Do government activities determine electricity consumption in Ghana? An empirical investigation

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Do government activities determine electricity consumption in Ghana? An empirical investigation

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Abstract

The paper investigates the long-run relationship between government activities and electricity consumption using annual data collected from world development indicator for a period of 1971 to 2011 in Ghana. The paper adopts the autoregressive distributed lag model of co integration for the estimation. The estimation reveals both short run and long-run relationships between government expenditure and electricity consumption. The findings suggest that government activities explain electricity consumption in Ghana for the period under discussion, and could be considered as a policy variable in the management of electricity consumption.

Keywords: Government expenditures; Electricity consumption; Co-integration; Short run; long run.
Jel Code: H50, H72

INTRODUCTION

Government expenditure patterns in Ghana have raised concerns to many people in the country; and given the current energy problems (specifically, electricity) in the country, the questions is, does the increasing trend of government expenditure reflect proportional changes in utilities usage such as electricity consumption?

Various empirical studies (Akpan, 2005; Loizides, & Vamvoukas, 2005; Mitchell, 2005; Gregoriou & Ghosh, 2007; Komain & Brahmasrene, 2007; Liu, Hsu, & Younis, 2008; Olugbenga & Owoye, 2007; Ranjan & Sharma, 2008; Abu & Abdullahi, 2010; Arewa & Nwakahma, 2012) have examined the impact of government activities on key macroeconomic variables (Economic growth, interest rate, exchange rate, and inflation) and have reported significant impact of government expenditures on those macroeconomic variables.

Empirical studies (Fatas & Mihov, 2001; Blanchard & Perotti, 2002; Mountford & Uhlig, 2002; Perotti, 2002; Burnside, Eichenbaum & Fisher, 2003; Woodford, 2003; Galì, Lopez-Salido & Valles, 2003; Werner, 2004; Heppke-Falk, Tenhofen & Wolff, 2006; Perotti, 2008; Hall, 2009; Lorenzoni, 2009; Ramey, 2011; Murphy, 2013) have also examined the impact of government expenditure on consumption and have reported significant impact on consumption.

Studies on the determinants of electricity consumption abound in the empirical literature. The findings are found in the works of these researchers (Wolde-Rufael, 2006; Jaunky, 2007; Zuresh, & Peter, 2007; Athukorala, & Wilson, 2010; Alberni, & Filippini, 2011; Bernstein, & Madlener, 2011; Ekpo, Chuku, & Effiong, 2011; Adom, & Bekoe, 2012; Adom, Bekoe, & Akoena, 2012; Kwakwa, 2012; Zaman, Khan, Ahmad, & Rustam, 2012; Adom, 2013; Adom, & Bekoe, 2013; Alinsato, 2013; Kwakwa, Wiafe, & Alhassan, 2013; Mawia, 2013; Ubani, 2013; Adom, & Kwakwa, 2014; Arisoy, & Ozturk, 2014; Bekhet, & Othman, 2014; Chang, Kim, Miller, Park, & Park, 2014; Dhungel, 2014; El sahati, 2014; Ivy-Yap, & Bekhet, 2014; Adom, 2015; Latif, 2015; Alawin, Al-Hamdi & Alomeri, 2016; Hasanov, Hunt, & Mikayilov, 2016; Kwakwa, & Adu, 2016; Rafindadi, & Ozturk, 2016; Sekantsi, Retselisitsoe, & Mohatonyane, 2016; Ismail, Mahmud, & Rahman, 2017; Khobai, & Roux, 2017; Kwakwa, 2017; Mikayilov, Hasanov, Bollino, & Mahmudlu, 2017; Otsuka, 2017; Sekantsi, & Timuno, 2017; Kwakwa, 2018).

The main determinants of electricity according to the works of these researchers are population, urbanization, education, industrialisation, price, income, financial development, trade (export and import), and investment.

Government expenditures seem to be neglected in the empirical literature on the determinants of electricity consumption though government expenditure is reported to impact on consumption in the consumption literature at the macro level. Yeboah (2017) indicated that very few empirical studies exist on the impact of government expenditure on energy consumption. According to Yeboah (2017), the few studies are the studies by Glasure (2002), Bukhari, Sillah, and Al-Sheikh (2012), and Eze (2017).

