

## **Energy Sector, A Curse or a Blessing to Financial Development in Selected Top Leading African Oil Exporting Countries**

**Ibrahim Sambo Farouq<sup>1</sup>, Zunaidah Sulong<sup>\*2</sup>**

Department of economics, Universiti Sultan Zainal Abidin, Malaysia<sup>1,2</sup>

E-mail: ibrahimumms@gmail.com<sup>1</sup>

### **Abstract**

*This study aimed to investigate the causality relationships between energy use, energy intensity, energy price with financial development of some selected top leading African oil-exporting countries. Regarding the data analysis, the study covered the period of 1976 until 2019. All relevant preliminary tests were conducted in order to validate the data before the main analysis. We deployed Larsson heterogeneous panel co-integration test approach for long-run relationship, as well as Dumitrescu and Hurlin heterogeneous panel causality econometrics technique. The empirical results show the presence of long-run relationship among the variables. We also found out that a uni-directional causal relationship running from energy use to financial development exists. Similarly, we observed a presence of another one-way causal relationship running from energy intensity to financial development. Whereas, a bi-directional causal relationship exists between energy price and financial development in the sampled panel data of these selected top leading African oil-exporting countries. The study makes available policy recommendations in the last part of the paper.*

**Keywords:** energy intensity, energy price, financial development, Dumitrescu, Hurlin

### **Introduction**

The causal relationship between the energy sector and financial development is studied for three key reasons: (i) The empiric analysis of the relationship between the energy sector and financial development is still fresh. The energy sector can be a curse or even a blessing for financial development. The latter promotes economic development by providing financial services to successful investment projects and the oil sector may have an effect on finance – a growth nexus that also sheds light on productivity expansion (Baland, & Francois, 2000; Guiso et al., 2004). (ii) Assessing the link between the energy sector and financial development is relevant for policymakers to establish further a consistent economic policy for using energy as a tool to boost economic activities and enhance financial development in the country based on empirical results (Baltagi et al., 2009). (iii) Empirical analysis of energy sector and the relationship to financial development may also offer a new understanding for regions with different rates of financial development by expanding our lack of attention to how the abundance energy sector is and how efficient it can help shape financial development (Gylfason, & Zoega, 2006). As oil-exporting countries, the sampled countries are characterized by its abundant natural resource, which the energy sector is the most crucial one.

In several economic structures, the fundamentals of the finance market can never be underestimated, as a medium and a savings mobilizer, it supplies debt for both short-term and long-term ventures. For quite a while now, financial sectors in Africa has recorded a tremendous improvement, especially the leading oil-exporting economies in the continent. The pace of growth followed this. This rapid growth has led to increased interest in Africa and has transformed its image from a civil war zone, poverty and chaos into a province of optimism, prosperity, and trade.

In this article, we claim that one of the leading sectors associated with this significant victory includes the energy sector; therefore, we intend to add to research by analysing the value of energy about the financial sector development of selected top oil-exporting economies in Africa. Energy use promotes economic opportunities, reduces travel costs and improves the industrial base that contributes to urban regeneration, which in turn increases the demand for financial services and then triggers financial development (Ahmad et al., 2020).

Due to rising environmental issues, the UN Sustainable Energy for All (SE4All) initiative has been launched to benefit from renewable energy for all by 2030. Furthermore, it has become a challenge for developing countries to use energy efficiently. It is therefore believed that to achieve low-level intensity,

that depends on the level of financial development of that given economy, as poor state of the financial sector could limit incentives that would reduce energy intensity (Aller, Herrerias, & Ordóñez, 2018).

Whereas, given the broad consensus that the financial system in most oil-exporting countries is poor and unable to channel resources efficiently (see Barajas, Chami, & Yousefi, 2013; Beck, 2011; Farouq et al. 2020). The efficient mobilization of savings and allocation of resources in the economy needs an environment of macroeconomic stability, which is genuinely not obtainable in the case of oil price. As movements in crude oil price may influence the development of the financial sector in these sampled economies. Giving that economic activities in these developing countries depend significantly on crude oil price (Lescaroux & Mignon, 2008; Mehrara, 2008; Moshiri, 2015; Omojolaibi, 2014).

Energy has also been closely linked to the development of the financial sector, considering its essential contribution to economic activities and, of course, its role as a capital liquidity booster. Nonetheless, if a nation is highly dependent on the energy sector, conservation policies will limit economic activities (Ahmad et al., 2020). This is very evident in the sampled countries, as their financial system is mostly dominated by their respective governments (Farouq et al., 2020). Policymakers, therefore, need to know about the causal relationship between energy usage, energy intensity, energy price with financial development. Zeren and Koc (2014) argued that financial development could lead to more efficient use of energy sources and thus, to a reduction in the cost of energy consumption. Moreover, rising economic activity, based on financial development, is the justification for spending funds comfortably and thus triggers a rise in energy use.

