SOAS University of London

Centre for Global Finance

Working Paper Series

No. 6/ 2022

Energy consumption, institutional quality and private capital inflows in Africa

By Joshua Y. Abor, Emmanuel Sarpong-Kumankoma, Jephthah O. Osei, and Daniel Ofori-Sasu

The Centre for Global Finance (CGF) Working Paper Series features recent studies by resident members of CGF as well as visiting researchers, altogether demonstrating the depth and breadth of research being undertaken at CGF. The papers are published to facilitate preliminary dissemination of ongoing research, enhance quality of work and contribute to the advancement of knowledge. We acknowledge, without implication, financial support from the DEGRP Research Grant (ES/N013344/2) on "Delivering Inclusive Financial Development and Growth", funded by the ESRC and the former UK Department for International Development, which merged with the Foreign & Commonwealth Office on 2 September 2020 to become the Foreign, Commonwealth & Development Office (FCDO), the ESRC-NSFC (ES/P005241/1) Research Grant on "Developing financial systems to support sustainable growth in China – The role of innovation, diversity and financial regulation", and the AXA Research Fund.

List of previous Working Papers of CGF:

No.1/2018 *Capital, risk and profitability of WAEMU banks: Does cross-border banking matter?* By Désiré Kanga, Victor Murinde, and Issouf Soumaré

No.2/2018 *Capital flows and productivity in Africa: The angel is in the details.* By François A. B. Bationo, Stephany Griffith-Jones, Victor Murinde, Issouf Soumaré and Judith Tyson

No.3/2018 *The persistence of bank fragility in Africa: GMM dynamic panel data evidence.* By Abbi M. Kedir, Syed Faizan Iftikhar, Victor Murinde and Bernadette Kamgnia

No.4/2018 *Reflections on central banking*. By Victor Murinde and Patrick Njoroge

No.5/2018 *Let beholders behold: Can banks see beyond oil booms and mitigate the Dutch disease?* By Morakinyo O. Adetutu, John E. Ebireri, Victor Murinde and Kayode A. Odusanya

No.6/2018 *National culture, CEO power and risk-taking by global banks.* By Eilnaz Kashefi Pour and Victor Murinde

No.7/2018 *Corporate investment, financing and payout decisions under financial constraints and uncertainty: Evidence from UK firms*. By Qingwei Meng, Victor Murinde and Ping Wang

No.8/2018 *Bank opacity and risk-taking: Evidence from analysts' forecasts* By Samuel Fosu, Collins G. Ntim, William Coffie, and Victor Murinde

No.9/2018 *Does microcredit increase hope, aspirations and well-being? Evidence from Sierra Leone.* By Adriana Garcia, Robert Lensink, and Maarten Voors

No.10/2018 *Lessons from emerging economies for African low income countries on managing capital flows.* By Stephany Griffith-Jones and José Antonio Ocampo

No.11/2018 *Financial inclusion and economic growth: What do we know?* By Joshua Y. Abor, Haruna Issahaku, Mohammed Amidu, and Victor Murinde

No.12/2018 *Climate vulnerability and the cost of debt.* By Gerhard Kling, Yuen C Lo, Victor Murinde, and Ulrich Volz

No.13/2018 *Pan-African banks on the rise: Does cross-border banking increase firms' Access to finance in WAEMU?* By Désiré Kanga,Victor Murinde, Lemma Senbet, and Issouf Soumaré

No.14/2018 *The peer monitoring role of the interbank market and implications for bank regulation: Evidence from Kenya.* By Victor Murinde, Ye Bai, Christopher J. Green, Isaya Maana, Samuel Tiriongo, and Kethi Ngoka-Kisinguh

No.1/2019 *Central bank independence: What are the key issues*? By Désiré Kanga and Victor Murinde

No.2/2019 *Banking services and inclusive development in sub-Saharan Africa.* By Haruna Issahaku, Mohammed Amidu and Aisha Mohammed Sissy

No.3/2019 *A survey of literature on financial literacy and financial behaviour: Is there a gender gap*? By Maryam Sholevar and Laurence Harris

No.4/2019 *Capital adjustment over the cycle: Evidence from microfinance institutions*. By Issouf Soumaré, Hubert Tchakoute Tchuigoua, and Hélyoth T.S. Hessou

No.5/2019 *Provisioning and business cycle: Evidence from microfinance institutions*. By Hélyoth T.S. Hessou, Robert Lensink, Issouf Soumaré, and Hubert Tchakoute Tchuigoua

No.6/2019 *Lending and business cycle: evidence from microfinance institutions*. By Hubert Tchakoute Tchuigoua, Issouf Soumaré, and Hélyoth T.S. Hessou

No.7/2019 *Term structure of CDS spreads & risk-based capital of the protection seller: an extension of the dynamic Nelson-Siegel model with regime switching.* By Standley R. Baron and Issouf Soumaré

No.8/2019 *Confidence, financial inclusion and sustainable economic development.* By Ayse Demir, Reinhard Bachmann, Victor Murinde, Laurence Harris, Christine Oughton and Meng Xie

No.9/2019 *The network structure of the Malawi interbank market: implications for liquidity distribution and contagion around the banking system.* By Esmie Koriheya Kanyumbu

No.10/2019 *Aid and Exchange Rates in sub-Saharan Africa: No More Dutch Disease?* By Oliver Morrissey, Lionel Roger and Lars Spreng

No.11/2019 *Does credit deepening increase financial fragility*? By Peng Yiqing, Niels Hermes, and Robert Lensink

No.12/2019 *Does microcredit increase aspirational hope? Evidence from a group lending scheme in Sierra Leone.* By Adriana Garcia, Robert Lensink, and Maarten Voors

No.13/2019 *Do better formal institutions promote financial inclusion*? By Peng Yiqing, Niels Hermes, and Robert Lensink

No.14/2019 *Do interbank interest rates reflect the financial soundness of borrowing banks*? By Thomas Bwire, Martin Brownbridge, Doreen K. Rubatsimbira and Grace A. Tinyinondi

No.15/2019 *Institutional environment and the microstructure of the interbank market*. By Thomas Bwire, Martin Brownbridge, Doreen K. Rubatsimbira, and Grace A. Tinyinondi

No.16/2019 *Segmentation of the interbank money market in Zambia*. By Jonathan M Chipili, Francis Z Mbao, Alick B Lungu, Shula M Sikaona, Anthony Bwalya, and Cosam S Chanda

No.1/2020 *How has the rise of Pan-African banks impacted bank stability in WAEMU?* By Désiré Kanga, Victor Murinde, and Issouf Soumaré

No.2/2020 *Threshold effects of financial inclusion on income inequality*. By Ayse Demir, Vanesa Pesqué-Cela, and Victor Murinde

No.3/2020 *FinTech, financial inclusion and income inequality: A quantile regression approach.* By Ayse Demir, Vanesa Pesqué-Cela, Yener Altunbas, Victor Murinde

No.4/2020 *Director reputation and earnings management: evidence from the British honours system*. By Tolulola Lawal

No.5/2020 *Financial inclusion and the growth-inequality-poverty triangle: New evidence from Africa.* By Ayse Demir and Victor Murinde