The study by Yeboah (2017) for Ghana, Glasure (2002) for China, Bukhari et al. (2012) for the Gulf Cooperation Council Countries, and Eze (2017) for Nigeria indicate that government expenditure affects electricity consumption. The current study adds to the literature since few works exist especially in the area of electricity consumption, by modelling the long run and short run link between government activities (proxied by government expenditure) and electricity consumption in Ghana.

The empirical studies of the role of government expenditures in electricity consumption is very important because of the crucial role electricity as a source of energy plays in the economies of countries, especially "small and open" economies such as Ghana.

The main purpose of the current study is to empirically examine the impact of government activities on electricity consumption to contribute to the energy literature. The hypothesis underlying the study is that government activities statistically and significantly determines electricity consumption. The research question underlying the study is; how does government activities influence electricity consumption in both short run and long run?

The current study is limited by the fact that issues such as causality, structural breaks and multivariate analysis are not considered. In addition, the findings are challenged by the limitations of the estimation method used (ARDL model). The rest of the sections consider the model specification and data, the empirical results and the conclusion.

2. MODEL SPECIFICATION AND DATA

2.1 Data

Annual secondary data for the period 1970 to 2011, for Ghana was used for the empirical examination of the effect of government activities and electricity consumption. The sample size for the study is 54. The data was obtained from World Bank database (World Development Indicator). The data description, proxies, and sources are reported in Table 1.

Table 1 Data Description, Proxies and Sources

Data Description	Source
Government Activities (GOV) is proxied by Government Expenditure	World Bank World Development Indicator (WDI)
Electricity consumption (EC) is proxied by Total Energy Consumption	World Bank World Development Indicator (WDI)

2.2 Estimation Method

The Augmented Dickey-Fuller (ADF) stationarity test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity tests were used to investigate the unit root features of the data used in the study.

The ADF test is first used and it is based on the null hypothesis that the variables under investigation are not unit root in levels against the alternative hypothesis that the variables in the study model are unit root in levels.

The KPSS test used after the ADF test is performed as a confirmatory test, and it is based on the hypothesis that there is non-unit root around a deterministic trend. The alternative hypothesis is that the variables in the study model are unit root around a deterministic trend.

The ARDL method of cointegration is used after the investigation of the unit root properties, to examine the long run impact of government activities on electricity consumption. The ARDL model has many advantages such as dealing with small data set, and can be employed irrespective of the stationarity properties, integrated of order zero, I(0), or order one, I(1). However, none of the variables in the model should be integrated of order two, I (2). The ARDL, KPSS, and ADF method are not extensively reviewed in the current study since there are numerous literature on them (see Dickey, & Fuller, 1979; Kwiatkowski, Phillips, Schmidt, & Shin, 1992; Pesaran, & Shin, 1999).

2.3 Conceptual Framework and the Empirical Model

The empirical model for the verification of the effect of government activities on electricity consumption is shown in equation (1), in a bivariate model, with electricity consumption (EC) as the dependent variable, and government activities (proxied by government expenditure) as the independent variable. There is no control variable in the model.

$$\ln EC_t = \alpha \ln a + \beta \ln GOV_t + e_t ....(1)$$

3. EMPIRICAL RESULTS

3.1 Descriptive Statistics

3.1.1. Results of Central tendencies and Dispersion

Table 2 reports the results of the statistics of the variables in the estimated model. The mean values show that the estimated model is well fitted. The results show that electricity consumption falls as low as 92.359GWh and rise as high as 421.233GWh, whereas government activities falls as low as 5.861 dollars and rise as high as 15.308 dollars. Electricity consumption (0.229) variable is more volatile than government expenditure (0.177) variable. The coefficient value of the kurtosis of EC (0.867) is more than zero (0) which indicates less flat-topped distribution. The coefficient value of the kurtosis of GOV (0.495) is less than unity (1) which shows more flat-topped distribution. Both variables are negatively skewed since they are negatively signed.