While the correlation between energy usage and sustainable growth has a large part to play in the literature (Altunbas & Kapusuzoglu, 2011; Apergis & Payne, 2010; Apergis and Tang, 2013; Bartleet & Gounder, 2010; Belloumi, 2009; Chontanawata et al., 2008; Karanfil, 2009; Ozturk & Acaravci, 2010; Ozturk, 2010), the link between financial development and energy sector is a pristine field for which has no many kinds of research. Transparent relationships have been established in these researches, both between growth-finance and between energy-growth.

This scenario has led us to examine the causal relationship between energy usage, energy intensity, energy price and financial development. As Mulali and Sab (2012a) researched sub-Saharan African countries through the Granger Causality Test, they discovered the vital role of energy consumption in finance and economic growth. Mulali and Sab (2012b) also observed that in their study of 19 industrialized and developing economies. In contrast to other findings, Chtioui (2012) concluded, based on his investigation using Tunisia, that energy usage Granger causes financial development. Through the application of the Auto-regressive Distributive Lag test, Mehrara and Musai (2012) evaluated Iran and confirmed the long-run relationship among the variables in their study.

Compared with other studies in the literature, the unique part of this study are: (i) the use of heterogeneous econometrics techniques in addressing the relationship effects among the two sectors, (ii) its consideration of various segments of the energy sector concerning the financial development of the sampled countries, (iii) it is the ability to draw the attention of the stakeholders into the understanding of how relevant these different units of the energy sector are to the development of their financial system, (v) being major oil-exporting countries in the continent with the relatively weak financial system, this data will be helpful to the stake-holders, more especially the policymakers in understanding the impact of the energy sector from all of its dimension to finance. The data might also reveal the vulnerability of the oil shocks to the countries' financial system and offer a chance to boost the financial development of these oil-exporting African countries from an energy perspective.

## **Literature Review**

While there is a relatively substantial number of literature evaluating the causal link between financial development and energy usage, no consensus has been reached and the correlations between energy use, energy intensity, energy price with financial development remain obscure. Various countries are showing varying results of the energy sector relationship about financial development. Numerous studies employ cross-sectional data to analyse the nature of the relationship. While several studies concentrate on factors affecting energy intensity at various national levels, there seems to be no much systematic or detailed study that demonstrates the relationship between financial development and

energy intensity. Most studies are focused on the conventional relationship between financial development and energy use or carbon emissions. Besides, researchers found that financial development can have a positive or negative effect on the environment.

A financial system is mostly expected to respond negatively in such situations of oil volatility. From a theoretical viewpoint, oil prices affect banking output across 2 separate channels: the level of inflation and the amount of economic growth, and the rate of unemployment. A rise in inflation appears to raise credit market volatility, resulting in adverse effects on financial institutions' efficiency (Boyd et al., 2001; Huybens & Smith, 1999). Concerning unemployment and economic growth, past studies have reported a negative relationship between oil prices and economic growth (Brückner & Ciccone, 2010; Deaton & Miller, 1995; Kilian, 2008; Kilian & Vigfusson, 2011). As Hesse and Poghosyan (2016) point out, banks appear to grow, lend, and produce more revenue due to increased financial market activity during economic boom times.

Khandelwal et al. (2016) analysed the impact of shifts in oil prices on economic and financial developments for the year 1999 to 2014. Their evidential analysis of the GMM strategy discloses that there exists a feedback effect between energy price and financial development. Gazdar et al. (2018) observed the correlation between energy price and economic growth along with financial development in the production role of the GCC economies covering the period 1999 to 2016. They discovered that trading oil prices had an engaging effect on economic prosperity. Their empiric research also showed that financial trends are strengthening oil price–growth nexus in GCC economies.

Riti et al. (2017) picked 90 economies categorized as low, middle and high-income countries to evaluate the linkages between financial sector development and energy consumption. Results showed that financial development was beneficial to a reduction in greenhouse gas emissions in high-income economies while having a marginal effect on energy use in some low and middle-income countries. Several single countries study the relationship between financial development and energy usage.

Islam et al. (2013) observed that the long-term effects of financial development on energy use in Malaysia were significant and optimistic. Shahbaz and Lean (2012) found that financial development greatly influenced energy use in Tunisia. There has been a negative and significant relationship between financial development and energy use in South Africa (Shahbaz et al., 2013). Some studies investigate the impact of financial development and energy use in transition economies.