No.6/2020 *Fellowship amongst peers: A systematic and selective survey of literature on the analysis of interbank lending networks*. By Anosi F. Ikimalo and Victor Murinde

No.7/2020 *Exploring the impact of COVID-19 pandemic on Africa's FinTech space*. By Joshua Yindenaba Abor

No.8/2020 *Financial market integration in sub-saharan Africa: How important is contagion*? By Robert Akunga, Ahmad Hassan Ahmad and Simeon Coleman

No.9/2020 *Finance and well-being in developing countries: Does access to mobile money improve household well-being*? By Fei Jiang, Christopher J. Green, Ahmad Hassan Ahmad and Carlos Sakyi-Nyarko

No.10/2020 *Mobile money, ICT, financial inclusion and inclusive growth: How different is Africa*? By By Fei Jiang, Christopher J. Green, Ahmad Hassan Ahmad and Victor Murinde

No.11/2020 *Financial inclusion and welfare improvement: Empirical evidence from A households survey data*. By Carlos Sakyi-Nyarko, Ahmad Hassan Ahmad and Christopher J. Green

No.12/2020 *The FinTech revolution: What are the opportunities and risks*? By Victor Murinde and Efthymios Rizopoulos

No.13/2020 *The COVID-19 pandemic and its impact on African economies and financial markets: A review*. By Elikplimi Komla Agbloyor and Joshua Yindenaba Abor

No.14/2020 *Online data collection for monitoring the impact of COVID-19*. By Victor Murinde, Athina Petropoulou and Meng Xie

No.15/2020 *Towards resolving the partner selection problem in venture capital syndication: new insights from a neural network based study*. By Qiong Ji, Xiaoming Ding and Victor Murinde

No.16/2020 *Government policy and financial inclusion: Analysing the impact of the Indian national mission for financial inclusion*. By Rachel Hadar and Ronny Manos

No.1/2021 *Forecasting the CBOE VIX with a hybrid LSTM-ARIMA model and sentiment analysis*. By Yossi Shvimer, Victor Murinde and Avi Herbon

No.2/2021 *A political economy analysis (PEA) of capital account management (CAM) measures in Ghana*. By Peter O'Flynn, Stephany Griffith-Jones, and Stephen Spratt

No.3/2021 *Does energy efficiency matter for prices of tenant-owned apartments*? By David Stenvall, Pontus Cerin, Bo Sjö, and Gazi Salah Uddin

No.4/2021 *Finance and well-being in developing countries: Does access to mobile money improve household well-being*? By Ahmad Hassan Ahmad, Christopher J. Green, Fei Jiang, and Carlos Sakyi-Nyarko

No.5/2021 *Mobile money access and usage: Evidence from household surveys*. Carlos Sakyi-Nyarko, Ahmad Hassan Ahmad and Christopher J. Green

No.6/2021 *The Gender-Differential Effect of Financial Inclusion on Household Financial Resilience*. By Carlos Sakyi-Nyarko, Ahmad Hassan Ahmad, and Christopher J. Green

No.7/2021 *The impact of ICT and mobile money on inclusive growth and financial development. Is Africa different*? By Ahmad Hassan Ahmad, Christopher J. Green, Fei Jiang, and Victor Murinde

No.8/2021 *Fertility decline, women's empowerment and financial inclusion in Kenya: It may not be 'As You Like It'*? By Maren Duvendack

No.9/2021 *Credit information sharing, access to finance and bank risk: what do we know*? By Jeffrey Ighedosa

No.10/2021 *COVID-19 debt relief.* By Leonardo Becchetti and Pasquale Scaramozzino

No.11/2021 *Venture capital and corporate investment: Evidence from Chinese firms.* By Qiong Ji, Xiaoming Ding, and Victor Murinde

No. 12/ 2021 *Venture capital experience and portfolio firms' long-run performance in China*. By Qiong Ji, Xiaoming Ding, and Victor Murinde

No.1/2022 *Foreign direct investment and human capital development in Africa.* By Phyllis Papadavid, Sherillyn Raga, and Dirk Willem te Velde

No.2/2022 *Heterogeneity of assets, structure of interbank market and systemic risk: Evidence from East African banking sector*. By Peter Wamalwa, Cappitus Chironga, Anne Kamau and Samuel Tiriongo

No.3/2022 *Can national development banks help alleviate the shortage of patient investment capital in Africa? Evidence from bank-level panel data*. By Léonce Ndikumana, Karmen Naidoo and Francisco Perez

No.4/2022 *From Bilateral Trade to Centralized Markets: A Search Model for Commodity Exchanges in Africa*. By Yaw Nyarko and Heitor S. Pellegrina

No.5/2022 *Segmentation of The Interbank Money Market in Zambia.* By Jonathan M Chipili, Francis Z Mbao, Alick B Lungu, Shula M Sikaona, Anthony Bwalya, and Cosam S Chanda

Centre for Global Finance
SOAS University of London
10 Thornhaugh Street, Russell Square
London
WC1H 0XG

Email: cgf@soas.ac.uk
Website: https://www.soas.ac.uk/centreforglobalfinance/publications/

Energy Consumption, Institutional Quality and Private Capital Inflows in Africa

Joshua Y. Abor, Emmanuel Sarpong-Kumankoma[1], Jephthah O. Osei, and Daniel Ofori-Sasu
Department of Finance, University of Ghana Business School

Abstract
This paper investigates how institutional quality conditions energy consumption to influence private capital inflows in Africa using data from 1990 to 2019. The paper employed a modified dynamic system Generalised Method of Moment. With this approach, we introduce an interactive term into the base model to moderate the relationship between the major variables of interest. Our results show that, institutional quality on its own has a direct influence on private capital inflows, particularly FDI inflows to Africa but not as a conduit for energy consumption to influence private capital inflows. On the reverse, the findings show that FDI does not essentially require strong institutional quality before flowing into Africa but portfolio investment does. Therefore, governments in Africa should make conscious effort to ensure a reliable energy supply in order to increase investor trust in energy accessibility and consumption. Efforts should be made to add value to the primary energy generated in order to boost its consumption competitiveness on the global market. Again, there should be policies and laws that deepen, expand and enhance institutional quality to attract much portfolio investment.

Keywords: Energy consumption; Institutional Quality; Private Capital Inflows

[1] Correspondence: esarpong-kumankoma@ug.edu.gh

1. Introduction

The impact of private capital flows on economic growth has been discussed immensely in the literature both in the advanced and developing economies (see Soto 2003; Mody and Murshid 2005; Di-Giovanni 2005; Khamfula 2007; Pazienza and Vecchione 2009; Tvaronavičienė *et al*., 2008; Tvaronavičienė and Kalašinskaitė 2010; Weng *et al.,* 2010; Choong *et al*., 2010). However, the famous "Lucas Paradox[2]" remains unsolved especially in Africa. According to Lucas (1990) the assertion by the neoclassical production function that there is capital mobility from rich to poor countries does not depict the reality. This is because in reality the flows of capital to advanced nations are far greater than those to developing countries (Lucas, 1990; Okada, 2013). For example, the flow of foreign direct investment (FDI) into Organisation for Economic Co-operation and Development (OECD) countries was far greater than inflows to developing countries from 1985 to 2009 (Okada, 2013).