Table 2 Summary Statistics, using the Observations 1970-2011

Var	Mean	Min.	Max.	S.D	CV.	SK.	KUR.
EC	311.580	92.359	213.630	71.435	15.308	-0.897	0.867
GOV	10.967	5.861	15.308	1.945	0.177	-0.439	0.495

Source: Author's computation, 2013. SK=Skewness; KUR. =Kurtosis; CV=Coefficient of Variation; Min. Minimum; Max. =Maximum; S.D=Standard Deviation

3.1.2. Correlation Analysis

Correlation matrix used to examine the issue of multicollinearity between the variables in the estimated model. Table 3 reports the results. The results show there is positive link between government activities and electricity consumption and that there is no serious potential problem of multicollinearity.

Table 3 Correlation Matrix for Test's Variables

Var	EC	GOV
EC	1.000	
GOV	0.314	1.000

Source: Author's computation, 2013

3.2 The ADF and KPSS Unit Root Tests results

3.2.1 The ADF Test

Table 4 shows the results of the ADF test for unit root test. The results in levels indicate that the variables are non-stationary in intercept. The null hypothesis of unit root was accepted for both variables.

Table 4 ADF stationarity test results with a constant and trend

Variables	t-statistics	ADF/P-Value	Results	Lag length
GOV	-2.4671	0.3419	Not stationary	1
GOV-1st dif.	-5.8498	0.0001***	Stationary	1
EC	-3.4705	0.0426**	Stationary	1
EC-1st dif.	-5.2808	0.0000***		1

Source: Author's computation, 2013: Note: *** and *** denote significance at 1%, and 5% level of significance

The variables were examined by taking the logarithm of the first difference of the series and tested these with intercept and trend. The variables attained stationary. The null hypothesis of unit root is rejected. Table 5 report the results.

Table 5 ADF stationarity test results with a constant and a time trend

Variables(1st dif.)	t-statistics	ADF/P-Value	Results	Lag length
ΔlnGOV	-5.0712	0.0009***	Stationary	1
ΔlnEC	-5.4304	0.0000***	Stationary	1

Source: Author's computation, 2013: NB: *** denotes significance at 1% level

3.2.2 The KPSS Test

Table 6 and Table7 show the test results of the KPSS. The variables are investigated in levels, in first difference, and in their logarithm. The variables are not unit root in levels, and in first difference, indicating that they are integrated both of order zero, I(0), and order, one, I(1). The levels of significance are 1%; 5% and 10%.

Table 6 KPSS stationarity test results with a constant and a time trend

Variables	t-statistics	P-Value	Results	Lag length
GOV	0.1073	n.a	Stationary	3
GOV-1st dif.	0.0725	n.a	Stationary	3
EC	0.06505	n.a	Stationary	3
EC-1st dif.	0.0477	n.a	Stationary	3

(Source: Author's computation, 2013): Critical values at 10%, 5% and 1% significant levels are 0.122 0.149 0.212 respectively

The results based on logarithm form shows the variables are stationary in first difference in addition. Government activities and electricity consumption are not unit root and are not integrated of order two, I(2). Hence, the cointegration test was performed and the results are reported in Table.

Table 7 KPSS stationarity test results with a constant and a time trend

Variable	KPSS P-value	Results	Lag Length
ΔlnGOV	0.0712	Stationary	3
ΔlnEC	0.0451	Stationary	3

(Source: Author's computation, 2013): Critical values at 10%, 5% and 1% significant levels are 0.122; 0.149; and 0.212 respectively

3.3 The cointegration, Long run, and short run tests results

3.3.1 Results of Autoregressive Distributed Lag (ARDL) model/Bound Approach to Cointegration for Electricity Consumption and Government Expenditure

The results reported in Table 8 indicate significant cointegration between electricity consumption and government expenditure since the calculated F-statistics of 9.6429 in model 2 and 39.2670 in model 1 are greater than the critical values of the upper bounds at the 99%, 95% and 90% levels of significance. The null assumption of no cointegration is rejected in model 1 and 2. The results indicate that government expenditure is a long-run equilibrium variable that explains electricity consumption during the period under discussion.