Tamazian and Rao (2010) indicated that financial development could increase the quality of the environment by lowering carbon dioxide emissions in 24 emerging markets. Using China as an example, Zhang (2011) found that financial developments in China have become the main driver of carbon emissions, thereby growing energy usage.

Nonetheless, Jalil and Feridun (2011) offered strong evidence that, in the longer run, financial development in China would reduce energy usage. Different proxies were used as financial development index and the results of the effect of financial development on energy usage tend to be related to these various financial development indexes. The percentage of domestic credit to the private sector is the most widely used measure of financial development (Omri et al., 2015; Ozturk & Acaravci, 2013; Dogan & Seker, 2016; Shahbaz et al., 2018; Javid & Sharif, 2016).

The following are most of the approaches previously used in analyzing the relationships. For instance, the Autoregressive Distributed Lag (ARDL), Vector Error-Correction Model (VECM), and Generalized Moment Method (GMM) econometrics techniques. Tamazian et al. (2009) used the 1992–2004 regression analysis and panel data to evaluate the correlation between financial development and greenhouse gas emissions. Empirical findings show that financial development increased energy use and environmental pollution.

Mahalik et al. (2017) employed time series data spanning 1971 until 2011 and the ARDL bound test approach to validate the positive correlation between financial development and energy usage from a long-term perspective. The ARDL method was also used by Bekhet et al. (2017) to explore the relationship between financial development and energy usage. The findings show that financial development encourages energy usage in certain GCC (Gulf Cooperation Council) nations.

Charfeddine and Ben Khediri (2016) used the VECM Granger causality approach to investigate the negative effect of financial development on energy use. Yang and Li (2018) studied that a comprehensive measure of financial development helps reduce energy usage through the application of the VAR panel in the context of the GMM (Generalized Method of Moments) in China. Incredibly few studies consider second-generation econometric techniques to analyse the financial growth of the energy sector nexus.

**Empirical Methodology and Data**

Because finance theory lacks an explicit model (Ndako, 2010), we, therefore, build on the endogenous growth model of Romer (1986) and Lucas (1988).

$$Y = F(K, M, A)$$

Where Y represents total output, M denotes labour input, K stands for capital, while A denotes the level of technology, which paves the way for the other determinants. Moreover, to adapt the model, we have:

$$FD = F(EU, EI, EP)$$

the econometrics model is given as:

$$LFD_{it} = \beta_0 + \gamma_{1i}LEU_{it} + \gamma_{2i}LEI_{it} + \gamma_{3i}LEP_{it} + u_{it}$$

Where FD is the financial development, the EU represents the energy use, EI denotes energy intensity and EP stands for energy price, while **u** is the error term, and **it** represents the cross-sectional countries and years.

We further deploy Dumitrescu and Hurlin (2012) to uncover the causal relationship between the parameters. Given that the approach works very fine with heterogeneous data and fixed coefficient models. Moreover, it has the null hypothesis of no causal relationship. While the alternative hypothesis works with two sub-groups of cross-sectionals: on one side, it is from a to b causal relationship and the other side shows no causal relationship from a to b. The estimates of this heterogeneous panel causality test are:

$$\Delta LFD_{i,t} = \beta_i + \sum_{k=1}^K \theta_i^{(k)} \Delta LEU_{i,t-k} + \sum_{k=1}^K \delta_i^{(k)} \Delta LEI_{i,t-k} + \sum_{k=1}^K \gamma_i^{(k)} \Delta LEP_{i,t-k} + \varepsilon_{i,t}$$

$$\Delta LEU_{i,t} = \beta_i + \sum_{k=1}^K \gamma_i^{(k)} \Delta LFD_{i,t-k} + \sum_{k=1}^K \theta_i^{(k)} \Delta LEI_{i,t-k} + \sum_{k=1}^K \delta_i^{(k)} \Delta LEP_{i,t-k} + \varepsilon_{i,t}$$

$$\Delta LEI_{i,t} = \beta_i + \sum_{k=1}^K \delta_i^{(k)} \Delta LFD_{i,t-k} + \sum_{k=1}^K \gamma_i^{(k)} \Delta LEU_{i,t-k} + \sum_{k=1}^K \theta_i^{(k)} \Delta LEP_{i,t-k} + \varepsilon_{i,t}$$

$$\Delta LEP_{i,t} = \beta_i + \sum_{k=1}^K \theta_i^{(k)} \Delta LFD_{i,t-k} + \sum_{k=1}^K \delta_i^{(k)} \Delta LEI_{i,t-k} + \sum_{k=1}^K \gamma_i^{(k)} \Delta LEU_{i,t-k} + \varepsilon_{i,t}$$

Where  $\beta_i$  is the constant, and **K** stands as the constant lag.  $\theta_i^{(k)}, \gamma_i^{(k)}, \delta_i^{(k)}$  and  $\theta_i^{(k)}$  represents the slope coefficient and autoregressive vectors to vary among the groups. The model uses a fixed individual effect and the fixed coefficient model. The probability value and F-statistics value which depicts whether or not to reject the null hypothesis, account the existence of causality or not, respectively.