Meanwhile, capital inflows play significant role in the growth of developing economies. Private capital inflows, especially Foreign Direct Investment (FDI) into Africa, date back to the colonial era (Olaoye *et al*., 2020). The Economic Community of West African States (ECOWAS) countries for instance receive 70% of total FDI inflows to Africa, according to the United Nations Conference on Trade and Development report (UNCTAD, 2017). Private capital inflows to Africa, on the other hand, have been decreasing recently. According to the United Nations Conference on Trade and Growth, the continent's inflows fell by 10% to $45 billion in 2019. (UNCTAD, 2020). FDI inflows to North Africa, for example, fell by 11% to $14 billion, with decreases in all countries except Egypt, which remained the largest FDI recipient. In 2019, the country received the most FDI in Africa, with inflows rising by 11% to $9 billion. Following a large rise in 2018, FDI flows to Sub-Saharan Africa fell by 10% to $32 billion in 2019 due to a slowdown in net divestment from Angola. Despite significant investments in mining and manufacturing, FDI inflows to South Africa fell by 15% to $4.6 billion in 2019. In 2019, FDI to the West African economy shrank by 21% to $11 billion. This was largely due to a sharp drop in investment in Nigeria as a result of new investment rules for multinational oil and gas companies. FDI flows to East Africa fell by 9% to $7.8 billion. Inflows into Ethiopia fell by a quarter to $2.5 billion, owing in part to political tensions in the region. Similarly, amid many new IT and healthcare programs, inflows to Kenya fell 18 percent to $1.3 billion. Central Africa earned $8.7 billion in FDI, down 7% from the previous year. The decline in flows to the Democratic Republic of the Congo (9 percent to $1.5 billion) was a major highlight in the sub-region. As a result, African governments are enacting policies to restructure private capital flows (Alfaro *et al*., 2004 and Azman-Saini *et al*., 2010). As a result, it is critical to pinpoint the factors that promote steady growth and a sizable amount of long-term capital inflows to Africa.

Energy is paramount because sustainable development in the medium to long term depends largely on stable and affordable energy devoid of environmental defect (Qamruzzaman and Jianguo, 2020). The rapid growth in population and urbanization coupled with excess demand for economic activities particularly in developing countries has heightened the consumption of energy (Alam *et al*., 2016). However, energy supply in these economies especially those in sub-Saharan Africa continues to fall short of the aggregate market demand. For example, a resource-endowed country like Nigeria only generates 12,522MW of power, which is not capable of meeting the energy demand of a country with a population of close to 200 million

[2] The question; "why doesn't capital flow from rich to poor countries?" is what is termed as the Lucas Paradox. It is the title of the seminal paper by Lucas (1990).

people. Ghana, a potential industrialized nation, is beset by major power outages, which have stymied the country's industrialization plans.

The literature on the energy use and foreign direct investment nexus is mixed. Studies like Olaoye et al. (2020) found an inverse relationship for Nigeria, while Xu et al. (2019) found a positive impact of energy consumption on FDI. Amoako and Insaidoo (2021) investigated the symmetric effect of FDI on energy consumption in Ghana using the Fully Modified Ordinary Least Squares (FMOLS) and Canonical Cointegration Regression (CCR) approaches and found a positive relationship. Achour and Belloumi, (2016), and Saidi and Hamami, (2015) claim that higher economic growth is directly proportional to energy consumption. According to North (1990, p3; cited by Okada, 2013) institutions are "the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction". According to him, such institutions comprise the society's incentive structure and in particular, the political and economic institutions form the basis of economic growth. The literature has also discussed extensively and established that improved institutional qualities lead to higher economic growth and development (see, Knack and Keefer 1995; Mauro, 1995; Hall and Jones, 1999; Acemoglu *et al*., 2001; Okada, 2013).

A plethora of studies have also established the connection between institutional factors and capital flows (see Barro, 1997, Oliva and Rivera-Batiz, 2002; Okada, 2013) with focus mainly on political and legal factors. Others such as Dincer (2000) and Qamruzzaman and Jianguo (2020) have considered the relationship between foreign capital flows and energy consumption and established the fact that energy is a key driver of capital flows towards economic growth. However, the role of energy and institutional quality (such as rule of law and political stability) in drawing capital inflows and creating the enabling environment for them to thrive has not been studied systematically. Meanwhile these factors have been proven to be critical drivers of capital inflows especially in environments characterised by declining regulation and weak financial integration systems such as Africa (Oliva and Rivera-Batiz, 2002). In this paper we examine the effect of energy consumption on private capital inflows to Africa by interacting energy consumption with institutional quality variables. In addition, we use more recent data spanning the current two decades from 1990 to 2019 and apply a dynamic panel estimator, the system Generalised Method of Moments (system GMM). This model is preferred because of its ability to solve both endogeneity problems between the dependent variable and the random term and between the regressors and the unobserved country specific-effect using higher lags. Moreover, we improve on the dynamic model specified by Sadorsky (2010; 2011) and Doytch and Narayan (2016) to include an interaction term as moderating factor to examine the energy consumption – private capital inflows nexus.

The remaining sections of the study are structured as follows: section 2 provides the literature review. Section 3 presents the research methodology employed in the study. The empirical findings are discussed in section 4, while section 5 finally concludes the paper with policy recommendations.

2. Literature Review

The flows of capital in the form of foreign direct investment[3] (FDI) and equity has direct effect on the overall production process in an economy through industrialization and infrastructural

[3] FDI is defined traditionally to include the transfer of knowledge, managerial expertise, and technology from the resident country to a hosting country.

development (Qamruzzaman and Jianguo, 2020). The use of traditional energy and its adverse environmental and production cost put the effect of FDI inflows on energy into two; composition and technique effects (Hübler and Keller, 2010; Fisher-Vanden *et al*., 2006). The former involves structural dynamics in the economy such as reducing one sector and expanding the other. The latter requires the transformation of novel technology to replace the outmoded ones (Hübler and Keller, 2010) to ensure energy efficiency (Qamruzzaman and Jianguo 2020). For emerging markets, transforming technology increases the consumption of energy by shifting from non-renewable to renewable energy source.

Studies such as Doytch and Narayan (2016) and Mielnik and Goldemberg (2002) showed an inverse relationship between energy intensity, defined as energy consumption as a share of GDP, and foreign direct investment. Deutsch and Narayan (2016) for example, argue that this negative relationship results from the introduction of new technologies in developing countries. Other studies such as Hübler and Keller (2010) and Sadorsky (2010) failed to find a significant effect of FDI on energy consumption in a longitudinal panel study. Chang (2015) expanded this study to include fifty-three sampled countries within a non-linear analytical framework. Yet the study discovered no statistically significant effects of foreign direct investment on energy consumption. Sadorsky (2011) followed a similar approach but controlled for banking variants to investigate the nexus with focus on Central and Eastern Europe countries. Of the nine sampled economies from these regions, the results showed a direct influence of FDI on energy consumption. This direct relationship has also been revealed by other studies such as (Çoban and Topcu, 2013; Sadorsky, 2011; Pao and Tsai, 2011; Lee, 2013; Mielnik and Goldemberg, 2000).

