Electricity Consumption, Inward FDI, and Economic Development in Pakistan: VECM and Causality Analysis

Muhammad Uzair Ali

Business School of Xiangtan University Xiangtan University, Xiangtan, Hunan, China E-mail: Uzair@smail.xtu.edu.cn

Zhimin Gong

Business School of Xiangtan University Xiangtan University, Xiangtan, Hunan, China E-mail: gzm@xtu.edu.cn

Xiong wu

Business school of Xiangtan University Xiangtan University, Xiangtan, Hunan, China E-mail: 201931000040@smail.xtu.edu.cn

Muhammad Rizwanullah

School of Public Administration Xiangtan University, Xiangtan, Hunan, China E-mail: 486676406@qq.com

Abstract

Current study discussed the Inward FDI, Electricity consumption, and Economic development situation in the Pakistan and observed the causal relationships between under study variables for the period 1975-2014. ADF and NP Perron tests, Johnsen co-integration test, and VECM econometric techniques were used for experimental analysis. The trend of Inward FDI was fluctuating over the study period and a regular increase noted in Electricity consumption. New evidence discovered that Electricity consumption and FDI had a positive impact on GDP growth. Bidirectional associations between economic development & Inward FDI and Electricity consumption & Inward FDI were discovered, and confirmed the feedback hypothesis, "FDI-led growth hypothesis", and "Market size hypothesis". Furthermore, GDP granger causes Electricity consumption in the short run and confirmed the conservation Hypothesis. FDI is essential for uplifting the economy of Pakistan and serve as an engine for the economic development. Pakistan is currently struggling to fulfill the demand for electricity to various sectors & industries and consequently negatively affecting Pakistan economy. Policy makers should focus on removing barrier that can hinder the inflow of FDI and new sources of electric power should be used such as hydro power energy production, solar energy, energy from biomass, and energy from the wind.

Keywords: Economic development; Inward FDI, Electricity consumption; VECM; Granger causality; Pakistan.

1. Introduction

Electric power production & consumption and Inward Foreign Direct Investment (FDI) are major foundations of a country's economic development. Relentless & smooth Electricity supply and a striking amount of Inward FDI are life savers for the economic health of developing countries like Pakistan. In most developing and underdeveloped countries, the declining economic growth is because of Power shortage. Furthermore, the Electricity shortages & scarcities are related to incompetence & inabilities of the authorities to create & set up new power generating capacities and look for new sources of energy. Where incase of sole Hydropower source, during droughts periods, the diminishing electricity supply is severe. Foreign Direct Investment benefits and supports Pakistan's economy because it can supplements & supports Domestic investment and can bring technology & innovation. Furthermore, Inward FDI increases the supply of capital and facilitate technology transfer through direct and indirect channels. For Pakistan, China has continued to be a blessing and lifesaver on the FDI front. Under the multibillion-dollar China-Pakistan Economic Corridor (CPEC), China continues to lend to Pakistan in the shape of investment and supports the Pakistan economy. But still the Inward foreign direct investment has not been satisfactory, some of the reasons are poor governance, political instability, corruption and mismanagement of country resources.

How good the Government of Pakistan has been to generate new sources and volume of electric power and the amount of FDI Government managed to fetch? And to what extent Electricity consumption and foreign direct investment have been contributed to economic growth? must be investigated to attain an objective view. This research evaluates and examines the association between Electricity Consumption, Inward FDI, and GDP per capita through econometric analysis based on time series data. The study aims to explore the causal relationship between GDP, electricity, and Inward FDI through VECM (Vector Error Correction Model) and Granger causality test.

The rest of the study has been divided in such manner that the second section is the literature review, includes literature on the relationship between Electricity consumption, Inward FDI and GDP growth. Section four contains the Methodology and econometrics analysis results. The last section is the summary, conclusion, and based on study findings policy recommendations have been presented.