Table 8: Test for cointegration relationship

Critical bounds of the F -statistic: intercept and trend						
	90% level		95% level		99% level	
	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
	2.915	3.695	3.538	4.428	5.155	6.265
	Computed F - Stats		**Decision**			
F_{EC}(EC/GOV)	39.2670***		Cointegrated			
F_{GOV}(GOV/EC)	9.6429***		Cointegrated			

Source: Author's computation, 2013: Note: critical values are obtained from Pesaran et al. (2001) and Narayan, (2004): NB *** denotes significance at 1% level

3.3.2 Results of Long-Run Elasticities of ARDL Model

The long-run determinants of electricity consumption was estimated using the model in which electricity consumption is the dependent variable. The results are reported in Table 9. The results indicate that government activities statistically significantly determine electricity consumption in the long run. The coefficient of government activities variable has expected a priori theoretical sign, which is positive. This means in the long run increase in government activities leads to increase in electricity consumption, other things equal.

Table 9 Estimated long-run coefficients. Dependent variable is $lnEC$

Variable	**Coefficient**	**Std. Error**	**T-ratio**	**P-value**
Constant	3.4307	0.9681	3.5436	0.001***
Trend	-0.0082	0.0056	-1.4822	0.148
lnGOV	1.0395	0.4129	2.5169	0.017**

Author's computation, 2013: Note: *** and ** denotes statistical significance at the 1% and 5% levels respectively. ARDL (2) selected based on Akaike Information Criterion

3.3.3 Results of Short-Run Elasticities of ARDL Model

The results of short-run dynamic equilibrium relationship coefficients estimated with trend, intercept and error correction term (ecm) are reported in Table 10. The results on the nature of the short run coefficients are not different from that of the long-run coefficients. Government activities variable is significant determinant of electricity consumption in the short run. The error correction mechanism serves as a means of reconciling short-run behaviour of an economic variable with its long-run behaviour. The error correction term (ecm) is statistically significant at 1% level of significance and have the theoretical expected sign which is negative. The coefficient of -0.46038 indicates that, after 1 percent deviation or shock to the system, the long-run equilibrium relationship of electricity consumption is quickly re-established at the rate of 46.0% percent per annum. The value does not indicate stronger adjustment rate.

Table 10: Short-run representation of ARDL model. ARDL (2) selected based on Schwarz Bayesian Criterion. Dependent variable: $\Delta lnEC$

Variable	Coefficient	Standard error	T-statistic	P-value
Constant	1.5794	0.7279	2.1699	0.037**
Trend	-0.0038	0.0026	-1.4370	0.160
$\Delta lnEC_{-1}$	0.3367	0.1395	2.4143	0.021**
ΔlnGOV	0.4786	0.1541	3.1053	0.004***
ecm (-1)	-0.4604	0.1083	-4.2504	0.000***

ecm = LNEC -3.4307C + 0.0082T -1.0395LNGOV …………………..(2)

R-Squared	0.6838	R-Bar-Squared	0.6466
S.E. of Regression	0.1777	F-stat. F(4, 34)	18.3807[0.000***]
Mean of Dependent Variable	5.7033	S.D. of Dependent Variable	0.2989
Residual Sum of Squares	1.0738	Equation Log-likelihood	14.7115
Akaike Info. Criterion	9.7115	Schwarz Bayesian Criterion	5.5526
DW-statistic	2.1674		

Source: Author's computation, 2013. Note: ** and *** denotes statistical significance at the 5% and 1% levels respectively

3.3.4 Results of Diagnostic Tests

The diagnostic tests of the short-run estimation to examine the reliability of the results of the error correction model are reported in Table 11. The null hypothesis of no serial correlation could not be rejected using the Lagrange multiplier test and the F-statistics. The RESET test showed evidence of incorrect functional specification of the model through a rejection of the null hypothesis. The estimated model did not pass the normality test. The model passed Heteroscadasticity test indicating the variances are constant over time. The R^2 (0.6838) and the adjusted R^2 (0.6466) are not an indication of a very well behaved model. The coefficient indicate approximately 68.38% of the variations in electricity consumption are attributed to the explanatory variable.