The present study consists of 258 observations obtained from the World Development Indicators and the West Texas Intermediate (WTI). The data spread over forty-four (44) years from 1976 to 2019. We analyse the causal relationship between energy use, energy intensity, energy price and financial development in selected African oil-exporting countries namely: Algeria, Angola, Gabon, Libya, Nigeria, and the Republic of Congo, using Panel Dumitrescu and Hurlin heterogeneous Granger causality technique.

The energy price indicator was derived by measuring the market prices of different barrels of oil divided by (CPI) Consumer Price Index for the respective countries. We measure energy use by kg of oil equivalent per capita. Meanwhile, energy intensity was calculated by dividing the overall primary energy consumption by the Gross Domestic Product expressed in US dollars by purchasing power parity. Furthermore, finally, we proxy financial development through domestic credit to the private sector by banks.

## Empirical Results

### Descriptive Summary

A significant proportion of the economic panel data is highly classified as normal, unlike the time series data. The primary justification for this is the existence of fewer outliers within the pattern. The Jarque-Bera test is used from Table 1 below to test the normality of the sequence. The study includes skewness and kurtosis coefficients considering the mean values to test the normality of the parameters in our model. Skewness serves as the tilt in the collection and therefore should be within the range values between 0 and + 3 for the series to be normally distributed. Nevertheless, on the other side, for the series to be normally distributed, Kurtosis refers to the height of the distribution and should, therefore, be between the range 0 and + 3.

It can be seen from Table 1 below that the sequence is normally distributed. The mean coefficients of Jarque-Bera suggest that the series are normally distributed. At the other end, the standard deviation in the frequency distributions also insisted that the data is normally collected. The standard deviation values in Table 1 below are less than the mean, only except for energy price, which deviates as a result of the computation in the variable as expected. Also, the effects of the correlation summary for the sequence are further represented in table 2. Moreover, from table 2 result, given the correlation values, there exists no problem of multi-collinearity among the sequence.

Table 1: *Summary Statistics*

Variables	Mean	Standard deviation	Skewness	Kurtosis	Jarque-Bera
FD <sub>it</sub>	23.850	13.724	2.425	7.835	429.327 (0.000)
EP <sub>it</sub>	6.792	7.560	12.035	9.543	45.8* (0.000)
EI <sub>it</sub>	4.973	2.367	1.246	3.752	64.653* (0.000)
EU <sub>it</sub>	6.862	0.843	0.386	1.258	15.752* (0.000)

\* Significant at 1 and 5% levels. Figures in parentheses denote p-values

Table 2: *Correlation Statistic*

	FD <sub>it</sub>	EP <sub>it</sub>	EI <sub>it</sub>	EU <sub>it</sub>
FD <sub>it</sub>	1			
EP <sub>it</sub>	-0.075	1		
EI <sub>it</sub>	-0.237	-0.007	1	
EU <sub>it</sub>	0.195	-0.072	0.147	1

### Cross-sectional Dependence

This research uses an empirical approach that discusses the question of cross-sectional dependency. Table 3 below shows the results of cross-sectional dependence evaluations and indicates that energy use, energy intensity, energy price and financial development of the sampled countries are highly dependent upon each other across the boundaries.

Nevertheless, the likelihood values highlighted that the null statistical hypothesis was slowly rejected at 1% significance level, as such cross-sectional dependence must be included in the analysis of the figures for this study in order to prevent bias in the results. The result of cross-sectional dependence is that all variables are cross-sectionally dependent across countries. This makes the use of second-generation methods to analyse the data of the current study paramount.

Table 2 Cross-sectional Dependence Tests

Tests	Statistics	P-Values
LM	53.79	0.000*
LM adj*	20.14	0.000*
LM CD* <sub>t</sub>	4.517	0.000*

\* Denotes 1 percent significance level

**Slope Homogeneity**

Given the estimated values of the delta and adjusted delta in table 4 below, and considering their P-values respectively, the study rejects the null hypothesis coefficients of homogeneity confidently at a 1 percent significance level. This means that all the parameters in the current study across the sampled countries are not in any sense homogeneous, but there is heterogeneity between the countries. It is therefore essential to apply heterogeneous panel techniques in which variables differ across individual cross-sections.

