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Electricity Consumption and Export Performance: Evidence from Nepal

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ABSTRACT

This paper, noting positive marks due to regular supply of electricity and increased consumption of its, examines the role of electricity consumption in export performance of Nepal employing the Autoregressive distributed lag (ARDL) approach of cointegration for the period of 1975-2018. The results show that electricity does have a strong long-run positive relationship with the export performance of Nepal. Therefore, it can be suggested, based on the results, that increasing electricity consumption might increase the exports values. Also, there is a need for building infrastructure to support production activities, not just the means of transportation to reach our villages. Only those infrastructures focused on production activities will contribute to increasing the exports attracting more foreign direct investment in the country.

Keywords: Energy, Electricity, Export performance, Nepal
JEL Classifications: O13, L94, F13, O53

1. INTRODUCTION

Nepal went through a period of the electricity crisis exposed by the series of routine load-shedding that has a compelling adverse impact on production activities, which may result in a juxtapose poor export of goods and services. In recent years, the shiver load-shedding problem is solved partly, but the export performance is not exciting yet. The data show that energy consumption is in increasing trend since 2000. The energy consumption doubles within 1 year, i.e., in 2002 but with the very low base (International Energy Agency 2020) partly by own production and partly by importing the electricity from India. It seems that increasing the electricity supply in the country got priority since 2000 when the Electricity Development Center was converted as a government's department and renamed as Department of Electricity. Electricity supply got a national priority acknowledging the role of energy in the economic development of the country (Government of Nepal 2001). Generally, the landlocked countries' export performance is said to be poor due to various reasons associated with exports costs, but those disadvantages can be minimized adopting appropriate strategies for exports and improvement is possible as discussed in Paudel (2014). Therefore, the role of electricity consumption as the best source of energy in the country in export performance is an interesting area of research in the context of Nepal, which has a huge potentiality of hydro base electricity.

The role of energy, which can be a good way to enhance export performance as it supports to increase productivity, but there is not much discussion in the literature. However, we find a narrow string of the literature, and it suggests that energy supply plays a crucial role in economic growth via increasing trade and factor productivity (Erickson, 1989). Costantini and Crespi (2008) suggest that an environmental regulation complemented by the strength of the National Innovation System contribute to export performance related to energy technologies. Bouoiyour and Selmi (2015) find that export of energy has a multidimensional impact on export performance in Egypt as it can help to increase the exportable outputs, and on the other hand, these products are also in high demand in the international market. Recently, Sakamoto and Managi (2017) suggest that energy and environmental efficiency can be a source of the comparative advantage in industries to boost export performance.

The brief literature gives a perception that energy consumption promotes export performance in many ways in the economy. It builds the confidence of the economy, increases the factors' productivity, and helps to increase the economic activities in the country so that boosting export performance becomes comparatively an easy task for the policymakers. However, there is a dearth of literature on the export promoting tole of electricity consumption in the case of Nepal.

Nepal is a unique country for the country-specific case study because of various reasons. It is one of the landlocked developing countries situated geographically between a massive market, China and India. It looks like Nepal is failing to exploit the comparative advantages of the prevailing pool of natural and hydro resources, large markets in the closed neighbourhood, comparatively cheap labour force with a high demographic dividend. A notable point here is that Nepal started reform since the mid-1980s as prescribed by the international financial institutions, donor agencies and development partners aiming to improve the export performance, but results are not encouraging. A conventional perception is that a country with liberalization and reform policy progresses fast towards export performance (Paudel, 2016). In this background, we are interested to know whether the role of electricity consumption is a crucial factor for improving export performance or not in Nepal.

This study uses the electricity consumption data to analyze the energy's impact on export performance for the period of 1975-2018 employing autoregressive distributed lag (ARDL) approach of cointegration that provides both long-run and short-run coefficients despite the different order of cointegration of the variables, such as, I(0) and I(1).

The findings of this paper reveal that the electricity consumption has a robust long-run relationship with the export performance indicating that a one per cent increase in electricity consumption causes to increase exports on average by more than a half per cent. Also, the finding suggests that infrastructures improvement to foster manufacturing and attract foreign direct investments might improve the export performance in the country.