Table 11: Short-Run Diagnostic Tests of ARDL Model

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.2536[0.263]	F(1, 33)= 1.0960[0.303]
B:Functional Form	CHSQ(1)= 1.0466[0.306]	F(1, 33)= 0.9100[0.347]
C:Normality	CHSQ(2)= 3.0215[0.221]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 10.8631[0.001]	F(1, 37)= 14.2850[0.001]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Source: Author's computation, 2013.

The stability of the long-run estimates was determined by employing the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) procedures. This was determined using the residuals of the error-correction model indicated by equation (2). The CUSUM test of stability determines the methodological arrangements of the estimates and its null hypothesis states the coefficients are stable. The null assumption is rejected when the CUSUM surpasses the given critical boundaries which demonstrate unstable nature of the estimates. The CUSUMSQ determines the stability of the variance. Both tests as indicated in Figure 1 and 2 show that the estimates and the variance were stable as the residuals and the squared residuals fall within the various 5% critical boundaries. The null hypothesis are rejected in both tests.

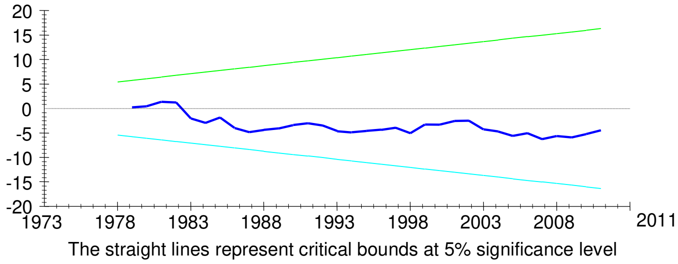

Figure 1: Plot of Cumulative sum of recursive residuals

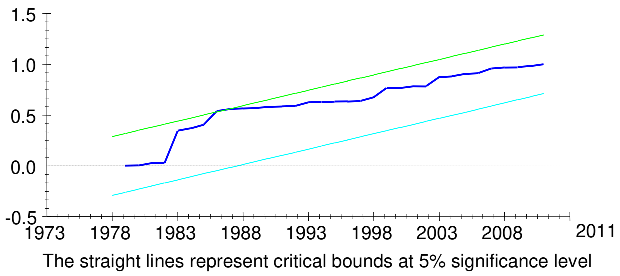

Figure 2: Plot of Cumulative sum of squares of recursive residuals

4. CONCLUSIONS

The present study empirically analysed the impact of government activities on electricity consumption by using the ARDL cointegration approach for the period 1970 to 2011 for Ghana. Annual secondary data were used. The results indicate both stable long run, and short run impact of government activities on electricity consumption.

The findings of the study are consistent with that of previous studies (Glasure, 2002; Bukhari et al., 2012; Eze, 2017; Yeboah, 2017) that reported significant positive effect of government activities on energy consumption in the literature. The findings are in line with the theoretical preposition that government activities influenced consumption and that in the case of electricity consumption in Ghana, government activities (proxied by government expenditures) are policy tools in managing electricity consumption in the face of inadequate electricity supply, in other to ensure sufficient energy supply for economic growth and development.

Since the estimated model in the present study is bivariate, multivariate analysis in further studies is worth undertaking to find out if the current findings will be replicated. Other analyses that were not considered in the current study such as causality analysis, and stationarity with structural breaks should be considered to determine if the current findings would be collaborated.

REFERENCES

Abu, N., & Abdullah, U. (2010). “Government Expenditure and Economic Growth in Nigeria, 1970-2008: A Disaggregated Analysis”. *Business and Economic Journal*, 4, 2-4.

Adom, P. K., & Bekoe, W. (2012). Conditional dynamic forecast of electrical energy consumption requirements in Ghana by 2020: a comparison of ARDL and PAM. *Energy*, 44, 367-380.