2. Literature Review

The available literature on Granger causality relationship between Electrical energy consumption and GDP growth is in a substantial amount and has concluded the entire possible hypothesis. The feedback hypothesis suggests that energy consumption and economic growth are interrelated and might be served as complementary to each other. A unidirectional causal relationship running from electricity consumption to economic growth signifies the Growth Hypothesis, means that, for Economic growth the electricity consumption is a limiting factor and its shortage would harm the Economic development. Third is the conservation hypothesis, describing a unidirectional causality running from economic growth to energy consumption. However, Yao & kim (2006) discussed that in the case of developing economies, misuse of resources could produce shortages of electricity consumption. And in this scenario, an upsurge in economic growth would have a hostile effect on energy consumption, mentioned by Apergis (2009). Lastly, the hypothesis of neutrality proposes that there is no causality between economic growth and energy consumption. The hypothesis of neutrality reflects energy consumption to be a small factor of overall economic growth and consequently has slight or not any effect on economic growth.

The correlation between the Inward Foreign Direct Investment (FDI) and Economic development of the host countries has been the center of focus of various researches. According to past theories, the causal relationship between Economic development and Inward Foreign Direct Investment (FDI) can run in either direction. The "FDI-led growth hypothesis" states that the Inward Foreign Direct Investment (FDI) increases job opportunities, easing the transfer of technology and the capital stock (Borensztein et al, 1998; De Gregorio,2003; De Mello, 1997). Mah (2010) briefed that

according to the "Market size hypothesis", new investment opportunities produced by massive and rapid growth in the Economy which leads in larger inflow of Foreign Direct Investment (FDI) to the host country. Aitken and Harrison (1999) said that FDI can also negatively affect the economy by crowding out investment, which results in dependency and enhances external vulnerability. Finally, according to the neutrality hypothesis, the causal relationship running from Foreign Direct Investment to GDP growth doesn't exist. Dependency theories have advised that Inward Foreign Direct Investment (FDI) had not always been a blessing. Following these theories, foreign investment dependency might yield a negative impact on income distribution and GDP growth. Bornschier and Chase-Dunn (1985) presented that since Inward Foreign Direct Investment (FDI) generates monopolies in the industrial sector that might result in underutilization of domestic resources.

The causal association between study variables might be fashioned into following testable hypotheses.

- The feedback hypothesis suggests a bidirectional causality relationship.
- The Growth hypothesis proposes a unidirectional causality.
- The Third is **the conservation hypothesis**, which entails unidirectional causality (opposite direction) and opposite to the Growth Hypothesis.
- The hypothesis of neutrality proposes that there no causality.
- "FDI-led growth hypothesis" FDI stimulates growth.
- "Market size hypothesis" Growth in Economy leads in Inward FDI.

Sr.	Researchers	Country(s)	Econometric model	Objective (s)	Conclusion (s)
1	Gosh (2002)	India	Granger causality	GDP -ELE nexus	GDP→ELE
			test		
2	Shiu and lan (2004)	china	CO integration and	GDP -ELE nexus	GDP→ELE
			ECM techinque		
3	Yoo S.K (2006)	Indonesia	Engle-Granger and	GDP -ELE nexus	GDP→ELE
			VAR Model		
4	Odhiambo (2009)	South Africa	Granger Causality	GDP -ELE nexus	GDP↔ELE
5	Tang in 2008)	Malaysia	ARDL bonds test;	GDP -ELE nexus	GDP↔ELE
			Granger causality		
6	Acaravci (2010)	Turkey	Toda and	GDP -ELE nexus	GDP↔ELE
			Yamamoto (1995)		
7	Kumari and Sharma	India	Co-integration &	GDP -ELE nexus	ELE↔GDP
	(2016)		VECM		
8	Srinivasan &	Bangladesh,	Granger causality	GDP -FDI nexus	$FDI \leftrightarrow GDP$, in all countries
	Kalaivani in 2011	Pakistan, India, Sri			except India.
		Lanka, and Nepal.			
9	Ramirz (2006)	Mexico	causality	GDP -FDI nexus	FDI positive impacts on
					GDP Level
10	Li and Liu in 2005	84 developing	causality	GDP -FDI nexus	Positive association
		countries			between FDI and GDP
11	Hansen & Rand 2006	31 developing	panel data analyses	GDP -FDI nexus	FDI↔GDP
		countries			
13	Bayar (2014)	Turkey	Granger causlity	GDP -FDI nexus	FDI negatively effects
					GDP in short and long-run.
14	2011, Pao & Tsai	BRICs Countries	Panel cointegration	ELE-GDP-FDI	ELE→GDP
				nexus	ELE→FDI
					C02⇔ELE
15	Essien in 2011	Colombia	Granger causality	ELE-GDP-FDI	ELE \rightarrow FDI, in short-run
				nexus	and long-run.
16	Kuo & Liu, (2014)	Germany	Granger causality	ELE-GDP-FDI	GDP→ELE
				nexus	GDP→FDI
17	Mutafoglu (2012) in	Turkey	Granger causality	ELE-GDP-FDI	GDP→FDI, but not vice-
				nexus	versa