This article consists of five sections. The following section highlights the electricity consumption and export performance nexus in the context of Nepal. In section three describes the methodology followed by the results and discussion in the fourth section. The final one concludes the paper.

2. ELECTRICITY CONSUMPTION AND EXPORT NEXUS IN NEPAL

Nepal went through the electricity crisis for a long time, and the supply was very limited to mostly into the cities with irregular supplies. The crisis levels were different in different years, but the daily several hourly load-shedding was a regular phenomenon that demand always overweighted its supplies (Shrestha, 2010). It remained as an irony that the electricity generation potential from her rivers (Paudel, 2013). This situation of excess demand persists, but with the various efforts from the governments at different times, particularly the result-oriented management shift directed by then Minister for Energy Janardan Sharma contributed substantially to solve the immediate crisis of electricity. However, the right match of growing demand and struggling production process might take a few more years (The Kathmandu Post, 2017, Bhandari and Pandit, 2018). Unprecedented disturbances occur from time to time in hydroelectricity projects and, the delays in hydro projects completion is a regular phenomenon these days. Consequently, the industrial-sector demand for electricity is still unmatched. The business community believes that the insufficient electricity supply is one of the constraints to the manufacturing sector.

If we look at the household level of electricity consumption data, about 95% of households in Nepal have access to electricity. However, the quality and regularity are questionable. Only 72% of households have a regular and reliable source of electricity as of 2017 (World Bank, 2019).

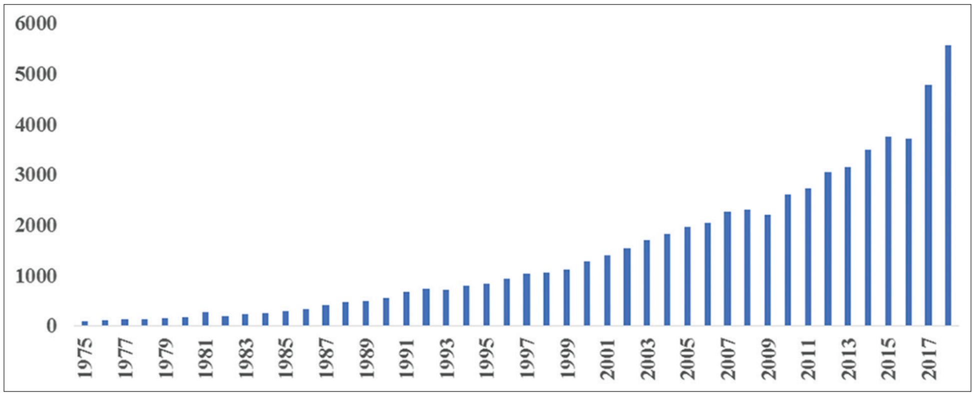
Figure 1 shows the electricity consumption trend over the period of 1975-2018. The trend is increasing; however, it took momentum after the mid-1980s. Past few years have been recorded with remarkable achievement in electricity supply, thus leading to an increase in electricity consumption. As of 2018 total of electricity consumption was 5560GWH (Gigawatt Hour), an increment from 4777GWH in the year 2017.

To analyze the impact of electricity on export performance, a comparison of the growth rate of electricity and export values give a general indication of how they move over time. For this purpose, Figure 2 presents the trends in electricity consumption's growth and Nepal's export growth for the period of 1976-2018. As can be seen in the figure, generally they have a positive relationship with some fluctuations among these two variables. These variables have different magnitude to change, but primarily they move to the same direction. For example, these both were declining at during the mid-1970s and increased in the early 1980s an exception in 1982. If we observe them sincerely, we find that the increase in consumption affects exports positively. The channel of such an impact may be the factor's productivity and direct use of electricity in the production procedures of the goods and commodities, which can be exported.

