=1}^{p-1} \beta_6 \Delta \ln \mathrm{IM}_{t-j} + \sum_{i=1}^{q-1} \beta_7 \Delta \ln \mathrm{DI}_{t-i} + \sum_{i=1}^{r-1} \beta_8 \Delta \ln \mathrm{Ex}_{t-i} \\ &+ \sum_{i=1}^{s-1} \beta_9 \Delta \ln \mathrm{Price}_{t-i} + \sum_{t=1}^{w-1} \beta_{10} \Delta \ln \mathrm{Tour}_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

From Equation (2), a long-run relationship or conintegration is presented. The F-test is conducted to confirm the long-run relationship of model. The F-statistic depends on the null hypothesis *Ho*: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ which means equation (2) has no cointegration among the variables. In the opposite direction, the alternative hypothesis $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5$ means equation (2) is cointegrated among variables. This study employs the critical value employed with Sam et al. (2019) in case III (unrestricted intercept and no trend). The test involves I(0) and I(1). When the critical value for I(0) or I(1) series are above the critical values, the variables are cointegrated. If the statistic test is lower than the critical values, the variables are not cointegrated. In addtion, if the variables are cointegrated, this is evidence of a long-run relationship. The ARDL long run model that was apllied from Sam et al. (2019) is presented as follows:

$$\begin{aligned}\ln \mathrm{IM}_t &= \beta_0 + \sum_{j=1}^{p} \beta_6 \Delta \ln \mathrm{IM}_{j-1} + \sum_{j=1}^{q} \beta_1 \ln \mathrm{DI}_{t-1} + \sum_{j=1}^{r} \beta_2 \ln EX_{t-1} \\ &+ \sum_{j=1}^{s} \beta_3 \ln \mathrm{Price}_{t-1} + \sum_{j=1}^{w} \beta_4 \ln \mathrm{Tour}_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

Where β_0 is the constant, andis the error term and the rest are coefficients of the independent variables. The order of lags in the ARDL model is selected by employing the akaike information criterion (AIC).

3.3. The Short –Run Model

After we can confirm the cointegration and the ARDL long-run estimation from topic 3.2, the next step is the traditional procedure conducted using the Vector error –correction model (VECM) including the error correction term (ε_t) from Equation (4). The error correction term can show the short-run deviations of the series from the long-run equilibrium path. The short-run model is as follows:

$$\begin{aligned}\ln \mathrm{Im}_t &= \theta_0 + \sum_{j=1}^{p-1} \theta_1 \Delta \ln \mathrm{Im}_{t-j} + \sum_{i=1}^{q-1} \theta_2 \Delta \ln \mathrm{DI}_{t-i} + \sum_{i=1}^{r-1} \theta_3 \Delta \ln \mathrm{Ex}_{t-i} \\ &+ \sum_{i=1}^{s-1} \theta_4 \Delta \ln \mathrm{Price}_{t-i} + \sum_{i=1}^{w-1} \theta_5 \Delta \ln \mathrm{Tour}_{t-i} + \theta_6 \varepsilon_{t-1} + \upsilon_t \end{aligned} \quad (4)$$

Where θ_0 is the constant, Δ denotes the differences, υ_t the disturbance term, ε_{t-1} is the lagged error correction term generated from the long run error term from Equation (4). The coefficients of the exogenous variables are presented by θ_1–θ_5 for the short –run equation. The F-test and the Wald test of the explanatory variables indicate short- run casual effects between the dependent variables and independent variables. Thus, the long-run causal nexus is measured by the significance of the t-statistic of the lagged error correction term (θ_6).

4. RESULTS OF THE STUDY

The combination of results from the Augmented Dickey-Fuller and Phillips-Perron tests are integrated in order I(1). This means all variables can be tested in the cointegration procedure. The estimation results are as follows:

4.1. Cointegration and Long-run Coefficient Test

Equation (2), based on is tested by using an ARDL bounds testing approach with a maximum order lag set to 8 from the AIC lag selection criteria. The ARDL bounds testing approach is ARDL (5,2,0,2,3) which is presented in Table 1. From Table 2, the F –statistic calculation is at 4.85, which is greater than the 5% upper bounds critical value in Case III: unrestricted intercept and no trend. The stability test with CUSUM and CUSUMsq shows