Table 1: Summary of available literature

Table 1 contains the summary of previous work done on the associations between Electricity consumption and economic development, Inward FDI and Economic development, and the association between Electricity consumption, Inward FDI, and Economic development. From the discussed literature it has been specified that there is no proper consensus on the dynamic effects of Electricity consumption and Inward Foreign Direct Investment (FDI) on Economic growth. The researchers have argued that the impact of Electricity consumption and Inward Foreign Direct Investment (FDI) on Economic growth varies across the nations. From last two and half decades Pakistan is facing massive shortfall and shortages of electricity production, so severely harshen the industrial production and manufacturing. Through current study, we would find the current status of Electricity and amount of loss Pakistan has suffered from the current shortfall & shortages of electricity produce. Furthermore, the effects of Inward FDI in relatively open economies have statistically significant results and consequences. On the contrary, some researchers have shown that the direction of causality between Inward Foreign Direct Investment (FDI) and economic growth depends on the trade policies of receiver nations. Pakistan from the last twelve years struggling in tracking foreign investors to invest in different sectors and it's worthwhile to experiment the impact of inward FDI on economic development of Pakistan. Besides, only a few studies had explored the possibility of a causal relationship between Inward Foreign Direct Investment (FDI), Electricity consumption and economic growth. While providing a review of earlier studies on the role of Inward Foreign Direct Investment (FDI) and Electricity in economic growth, the literature is still in its infancy. The current study has attempted to contribute to the existing literature.

104

3. Methodology

The current study investigates causal relationship between GDP, Electricity consumption and Foreign Direct Investment through Time series data analysis. For study analysis, the data has selected from the World bank economic indicator for the period 1975 to 2014. The econometric tests for causal relationships between Model variables i.e. Electricity, Inward FDI, and GDP have executed through three steps.

The first step is the paper test, to look for the stationarity in data series i.e. GDP per capita and Electricity consumption and Inward FDI. ADF Test and NP Perron test are employed for finding the unit root. The second step is identifying co-integration after finding the optimal lag length. The Johnsen co-integration test is used to examine and estimate the long run relationship among Electricity, FDI, and GDP. The third step is the Vector Error Correction Model approach, has been employed to identify the impact, sources, and directions of causal relationships.

3.1. Unit Root Test

In past literature, many stationarity tests were used, and current study uses the ADF Test and NP Perron test. In the case of ADF test, if the p-value is greater than 0.05 then we cannot reject the Null hypothesis, that the time series are not stable. NP Perron unit root test is more convincing than the traditional unit root test, especially when it comes to small data sample. The null hypothesis cannot be rejected if the calculated values of MZa and MZt are smaller than the critical value. Furthermore, the null hypothesis also cannot be rejected if the values of MSB and MPT are larger than the critical value. If the calculated values of MZa and MZt has been more than the critical value, then the null hypothesis will be rejected, and the series is stable.

3.2. Co-Integration Approach

The co-integration approach is used to investigate and examine the long-run equilibrium between the model variables. Agbola (2004) had stated that the Johansen co-integration test (Johansen, 1994) demonstrates an analytical statistical framework for ascertaining and discovering the long-run

relationship between the variables. Decision criteria of no integration are based on the and trace value and Max Eigenvalue at 5% confidence level. The lower confidence value leads to rejection of no integration hypothesis (Null Hypothesis). The study can reject the null hypothesis of one or two co-integration equation in the model, in case the Trace value and Max Egin values are >5% critical value.