Table 4: Slope Homogeneity Tests

Group	Test	Statistic	P-value
	Delta	3.108**	0.036
	Adjusted Delta	3.359**	0.025

\*\* indicates significance at 5 %

**Unit Root**

In the analysis, we looked at the presence of non-stationary stochastic powers. We used Pesaran (2006) cross-sectional augmented dicky fuller (CADF) and cross-sectional ImPesaran (CIPS) developed by Pesaran (2007) as a second-generation unit root test technique. Table 5 presents the stationary effects of all variables used, indicating the mixed stationary properties of the various unit-root solution. As such, the tests of CADF and CIPS show mixed stationarity results at a 1% significance level.

Table 5: Panel Unit Root Test

	CADF		CIPS	
	At level	At first diff	At level	At first diff
LFD <sub>it</sub>	-4.632* (0.000)	-6.246* (0.000)	-4.310* (-3.06)	-6.251* (-3.06)
LEU <sub>it</sub>	-4.252* (0.000)	-6.284* (0.000)	-5.082* (-3.06)	-6.023* (-3.06)
LEI <sub>it</sub>	-4.542* (0.000)	-6.245* (0.000)	-4.241* (-3.06)	-6.172* (-3.06)
LEP <sub>it</sub>	-3.207* (0.001)	-6.721* (0.000)	-5.941* (-3.06)	-6.923* (-3.06)

Note: \*\* and \* denotes in 5% and 1% levels. The p-values are in the brackets, but as for the CIPS, those in brackets represent the critical values.

### Co-integration Result

The principle of co-integration corresponds to the econometrics approach used to demonstrate the likelihood of a long-term relationship between non-stationary parameters. Therefore, there is a reasonable chance that these non-stationary parameters can walk with each other in the long term (Balke & Fomby, 1997; Stigler, 2010; Engle & Granger, 1987). Panel analysts have developed and used various approaches to assess long-term relationships and the complexity of their interactions. Below is the product of the Larsson Co-integration approach, which shows that there is a long-term relationship between energy usage, energy intensity, energy price and financial development in the top-selected African oil-exporting countries.

Table 6: Summary Results of Heterogeneous Co-Integration Tests

Countries	r=0	r=1	r=2	r=3
ALGERIA	61.744*	42.203**	24.842	5.732**
ANGOLA	42.354	27.213	23.872	3.282
GABON	37.802	27.263	32.521*	1.283
LIBYA	20.832	31.742	31.632*	2.572
NIGERIA	34.863	32.965	15.742	1.913
CONGO	2.285**	32.962	16.239	2.394
LR-NT	50.131**	24.542	10.738	2.363
LR-test	8.527	5.233	6.86	1.961
E( $Z_k$ )	28.843	32.352	20.045	1.320
Var( $Z_k$ )	52.184	38.632	23.352	2.612

Note: \* and \*\* denote rejection of the null hypothesis of no co-integration at 1 and 5% levels of significance

### Causality Result

The study employed the Dumitrescu and Hurlin (2012) panel heterogeneous causality test to examine the nature of the causal link between the variables within the model. Table 7 below shows the Dumitrescu and Hurlin heterogeneous causality test results. Looking at the decision column in table 7, and considering their corresponding P-Values, financial development does not granger cause energy use, whereas, energy use causes financial development in the sampled countries, which is very consistent with the findings of Mulali and Sab (2012b); and Chtioui (2012) as they found same results in their various studies.

Likewise, another one-way causal relationship as well exists, running from energy intensity to the financial development of these selected top leading African oil-exporting countries. In line with Adom, Appiah, and Agradi (2019), energy intensity which measures how inefficient in terms of energy a country might be, increases employment, lowers production cost, lowers energy intensity (which makes it efficient) and improves energy security and environmental standards. These will in return, pave the way for the improvement in the economic activities of the said economies and as a result, brings about financial sector development of these sampled economies in question.

Meanwhile, energy price and financial development appear to have a bi-causal relationship among them in these sampled countries, which aligns with the findings of Khandelwal et al. (2016) that found the same feedback causal effect. It is imperative to note that energy prices provide the required financial funds to boost economic activities which subsequently lead to financial sector development. This shows that financial sector development is as well a function of energy price (Poghosyan & Hesse, 2009; Samargandi et al., 2014). Furthermore, concomitantly, the financial sector can use its intermediary role to channel the mobilized savings into the efficient and effective productive sectors of the economy in order to suppress the shocks of this energy price (Atil, Nawaz, Lahiani, & Roubaud, 2020).

