Journal of Financial, Accounting and Managerial Studies
ISSN 2352-9962/E-ISSN 2572-0147
Volume09 Number 02- December 2022

OEB Univ. Publish. Co.

Impact of electricity subsidies on economic growth in energy-exporting countries: Analysis with Panel Data

أثر دعم الكهرباء على النمو الاقتصادي في الدول المصدرة للطاقة: التحليل باستخدام بيانات البانل

LAISSOUF Samir [1]*, LAHOUEL Kamel [2]
[1] Faculty of Economic Sciences, Commerce and Management Sciences. University of Tlemcen: laissouf.samir1385@gmail.com,
[2] Faculty of Economic Sciences, Commerce and Management Sciences. University of Tlemcen: kamel1667@hotmauil.com,

Date of receipt: 2022-06-22 Date of revision: 2022-06-28 Date of acceptation: 2022-12-30

Abstract

This study attempted to measure the impact of electricity subsidy on economic growth using Panel data from 2010 to 2019 of a sample of 11 energy-exporting countries. The sample was selected based on data availability during the study period. Six independent variables were used in addition to the annual growth rate of GDP as a dependent variable.

Based on the model's estimation findings, the study found that the electricity subsidy variable had a negative and significant relationship to economic growth. This result also raises several questions about the viability of this policy in many States. Although the subsidy aims to protect consumers, it exacerbates public finance imbalances and crowds out fields of social expenditure such as education and health.

Keywords: Electricity subsidy, economic growth, energy-exporting countries, Panel data.

ملخص

حاولت هذه الدراسة قياس أثر دعم الكهرباء على النمو الاقتصادي باستخدام بيانات البانل للفترة (2010-2019) لعينة من 11 دولة مصدرة للطاقة، وقد تم اختيارها بالاعتماد على توفر البيانات خلال فترة الدراسة، كما تم استخدام ست (06) متغيرات مستقلة ومعدل النمو السنوي من الناتج المحلي الإجمالي كمتغير تابع.

وبناء على نتائج تقدير النموذج توصلت الدراسة الى أن متغير دعم الكهرباء كانت له علاقة سلبية ومعنوية على النمو الاقتصادي، كما تثير هذه النتيجة عدة تساؤلات عن جدوى الاستمرار في هذه السياسة لدى العديد من الدول. فرغم أن الدعم يهدف إلى حماية المستهلكين، فإنه يؤدي إلى تفاقم اختلالات المالية العامة، ومزاحمة مجالات الإنفاق الاجتماعي على غرار التعليم والصحة.

الكلمات المفتاحية: دعم الكهرباء، النمو الاقتصادي، الدول المصدرة للطاقة، بيانات البانل

* Corresponding Author

1. INTRODUCTION

Many countries' energy subsidy policies have been aimed at protecting low-income families and achieving the well-being of citizens, as well as expanding access to energy to promote investment and growth in industrial sectors to diversify national income sources. Electricity is one of the most vital products that countries are interested in supporting. According to IEA data, the financial cost of its subsidy was estimated at **124 billion US dollar** for **2019**, with petroleum exporting countries coming first.

1.1.Study Problem:

The problem of the study is that the electricity subsidy policy is increasing markedly, and has become a drag on many countries' public finances. The repercussions of subsidy also go far beyond public financial costs, affecting economic growth channels by crowding out necessary expenditures such as education, health, and infrastructure, which affects human capital development. Furthermore, the subsidy is causing a poor distribution of resources to energy-intensive industries, where subsidized technology is overused. From this basis, the following problem arises: **how does the electricity subsidy policy affect the economic growth of energy-exporting countries?**

1.2.Study hypothesis:

In order to answer the problem of the study, we propose the following hypothesis: **electricity subsidy policy negatively affects economic growth in energy-exporting countries**.

1.3.Study importance:

The importance of the study is reflected in the fact that it addresses a topic that currently occupies an essential place in the economies of various states of the world, especially in the light of conventional energy price volatility and the rise in voices calling for reform of subsidy and reorientation for beneficiaries.