Ting et al. (2011) provided specific evidence for Chinese Jiangsu province concerning the direct effect of sector-wide FDI on energy consumption. The results revealed that FDI inflows in the province is largely concentrated in industry (extraction and manufacturing) energy consumption, but also has a cumulative share in the services sector. Meanwhile the impacts of foreign direct investment in agriculture, industry, transport and communications on energy consumption was initially positive but became negative from 2004 onwards unlike the effects of FDI in construction and "other industries" that was close to stabilizing, with the effect close to zero. Subsequent study by Jiang et al. (2014) reached similar conclusion after adjusting for the impact of energy efficiency in the sub-sectors of manufacturing industry. Although their study does not specifically target renewable energy, they conclude that foreign direct investment is an “effective tool for transferring FDI in the form of advanced technology to China”.

The literature documents country-specific studies of private capital flows in energy consumption analysis with majority evidence in favour of plummeting energy intensity in foreign direct investment (Doytch and Narayan, 2016). For example, Dube (2009) and Tang (2009) found a co-integration relationship between electricity consumption and foreign direct investment, respectively, for South Africa and Malaysia, and He et al. (2012) indicate two-way effects between foreign direct investment and energy consumption in Shanghai, in which foreign direct investment leads to energy savings. Mudakkar et al. (2013) found that in Bangladesh and Sri Lanka, the causal relationship extends from energy consumption to foreign direct investment, while in India; causation extends from foreign direct investment to energy consumption. Additionally, Azam et al. (2015) adds that both foreign direct investment and GDP have a lot to do with energy consumption in Thailand, Malaysia and Indonesia. Xu et al. (2016) used time series data from 1991 to 2013 on Shanghai to examine the effect of energy

consumption on FDI at the country level. They find a statistically relevant association between energy use and foreign direct investment in the short term, but not in the long run.

Despite the ensuing controversy in the literature, extensive studies have not been conducted to substantiate the proposed nexus. Only a few studies have investigated the causal relationships and the possible directional effect (see Khandker et al., 2018; Doytch and Narayan 2016; Ghazouani 2018; Paramati *et al*., 2016). For example, Khandker *et al*., (2018) used the vector error correction model to investigate the relationship between foreign direct investment and renewable energy consumption in Bangladesh, finding a long run cointegration but no causal impact in the short run. Ghazouani (2018) used the Autoregressive Distributed Lag (ARDL) bound test method to examine their relationship with economic growth in a related analysis. Contrary to Khandker et al. (2018), the paper showed that for countries such as Armenia, Morocco, Egypt, and Turkey, there is a unidirectional causal effect emanating from renewable energy consumption to FDI but the reverse for Algeria. On the other hand, Israel and Tunisia revealed bidirectional causality for FDI and renewable energy consumption. Doytch and Narayan (2016) investigated the effect of energy (renewable and non-renewable) consumption in a longitudinal dynamic panel of 74 countries spanning 1985 – 2012 using the Generalised method of moments (GMM). The paper showed that FDI increases the consumption of renewable energy than non-renewable energy. Further, Paramati et al., (2016) conducted a similar study using panel data for 20 emerging countries and confirmed the direct relationship between FDI and clean energy consumption but with a unidirectional Granger causality moving from FDI inflows to clean energy consumption both in the short and long run periods. Clearly, there is no uniform connection between energy consumption and capital flow in the literature especially for Africa. The debate has since not established the directional link for these variables. Qamruzzaman and Jianguo (2020) suggest that the connection can be observed in either way since both FDI and energy consumption are key determinants of economic growth. The need therefore arises for a formal study to establish the relationship especially for developing economies that rely heavily on private capital inflows.

Meanwhile, effective flow of private capital into Africa relies greatly on institutional quality to create the enabling environment for business success (Acemoglu *et al*., 2001; Okada, 2013). Okada (2013) for example hypothesised in his study that the effectiveness of international capital inflows depends largely on institutional quality of the receiving country. According to the paper, good institutional quality fosters international capital inflows through financial globalization while weak and poor institutional quality hinders international capital flows regardless of financial globalisation. For instance, countries with strong institutions with full operation of the rule of law attract capital inflows from multinational firms whereas the absence of rule of law deters investments from multinational firms (Okada, 2013). This means that despite the constant supply of energy, multinational firms are likely not to flow capital to countries with poor institutional quality even if the economy is financially open partly due to expropriation on the part of government and non-stability of rules after investment. In this study, institutional quality compliments energy consumption as interaction component prerequisite for moderating the relationship between renewable energy and private capital inflows to Africa.

3. Methodology

3.1 The Model

Our model follows earlier studies by Sadorsky (2010; 2011) and Doytch and Narayan (2015) that specified a dynamic panel to investigate the relationship between FDI and energy consumption. We expand their model by introducing an interaction variable (i.e. institutional

quality) to regulate the relationship between energy consumption and private capital inflows. Furthermore, we estimate a reverse model to investigate whether private capital inflows also influence changes in energy consumption. The regression functions of interest are specified as follows:

$$ln(PCI_{it}^{j}) = \phi_1 \ln(PCI_{it-1}^{j}) + \phi_2 \ln(Ene_{it}) + \phi_3 \ln(Inst_{it}^{k}) + \emptyset_k y_{it} + \psi_i + \varepsilon_{it} \ldots\ldots\ldots (1)$$

$$ln(PCI_{it}^{j}) = \varphi_1 \ln(PCI_{it-1}^{j}) + \varphi_2 \ln(Ene_{it}) + \varphi_3 \ln(Inst_{it}^{k}) + \varphi_4 \ln(Ene_{it} * Inst_{it}^{k}) + \varphi_k y_{it} + \psi_i + \varepsilon_{it} \ldots\ldots\ldots (2)$$

$$ln(Ene_{it}) = \partial_1 \ln(Ene_{it-1}) + \partial_2 \ln(FDI_{it}) + \partial_3 \ln(Inst_{it}^{k}) + \partial_4 \ln(FDI_{it} * Inst_{it}^{k}) + \partial_k y_{it} + \psi_i + \varepsilon_{it} \ldots\ldots\ldots (3)$$

$$ln(Ene_{it}) = \alpha_1 \ln(Ene_{it-1}) + \alpha_2 \ln(PFI_{it}) + \alpha_3 \ln(Inst_{it}^{k}) + \alpha_4 \ln(PFI_{it} * Inst_{it}^{k}) + \alpha_k y_{it} + \psi_i + \varepsilon_{it} \ldots\ldots\ldots (4)$$

Where: PCI is a vector of private capital inflow[4] variables measured by FDI and Portfolio Investment (PFI) and $ln(PCI_{it}^{j})$ is the natural log of the specific dependent variable (i.e. FDI or Portfolio Investment), $\ln(Ene_{it})$ is the natural log of energy consumption; $\ln(Inst_{it}^{k})$ represents the natural log of institutional quality and y_{it} is a vector of state variables; $\phi_1, \ldots, \phi_3$; $\varphi_0, \ldots, \varphi_k$; $\alpha_1, \ldots, \alpha_3$; $\partial_1, \ldots, \partial_3$ are the coefficient parameters and ψ_i is the unobserved country-specific effect assumed to be independent and identically distributed. ε_{it} is the stochastic component defined as $\varepsilon_{it} \sim i.i.d.(0, \sigma_\varepsilon), and\ E(\psi_i \varepsilon_{it}) = 0$.