Adom, P. K., & Bekoe, W. (2013). Modelling electricity demand in Ghana revisited: the role of policy regime changes. *Energy Policy*, 61, 42-50

Adom, P. K. (2013). Time-varying analysis of aggregate electricity demand in Ghana: a rolling analysis. OPEC *Energy Review*, 37(1), 63-80.

Adom, P. K. (2015). Asymmetric impacts of the determinants of energy intensity in Nigeria. *Energy Economics*, 49(2), 570-580.

Adom, P. K., Bekoe, W., & Akoena, S. K. K. (2012). Modelling aggregate domestic electricity demand in Ghana: an autoregressive distributed lag bounds cointegration approach. *Energy Policy*, 42, 530-537

Adom, P. K., & Kwakwa, P. A., (2014). "Effects of changing trade structure and technical characteristics of the manufacturing sector on energy intensity in Ghana," Renewable and Sustainable Energy Reviews, *Elsevier*, 35(C), 475-483.

Akpan, N. I. (2005). Government Expenditure and Economic Growth in Nigeria, A Disaggregated Approach. *Central Bank of Nigeria Financial Review*, 43(1), 51-69.

Alawin, M., Al-Hamdi, M., & Alomeri, M. (2016). Determinants of Electricity Demand in Jordan. *Indian Journal of Science and Technology,* 9(15), 1-7.

Alberni, A., & Filippini, M. (2011). Response of residential electricity demand to price: The effect of measurement error. *Energy Economics*, 33(5), 889-895,

Alinsato, A. S. (2013). Electricity consumption and gross domestic product in an electricity community: Evidence from bound testing co-integration and Granger-causality tests. *Journal of Economics and International Finance*, 5(4), 99-105.

Arewa, A., & Nwakanma, P. C. (2012). Potential-real GDP relationship and growth process of Nigerian economy: An empirical re-evaluation of Okun's law. *European Scientific Journal*, 8(9), 25-33

Arisoy, I., & Ozturk, I. (2014). "Estimating industrial and residential electricity demand in Turkey: A time varying parameter approach," *Energy, Elsevier*, 66(C), 959-964.

Athukorala, P. P. A. W., & Wilson, C. (2010). Estimating short and long-term residential demand for electricity: New evidence from Sri Lanka. *Energy Economics*, 32(1), S34-S40.

Bekhet, H. A., & Othman, N. S. (2014). Long-run elasticities of electricity consumption, FDI, export and GDP in Malaysia. *Int. J. Econ. Financ*. 6(8), 78-90.

Bernstein, R., & Madlener, R. (2011). Residential Natural Gas Demand Elasticities in OECD Countries: An ARDL Bounds Testing Approach. *FCN Working Paper*, 15/2011.

Blanchard, O., & Perotti, R. (2002). "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes". *The Quarterly Journal of Economics*, 117 (4), 1329-1368.

Bukhari, M. S., Sillah, H., & Al-Sheikh, M. H. (2012). Income, price, and government expenditure elasticities of oil in the gulf cooperation council countries. *International Journal of Energy Economics and Policy*, 2(4), 333-341.

Burnside, C., Eichenbaum, M., & Fisher, J. (2003). Fiscal shocks and their consequences. *NBER working paper*, 9772.

Chang, Y., Kim, C. K., Miller, J. I., Park, J. Y., & Park, S. (2014). Time-varying long-run income and output elasticities of electricity demand with an application to Korea. *Energ Econ*., 46(1), 334-347.

Dhungel, K. R. (2013). Does Foreign Aid Cause Gross Domestic Product? Empirical Evidence. Foreign Aid and Making Democracy in Nepal, 175-182.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4), 1057-1072.

Ekpo, U., Chuku, C., & Effiong, E. (2011). The dynamics of electricity demand and consumption in Nigeria: application of the bounds testing approach. *Current Research Journal of Economic Theory*, 3(2), 43-52.

El sahati, K. (2014). Determinants of Electricity Demand in Libya: An Empirical Study for the Period 1980-2010. A thesis submitted in partial fulfilment of the requirements of Liverpool John Moores University for the degree of Doctor of Philosophy.