The objectives of the study are also to highlight the theoretical aspect of the electricity subsidy policy and economic growth as well as their relationship through experimental studies, in addition to highlighting the applied aspect in which we will measure the impact of electricity subsidy policy on the economic growth of a sample of energy-exporting countries during (**2010-2019**).

1.4.Previous studies:

- The study of Mundaca in **2017**, entitled **"Energy Subsidies, Public Investment and Endogenous Growth".**

This study attempted to identify the relationship between energy product subsidy policy, public projects, and economic growth over three periods (**1998-2002**), **(2003-2007**), and (**2008-2012**) by focusing on MENA countries, using the Panel models. The study confirmed that there are at least three advantages to eliminating or reducing fuel subsidies:

- It increases entrepreneurial activities and raises employment rates.
- It also leads to higher efficiency in using production inputs.
- It allows for economizing many expenditures which can be reinvested in other areas.

The study's findings concluded that reducing subsidies and increasing the price of energy products by **20** US cents per liter would contribute to an increase in GDP per capita by **1.33%, 0.30%,** and **0.48%** for the periods (**1998-2002**), (**2003-2007**), and (**2008-2012**) respectively. **(Mundaca, 2017)**

- The study of Sulistiowati in **2015**, entitled **"The impact of fossil fuel subsidies on growth".**

This study attempted to measure the impact of fuel, electricity, natural gas, and coal subsidy on economic growth depending on **37** countries using Panel data from **2007** to **2013**. The study found several findings, the most important of which was the existence of a significant negative relationship between electricity subsidy and economic growth. The study questioned the feasibility of continued energy subsidy in many countries of the world in light of the misallocation of resources. **(Sulistiowati, E, 2015)**

- The study of Ebeke & Ngouana in **2015**, entitled **"Energy subsidies and public social spending: Theory and evidence."**

This study attempted to investigate the impact of crowding out energy subsidies on the social spending priorities of a sample of **109** low- and middle-income countries during the period **2000** to **2011** using Panel data. The study's findings concluded that supporting fuel, electricity, and natural gas actually exceeded the social spending directed at both the education and health sectors. An increase of **1** percent in energy subsidies to GDP on average reduces public spending on education and health by **0.6** percent of GDP. The study also found that the impact of crowding out energy subsidies for education and health expenditures was stronger in low-income and oil-importing countries as well as countries with weak government institutions.

(Ebeke, M. C., & Ngouana, M. C. L, 2015)

- The study of BRIDLE & Wooders in **2014**, entitled **"Fossil-fuel subsidies: A barrier to renewable energy in five Middle East and North African countries."**

The study attempted to uncover the relationship between fossil fuel subsidies and growth-supporting renewables for Morocco, Tunisia, Libya, Egypt, and Jordan. The study found that these states' subsidy policies continue to increase investments in coal and natural gas for electricity generation despite their high emissions. More than **33** percent of the region's electricity is generated from traditional energy sources as a result of subsidies at the expense of renewable energies. **(Bridle, R., Kitson, L., & Wooders, P, 2014)**

- The study of Doug Koplow in **2014**, entitled **"Global energy subsidies: Scale, opportunity costs, and barriers to reform".**

This study attempted to compare the IEA's estimate of the amount of subsidy provided for fuel, electricity, gas, and coal to some countries and the amount spent on health care for **2011**. **18** of **37** countries with subsidy levels were found to significantly exceed their public spending on health care. The study indicated that the adoption of oil market prices for those countries would improve economic growth prospects in the long term. **(Koplow, D, 2014)**

- The study of Foster in **2009**, entitled **"Paying the price for unreliable power supplies: In-house generation of electricity by firms in Africa."**

This study attempted to document the prevalence of electricity generation by institutions in **30** countries as a sample in sub-Saharan Africa during the period **2005-2009**. The study noted that these countries subsidy electricity by **1.7%** of GDP, reflecting the high production costs due to the extensive use of electricity generation systems. The study's findings found that subsidized electricity prices have medium- and long-term impacts on energy production, reducing electricity companies' profits and suffering heavy losses. Low energy prices also contribute to discouraging investment to expand production and improve service quality. **(Foster, V., & Steinbuks, J, 2009)**