Variable Measure

Variable	Measurement	Data Source
Foreign Direct Investment	Natural log of Net inflows as a percentage of GDP	WDI
Portfolio Investment	Natural log of Portfolio Investment, net (BoP, current US$)	WDI
Energy Consumption	Natural log Energy Consumption	WDI
Inflation	Natural log of Consumer prices (annual %)	WDI
Openness	Natural log of aggregate export and import to GDP	WDI
Broad Money Balances	Natural log of broad money at current value	WDI

3.2 *Estimation Technique*

In this study, we measure private capital inflows as FDI and portfolio investment flows into the host country. Institutional quality is also measured using the six indicators of governance quality as measured by the World Bank's World Development Indicators (i.e. control of corruption, government effectiveness, political stability, regulatory quality, voice and accountability, and rule of law). Equation (1) is the base model establishing the relationship between renewable energy, institutional quality and private capital inflows. Equation (2) on the other hand, specifies the link between renewable energy and private capital inflows by interacting renewable energy with institutional quality variables, whiles controlling for inflation, , export and import to GDP ratio, and broad money supply, which are factors greatly considered by multilateral firms before investing especially in developing economies. Equations (3) and (4) are the reverse models specifying the effect of FDI and PFI on renewable energy use respectively with institutional factors as interaction.

[4] We ignore Gross Portfolio Debt as a measure of PCI due to non-availability of data for most countries used in the study

Both equations are estimated using the extended 'system' Generalised Method of Moments (system GMM) proposed by Blundell and Bond (2000). It is an improved technique over the first-differenced GMM proposed by Arellano and Bond (1991). The system GMM is capable of avoiding finite sample bias due to weak instruments especially in the presence of unit root. It does so by introducing higher lags[5] other than first lag (as in the case of Arellano-Bond GMM) as instruments for the lagged dependent variable so that there is zero correlation between the random component and the lagged dependent regressor. In addition, the system GMM corrects for any correlation between the unobserved country-specific effect and the difference variables, allowing for the use of lagged first difference as instruments for levels. This quality makes it a more efficient estimator than the static fixed effect estimator (Baum and Rother, 2013). For robustness purpose, the Arellano-Bond (AR2) test for zero autocorrelation in first-differenced errors and the Sargan test for over-identification to investigate the validity of instruments were conducted.

4. Discussion of Results

In all the panel estimates presented in Tables 1, 2, 4, and 5, we fail to reject the null hypothesis of no autocorrelation for AR(2). Also overidentifying restrictions were valid for all instruments.

Table 1 shows the effect of energy consumption on FDI after controlling for institutional indices. Column 1 is the base model while columns 2 to 7 represent the effect of energy consumption on FDI after controlling for the specific institutional variable. In all seven (7) columns, the coefficient of lagged FDI showed that historic FDI positively influence current levels of FDI inflows. For example, in column 1 an average percentage increase in previous inflows of FDI resulted in 0.2% increase in current levels of FDI, holding other variables constant. The higher significance level indicates clearly that inflows of FDI are reliably determined by historical facts. In addition, energy consumption showed the expected positive relationship with foreign direct investment inflows in all columns. This means that an average percentage increase in energy consumption leads to 0.499%, 0.376%, and 0.497% increase in FDI inflows as shown from columns 1 to 3 respectively. The relationship corresponds to earlier results of Xu et al. (2016) in Shanghai but contradicts that of Olaoye et al. (2020) in Nigeria.

(Insert Table 1)

Furthermore, the various institutional variables revealed positive effect on FDI inflows and were statistically significant except for voice and accountability. The coefficient of control of corruption for instance shows that an average percentage increase in African governments' ability to control corruption leads to 0.406% increase in FDI inflows. Similarly, effective and sound government activities leads to 0.347% increase in FDI inflows. The existence of political stability increases FDI inflows by 0.156%. In addition, quality regulations and the practice of rule of law leads to 0.293 and 0.287 percentage points increase in FDI respectively. This means that favourable institutional qualities attract FDI inflows to Africa. In relation to the controls, inflation, trade openness, and broad money balances showed statistically significant positive relationships with FDI inflows in all columns. For example, an average proportional increase in general price levels result in 0.171% increase in FDI inflows to Africa. A similar

[5] The use of higher lags of the respondent variable as instruments hinges critically on the assumption of no autocorrelation in the initial disturbance term.

proportional change in trade openness and broad money supply lead to 0.9% and 0.519% increase in FDI as seen in column 1.

Table 2 on the other hand shows the effect of energy consumption on Portfolio Investment Inflows (PFI) after controlling for institutional indices. Similar to Table 1, column 1 is the base model while columns 2 to 7 represent the effect of energy consumption on PFI after controlling for a specific institutional variable. In all seven (7) columns, the coefficient of lagged PFI revealed statistically significant positive influence of historic PFI on current levels of PFI inflows. Like FDI inflows, historical evidences reliably determine current PFI inflows. Energy consumption also showed positive and significant relationship with PFI inflows in all columns. An average percentage increase in energy consumption results in approximately 2% increase in PFI inflows from column 1 to 7. Unlike FDI inflows, however, basic institutional efficiency has no substantial significant influence on PFI inflows when considered individually, but when considered collectively, it has a positive effect on PFI of 10%, as shown in column 1. Thus, on average, favourable institutional policies increase the inflow of PFI by 0.168%. The control variables showed mixed effect on PFI. Whiles inflation revealed negative effect in all 7 columns, openness and broad money supply showed positive effect.

(Insert Table 2)

In Table 3, we made attempt to show the relationship between energy consumption and private capital inflow after interacting energy with the institution index. Independently, energy consumption confirmed the positive relationship with both FDI and PFI as seen from columns 1 and 2. However, the interaction term disclosed insignificant direct effect on FDI but significant and positive effect on PFI. This means that institutional quality does not provide a conduit or compliment for FDI, but it does for PFI inflows to Africa. In other words, the impacts of energy consumption on inflows of FDI into Africa are not necessarily influenced directly by the institutional policy as in the case of PFI.

(Insert Table 3)

However, in order to ascertain whether capital inflows also influence energy consumption (Aliero and Ibrahim 2012; Doytch and Narayan, 2016; Olaoye *et al*., 2020), we specified a reverse relationship with institutional quality still as the interactive variable. Tables 4 and 5 show the independent effects of FDI and PFI on energy consumption with Table 6 presenting the interactions result. We observed from Table 4 that, lagged energy consumption highly influences current energy consumption as seen from all even columns. FDI on the other hand showed an inverse but insignificant effect on energy consumption contrary to the reverse. In addition, independent institutional policy revealed no significant relationship with energy consumption. Among the controls, only inflation showed significant inverse effect on energy consumption.