Fat´as, A., & Mihov, I. (2001). 'The effects of fiscal policy on consumption and employment: theory and evidence', C.E.P.R. Discussion Papers 2760, Centre for Economic Policy Research.

Galì, J., Lopez-Salido, J. D., & Vallès, J. (2003). "Rule-of- Thumb Consumers and the Design of Interest Rate Rules", *Working Paper* 0320, Banco de Espana.

Gregoriou, A., & Ghosh, S. (2007). The impact of government expenditure on growth: Empirical evidence from heterogeneous parel.
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.133.6097&rep=rep1&type=pdf

Hall, R. E. (2009). "By How Much Does GDP Rise If the Government Buys More Output?" *Brookings Papers on Economic Activity*, 40(2), 183-249.

Hasanov, F. J., Hunt, L. C., & Mikayilov, C. I. (2016). Modelling and Forecasting Electricity Demand in Azerbaijan Using Cointegration Techniques. *Energies*, 9, 1045; doi:10.3390/en9121045

Heppke-Falk, K. H., Tenhofen, J., & Wolf, G. B. (2006). "The Macroeconomic Effects of Exogenous Fiscal Policy Shocks in Germany: a Disaggregated SVAR Analysis", Deutsche Bundesbank Discussion Paper Series 1: *Economic Studies*, No 41/2006

Ismail, M. T., Mahmud, N., & Rahman, R. A. (2017). The determinants of electricity consumption for ASEAN countries. *Malaysian Journal of Fundamental and Applied Sciences Special Issue on Some Advances in Industrial and Applied Mathematics*, 331-339

Ivy-Yap, L. L., & Bekhet, H. A. (2014). Modelling residential electricity consumption function in Malaysia: time series approach. *International Journal of Electrical, Electronic Science and Engineering*, 8, 3, 39-45.

Jaunky, V. C. (2007). Income elasticities of electric power consumption: evidence from African countries, 1971-2002. *Regional and Sectorial Economic Studies*, 7(2), 24-50.

Khobai, H., & Roux, P. L. (2017). The Effect of Rural Urban development Transformation on Electricity Consumption: *An Econometric Analysis in South Africa. International Journal of Energy Economics and Policy*, 7(4), 156-164.

Komain, J., & Brahmasrene, T. (2007). The Relationship between Government Expenditures and Economic Growth in Thailand. *Journal of Economics and Economic Education Research*, 18(1), 93-102.

Kwakwa, P. A., & Adu, G. (2016). Effects of income, energy consumption, and trade openness on carbon emissions in Sub-Saharan Africa. *The Journal of Energy and Development*, 41(1/2), 86-117.

Kwakwa, P. A. (2012). Disaggregated energy consumption and economic growth in Ghana. *International Journal of Energy Economics and Policy*, 4(2), 34-40.

Kwakwa, P. A. (2017). Electricity consumption in Egypt: a long-run analysis of its determinants. *OPEC Energy Review* 41(1), 3-22.

Kwaku, P. A. (2018). On the determinants of electricity power losses: empirics from Ghana. *OPEC Energy Review*, 42(1), 3-21.

Kwakwa, P. A., Wiafe, E. D., & Alhassan, H. (2013). Households Energy Choice in Ghana. *Journal of Empirical Economics*, 1(3), 96-103.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y., (1992). Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How sure are we that Economic Time Series have a Unit Root? *Journal of Econometrics*, 54(1-3), 159-178.

Latif, E. (2015). A Panel Data Analysis of the Demand for Electricity in Canada. Economic Society of Australia. *Economic papers*, 34(3), 192-205.

Liu, C. H., Hsu, C., & Younis, M. Z. (2008). The Association between Government Expenditure and Economic Growth: The Granger Causality test of the US Data, 1974-2002. *Journal of Public Budgeting, Accounting and Financial Management*, 20(4), 439-452.

Loizides, J., & Vamvoukas, G. (2005). Government Expenditure and Economic Growth: Evidence from Trivariate Causality Testing. *Applied Journal of Economics*, VIII(1), 125-152.