- ✓ **What distinguishes our study from previous studies?**

What can be noted from the very beginning of reviewing previous studies is the proliferation of Western applied studies in an attempt to highlight the negative impact of electricity subsidies on economic growth channels. This policy leads to:

- Reducing investment in the energy sector
- Undermining the private sector's competitiveness
- Contributes to crowding out social spending priorities

Our study coincides with other previous studies in discussing one of the economic aspects of energy subsidies, as well as using the same econometric method as the "Panel Models", similar to the Mundaca study in **2017**, the Ebeke and Lonkeng Ngouna study in **2015**, the Sulistiowati study in **2015**, and the Holton study in **2012**.

Our current study is distinct from other studies in that it attempts to build a model that will allow studying the impact of electricity subsidies on economic growth over a recent period (**2010-2019**) for a sample of energy-exporting countries that strongly subsidize electricity.

2. Theoretical framework of energy subsidy and economic growth

2.1. Concept of Energy Subsidy:

Subsidy contains many different concepts, which are often widely used. However, no critical concept of subsidy has been reached yet. (Schwartz et al) referred to it as something difficult to define **(Schwartz, Mr Gerd et al, 1995, p. 01)**. Its concept varies according to the economic and social objectives to be achieved and the implications. The word “subsidy” in English is derived from the Latin word “subsidium”, which means “support, assistance, subsidy, and protection” **(STEENBLIK, Ronald, 2007 , p. 08)**. Also, the word “subsidy” in the military field refers to “reserve forces” **(Rive, Vernon JC, 2019, p. 30)**. It is flexible and dynamic in its use due to its multiplicity of types and divisions, as well as the different effects it causes.

At the level of energy products subsidy, IMF considers subsidy to include consumption subsidy and production subsidy, as consumption subsidy arises when prices paid by households and companies are below a reference price, while production subsidy arises when suppliers’ prices are above that reference price. **(Clements, Mr. Benedict J et al, 2013, p. 05)**

The International Energy Agency (IEA) also contributed to defining the concept of energy subsidy and considered it: “Any government action that reduces the cost of energy production, raises the price paid by energy producers, or lowers the price paid by consumers.” **(IEA, 1999, p. 43)**

Through previous definitions, it can be said that energy subsidy is one of the mechanisms of state intervention aimed at providing goods and services at lower prices for families and companies, and also contributes to protecting local industries and enhancing their competitiveness. It can also be said that electricity subsidies include all government interventions that result in lower electricity production costs or lower prices paid by electricity consumers.

At the individual level, (**Kojima**) considered energy subsidies as deliberate actions by the Government specifically targeting electricity, fossil fuels or heating and having one or more of the following effects: **(Kojima, Masami, 2017, p. 14)**

- Reduce the net cost of energy purchased.
- Reduce the cost of producing or delivering power.
- Increased revenues held by energy suppliers.

2.2.Volume of energy subsidy according to Price-Gap Approach:

The concept of energy subsidy in accordance with the price gap approach represents “the difference between domestic energy price levels and reference price levels such as world energy prices or the cost-of-production recovery price” **(KOPLOW, Doug, 2009, p. 04)**

SUBSIDY = (REFERENCE PRICE - END-USER PRICE) × UNITS CONSUMED

The formula shows the difference between the internal prices directed at the end-user, whether consumer or producer, and the reference price. For products under international trade commodities such as gas and petroleum products, the reference price used in calculating subsidy is the adjusted international price by calculating distribution and transportation costs. In the case of non-commercial goods such as electricity, the reference price is the price of recovering its local product for its costs.