(Insert Table 4)

Similar results were observed when investigating the PFI energy consumption nexus as indicated in Table 5. For example, lagged energy consumption positively influenced current energy consumption. PFI and institutional policy presented no significant effect on energy consumption. Moreover, inflation also showed an inverse relationship with energy consumption as observed in the reverse model. Trade openness revealed a negative and significant effect on energy consumption but broad money had a positive effect.

(Insert Table 5)

We further examined the relationship after interacting FDI and portfolio inflows with institutional quality index as shown in Table 6. On the contrary, FDI and PFI independently revealed positive and significant effect on energy consumption after the interaction. Institutional quality on its own also showed negative effect on energy use for both FDI and PFI. However, the interaction of FDI and institutions has no significant effect on energy consumption. The interaction of PFI and institutions rather showed a significant positive effect on energy consumption.

(Insert Table 6)

5. Conclusion and Policy Recommendations

We have seen in this study that energy consumption directly influences private capital finlows but the reverse is statistically insignificant. As a result, we interacted energy consumption with institutional quality variables to examine their impact on private capital inflows. Our results showed that institutional qualities do not directly influence the effect of energy consumption on FDI but do influence the effect on PFI. However, independently, institutional quality positively motivates FDI inflows into Africa. On the contrary, the reverse analysis showed that private capital inflows do not influence energy consumption in Africa. We saw from the interactions that FDI does not essentially require strong institutional quality before flowing into Africa but portfolio investments do.

These findings have implications for policymakers, investors and scholars in Africa. Since FDI inflows are driven by energy consumption, African governments should make concerted efforts to ensure a reliable energy supply in order to increase investor trust in energy accessibility and consumption. Furthermore, efforts should be made to add value to the primary energy generated in order to boost its consumption competitiveness on the global market. In addition, to attract much portfolio investment into Africa, policymakers must enact policies and laws that deepen, expand and enhance institutional quality to boost investor confidence.

Table 1: Effect of Energy Consumption on FDI Inflows

	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI	(6) FDI	(7) FDI
FDI_{t-1}	0.200***	0.227***	0.201**	0.215***	0.195***	0.202***	0.224***
	(2.74)	(2.62)	(2.44)	(3.39)	(2.91)	(2.66)	(3.26)
Energy Consumption	0.449**	0.376*	0.497**	0.455**	0.506**	0.454**	0.513**
	(2.20)	(1.88)	(2.37)	(2.10)	(2.27)	(2.27)	(2.18)
Institutional Index	0.210**						
	(2.24)						
Inflation	0.171***	0.167**	0.175***	0.164**	0.186***	0.168***	0.192***
	(2.58)	(2.24)	(2.80)	(2.39)	(2.92)	(2.63)	(2.88)
Openness	0.900***	0.887***	0.903***	0.756**	0.930***	0.989***	0.764**
	(3.03)	(2.80)	(2.84)	(2.35)	(3.01)	(3.21)	(2.40)
Broad Money Balances	0.519***	0.503***	0.493***	0.517***	0.484***	0.510***	0.494***
	(3.58)	(3.42)	(3.26)	(3.62)	(3.25)	(3.51)	(3.44)
Control of corruption		0.406**					
		(2.40)					
Government Effectiveness			0.347**				
			(2.12)				
Political Stability				0.156***			
				(2.63)			
Regulatory Quality					0.293**		
					(2.05)		
Rule of Law						0.287**	
						(2.26)	
Voice and Accountability							0.0942
							(0.66)
Constant	4.058	4.927	4.302	3.881	4.160	4.437	3.954
	(1.15)	(1.46)	(1.20)	(1.08)	(1.17)	(1.26)	(1.06)
No. of Obs.	95	95	95	95	95	95	95
Sargan	0.430	0.461	0.453	0.404	0.405	0.421	0.328
AR(2)	0.296	0.256	0.306	0.349	0.363	0.363	0.622

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

Table 2: Effect of Energy Consumption on PFI Inflows

	(1) PFI	(2) PFI	(3) PFI	(4) PFI	(5) PFI	(6) PFI	(7) PFI
PFI_{t-1}	0.423**	0.460**	0.434**	0.449**	0.455**	0.465**	0.461**
	(2.31)	(2.40)	(2.16)	(2.26)	(2.40)	(2.43)	(2.40)
Energy Consumption	2.262*	2.205*	2.256*	2.247*	2.220*	2.195*	2.203*
	(1.77)	(1.69)	(1.71)	(1.67)	(1.74)	(1.71)	(1.68)
Institutional Index	0.168*						
	(1.79)						
Inflation	-0.193*	-0.169***	-0.149**	-0.170***	-0.163**	-0.170***	-0.165***
	(-1.73)	(-2.82)	(-2.09)	(-2.82)	(-2.55)	(-2.86)	(-2.81)
Openness	3.199**	2.834*	3.077**	2.856*	2.827*	2.792*	2.808*
	(2.11)	(1.88)	(2.21)	(1.79)	(1.89)	(1.84)	(1.78)
Broad Money Balances	2.399*	2.532*	1.843	2.425*	2.511**	2.652*	2.554**
	(1.353)	(1.86)	(1.30)	(1.69)	(2.10)	(1.88)	(2.06)
Control of Corruption		0.0253					
		(0.16)					
Government Effectiveness			0.211				
			(0.97)				
Political Stability				0.0549			
				(0.44)			
Regulatory Quality					0.0461		
					(0.25)		
Rule of Law						-0.0135	
						(-0.08)	
Voice and Accountability							0.0226
							(0.26)
Constant	-13.31	-13.22	-13.05	-13.39	-13.21	-13.17	-13.32
	(-1.42)	(-1.60)	(-1.50)	(-1.59)	(-1.59)	(-1.63)	(-1.60)
No. of Obs.	54	54	54	54	54	54	54
Sargan Test	0.322	0.511	0.515	0.531	0.510	0.505	0.510
AR(2)	0.735	0.875	0.886	0.909	0.805	0.894	0.893

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

Table 3: Interaction Effect of Energy Consumption and Institutions on FDI and PFI

	(1) FDI	(2) PFI
Energy Consumption	1.005*** (9.21)	2.238*** (8.58)
Institutions	-1.175 (-1.40)	-4.345** (-2.35)
Energy Consumption # Institutions	0.196 (1.52)	0.716** (2.41)
Inflation	0.143 (1.64)	-0.0926 (-0.59)
Openness	0.251*** (3.61)	-0.0252 (-0.12)
Broad Money Balances	0.697*** (10.12)	0.0568 (0.29)
No. of Obs.	283	156
R-Squared	0.993	0.977