Table 7: Dumitrescu and Hurlin Causality Results

Null hypothesis.	W-Stat.	Zbar-Stat.	P-value	Decision
FD does not cause EU	1.327	0.732	0.605	Fail to reject
EU does not cause FD	23.730	7.385	0.000	Reject
FD does not cause EI	1.872	0.523	0.753	Fail to reject
EI does not cause FD	51.0253	20.862	0.000	Reject
FD does not cause EP	7.963	-2.735	0.028	Reject
EP does not cause FD	32.264	9.219	0.000	Reject

## Conclusion and Policy Recommendation

This paper evaluated the causal relationship between the energy sector and financial development by taking into account energy use, energy intensity and energy price as factors influencing financial development in the case of Algeria, Angola, Gabon, Libya, Nigeria, and Republic of Congo from 1976 to 2019. All preliminary tests were conducted in order to validate the data and have a clear picture of what it looks like. The co-integration relationship approach is used to determine the variability of energy use, energy intensity, energy price with financial development.

The causational direction is investigated by deploying Dumitrescu and Hurlin (2012) panel heterogeneous causality test. The empirical results reveal that a uni-directional causal relationship running from energy use to financial development exists. Similarly, there is a presence of another one-way causal relationship running from energy intensity to financial development. Whereas, a bi-directional causal relationship exists between energy price and financial development in the sampled panel data of these selected top leading African oil-exporting countries.

The one-way causal relationships towards financial development and the corresponding bi-directional causality between energy price and financial development affirmed the hypothesis “energy sector a blessing for financial development.” This is distinctive research and logical assumption that a derived revenue from the energy sector and its efficiency can lead to mobilization of savings which might serve as a basis for domestic financial development. The financial sector can concomitantly act as an intermediary to allocate those accumulated savings to the most efficient and effective productive sectors of the economy (Atil, Nawaz, Lahiani, & Roubaud, 2020).

Having seen that, it requires the policymakers to use energy sector revenues most appropriately and cautiously, as well as facilitating the financial sector development that can be resilient enough in the times of volatility swings due to the fluctuations in the revenue and prices of oil. The fact that energy price contributes significantly to the development of the financial sectors of these sampled economies it implies that the oil market is crucial for their financial system which gives no doubt that it brings a rise in economic activities. It might interest the reader to note that even though some might expect that a rise in energy prices may limit economic activities as well as financial development. Nevertheless, an increase in energy price triggers the creation of credit which enhances the financial activities, and it is vital to note that the enhanced financial activities in return lead to increased economic activities.

## Declarations

We hereby declare this work to be original

## Funding

No funding

## Conflicts of interest/Competing interests

No conflict of interest

## Availability of data and material

Available in the repository via: <https://data.mendeley.com/datasets/7z6cx7szk3/draft?a=1fc74964-5808-4a45-b775-c0187cf13895>

## References

- Adom, P. K., Appiah, M. O., & Agradi, M. P. (2019). Does financial development lower energy intensity? *Frontiers in Energy*, 1-15.
- Ahmad, A. U., Adamu, I. M., Ahmad, I. M., Ismail, S., Farouq, I. S., Jakada, A. H., ... Mustapha, I. A. D. (2010). Empiric on the relationship between pollutant emissions, renewable energy consumption, and economic growth: Evidence from Sub-Saharan African countries.
- Aller, C., Herrerias, M. J., & Ordóñez, J. (2018). The effect of financial development on energy in China. *The Energy Journal*, 39(Special Issue 1).
- Al-Mulali, U., & Sab, C. N. B. C. (2012). The impact of energy consumption and CO2 emission on the economic growth and financial development in the Sub Saharan African countries. *Energy*, 39(1), 180-186.