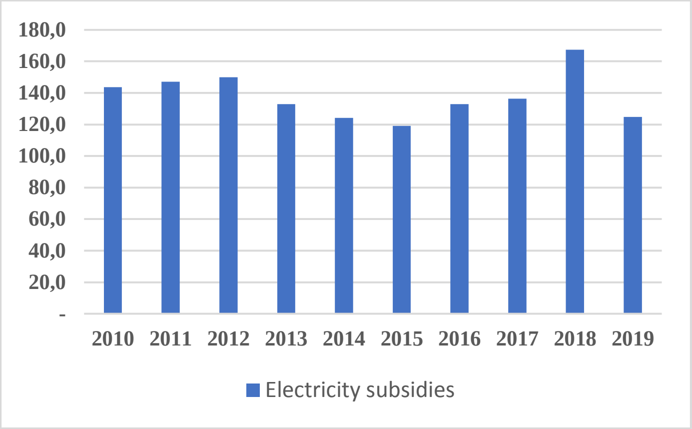
The International Energy Agency (IEA) systematically measures electricity subsidies for families, government, and private sectors using

Price-Gap Approach for **40** countries, primarily developing countries. **(Birol. F, 2013, p. 93)**

The following figure shows the global consumption estimates of electricity subsidies for **2010-2019**.

Figure (01): Estimates of electricity subsidies consumption for **2010-2019**

Unit: Billion U. S. dollars



Source: Prepared by researchers based on the International Energy Agency's (IEA) database.

It is noted from the above figure a fluctuation in the value of electrical power subsides from year to year due to: **(Birol. F., 2015, p. 96)**

- **International efforts in progressive reform operations of subsidies for many states:** following the G-20 Summit in 2010 on Global Energy Subsidies Analysis in Toronto (Canada), global organizations have called for energy price reform as a result of the economic and environmental impacts of subsidy policies.
- **High level of consumption of subsidized energy products:** domestic energy consumption is one of the main factors affecting a state's subsidy bill, and fuel smuggling operations are an incentive.
- **Fluctuating international energy prices such as oil and natural gas:** energy subsidies occupy a large part of many oil-exporting countries' budgets. As prices fluctuated, especially after the global oil crisis in mid-**2014**, these countries were quick to take several measures aimed at rationalizing and reforming the subsidy system.

2.3.Conceptual framework of the economic growth:

Economic growth is a process that increases income levels and alleviates states' political problems. Moreover, growth contributes to a steady and sustained increase in the productive capacity of the national economy. **(De Bruyn, 2012, p. 18).**

In this regard, many studies have been interested in the process of economic growth. It is a very complex phenomenon influenced by multiple factors. These factors are major determinants of economic growth, but there was no intellectual consensus on these determinants. According to **TODARO** and **SMITH**, there are **03** key determinants of economic growth of paramount importance: **(Todaro & Smith, 2003, p. 149)**

1) Capital accumulation including all new investments in the earth, material equipment, and human resources through improving health, education, and functional skills.
2) Population growth and hence growth in the labor force.
3) Technological advances, where commercial openness facilitates the flow of information and technological discoveries that raise the efficiency of the human element.

3. Data and Methodology:

To illustrate the nature of the relationship between electricity subsidy and economic growth, the econometric study was relied on using Panel data to prove the study's hypothesis stating that "economic growth that represents the dependent variable is adversely affected by electricity subsidy that represents the independent variable."

3.1.Model used:

This study uses on its econometric side a built-in database (**cross-sections and time series**) with a number of n = **11** CTs (i) of **11** countries. At the same time, each CT unit has a time series for a number of periods **t = 10**, covering the time frame from **2010** to **2019**. Thus, the number of observations used in the analysis (**t * n**) will be **110** observations.

3.2.Description of variables used in the study:

The variables used in the study were selected based on previous studies on the topic of the impact of electricity subsidies on economic growth. The study variables can be defined through the following table:

Table (01): study variables

Variable symbol	Variable name	Study data sources

GDPG	GDP growth (annual %)	World Bank database
S-electricity	Electricity subsidies (% of GDP)	IEA Database
Opens	Trade (% of GDP)	World Bank database
GCF	Gross capital formation (% of GDP)	World Bank database
SEP	School enrollment, primary (% gross)	World Bank database
OilR	Oil resource revenues, (% of GDP)	World Bank database
FDI	Foreign direct investment, net inflows (% of GDP)	World Bank database

Source: made by the researchers

3.3.Description of the sample of states adopted in the study:

The study community consists of **11** energy-producing and exporting countries, including **Algeria, Azerbaijan, Angola, Iran, Bahrain, Gabon, Kazakhstan, Kuwait, Egypt, Mexico, and Nigeria**. The study period covers **10** years and runs from **2010** to **2019**.