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

Table 4: Effect of FDI Inflows on Energy Consumption

	(1) Energy Consumption	(2) Energy Consumption	(3) Energy Consumption	(4) Energy Consumption	(5) Energy Consumption	(6) Energy Consumption	(7) Energy Consumption
$Energy_{t-1}$	0.999***	1.002***	1.000***	0.997***	0.996***	0.998***	1.000***
	(64.74)	(67.76)	(66.32)	(65.97)	(60.93)	(63.00)	(66.11)
FDI	-0.00319	-0.00230	-0.00298	-0.00349	-0.00387	-0.00339	-0.00367
	(-0.57)	(-0.41)	(-0.53)	(-0.60)	(-0.69)	(-0.61)	(-0.65)
Institutions	-0.00425						
	(-0.90)						
Inflation	-0.00814***	-0.00729***	-0.00837***	-0.00798***	-0.00858***	-0.00829***	-0.00874***
	(-4.26)	(-3.93)	(-3.81)	(-4.38)	(-3.76)	(-4.27)	(-3.81)
Openness	0.00224	0.000728	0.00242	0.00399	0.00669	0.00268	0.00475
	(0.07)	(0.02)	(0.07)	(0.12)	(0.19)	(0.08)	(0.14)
Broad Money Balances	0.0350	0.0273	0.0316	0.0395	0.0418	0.0381	0.0344
	(0.82)	(0.63)	(0.78)	(0.93)	(0.94)	(0.87)	(0.81)
Control of Corruption		-0.0125					
		(-1.57)					
Government Effectiveness			-0.00841				
			(-1.19)				
Political Stability				-0.00167			
				(-0.40)			
Regulatory Quality					-0.000206		
					(-0.03)		
Rule of Law						-0.00342	
						(-0.50)	
Voice and Accountability							-0.00779
							(-1.56)
Constant	-0.238	-0.268	-0.253	-0.236	-0.239	-0.243	-0.211
	(-1.04)	(-1.22)	(-1.11)	(-1.00)	(-1.01)	(-1.05)	(-0.95)
No. of Obs.	98	98	98	98	98	98	98
Sargan Test	0.926	0.936	0.930	0.927	0.926	0.927	0.943
AR (2)	0.902	0.859	0.939	0.728	0.793	0.728	0.805

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

Table 5: Effect of PFI on Energy Consumption

	(1) Energy Consumption	(2) Energy Consumption	(3) Energy Consumption	(4) Energy Consumption	(5) Energy Consumption	(6) Energy Consumption	(7) Energy Consumption
Energy Consumption $_{t-1}$	0.956***	0.957***	0.956***	0.953***	0.957***	0.957***	0.959***
	(22.90)	(23.57)	(22.92)	(22.08)	(23.83)	(23.22)	(24.86)
PFI	0.0104	0.0104	0.0107	0.0109	0.00965	0.00968	0.00970
	(1.23)	(1.30)	(1.24)	(1.28)	(1.25)	(1.18)	(1.24)
Institutions	-0.00484						
	(-0.61)						
Inflation	-0.0154***	-0.0149***	-0.0157***	-0.0149***	-0.0158***	-0.0157***	-0.0166***
	(-3.03)	(-3.14)	(-2.90)	(-3.05)	(-2.81)	(-2.97)	(-2.79)
Openness	-0.0966**	-0.0987**	-0.0927**	-0.103**	-0.0996**	-0.102**	-0.0959*
	(-2.11)	(-2.10)	(-2.12)	(-2.06)	(-2.18)	(-2.25)	(-1.96)
Broad Money Balances	0.102*	0.107*	0.0996*	0.105*	0.102*	0.101*	0.0954
	(1.79)	(1.90)	(1.75)	(1.82)	(1.83)	(1.78)	(1.53)
Control of Corruption		-0.00925					
		(-0.71)					
Government Effectiveness			-0.00912				
			(-0.65)				
Political Stability				-0.00486			
				(-0.84)			
Regulatory Quality					-0.00332		
					(-0.43)		
Rule of Law						-0.00281	
						(-0.29)	
Voice and Accountability							-0.00852
							(-0.64)
Constant	0.383*	0.376*	0.358*	0.404*	0.373*	0.384*	0.387*
	(1.82)	(1.78)	(1.77)	(1.82)	(1.89)	(1.89)	(1.81)
No. of Obs.	66	66	66	66	66	66	66
Sargan Test	0.948	0.947	0.948	0.947	0.947	0.948	0.950
AR(2)	0.399	0.382	0.451	0.307	0.360	0.284	0.412

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

Table 6: Interactions Effect of FDI, PFI and Institutions on Energy Consumption

	(1) Energy Consumption	(2) Energy Consumption
FDI	0.242***	
	(8.99)	
FDI # Institutions	0.0124	
	(0.42)	
PFI		0.147***
		(6.56)
PFI # Institutions		0.0417**
		(2.10)
Institutions	-0.162	-0.571*
	(-0.28)	(-1.83)
Inflation	0.0489	0.0321
	(1.18)	(0.74)
Openness	-0.00188	0.153***
	(-0.06)	(3.55)
Broad Money Balances	0.0539	0.273***
	(1.63)	(6.04)
R-Squared	0.984	0.989

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.010

References

Acemoglu, D., Johnson, S., and Robinson, J.A. (2001). The colonial origins of comparative development: an empirical investigation. *American Economic Review* 91(5), 1369–1401.

Achour, H., and Belloumi, M. (2016). Investigating the causal relationship between transport Infrastructure, transport energy consumption and economic growth in Tunisia. *Renewable and Sustainable Energy Reviews*, 56, 988-998.

Alam, A., Malik, I. A., Abdullah, A. B., Hassan, A., Awan, U., Ali, G., and Naseem, I. (2015). Does financial development contribute to SAARC′S energy demand? From energy crisis to energy reforms. *Renewable and Sustainable Energy Reviews*, 41, 818-829.

Alfaro, L., Chanda, A., Sebnem, K. O. and Sayek, S. (2004). FDI and economic growth: the role of local financial markets, *Journal of International Economics*, 64(1): 89–112. Doi:10.1016/S0022-1996(03)00081-3.

Aliero, H., and Ibrahim, S. (2012). The relationship between energy consumption and economic growth in Nigeria: A causality analysis. *International Journal of Marketing and Technology*, 2(3), 1-13.

Amoako, S., and Insaidoo, M. (2021). Symmetric impact of FDI on energy consumption: Evidence from Ghana. *Energy*, 223, 120005.

Arellano, M.and Bond, S.(1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studies*. 58 (2): 277 - 297

Azam, M., Khan, A. Q., Zaman, K., and Ahmad, M. (2015). Factors determining energy consumption: Evidence from Indonesia, Malaysia and Thailand. *Renewable and Sustainable Energy Reviews*, 42, 1123-1131.

Azman-Saini, W. N. W., Law, S. H., and Ahmad, A. H. (2010). FDI and economic growth: new evidence on the role of financial markets, *Economics Letters* 107, 211–213. doi:10.1016/j.econlet.2010.01.027

Barro, R.J., and Lee, J.-W. (2010). A new data set of educational attainment in the world, 1950–2010. NBER Working Paper 15902.

Baum, A., Checherita-Westphal, C. and Rother, P. (2013). Debt and growth: New evidence for the euro area. *Journal of International Money and Finance*, 32, 809-821.

Blundell, R. and Bond, S. (2000). GMM Estimation with persistent panel data: An application to production functions, *Econometric Review*, 19(3), 321 – 340.

Chang, S. C. (2015). Effects of financial developments and income on energy consumption. *International Review of Economics & Finance*, 35, 28-44.

Choong, C. K., Lam, S. Y., and Yusop, Z. (2010). Private capital flows to low-income countries: The role of domestic financial sector. *Journal of Business Economics and Management*, 11(4), 598-612.