3. RESEARCH METHODOLOGY

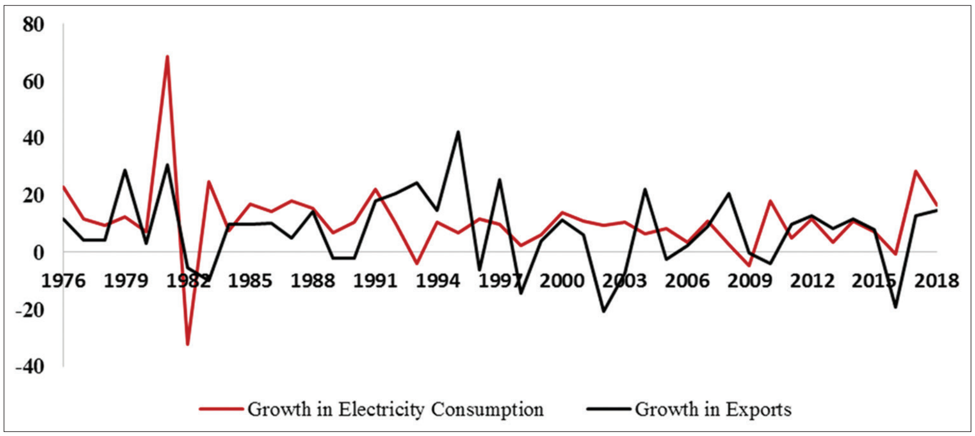
The export performance has been a pivotal issue for developing countries. The role of electricity consumption in export performance has not been discussed much in the literature. Therefore, we develop the research methodology to address our concern about whether the role of electricity consumption is crucial in the export performance of Nepal. Our methodology closely follows Paudel and Jayanthakumaran (2009). We test the structural

Figure 1: Electricity consumption



Source: Authors' calculation on the data from CEIC Data (2020)

Figure 2: Trend of electricity consumption and exports growth, 1976-2018



Source: Authors' calculation on the data from World Bank (2020) and CEIC Data (2020).

break and time-series properties of data at first, and then we test those data sets in the standard model to analyze the electricity consumption's role in export performance. The robustness check of the results is made testing alternative specifications of the model.

3.1. Model, Variables, and Data

This paper deploys model similar to Coban (2015) used to analyze the case of Turkish's exports performance. The nature of the data we use is different from the one the Coban (2015) used. Their data was at firm-level data; however, we are using the time series annual data in total exports (country level).

The total amount of exports in the natural log form (LEXPORT), the dependent variable, is employed as a proxy of export performance. The prime independent variable is the energy consumptions measured in GWH in log (LELCONS) to represent the overall consumption of electricity. Other explanatory variables are secondary school enrolment (EDU) measured in per cent of the total population, which represents the quality of human resources. The net foreign assets/investment in the natural log form (LFDI) is also one of the independent variables which capture the capital as well the context of policy reform. And, we use per capita gross domestic product in natural log (LGDPPC) explains the infrastructure development. The equation (1) summarizes the association among the dependent and independent variables as:

$$LEXPORT_t = \alpha + \beta_1 LELCONS_t + \beta_2 EDU_t + \beta_3 LFDI_t + \beta_4 LGDPPC_t + \epsilon_t \quad (1)$$

Where, α is a constant term, $\beta_1 \ldots \beta_4$ are the coefficients of the variables of the model, ϵ is the error term, t refers to the time, i.e., year as we are using the annual data spanning from 1975 to 2018. Based on the literature, we expect $\beta_1 \ldots \beta_4$ to be positive. The model largely represents the supply side factors of the exports, as discussed in Paudel (2016).

The data used in this empirical analysis are collected from the world development indicators as given in World Bank (2020) except LELCONS which are from CEIC Data (2020).

3.2. Structural Break Analysis

Then, let us move to discuss the nature of the time series property of the data. Our data cover 44 years and has a potential risk of structural break and unit root issues. If this is the case, the findings from our econometric analysis will be in doubt with the spurious results. To come out from this problem, structural break and unit root tests are mandatory for the standard time series data analysis. There are several methods for unit root test with and without a structural break. Among them, the Gregory and Hansen (1996) cointegration test captures the structural break also. The hypotheses for the cointegration test are:

Here, Null Hypothesis (H0): no-cointegration at the breakpoint

Alternative Hypothesis (H1): there is cointegration at the breakpoint

The summary of the results of the structural break is in Table 1, which shows that there are no structural breaks in the data. All the statistics in the absolute term are smaller than the critical values at 5% level of significance all specifications. We cannot reject the null hypothesis (H0); that is, there does not exhibit stable properties. Therefore, we conclude that there is no structural break in the data. All further econometric estimations assume the same.