Lorenzoni, G. (2010). "Optimal Monetary Policy with Uncertain Fundamentals and Dispersed Information." Review of Economic Studies, 77(1), 305-338.

Mawia, M. A. (2013). Elasticity of demand for electricity in Kenya from time series data. MA Thesis, Submitted to the School of Economics, University of Nairobi.

Mikayilov, J. I., Hasanov, F. J. Bollino, C. A., & Mahmudlu, C. (2017). Modelling of electricity demand for Azerbaijan: time-varying coefficient co-integration approach. *Energies*, 10(11), 114-132.

Mitchell, J. D. (2005). The Impact of Government Spending on Economic Growth. *Backgrounder*, 1831, 1-18. file:///C:/Users/Microsoft/Downloads/bg1831.pdf.

Mountford, A., & Uhlig, H. (2002). What are the effects of fiscal policy shocks? Discussion Papers No. 3338, CEPR.

Murphy, D. P. (2013). How Does Government Spending Stimulate Consumption? *Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper* No. 157
http://www.dallasfed.org/assets/documents/institute/wpapers/2013/0157.pdf

Olugbenga, A. O., & Owoye, O. (2007). Public Expenditure and Economic Growth: New Evidence from OECD Countries. *Business and Economic Journal*, 4(17).

Perotti, R. (2002). Estimating the Effects of Fiscal Policy in OECD Countries. *European Network of Economic Policy Research Institutes Working Paper No. 15/October 2002*

Otsuka, A. (2017). Determinants of efficiency in residential electricity demand: stochastic frontier analysis on Japan. *Energy, Sustainability and Society*, 7(31), 2-10.

Perotti, R. (2008). "In Search of the Transmission Mechanism of Fiscal Policy." In NBER Macroeconomics Annual 2007, edited by Daron Acemoglu, Kenneth Rogoff, and Michael Woodford, 169-226. University of Chicago Press.

Pesaran, H. M., Shin, Y., & Smith, R. P. (2001) Bounds Testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.

Rafindadi, A. A., & Ozturk, I. (2016). Effects of financial development, economic growth and trade on electricity consumption: evidence from post-Fukushima Japan. *Renewable and Sustainable Energy Reviews*, 54(c), 1073-1084.

Ramey, V. (2011), “Identifying Government Spending Shocks: It’s all in the Timing”. *Quarterly Journal of Economics*, 126(1), 1-50.

Ranjan, K. D., & Sharma, C. (2008). Government expenditure and economic growth: Evidence from India. *The ICFAI University Journal of Public Finance*, 6(3), 60-69.

Sekantsi, L. P., & Timuno, S. (2017). Electricity consumption in Botswana: the role of financial development, industrialisation and urbanization. *Review of economics and business studies*, 10(1), 75-102.

Sekantsi, L. P., Retselisitsoe, I., & Mohatonyane, L. E. (2016). Electricity consumption in Lesotho: the role of financial development, industrialisation and urbanisation. *Journal of International Business and Economics*, 4(1), 19-28.

Ubani, O. (2013). Determinants of the dynamics of electricity consumption in Nigeria. *OPEC Energy Review*, 36(2), 149-161.

Werner, R. A. (2004). “Why has Fiscal Policy Disappointed in Japan Revisiting the Pre-Keynesian View on the Ineffectiveness of Fiscal Policy”. Sophia University and University of Southampton, available online at <http://repec.org/mmfc04/9.pdf>

Wolde-Rufael, Y. (2006). Electricity Consumption and Economic Growth: A Time Series Experience for 17 African Countries. *Energy Policy*, 34(10), 1106-1114.

Woodford, M. (2003). *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press.

Yeboah, A. S. (2017). An econometric modelling of government activities-total energy demand nexus for Ghana. *MPRA,* 1-9.

Zaman, K., Khan, M. M., Ahmad, M., & Rustam, R. (2012). Determinants of electricity consumption function in Pakistan: old wine in a new bottle. *Energy Policy*, 50, 623-634.

Zuresh, A., & Peter, H. (2007). Electricity demand in Kazakhstan. *Energy policy*, 35(7), 3729-3743