Çoban, S., and Topcu, M. (2013). The nexus between financial development and energy consumption in the EU: A dynamic panel data analysis. *Energy Economics*, 39, 81-88.

Di Giovanni, J. (2005). What drives capital flows? The case of cross-border M&A activity and financial deepening. *Journal of International Economics*, 65(1), 127-149.

Dincer, I. (2000). Renewable energy and sustainable development: a crucial review. *Renewable and Sustainable Energy Reviews*, 4(2), 157-175.

Doytch, N., and Narayan, S. (2016). Does FDI influence renewable energy consumption? An analysis of sectoral FDI impact on renewable and non-renewable industrial energy consumption. *Energy Economics*, 54, 291-301.

Dube, S. (2009). Foreign direct investment and electricity consumption on economic growth: evidence from South Africa. *Economia Internazionale/International Economics*, 62(2), 175-200.

Fisher-Vanden K., Jefferson G.H., M. Jingkui, et al. (2006) Technology development and energy productivity in China, *Energy Econ*. 28 690 - 705.

Ghazouani T., (2018) Re-examining the foreign direct investment, renewable energy consumption and economic growth nexus: Evidence from a new bootstrap ARDL test for cointegration, University Library of Munich, Germany.

Hall, R.E., and Jones, C.I. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics*, 114 (1), 83–116.

He, W., Gao, G., and Wang, Y., (2012). The relationship of energy consumption, economic growth and foreign direct investment in Shanghai. *Adv. Appl. Econ. Finance* 3 (1), 507–512.

Hübler, M., and Keller, A. (2010). Energy savings via FDI? Empirical evidence from developing countries. *Environment and Development Economics*, 59-80.

Jiang, L., Folmer, H., and Ji, M. (2014). The drivers of energy intensity in China: A spatial panel data approach. *China Economic Review*, 31, 351-360.

Khamfula, Y. (2007). Foreign direct investment and economic growth in EP and IS countries: the role of corruption. *World Economy*, 30(12), 1843-1854.

Khandker L., Amin S., and Khan F., (2018). Renewable Energy Consumption and Foreign Direct Investment: Reports from Bangladesh. *Journal of Accounting, Finance and Economics*, 8(3), 72-87.

Knack, S., and Keefer, P. (1995). Institutions and economic performance: cross-country tests using alternative institutional measures. *Economics and Politics*, 7 (3), 207–227.

Lee J. W. (2013), The contribution of foreign direct investment to clean energy use, carbon emissions and economic growth. *Energy Pol*. 55, 483 – 489.

Lucas, Robert, (1990), Why Doesn't Capital Flow from Rich to Poor Countries? *American Economic Review*, 80(2) 92-96.

Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics*, 110 (3), 681–712.

Mielnik O., and Goldemberg J., (2000). Converging to a common pattern of energy use in developing and industrialized countries. *Energy Pol*. 28 503 - 508.

Mielnik, O., and Goldemberg, J. (2002). Foreign direct investment and decoupling between energy and gross domestic product in developing countries. *Energy policy*, 30(2), 87-89.

Mody, A., and Murshid, A. P. (2005). Growing up with capital flows. *Journal of International Economics*, 65(1), 249-266.

Mudakkar, S. R., Zaman, K., Shakir, H., Arif, M., Naseem, I., and Naz, L. (2013). Determinants of energy consumption function in SAARC countries: Balancing the odds. *Renewable and Sustainable Energy Reviews*, 28, 566-574.

North, D. (1990). *Institutions, Institutional Change and Economic Performance* (Political Economy of Institutions and Decisions). Cambridge: Cambridge University Press.

Okada, K. (2013). The interaction effects of financial openness and institutions on international capital flows. *Journal of Macroeconomics*, 35, 131-143.

Olaoye, O. P., Ayomitunde, A. T., Nwagwu, C. J., Jude-Okeke, Y., and Ezinwa, A. D. (2020). Energy consumption and foreign direct investment inflows in Nigeria: An empirical perspective. *International Journal of Energy Economics and Policy*, 10(2), 491.

Oliva, M. A., and Rivera-Batiz, L. A. (2002). Political institutions, capital flows, and developing country growth: An empirical investigation. *Review of Development Economics*, 6(2), 248-262.

Pao H. T., and Tsai C. M. (2011) Multivariate Granger causality between CO2 emissions, energy consumption, FDI (foreign direct investment) and GDP (gross domestic product): evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries, *Energy*, 36, 685 - 693.

Paramati S.R, Ummalla M., and Apergis N. (2016). The effect of foreign direct investment and stock market growth on clean energy use across a panel of emerging market economies, *Energy Econ*. 56 29-41.

Pazienza, P., and Vecchione, V. (2009). Preliminary investigation of the determinants of FDI distribution in Italy. *Journal of Business Economics and Management*, 10(2), 99-107.

Qamruzzaman, M., and Jianguo, W. (2020). The asymmetric relationship between financial development, trade openness, foreign capital flows, and renewable energy consumption: Fresh evidence from panel NARDL investigation. *Renewable Energy*, 159, 827-842.

Sadorsky P., (2011) Financial development and energy consumption in Central and Eastern European frontier economies. *Energy Pol*. 39 999 - 1006.

Sadorsky, P. (2010). The impact of financial development on energy consumption in emerging economies. *Energy Policy*, 38(5), 2528-2535.

Saidi, K., Hammami, S. (2015), The impact of CO2 emissions and economic growth on energy consumption in 58 countries. Energy Reports, 1, 62-70.

Soto, M. (2003). Taxing capital flows: an empirical comparative analysis. *Journal of Development Economics*, 72(1), 203-221.

Tang, C. F. (2009). Electricity consumption, income, foreign direct investment, and population in Malaysia. *Journal of Economic Studies*, 36(4), 371-382.

Ting, Y. U. E., Yin, L. R., and Ying, Z. Y. (2011). Analysis of the FDI effect on energy consumption intensity in Jiangsu province. *Energy Procedia*, 5, 100-104.

Tvaronavičienė, M. and Kalašinskaitė, K. (2010) Whether globalization in form of FDI enhances national wealth: empirical evidence from Lithuania. *Journal of Business Economics and Management* 11(1): 5–19. doi:10.3846/jbem.2010.01.

Tvaronavičiene, M., Grybaite, V., and Korsakiene, R. (2008). Foreign capital destinations: Baltic states versus India. *Journal of Business Economics and Management*, 9(3), 227-234.

UNCTAD. (2020), Investment flows in Africa set to drop 25% to 40% in 2020. Available from: https://unctad.org/news/investment-flows-africa-set-drop-25-40-2020.

Weng, Y., Yang, C. H., and Tu, F. C. (2010). Outward foreign direct investment and product quality of domestic productions: an empirical investigation. *Journal of Business Economics and Management* 11(3), 396–414. doi:10.3846/jbem.2010.19.

Xu, J., Zhou, M., and Li, H. (2016). ARDL based research on the nexus among FDI, environmental regulation and energy consumption in Shanghai (China). *Natural Hazards*, 81(1), 551-564.