3.3. Unit Root Tests

If the structural breaks were detected, it would mean the variables have unit root automatically. One important point to note here is that the variables may be non-stationary even without a structural break. Therefore, our next step is to conduct the unit root test to confirm whether each series is integrated and has a unit root using Dickey-Fuller test (DF), augmented Dickey-Fuller (ADF) test and the Phillips and Perron (PP).

We follow the standard technique and procedure for the unit root tests. The test results are achieved assuming the presence of a unit root (non-stationary variable) in the null hypothesis (H0) and no unit root (stationary variable) in the alternative hypothesis (Ha). For this, a decision is made based on the calculated statistic and McKinnon's critical value; that is, if the computed statistic is higher than McKinnon's critical value, then H0 is not rejected, and the considered variable is non-stationary (has a unit root). To make the test systematic and reliable, we observed in level and then in first differences, including the intercept and time trend, because this is the most flexible specification of the test, as illustrated in equation (2).

$$\Delta Z_t = \alpha_1 + \alpha_{2t} + \gamma Z_{t-1} + \sum_{j=1}^{k} \beta_j \Delta Z_{t-j} + \varepsilon_t \quad (2)$$

Where, is the first difference operator, Z is the variable of interest, α_1 is the intercept, t is the time, ΔZ the augmented terms, k is the appropriate lag length of the augmented terms and ε is the white noise error term. The ADF test is essentially the test of significance of the coefficient in the above equation. The DF test is performed without the augmented term. To select the lag length k, we start with a maximum lag of 4 and pare it down to the appropriate lag by examining the Schwarz Criterion (SC).

The unit root tests result for all dependent and independent variables are presented in Table 2. Following the standard practise, we employ the DF., ADF and PP tests are performed. The results suggest that only LELCONS is found to be I (0), even this is using a trend with constant. As the dataset has 44 observations, naturally having trend makes more sense. Therefore, we do not test this for the first difference. For other variables, we conduct

Table 1: Structural break analysis, Gregory-Hansen cointegration test

Model tests with	ADF		Z_t		Z_a	
	Statistics	Break Year	Statistics	Break Year	Statistics	Break Year
Intercept Shift	−4.91	1993	−4.97	1993	−32.13	1993
Intercept Shift with trend	−5.03	1993	−5.09	1993	−33.13	1993
Intercept shift with slope	−5.35	1993	−5.41	1993	−35.74	1993
Critical value @5%	−5.56, −5.83 and −6.41		−5.56, −5.83 and −6.41		−59.40, −65.44 and −78.52	

***, ** and *indicates the variables are significant at 1%, 5% and 10% level of significance. The results detect no structural breaks in any year as none of the statistics are statistically significant. The last row shows critical value at 5% is to be read for intercept shift, intercept shift with the trend and intercept shifts with the slope for the respective tests.

Table 2: Unit root test results of the variables

Unit root test at level	Test with constant			Test with constant and trend		
Variables	DF	ADF	PP	DF	ADF	PP
LEXPORT	0.78	−1.23	−1.28	−1.97	−2.03	−3.15
LELCONS	1.32	−1.18	−2.98**	−3.37**	−3.60**	−3.79**
EDU	1.60	−0.04	0.16	−2.01	−1.90	−1.94
LFDI	−0.36	−0.82	−0.46	−2.86	−2.86	−2.85
LGDPPC	2.66**	1.77	1.76	−0.88	−0.94	−1.06
Critical value at 5%	−1.95	−2.943	−2.943	−3.190	−3.536	−3.537
	Unit root test at difference					
Variables	**Test with constant**			**Test with constant and trend**		
	DF	**ADF**	**PP**	**DF**	**ADF**	**PP**
LEXPORT	−6.78**	−6.93**	−6.93**	−7.09**	−6.95**	−6.97**
EDU	−6.41**	−6.38**	−6.47**	−6.47**	−6.33**	−6.43**
LFDI	−7.19**	−7.11**	−8.37**	−7.20**	−7.05**	−9.84**
LGDPPC		−5.86**	−5.86**	−5.53**	−6.15**	−6.15**
Critical value at 5%	−1.95	−2.943	−2.943	−3.191	−3.548	−3.540

**indicates the statistics are significant at 5% level of significance.

those tests in the first difference. The results are in the lower panel of Table 2. As shown by the test results, we say that the rest of all variables are known I(I) as their calculated values are greater than their critical values at 5 per cent level of significance. They are statistically significant even at 1 per cent level. Therefore, we can conclude that the empirical variables are mixed with I(0) and I(1).