- Altunbas, Y., & Kapusuzoglu, A. (2011). The causality between energy consumption and economic growth in United Kingdom. *Economic research-Ekonomska istraživanja*, 24(2), 60-67.
- Apergis, N., & Payne, J. E. (2010). Renewable energy consumption and growth in Eurasia. *Energy Economics*, 32(6), 1392-1397.
- Apergis, N., & Tang, C. F. (2013). Is the energy-led growth hypothesis valid? New evidence from a sample of 85 countries. *Energy Economics*, 38, 24-31.
- Atil, A., Nawaz, K., Lahiani, A., & Roubaud, D. (2020). Are natural resources a blessing or a curse for financial development in Pakistan? The importance of oil prices, economic growth and economic globalization. *Resources Policy*, 67, 101683.
- Baland, J. M., & Francois, P. (2000). Rent-seeking and resource booms. *Journal of development Economics*, 61(2), 527-542.
- Baltagi, B. H., Demetriades, P. O., & Law, S. H. (2009). Financial development and openness: Evidence from panel data. *Journal of development economics*, 89(2), 285-296.
- Barajas, M. A., Chami, M. R., & Yousefi, M. R. (2013). *The finance and growth nexus re-examined: Do all countries benefit equally?* (No. 13-130). International Monetary Fund.
- Bartleet, M., & Gounder, R. (2010). Energy consumption and economic growth in New Zealand: Results of trivariate and multivariate models. *Energy Policy*, 38(7), 3508-3517.
- Beck, T. (2011). Finance and Oil: Is there a resource curse in financial development? *European Banking Center Discussion Paper*, (2011-004).
- Bekhet, H. A., Matar, A., & Yasmin, T. (2017). CO2 emissions, energy consumption, economic growth, and financial development in GCC countries: Dynamic simultaneous equation models. *Renewable and Sustainable Energy Reviews*, 70, 117-132.
- Belloumi, M. (2009). Energy consumption and GDP in Tunisia: cointegration and causality analysis. *Energy policy*, 37(7), 2745-2753.
- Boyd, J. H., Levine, R., & Smith, B. D. (2001). The impact of inflation on financial sector performance. *Journal of monetary Economics*, 47(2), 221-248.
- Brückner, M., & Ciccone, A. (2010). International commodity prices, growth and the outbreak of civil war in Sub-Saharan Africa. *The Economic Journal*, 120(544), 519-534.
- Charfeddine, L., & Khediri, K. B. (2016). Financial development and environmental quality in UAE: Cointegration with structural breaks. *Renewable and Sustainable Energy Reviews*, 55, 1322-1335.
- Chontanawata, J., Hunta, L. C., & Pierseb, R. (2008). Causality Between Energy Consumption and Economic Growth in OECD and Non-OECD Countries: A Panel Data Approach. *International Association for Energy Economics*.
- Chtioui, S. (2012). Does economic growth and financial development spur energy consumption in Tunisia? *Journal of Economics and International Finance*, 4(4), 150-158.
- Deaton, A., & Miller, R. (1995). International Commodity Prices. *Macroeconomic Performance, and Politics in Sub-Saharan Africa*, V Princeton Studies in International Finance, 79.
- Dogan, E., & Seker, F. (2016). The influence of real output, renewable and non-renewable energy, trade and financial development on carbon emissions in the top renewable energy countries. *Renewable and Sustainable Energy Reviews*, 60, 1074-1085.
- Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic modelling*, 29(4), 1450-1460.
- Farouq, I. S., Sulong, Z., & Sambo, N. U. (2020). An empirical review of the role economic growth and financial globalization uncertainty plays on financial development. *Innovation*, 3(1), 48-63.
- Guiso, L., Sapienza, P., & Zingales, L. (2004). The role of social capital in financial development. *American economic review*, 94(3), 526-556.
- Gylfason, T., & Zoega, G. (2006). Natural resources and economic growth: The role of investment. *World Economy*, 29(8), 1091-1115.
- Hesse, H., & Poghosyan, T. (2016). Oil prices and bank profitability: evidence from major oil-exporting countries in the Middle East and North Africa. In *Financial Deepening and Post-Crisis Development in Emerging Market* (pp. 247-270). Palgrave Macmillan, New York.
- Huybens, E., & Smith, B. D. (1999). Inflation, financial markets and long-run real activity. *Journal of monetary economics*, 43(2), 283-315.
- Islam, F., Shahbaz, M., Ahmed, A. U., & Alam, M. M. (2013). Financial development and energy consumption nexus in Malaysia: a multivariate time series analysis. *Economic Modelling*, 30, 435-441.