3.3. Vector Error Correction Model

In case the model time series are discovered to be co-integrated then VECM is applied to test the shortrun and long-run causal relationship. To find the causal direction among time series the Granger causality has been employed. For VECM specified Granger causality analysis, the study has considered the following three equations:

$$\Delta \text{GDP}_{t} = \sum_{i=1}^{k} \beta i \Delta \text{GDP}_{t-1} + \sum_{i=1}^{k} \beta i \Delta \text{ELC}_{t-1} + \sum_{i=1}^{k} \beta i \Delta \text{FDI}_{t-1} + \beta \text{ECT}_{t-1} + u_{\text{It}}$$
(1)

$$\Delta \text{ELC}_{t} = \sum_{i=1}^{k} \beta i \Delta \text{ELC}_{t-1} + \sum_{i=1}^{k} \beta i \Delta \text{FDI}_{t-1} + \beta \text{ECT}_{t-1} + \sum_{i=1}^{k} \beta i \Delta \text{GDP}_{t-1} + u_{2t}$$
(2)

$$\Delta FDI_{t} = \sum_{i=1}^{k} \beta i \Delta FDI_{t-1} + \sum_{i=1}^{k} \beta i \Delta GDP_{t-1} + \sum_{i=1}^{k} \beta i \Delta FDI_{t-1} + \beta ECT_{t-1} + u_{3t}$$
(3)

In Eq.1, Eq.2, and Eq.3, the Δ FDI, Δ GDP, and Δ ELC represent the differences in Inward Foreign Direct Investments, Gross Domestic Product and Electricity Consumption respectively. The short-run disturbances are captured by Δ FDI, Δ GDP, and Δ ELC. Long-run effects can be detected through ECTs (Error correction terms). And through a series of partial short-run adjustments the deviation from the long-run equilibrium has been adjusted. The function of error correction terms is to calculate long-term relationship in the VECM. K is the number of lag and $\mu 1$, $\mu 2$ and $\mu 3$ are serial uncorrelated error terms. In case the time series in the model are out of equilibrium, then Dependent variable would be adjusted to minimize the equilibrium error (minimize the long-run equilibrium error). All the three equations in the model denote that any variations in the dependent series (variables) are not only by series lags but also caused by the disequilibrium of pre-period in the level. In GDP equation (EQ 2), GDP per capita Granger cause Electricity consumption and Inward FDI in short-run if the lags value's coefficients are statically found to be significant. The Granger causality test can be employed to establish the long-run causality if the lagged disequilibrium term is significant.

4. Result Analysis and Interpretation4.1. Status of GDP Growth, Inward FDI, and Electricity Consumption

GDP per capita majorly used to quantify the economic development and health of a country. Figure 1 demonstrated the graphics view and trend of Gross domestic product per capita of Pakistan from 1975 to 2014. Many economic factors contribute to Economic development but in our paper, we are interested in Electricity consumption and Inward FDI impacts on Economic development in Pakistan.







Figure 2: Inward FDI, Source; World Bank (2020)

Figure 3: Electricity consumption Source; World Bank (2020)



Foreign Direct investment is the measure of the total investment injected by a corporation and business firm or a country in another foreign country. FDI leads to the rise of Capital, improve technology, bring innovation in industries, Human resources development, and increase employment. Figure 2 represents the graphic presentation of Foreign Direct Investment to Pakistan Economy from 1975 to the year 2014. Figure 2 illustrates that Pakistan is struggling in attracting FDI and foreign investor to the country and we will measure its impact on GDP.

In Pakistan, Electricity is the main and chief source of power supply for industrial and commercial activities. Electricity is also extravagantly consumed in non-commercial and daily household's activities in Pakistan. Figure 3 shows the graphic representation of Electricity consumption, which shows a heavy demand for Electricity in the future and the demand is increasing day after day. It is useful to check the impact of Electricity consumption on Economic development, so that policymakers may be built sound policy for generating Electrical power.

			Critic			
Var.	Level	First difference	1%	5%	10%	Decision
GDP	0.42(0.98)	-4.7(0.00)*	-3.6	-2.7	-2.6	I(1)
ELC	-3.2(.02)***	-	-3.6	-2.9	-2.6	I(0)
FDI	-1.65(0.44)	-3.98(0.0)*	-3.6	-2.9	-2.6	I(1)

Corresponding p-values are in parentheses. (1%), (5%)** and (10%)***

Variables	MZa	MZt	Msb	MPt	Decision
GDP	-13.38**	-2.58107	0.1937	1.839	I(1)
ELC	-12.536**	-2.42	0.19322	2.266	I(1)
FDI	-12.789**	-2.5183	0.1969	2.23	I(1)