3.4. Econometrics

In the next step, we go for the cointegration tests. The standard procedure is to conduct the cointegration test to know the coefficients of the relationship between the dependent and independent variables. As we have the time series data with the different order of integration, the variables included in the equation (1) will be analyzed using a cointegration test based on autoregressive distributed lag (ARDL) approach. The advantage of this method is that it gives the long-run and short-run coefficien of the variables irrelevance of the order of their integration (Pesaran et al., 2001; Paudel and Jayanthakumaran, 2009) if the variables are either I(0) or I(1).

Therefore, equation (1) will be modified as equation (3) to represent the ARDL version of the specification.

$$\Delta LEXPORT_t = \alpha + \beta_1 LEXPORT_{t-1} + \beta_2 LELCONS_{t-1} + \beta_3 LFDI_{t-1} + \beta_4 LGDPPC_{t-1} + \sum_{i=1}^{44} \gamma_i \Delta LEXPORT_{t-i} + \sum_{i=1}^{44} \delta_i \Delta LELCON_{t-i} + \sum_{i=1}^{44} \varphi_i \Delta LFDI_{t-i} + \sum_{i=1}^{44} \lambda_i \Delta LGDPPC_{t-i} + v_t \quad (3)$$

Here, the notable point is that the equation (3) captures the dynamic impact in the form of Auto-Regressive Distributed Lag Model, where Δ stands for the first order differential variable, α is the intercept, β_1, β_2, β_3, and β_4 are the coefficients of first-order variables. Similarly, γ_i, δ_i, ϕ_i and λ_i are error correction model parameters, and v_t is a random error vector.

Table 3: ARDL (2 0 2 1 1) model, long run coefficients Results, Dependent variable: LEXPORT

Variables	(1)	(2)	(3)	(4)
Electricity consumptions in GWH-log (LELCONS)	0.620***	0.678***	0.864***	0.742***
	(0.195)	(0.245)	(0.150)	(0.058)
Education-percent (EDU)	0.021	−0.007		
	(0.017)	(0.020)		
Foreign direct investment USD-log (LFDI)	0.209*	0.148		
	(0.126)	(0.139)		
GDP per capita in USD-log (LGDPPC)	−0.838**		−0.253	
	(0.369)		(0.262)	
Number of observations	42	42	42	42
Root MSE	0.03	0.05	0.05	0.04
Log likelihood	40.81	35.89	36.24	34.68
R-squared	0.45	0.30	0.31	0.21

**, ** and * indicate that the statistics are significant at 1%, 5% and 10% level of significance. The figures in the parenthesis are the standard error.

Table 4: ARDL (2 0 2 1 1) model, ECM Results

Dependent variable: ΔExports-log (ΔLEXPORT)	(1)	(2)	(3)	(4)
LEXPORT (-1)	0.62	0.046	0.181	0.063
	(0.173)	(0.176)	(0.167)	(0.156)
EDU (-1)	−0.005	−0.002		
	(0.008)	(0.008)		
EDU (-2)	−0.004	−0.005		
	(0.007)	(0.007)		
LFDI (-1)	−0.027	0.013		
	(0.040)	(0.040)		
LGDPPC (-1)	0.665		0.570**	
	(0.292)		(0.269)	
ECM (-1)	−0.35***	−0.29***	−0.29***	−0.35***
	(0.102)	(0.106)	(0.098)	(0.102)

***, ** and * indicate that the statistics are significant at 1%, 5% and 10% level of significance. The figures in the parenthesis are the standard error