Table 1: ARDL long –run estimation result

Dependent variable	Independent variables			
lnIm	ln D	In Ex	lnPrice	lnTour
	0.0021***	0.0026	–0.47554	0.0009***
	(0.0007)	(0.0049)	(0.2883)	(0.0001)

t-statistics is parentheses. The asterisk ***denotes significance at 1 percent level

Table 2: The results of ARDL cointegration test

F-bound test	Null hypothesis: No levels relationship				
	Value	Significance (%)	I(0)	I(1)	Stability test
F-statistic	4.85	10	2.45	3.52	CUSUM=Stable
k	4	5	2.86	4.01	CUSUMsq=Stable
		1	3.74	5.06	

From calculation

Table 3: Error correction coefficients in terms of ARDL model

Independent variable	Dependent variable (ARDL (5,2,0,2,3))	
	Coefficients	Standard error
Constant	0.5093***	0.0983
$\Delta lnlm_{t-1}$	0.6136***	0.1210
$\Delta lnlm_{t-2}$	0.0606	0.1556
$\Delta lnlm_{t-3}$	0.0510	0.1761
$\Delta lnlm_{t-4}$	0.5543**	0.1742
ΔlnDI	0.0001	0.0001
$\Delta lnDI_{t-1}$	–0.0001***	0.0001
Δln Price	0.1063	0.0733
Δln $Price_{t-1}$	0.1620**	0.0765
Δln *Tour*	0.0001**	0.0001
Δln $Tour_{t-1}$	–0.0001	0.0001
Δln $Tour_{t-2}$	–0.0001**	0.0001
ε_{t-1}	–0.1600***	0.0314
R^2	0.7753	
Adjust R^2	0.7318	
Durbin-Watson stat	1.6921	
ARCH (χ^2)	0.3173	

t-statistics is parentheses. ***And ** denotes significance at 1 and 5 percent level, respectively

stability. Therefore, it is cointegrated and the long–run estimation result is presented in Table 1.

4.2. Short-run Coefficient Test

The short-run estimation results are presented in Table 3. Disposable income from the Office of the National Economic and Social Development Council, foreign exchange from the Bank of Thailand, the price of Thailand's electricity and the number of international tourist arrivals in Thailand are factors that affect electricity imports from Lao PDR to Thailand. The impact deviates from the short-run to long-term equilibriums by approximately 16 percent in each time period ($\varepsilon_{t-1} = -0.16$).

5. CONCLUSION AND POLICY RECOMMENDATION

The main objective of the study is to examine the factors affecting the quantity of electricity imported from Lao PDR to Thailand. The ARDL bounds testing approach revealed that electricity imports from Lao PDR to Thailand are cointegrated with disposable income, the foreign exchange rate, the price of Thailand's electricity and the number of international tourist arrivals in Thailand. The long-run estimation results show that disposable income in Thailand and the number of international tourist arrivals in Thailand have positively significant effects on electricity imports from Lao PDR to Thailand. For the short-run, all independent variables will return to long-term equilibrium by approximately 16 percent in each time period.

From the estimation results, we found that disposable income in Thailand positively impacts the quantity of electricity imports from Lao PDR to Thailand, and this result is consistent with Psiloglou (2009); Michieka (2015). This means that when income in Thailand increases, the quantity of electricity imports from Lao PDR to Thailand will increase as well. This result supports import theory which states that product imports depend on income.

Moreover, this study is surprising because the number of international tourists to Thailand has a positive impact on the quantity of electricity imported from Lao PDR to Thailand because the international tourism market of Thailand had been expanding since 1992, support is provided by the Asia Development Bank and Thailand is major tourism destination in ASEAN. This result is consistent with Pablo-Romero et al. (2019) who found that tourism is an economic activity that increases energy consumption. This result suggests that with the open tourism policy of Thailand, Thailand needs to import electricity from Lao PDR to respond to the increased demand that derives from international tourism market expansion.

Based on the study results, (1) the government of Thailand should initiate measures to encourage people in the country to perform activities to reduce the quantity of electricity used and to make long-term contracts about the price of electricity from the government of Lao PDR to guarantee supply at reasonable rates. (2) Thailand should forecast the number of international tourists coming in Thailand as well as demand for electricity to achieve greater efficiency in the supply of electricity in Thailand in a sustainable way.

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