Table 3: NG-Perron unit root test

MacKinnon (1996); (1%)*, (5%)** and (10%)***

4.2. ADF Test and NG-Perron Tests

Table 2 & 3 contains the results of ADF and NG- Perron unit root test for the log of GDP, inward FDI and Electricity Consumption. Results illustrate that the GDP per capita and inward FDI are stationarity at First level and these variables are integrated of order one I (1). While Electricity Consumption attains stationarity at the level and is integrated of I (0). Table 2 contains the data for the NG- Perron Test, shows that the model series attain stationarity at 5% significance level and are integrated of Order one (I (1)).

4.3. Johansen Co-Integration Test results

Table 4 presents the outcome of the Johansen co-integration approach. Trace test and Max. Eigen test revealed that the three times series e.g. Electricity consumption, Inward FDI and GDP per capita are co-integrated in long-run at 1% significance level. Akaike Information Criterion (AIC) was the basis for choosing the optimal lag length to find out the co-integration in the model.

Ну	pothesized no	o of co-integra	Co-integration Rank test				
	(Trace Statistic)				(Max. Eigen Statistic)		
	Eigen V.	Trace St.	Crit V	Prob.	Max E St	Crit V.	Prob.
None*	0.5	35.5	29.7	0.00	27	21.13	0.00
At most 1	0.2	9	15.4	0.36	14.1	14.26	0.28
At most 2	0.0	0.02	3.8	0.89	2.84	3.841	0.89

Table 4: Johansen Co-integration test

* indicates refusal of the Null Hypothesis at the 5% level.

4.4. Vector Error Correction Model

The model variables have been co-integrated in the long run and the Vector Error Correction Model has employed to find the impact, source, and direction of the causal relationship. Table 4 contains the experimental results of the VECM approach. As the log-log model was specified for the study, so the interpretation of Co-integration equation will be in elasticity form and sign on variable's coefficient will be inverted. Following table 5, a 1-unit change in electricity consumption will result in a 0.82-unit increase in GDP and for FDI, a 1-unit change in FDI will lead to a 0.86-unit increase in GDP. It denotes that Electricity consumption and Foreign Direct investment has a positive impact on GDP growth. The coefficient of co-integration equation is 0.016 which denotes that previous deviation from long-run equilibrium has been corrected at a speed of 1.6%.

Table 5: Vector Error Correction N	Model
--	-------

Dependent variable: GDP									
Variables	Coefficient	Standard Error	T-value						
ELC	-0.82	(0.19)	[-4.22]						
FDI	-0.86	(0.64)	[1.33]						
С	7.74								
Coefficient (EQ1)	-0.016	(0.009)	[1.79]						

4.5. Short-Run and Long-Run Association

Table 6 presents the results of VECM Granger Causality/Block Exogeneity Wald Tests. The evidence showed a short- run bidirectional association between economic development and Inward FDI and another bidirectional association was existed between Electricity consumption and Inward FDI. Consequently, confirmed the feedback hypothesis (both variables served as complementary to each other) of bidirectional causality and also established the "FDI-led growth hypothesis" that FDI stimulates economy & "Market size hypothesis" that growth in the economy results in more foreign investment inflow. Furthermore, GDP growth granger causes Electricity consumption in the short run but reverse causality doesn't exist and confirmed the conservation hypothesis that misuse of resources could produce shortages of electricity consumption. Implies that enough electricity should be produced to support the economic activates.

The long-run causality is being tested through t-statistics of the error terms of \triangle GDP PC (EQ1), \triangle ELC (EQ2), and \triangle FDI (EQ3). Based on Table 5, the Coefficients of the error correction term (ECT-1) found significant in the all of the three equations e.g. GDP, FDI, and Electricity consumption. And imply that there has been a long-run relationship in Electricity Consumption (ELC) and Inward Foreign Direct Investment (FDI), and Gross Domestic Product.