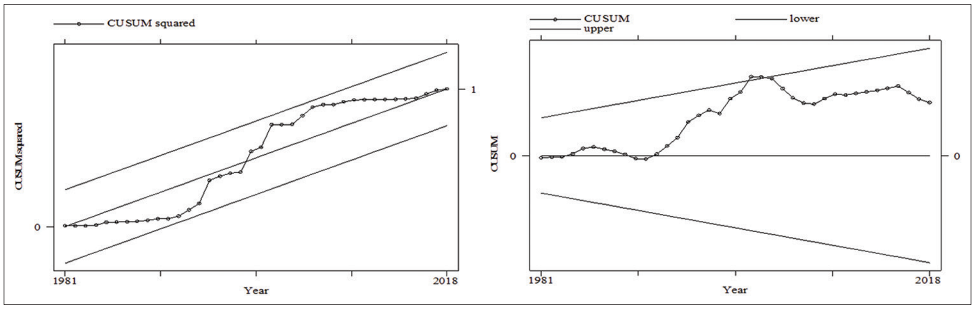
4. RESULTS AND INTERPRETATION

Table 3 presents the long-run relationship results for the model of different specifications in column (1), (2), (3) and (4). Similarly, Table 4 presents the results for the ECM model in different specifications of the model. Schwartz-Bayesian Criteria (SBC) is selected to fit in the data properties. The column (1) of both tables present the results for our benchmark model, likewise column (2), (3) and (4) present the results for the different specification of the model changing the number of variables. The column (4) is a bivariate model. F-statics (Bound) results are not reported but noted as higher than the upper bound of the critical value indicating that a long-run relationship exists in all these specifications of the model.

The results in Table 3 show that electricity consumption (LELCONS) does have a robust long-run relationship with export. It means these two variables move together in the same direction. These results mitigate the reflection of Figure 1. The results suggest that a 1% increase in the consumption of the electricity causes the exports to increase on average by about 0.60 percentage or more holding other variables in the model constant. Notably, in all specifications in all columns have the coefficients larger than 0.60 and have consistently maintained the level of significance indicating the results are robust.

The results of the education (EDU) is not statistically significant. It seems reasonable as the number of secondary school enrolment increases the export has not followed such direction. If that were the case Nepal's present exports would have been so better position than of today. The foreign direct investment seems to have a positive relationship with exports; however, it is at 10% level of significance. The per capita GDP (LGDPPC) variable is used as a proxy for infrastructure, shows the negative impact on exports. This result suggests that the infrastructure does suit the production activities. Instead, the infrastructure development is more focused on to demoralize such activities. This finding strongly seeks the attention to build the infrastructure to suit the production hubs and thus increased proportion of income should be invested to increase the total factor productivity so that it can contribute to improving the export performance. The results for our main

Figure 3: CUSUM and CUSUMSQ plotted against the critical bounds of 5% level of significance



variable of interest, electricity consumption, is consistent in all specifications of the model as presented in all columns of Table 3.

Table 4 presents the short-run results of the model with the different specification in the similar fashion of Table 3. In all four specifications, ECM (−1) are statistically significant with an expected negative sign indicating the disequilibrium that occurs in the previous year can be corrected in the present period following a short-run shock in a moderately quicker pace as the coefficient for this are smaller than 0.50. We did not find that impressive impact of the variables in the short run.

The R-square value is moderately high and has declined as the number of independent variables are reduced. This value shows that the overall goodness of fit of the model is moderately high. The diagnostic test results indicate that the model passes the tests for serial correlation, functional form, normality, and heteroscedasticity. Further, the stability test results (CUSUM and CUSUMSQ) plotted against the critical bounds of 5% level of significance are within the range, generally, indicating that the model is structurally stable (Figure 3).

5. CONCLUSIONS

We document a brief scenario of electricity consumption and its relationship with export values in the context of Nepal. In this process, first, we highlight the main issues and trends of the electricity consumption growth compared with the exports growth and then proceed to investigate the role of electricity consumption in export performance employing the ARDL approach of cointegration with structural break and unit root analysis using annual data from 1975 to 2018.

We follow the standard procedures to analyze the time series data, detect the long-run and short-run relationship among the dependent and independent variables in the model. Then, we look post estimation statistics to satisfy the procedures are followed correctly and present the results and relevant figures in suitable places.