They were chosen due to the availability of their data. Although their living standards vary and their systems of government vary, they form a combination of similarities in their economies as they are classified as member states and non-members of **OPEC**. They are also countries that strongly subsidize electricity prices and have initiated reform measures concerning their prices.

4. Results and Discussions

4.1. Steps to estimate Panel Models

To achieve this goal of estimating the model and reaching results that explain the impact of electricity subsidies on economic growth, the Panel data model will be estimated through several steps by applying **the Hsiao homogeneity tests**, which will allow us to ensure that our study is appropriate to the Panel model. The second step is to estimate the three models.

The next step is **Fisher's test**, which allows for choosing between the **pooled regression model** and the **fixed effects model**, as well as the **Hausman test**, which allows choosing between **the fixed effects model** and

the random-effects model. The fourth step is to determine its quality criteria so that the interpretation of the results obtained is logical in conformity with the theoretical interpretation or statistical interpretation or both.

4.2.Homogeneity Test (Hsiao 1986):

The homogeneity or heterogeneity test is important for determining the panel's data structure. In this context, (**Hsiao 1986**) has proposed serial hypotheses that allow for determining the consistency of data or not according to several steps **(Bourbonnais, Régis, 2015, p. 349)**. Based on Eviews' outputs, the following results were obtained:

Table (02): Homogeneity test results of (Hsiao 1986)

Hypotheses	F-stat	P-value
H1 (calculated Fisher F_1)	1.703740	0.046822
H2 (calculated Fisher F_2)	1389205	**0.154315**
H3 (calculated Fisher F_3)	2.870232	0.003666

Source: Prepared by researchers based on Eviews 10 outputs

We note from **Table No. (02)** that the **P-value** of the calculated F_1 is (**0.046822**), which is completely less than **0.05**, allowing us to reject the null hypothesis.

We move on to the second step where it is clear that the **P-value** of the calculated F_2 is (**0.154315**), which is greater than **0.05**, allowing us to accept the null hypothesis stating that regression parameters of interpretative variables are identical between individuals, and the source of difference may be in intersectional parameters.

In the third step, we note that the **P-value** of the calculated F_3 is (**0.003666**), which is less than **0.05**, allowing us to reject the null hypothesis stating that intersectional parameters are similar between individuals, i.e. we are in the case of a model with individual effects.

4.3.Panel models estimation:

To achieve this goal, three models will be applied, namely: **pooled regression model, fixed-effects model, and random-effects model**. Based on Eviews 10, we got the following results:

Table (03): Results of estimating Panel models

	Pooled	Fixed effects	Random effects

	regression model	model	model
C	2.735121 (0.2364)	-6.267548 (0.3981)	2.054167 0.4036
S-electricity **P-value**	0.511280- 0.0041	**-0.804170** **(0.0040)**	0.558155- 0.0023
Opens **P-value**	0.009049 0.3081)	0.036729 (0.2088)	0.011425 0.2315
GCF **P-value**	0.149006 0.0000	0.113689 (0.0009)	0.144665 0.0000
SEP **P-value**	0.003143- (0.8785)	0.048824 (0.4733)	0.000312 0.9887
FDI **P-value**	0.036841- 0.6840	0.007242 0.9490	0.023973- 0.7872
OILR **P-value**	0.005573- 0.7873	0.125749 0.0070	0.007288 0.7377
R-squared	0.254381	0.430228	0.251495
Adjusted R-squared	0.210947	0.332203	0.207893
F-Stat	5.856714	4.388952	5.767951
Prob (F-statistic)	0.000028	0.000002	0.000033
Durbin-Watson stat	1.518149	1.897525	1.557049

Source: Prepared by researchers based on EVIEWS 10

After estimating the pooled regression model, the fixed effects model, and the random-effects model, we use the following statistical tests:

3.4.4 Fisher's test:

Fisher's test allows to choose between the pooled regression model and the fixed-effects model, i.e., whether or not a difference exists between States, under the following hypotheses:

- **H0:** The pooled regression model is the appropriate one.
- **H1:** The fixed-effects model is the appropriate one.