	Short-run			Long-run. ECT _{t-1}	Short-run relationship	Long-run relationship
Dependent variable	GDP	ELE	FDI			
GDP		2.8*	9.2**	0.016(0.076)	GDP ↔ FDI (Bidirectional)	Yes
FDI	2.7*		2.7*	0.37(0.71)	FDI ↔ELE (Bidirectional)	Yes
ELC	0.6	1.28*		0.07(0.0012)	ELE→FDI(Uni directional)	Yes

Table 6:	VECM	specified	Granger	causality	test
----------	------	-----------	---------	-----------	------

*, **, and ***Implies significance at 10%, 5%, and 1% respectively

5. Summary, Conclusion and Policy Recommendation

5.1. Summary

The research investigated the current status of Electricity consumption, Inward FDI, and Economic development, the impact of Electricity consumption and Inward Foreign Direct Investment on GDP growth, and causality associations between GDP per capita, Electricity consumption and Inward Foreign Direct Investment in Pakistan for the period of 1975-2014 through Times series data. ADF and NG- Perron unit root tests confirmed that times series variables are stationary at their Level and first difference. The Johansen co-integration test specified a long-run equilibrium relationship between GDP, Electricity, and Inward FDI. Vector Error Correction Model proposed the positive impact of Inward FDI, and Electricity consumption economic development. Grangers Causality test confirmed two bidirectional associations and one unidirectional association between study variables.

5.2. Conclusion

Study results discovered many new proofs. First, all the of time series variables i.e. Inward FDI, Electricity Consumption and GDP are co-integrated in the long run, implies that explanatory variables have been conjoining with GDP to accomplish their equilibrium in the long run while deviations may happen in the short-run. Secondly, Inward FDI and Electricity consumption has a positive impact on economic development. Thirdly, short-run bidirectional causalities were discovered between Economic development & Inward FDI and electric power consumption & Inward FDI, means that in both

associations variables serve as complementary to each other and follow the feedback hypothesis. Consequently, these two bidirectional associations also confirmed the "FDI-led growth hypothesis" that FDI stimulates economy & "Market size hypothesis" that growth in the economy results in more foreign investment inflow. Furthermore, GDP growth granger causes Electricity consumption in the short run but reverse causality doesn't exist and confirmed the conservation hypothesis, that misuse of resources could produce shortages of electricity consumption. Lastly, these new finding richly contribute to the current literature of Inward FDI, Electric power consumption, and economic development.

Our analysis showed that efforts should be made to enhance the inflow of Inward FDI into the economy through various channels i.e. Direct channel or two Governments partnership because Inward FDI is essential for uplifting the economy of Pakistan and serve as an engine for the economic development. This underscore the need for high volume of Inward FDI in the country to boost the economy because FDI escalates the frequency of economic activates. Electricity supply is also a significant element in economic development. In results, Pakistan is currently struggling to fulfill the demand for electricity to various sectors & industries and in consequently negatively affecting Pakistan economy. Effort and determination are required to ensure a constant supply of electricity for the industrial activities because the higher the electricity availability for economic activities greater the rate of GDP Growth.

5.3. Policy Recommendations

Policy makers should focus on removing barrier that can hinder the flow of Inward FDI such as the instability of political system, poor governance, corruption, delayed in decision making, and especially the poor efficiency of human resources. The government has to generate concrete ideas and policies, to overcome the ongoing electricity crisis to avoid any further economic loss. Government has to discover innovative and new sources such as hydro power energy production, solar energy, energy from biomass, and energy from the wind. These energy sources are renewable and environmental friendly compare to coal, gas or fossil oil energy. Current research focused only on energy use rather than disaggregated sources, e.g. renewable and non-renewable sources of energy which would potential idea for future research work.

Acknowledgment and Funding Source

This work has been supported by the National Social Sciences Foundation of China project to reconstruct the dynamic mechanism of effective supply and effective demand linkage and matching through income distribution reform (project, No. 17BL012). The Chinese Government scholarship (CSC Council Beijing China), is also greatly acknowledged for providing Financial support. (CSC No.2017DFH016032). We also greatly appreciate the thoughtful comments and valuable suggestions from anonymous reviewers for the improvement of this manuscript.

References

- [1] Acaravci, A., 2010. "Structural Breaks, Electricity Consumption, and Economic development: Evidence from Turkey," *Journal for Economic Forecasting*, 2 140-154. 2010.
- [2] Aitken, B. and A. Harrison,1999 "Do domestic firms benefit from direct foreign investment? Evidence from Venezuela," *American Economic Review*, 89 605–618..
- [3] Agbola. T., 2004 "Readings in Urban and Regional Planning," *Published by Macmillan Nigeria Limited, Ibadan, Oyo State, Nigeria.* Pp. 179.
- [4] Apergis, N. and J.E. Payne, 2009 "Energy consumption and economic development in Central America," *Energy Economics*, 211-216..