- Jalil, A., & Feridun, M. (2011). The impact of growth, energy and financial development on the environment in China: a cointegration analysis. *Energy Economics*, 33(2), 284-291.
- Javid, M., & Sharif, F. (2016). Environmental Kuznets curve and financial development in Pakistan. *Renewable and Sustainable Energy Reviews*, 54, 406-414.
- Karanfil, F. (2009). How many times again will we examine the energy-income nexus using a limited range of traditional econometric tools? *Energy Policy*, 37(4), 1191-1194.
- Khandelwal, P., Miyajima, M. K., & Santos, M. A. O. (2016). *The impact of oil prices on the banking system in the GCC*. International Monetary Fund.
- Kilian, L. (2008). The economic effects of energy price shocks. *Journal of Economic Literature*, 46(4), 871-909.
- Kilian, L., & Vigfusson, R. J. (2011). Are the responses of the US economy asymmetric in energy price increases and decreases? *Quantitative Economics*, 2(3), 419-453.
- Lescaroux, F., & Mignon, V. (2008). On the influence of oil prices on economic activity and other macroeconomic and financial variables. *OPEC Energy Review*, 32(4), 343-380.
- Luo, Z., Bin, H., Liu, T., Zhang, Z. G., Yang, Y., Zhong, C., ... & Wu, K. (2018). Fine-tuning of molecular packing and energy level through methyl substitution enabling excellent small molecule acceptors for nonfullerene polymer solar cells with efficiency up to 12.54%. *Advanced Materials*, 30(9), 1706124.
- Mehrara, M. (2008). The asymmetric relationship between oil revenues and economic activities: The case of oil-exporting countries. *Energy Policy*, 36(3), 1164-1168.
- Mehrara, M., & Musai, M. (2012). Energy consumption, financial development and economic growth: an ARDL approach for the case of Iran. *International Journal of Business and Behavioral Sciences*, 2(6), 92-99.
- Moshiri, S. (2015). The effects of the energy price reform on households consumption in Iran. *Energy Policy*, 79, 177-188.
- Ndako, U. B. (2010). Stock markets, banks and economic growth: time series evidence from South Africa. *African Finance Journal*, 12(2), 72-92.
- Omitogun, O., Longe, A. E., & Muhammad, S. (2018). The impact of oil price and revenue variations on economic growth in Nigeria. *OPEC Energy Review*, 42(4), 387-402.
- Omojolaibi, J. A. (2014). Crude oil price dynamics and transmission mechanism of the macroeconomic indicators in Nigeria. *OPEC Energy Review*, 38(3), 341-355.
- Omri, A., Daly, S., Rault, C., & Chaibi, A. (2015). Financial development, environmental quality, trade and economic growth: What causes what in MENA countries. *Energy Economics*, 48, 242-252.
- Ozturk, I. (2010). A literature survey on energy-growth nexus. *Energy Policy*, 38(1), 340-349.
- Öztürk, I., & Acaravci, A. (2010). Energy consumption and CO<sub>2</sub> emissions economic growth in Turkey. *Renewable and Sustainable Energy Reviews*, 14(9), 3220-3225.
- Ozturk, I., & Acaravci, A. (2013). The long-run and causal analysis of energy, growth, openness and financial development on carbon emissions in Turkey. *Energy Economics*, 36, 262-267.
- Riti, J. S., Shu, Y., Song, D., & Kamah, M. (2017). The contribution of energy use and financial development by source in climate change mitigation process: a global empirical perspective. *Journal of Cleaner Production*, 148, 882-894.
- Samargandi, N., Fidrmuc, J., & Ghosh, S. (2014). Financial development and economic growth in an oil-rich economy: The case of Saudi Arabia. *Economic Modelling*, 43, 267-278.
- Shahbaz, A. K., Lewińska, K., Iqbal, J., Ali, Q., Iqbal, M., Abbas, F., ... & Ramzani, P. M. A. (2018). Improvement in productivity, nutritional quality, and antioxidative defense mechanisms of sunflower (*Helianthus annuus* L.) and maize (*Zea mays* L.) in nickel contaminated soil amended with different biochar and zeolite ratios. *Journal of environmental management*, 218, 256-270.
- Shahbaz, M., & Lean, H. H. (2012). Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy policy*, 40, 473-479.
- Shahbaz, M., Khan, S., & Tahir, M. I. (2013). The dynamic links between energy consumption, economic growth, financial development and trade in China: fresh evidence from multivariate framework analysis. *Energy economics*, 40, 8-21.
- Shahbaz, M., Van Hoang, T. H., Mahalik, M. K., & Roubaud, D. (2017). Energy consumption, financial development and economic growth in India: New evidence from a nonlinear and asymmetric analysis. *Energy Economics*, 63, 199-212.
- Tamazian, A., & Rao, B. B. (2010). Do economic, financial and institutional developments matter for environmental degradation? Evidence from transitional economies. *Energy Economics*, 32(1), 137-145.

- Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. *Energy policy*, 37(1), 246-253.
- Zeren, F., & Koc, M. (2014). The nexus between energy consumption and financial development with asymmetric causality test: new evidence from newly industrialized countries. *International Journal of Energy Economics and Policy*, 4(1), 83-91.
- Zhang, Y. J. (2011). The impact of financial development on carbon emissions: An empirical analysis in China. *Energy policy*, 39(4), 2197-2203.