The empirical analysis results show that electricity consumption does have a significant impact on the export performance of Nepal. It suggests that as of now and past, increasing the electricity supply to increase electricity consumption may be a way to improve export performance. Further, we did not focus much, but on the go results for foreign direct investment, suggest that one way to improve the export performance of Nepal may be to make more favourable environment to foreign investors. Also, the results indicate that there is a need for building infrastructure to support the production activities, not for just the means of transportation, so that it would contribute to improving the export performance.

REFERENCES

Bhandari, R., Pandit, S. (2018), Electricity as a cooking means in nepal-a modelling tool approach. Sustainability, 10(8), 2841.

Bouoiyour, J., Selmi, R. (2015), Exchange volatility and export performance in Egypt: New insights from wavelet decomposition and optimal GARCH model. The Journal of International Trade and Economic Development, 24(2), 201-227.

CEIC Data. (2020), Nepal Electricity Consumption: Total, CEIC Database. Available from: https://www.ceicdata.com/en/nepal/electricity-consumption/electricity-consumption-total. [Last accessed on 2020 May 07].

Coban, S. (2015), Does the financial development spur export performance? Evidence from Turkish firm-level data. International Journal of Economics and Financial Issues, 5(2), 434-440.

Costantini, V., Crespi, F. (2008), Environmental regulation and the export dynamics of energy technologies. Ecological Economics, 66(2-3), 447-460.

Erickson, R.A. (1989), Export performance and state industrial growth. Economic Geography, 65(4), 280-292.

Government of Nepal. (2001), Hydropower Development Policy, 2058 (2001) Department of Electricity. Available from: https://www.doed.gov.np/storage/listies/January2020/hydropower-development-policy-2058-2001.pdf. [Last accessed on 2020 May 07].

Gregory, A.W., Hansen, B.E. (1996), Residual-based tests for cointegration in models with regime shifts. Journal of Econometrics, 70, 99-126.

International Energy Agency. (2020), Data and Statistics. I.E. Agency. Available from: https://www.iea.org/data-and-statistics?country=NEPAL&fuel=Key%20indicators&indicator=Electricity%20consumption. [Last accessed on 2020 May 07].

Paudel, R.C. (2013), Growth and Export Performance of Developing Countries: Is Landlockedness Destiny? PhD Dissertation, Crawford School of Economics and Public Policy. Canberra, Australia: Australian National University.

Paudel, R.C. (2014), Export Performance in Developing Countries: A Comparative Perspective. Canberra: Arndt-corden Department of Economics, Crawford School of Economics, Australian National University.

Paudel, R.C. (2016), Liberalization reform and export performance of India. Journal of Economics and Economic Education Research, 17(3), 201-219.

Paudel, R.C., Jayanthakumaran, K. (2009), Financial liberalization and performance in Sri Lanka: The ARDL approach. South Asia Economic Journal, 10(1), 127-156.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, 289-326.

Sakamoto, T., Managi, S. (2017), New evidence of environmental efficiency on export performance. Applied Energy, 185, 615-626.

Shrestha, R.S. (2010), Electricity crisis (load shedding) in Nepal, its manifestations and ramifications. Hydro Nepal: Journal of Water, Energy and Environment, 6, 7-17.

The Kathmandu Post. (2017), Janardan Sharma Recounts His Mission to End Load-shedding in Country. Available from: https://www.kathmandupost.com/national/2017/10/20/janardhan-sharma-recounts-his-mission-to-end-loadshedding-in-country.

World Bank. (2019), First of Its Kind World Bank Survey on Quality of Electricity Access in Nepal Shows Remarkable Progress; Challenges Persist on Clean Cooking. World Bank. Available from: https://www.worldbank.org/en/news/press-release/2019/11/19/first-of-its-kind-world-bank-survey-on-quality-of-electricity-access-in-nepal-shows-remarkable-progress-challenges-persist-on-clean-cooking. [Last accessed on 2020 May 07].

World Bank. (2020), World Development Indicators. Washington DC: World Bank. Available from: http://www.data.worldbank.org. [Last accessed on 2020 Nov 03].