Table (04) : Fisher's test results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.870232	(10,93)	0.0037

Source: Prepared by researchers based on EVIEWS 10

Through **Table No. (04)**, we note that the (**Cross-section F**) value is **2.870232** and the probability value is **0.0037**, which is smaller than **5%**, and therefore we reject the null hypothesis and accept the alternative hypothesis. Accordingly, the fixed effects model is likely to be the appropriate one.

4.4. Hausman test:

The Haussmann test allows us to choose between the **random effects model** and the **fixed effects model** by testing the two models' abilities under the following hypotheses:

- **H0:** The random-effects model is the appropriate one.
- **H1:** The fixed-effects model is the appropriate one.

The test results are shown in the following table:

Table (05): Haussman's test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	20.523613	6	0.0022

Source: Prepared by researchers based on EVIEWS 10

Hausman's test results indicate that it is statistically significant at the level of **0.05**, where the probability value of the test was **0.0022**. Thus, we reject the null hypothesis and accept the alternative hypothesis stating that the **fixed effects model is the appropriate model for our study**.

4.5. Statistical interpretation of the results of the most appropriate model (fixed effects model)

Based on Hausman's selection test between models, the fixed effects model is the appropriate model, so the results can be interpreted as follows:

- **Statistical significance test of estimated parameters (Student Test):**

We note from **table No. 03** that all **P-values** of electricity subsidies as a percentage of GDP (**0.0040**), oil rents as a percentage of GDP (**0.0070**), and the annual growth rate of gross capital (**0.0009**) are below the significance level of **0.05**, that is, its estimated parameters are significantly different from zero (**they have statistical significance**), and therefore there is a statistically significant correlation of these variables with **the annual growth rate of GDP.**

Whereas the probability values of the fixed limit C (**0.3981**), the **FDI** flows received as a percentage of GDP (**0.94905**), **primary school enrolment as a percentage of the gros**s (0.9385), and trade **openness as a percentage of GDP** (**0.2088**) were higher than the significance level of **0.05**, which means that its estimated parameters are not significantly different from zero (**not statistically significant**). Therefore, there is no statistically significant relationship between these variables with the annual growth rate of GDP per capita.

- **Goodness of fit test (R-squared):**

Based on the results of the model in **Table 03**, we note that the R-squared value has reached **0.430228**, i.e., independent variables contribute to interpreting **43.02%** of economic growth. The remaining **56.98%** is interpreted by other variables not included in the model (**economic, social, and other factors**), but included in the margin of error.

- **Model quality test (F-statistic)**

Through the results of **Table No. (03)**, Fisher's statistic of the model is equal to **4.388952** with an estimated **P-value** of **0.000002**, which is completely below the significance level of **0.05**, i.e. the estimated parameter is significantly different from zero, and therefore the estimated model has a total statistical significance at the significance level of **0.05**, allowing us to say that the model has a statistical significance as a whole. All model parameters as a group intrinsically affect the dependent variable. On the other hand, the statistical value (**DW = 1.89**) is approximately equal to (**2**), which confirms the absence of an autocorrelation problem between errors. Hence, the general result is that the model is statistically acceptable.

3.4.7. Analysis and discussion of results:

Based on **Table No. (05)** which shows the results of the Panel Model Estimation and based on Hausmann test results indicating that the

Fixed Effects Model is appropriate, we can express the results of the study economically as follows:

➢ The existence of a **significant negative impact of electricity subsidies on economic growth**: increasing electricity subsidies by **1%** will reduce growth by **0.80%.** These results can be explained by the channels through which energy subsidies policy negatively affects economic growth, such as the contribution of subsidies to the private sector's reluctance to invest in the energy sector and undermine its competitiveness, as well as the crowding out of expenditure aimed at promoting growth items such as health care, education, and social safety nets.

➢ The existence of **a significant positive impact of the annual growth rate of total capital formation on economic growth:** an increase in total capital formation by **1%** will increase growth by **0.11%.** This result is consistent with economic theory assumptions that emphasize the role of domestic investments in stimulating economic growth through spending policies geared towards procurement of machinery and equipment, investment in infrastructure projects, and focusing on sensitive sectors such as education, health, provision of water to the population, which improves the productivity of productive elements such as capital and work, thereby improving people's living standards and reducing unemployment.