- [5] Bayar, Y., 2014. "Effects of Inward Foreign Direct investments and domestic investment on economic development: evidence from Turkey," *Int. J. Econ. Finance*, 6: 69.
- [6] Borensztein, E., D. Gregorio, and J.W. Lee, 1998. "How does foreign investment affect growth? Evidence from Venezuela," *American Economic Review*, 89605–618.
- [7] Bornschier, V. and C. Chase-Dunn, 1985. "Transnational corporations and underdevelopment," *New York: Praeger,*
- [8] DeGregorio, J., 2003. "The role of foreign direct investment and natural resources in economic development," *Working Paper No. 196*.
- [9] De Mello, L., 1997. "Foreign direct investment in developing countries and growth: a selective survey," *Journal of Development Studies*, 34 1–34.
- [10] Essien, A. V, 2011. "The Nigeria Energy Sector: Electricity Consumption and the Macroeconomic Performance (1980–2009)," *Available at SSRN* 2150459.
- [11] Francisco, R. and R. Dani, 2000. "TRADE POLICY AND ECONOMIC GROWTH: A SKEPTIC'S GUIDE TO THE CROSS-NATIONAL EVIDENCE," *Francisco Rodríguez and Dani Rodrik University of Maryland and Harvard University*, Revised May.
- [12] Ghosh, S., 2002. "Electricity consumption and economic development in India," *Energy Policy*, 30 125–129.
- [13] Hansen, H., and L. Rand, 2006. "On the causal links between FDI and growth in developing countries," *World Econ*, 29 21–41.
- [14] Johansen, J., 1990. "Maximum likelihood selection and inference on cointegration with applications to demand money," *Oxford Bulletin of Economics and Statistics*, vol-52 169-210.
- [15] Khatun, F., Mazbahul and Ahamad, 2015."Foreign direct investment in the energy and power sector." *Renewable and Sustainable Energy Reviews*, 52 1369–1377.
- [16] Kumari, A. and A.K. Sharma, 2018. "Causal relationships among electricity consumption, foreign direct investment and economic growth in India," *The Electricity Journal*, 33-38.
- [17] Li, X. and X. Liu, 2005. "Foreign direct investment and economic development: an increasingly endogenous relationship," *World Dev*, 33 393–407.
- [18] Mah, J., 2010. "Inward Foreign Direct investment s and economic development of China," *Journal of Policy Modeling*, 32 155–158.
- [19] Mutafoglu, T. H., 2012. "Foreign direct investment, pollution, and economic development evidence from Turkey," *J. Dev. Soc*, 28 281–297.
- [20] Odhiambo, N. M., 2009. "Electricity consumption and economic development in South Africa: a trivariate causality test," *Energy Economics*, 31635–640.
- [21] Pao, H. T. and C.M.Tsai, 2011. "Multivariate Granger causality between CO2 emissions, energy consumption, FDI (foreign direct investment) and GDP (gross domestic product): evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries," *Energy*, 36 685–693.
- [22] Ramirez, M. D., 2006. "Is foreign direct investment beneficial for Mexico? An empirical analysis 1960–2001," *World Dev*, 34802–817.
- [23] Shiu, A. and P. Lam, 2004. "Electricity consumption and economic development in China," *Energy*, 47–54.
- [24] Srinivasan, P. and M.P. Ibrahim Kalaivani, 2011. "An empirical investigation of foreign direct Investment and economic development in SAARC nations," JAsiaBusStud, 232–48.
- [25] Tang, C. F., 2008. "A re-examination of the relationship between electricity consumption and economic development in Malaysia," *Energy Policy*, 36. 3067-3075.
- [26] Squalli, J., 2007. "Electricity consumption and economic development: bounds and causality analyses of OPEC countries," *Energy Economics*, 1192–1205.
- [27] Yoo, S. H. and Y. Kim, 2006. "Electricity generation and economic development in Indonesia," *Energy*, 31: 2890–2899.