➢ The existence of a **significant positive impact of oil resource revenues on economic growth**: an increase of **1%** in oil resource revenues will increase economic growth by **0.125%.** The incomes of the oil resources sector contribute to supporting productive sectors and broadening the base of the domestic economy of the sample states, as well as stimulating trade exchange and raising the population's living standards.

➢ The existence of an **insignificant positive impact of trade openness on economic growth:** increasing the rate of trade openness by **1%** will increase growth by **0.03%.**

➢ The existence of an **insignificant positive impact of education which is measured by the primary school enrolment rate**: any increase in the education rate by **1%** will increase growth by **0.048%.**

➢ The existence of **an insignificant positive impact of FDI flows on economic growth**: increasing FDI flows by **1%** will boost economic growth by **0.007%.**

5. CONCLUSION

During this study, we attempted to measure the impact of electricity subsidies on the economic growth regarding a sample of energy-exporting countries using the panel model, drawing on annual data of the annual growth rate of GDP, the total electricity subsidy variable, as well as other interpretative variables. The study's findings concluded a significant negative impact of the electricity subsidy policy on the economic growth of the countries under study. This result is consistent with most previous studies that confirmed the negative impact of electricity subsidies on economic growth channels. This result also raises several questions about the viability of this policy in many countries. Although the subsidy is aimed at protecting consumers, it exacerbates public fiscal imbalances and crowds out areas of social expenditure such as education and health, which may present Governments with reforms affecting the overall subsidy system that allow for economic rebalancing and a transition towards a more targeted social subsidy system.

6. Bibliography List:

Birol. F. (2013). World energy outlook. Paris: International Energy Agency.

Birol. F. (2015). World energy outlook. Paris: International Energy Agency.

Bourbonnais, Régis. (2015). Econométrie. Paris: Dunod.

Bridle, R., Kitson, L., & Wooders, P. (2014). Fossil-fuel subsidies: A barrier to renewable energy in five Middle East and North African countries. Winnipeg: IISD.

Clements, Mr. Benedict J et al. (2013). Energy Subsidy Reform: Lessons and Implications. washington: International Monetary Fund.

De Bruyn. (2012). Economic growth and the environment: An empirical analysis. Springer Science & Business Media, 18.

Ebeke, M. C., & Ngouana, M. C. L. (2015). Energy subsidies and public social spending: Theory and evidence. International Monetary Fund.

Foster, V., & Steinbuks, J. (2009). Paying the price for unreliable power supplies: In-house generation of electricity by firms in Africa. World Bank Policy Research Working Paper,(4913).

IEA. (1999). World Energy Outlook: 1999 Insights-Looking at Energy Subsidies: Getting the Prices Right. Geneve: Organization for Economic Co-operation and Development.

Kojima, Masami. (2017). Identifying and Quantifying Energy Subsidies. washington: Energy Subsidy Reform Assessment Framework (ESRAF) Good Practice Note 1.

Koplow, D. (2014). Global Energy Subsidies. Energy poverty: Global challenges and local solutions, 316.

KOPLOW, Doug. (2009). Measuring energy subsidies using the price-gap approach: What does it leave out? . IISD Trade, Investment and Climate Change Series.

Mundaca. (2017). Energy subsidies, public investment and endogenous growth. Energy Policy, 693-709.

Rive, Vernon JC. (2019). Fossil Fuel Subsidy Reform: An International Law Response. Edward Elgar Publishing.

Schwartz, Mr Gerd et al. (1995). Government Subsidies: Concepts, International Trends, and Reform Options. washington: International Monetary Fund.

STEENBLIK, Ronald. (2007). A subsidy primer. Geneva: Global Subsidies Initiative of the International Institute for Sustainable Development.

Sulistiowati, E. (2015). The impact of fossil fuel subsidies on growth. Economics of Development (ECD). Récupéré sur https://thesis. eur. nl/pub/33406.

Todaro & Smith. (2003). Economic development 11th edition. United States: Financial Times/Prentice Hall.