Cuadernos de economía

ARTÍCULO

Banking Development, Economic Growth and Energy Consumption in Vietnam

Phuoc Minh Hiep[*a], Nguyen Van Tien[b], Dinh Xuan Hung[c], Phuoc Van Hanh[d,e], Ha Thi Viet Thuy[f,g]

[a]*Binh Duong University Journal of Science and Technology, Binh Duong, Vietnam; pmhiep@bdu.edu.vn*
[b]*Faculty of Business Administration, Banking University Ho Chi Minh City, Vietnam; tiennv@buh.edu.vn*
[c]*Faculty of Business Administration, Saigon University, Vietnam; hungdinh80@gmail.com*
[d]*Faculty of Business Administration, International University, Ho Chi Minh City, Vietnam*
[e]*International University, Vietnam National University Ho Chi Minh City, Vietnam; pvhanh@hcmiu.edu.vn*
[f]*Academy of Politics Region II, Ho Chi Minh City, Vietnam; Email: thuyhtv@hcma2.edu.vn*
[g]*University of Economics and Law, Vietnam National University Ho Chi Minh City, Vietnam; Email: thuyhtv20701@sdh.uel.edu.vn*
[*] *Correspondence: pmhiep@bdu.edu.vn (P.M.H.)*

Abstract: The main objective of this paper is to examine causal nexus between Banking Development, Economic Growth, and the Energy Consumption in the context of a single country. To achieve this objective, the data of banking development, economic growth and the energy consumption is collected for Vietnam. The data is sources from World Development Indicators (WDI), data spanning from 1995 to 2019 which covers a period of 25 years. Given the time series nature of the data, the paper uses the approach of Autoregressive Distributed Lag (ARDL). The findings suggest the economic growth, energy consumption and banking development in Vietnam are cointegrated, suggesting long run relation amongst the three variables. More precisely, the paper finds a positive impact of energy consumption as well as the banking development on economic growth. The research findings of this paper have several policy implications for Vietnam. The positive effect of energy consumption on the economic development of Vietnam suggest that the country is making efficient use of its energy consumption. Nevertheless, Vietnam must take cautious approach while harnessing energy consumption and continuously evaluate the channels. Moreover, Vietnam should also keep improving the banking system in order to support the long run economic growth in the Vietnam. As a direction for future research, researchers are suggested to employ non-linear approaches to evaluate the non-linear relationship between economic growth, banking development and energy consumption.

Author Correspondence: pmhiep@bdu.edu.vn

1.   Introduction

The beginning of the 21st century witnessed a huge research interest in the renewables as there is a large bunch of papers published in top academic journals on various aspects of renewable energy. Advances in scientific research are remarkable and keep pushing the renewable industry to become more efficient, at least from the cost perspective. In that sense, the researchers have made some significant inroads and have produced state-of-the-art technologies that are not just more reliable but also more practical. Even after truly path-breaking discoveries, the shift from non-renewable energy to renewable energy is still very sluggish. This is truer in case of developing countries as opposed to developed nations where the use of renewable energy has become significant over the past decade or so. The unfortunate part of low penetration of renewable energy in the developing country is the availability of abundance of renewable energy resources such as wind and solar energy. More importantly, these resources are available across developing countries and hence does not even require a centralized distribution place to spread energy to other regions. Moreover, there have been various incentive schemes introduced by governments, yet the adoption of these renewable energy is not picking as it supposed to be. Therefore, the potential of utilizing these renewable energy sources, somehow, remains limited as opposed to the potential adoption that a country can achieve. Moreover, the exponential increase in the population of these countries and the corresponding increase in the demand of energy has added to the already existing low energy supply issues.

Although conventional energy sources still form the major proportion in globally used energy, the enduring issue associated with the use of traditional energy is the CO_2 emitted in the atmosphere remains a matter of concern for stakeholders. In fact, CO_2 emission in the atmosphere due to use of traditional energy unsurprisingly forms the foremost source of CO_2 emission in the atmosphere. This has led to numerous issues, most notably, climate change due to global warming issues. The United Nations Organisation is diligently working towards educating nations on how to adopt more sustainable lifestyles and one of the main ways to achieve this goal is adoption of clean energy. In fact, the UN has provided a blueprint by proposing 17 Sustainable Development Goals (SDGs) with a view to realizing the vision of a more prosperous and peaceful place not just for the human being but also the natural environment and eco-systems. The adoption and promotion of clean energy is one of the key strategies proposed by the UN to tackle global warming. The presentation of UN's SDGs did create some effect on the developing countries and things have started to move in an eco-friendlier direction. Most notably, now there are various incentives and clear policies and procedures laid down by most of developing countries with regards to the use of and adoption of renewable source of energy. One of the main policies that these emerging countries have used is to provide solar panels at a heavily discounted price. This is done to encourage more and more people to install solar panels. In some cases, these solar panels are provided even at a discounted price of close to 80%. These countries have also drafted policies to buy the excess energy produced by these households. These incentive structures are supposed to provide good motivations for individual households as well as corporate organizations to adopt and use renewable energy sources.

The result of introduction of SDGs has also led to increased awareness about the issue of CO_2 being emitted in the atmosphere by use of traditional energy source among the institutional investors. This has forced the asset and the wealth managers to integrate climate change criteria in their investment models. Some of the retail investors are also becoming more aware about the gravity of the issue and are hence selecting fund managers that integrate these principles in their investment models. The criteria of integrating these principles while making investment has indirectly increased the adoption of renewable amongst the corporates that are willing to be categorized in those principles. In other words, this indirect pressure from institutional and some retail investors have increased the level of adoption rate of renewables amongst the government institutions, industry players, corporates, and the Non-Governmental Organizations (NGOs). The asset and the wealth managers have become the main channel of this increased adoption rate of shift from non-renewable energy to renewable energy.

The current spread of COVID 19 virus has also had an adverse effect on the energy prices. Although the lockdowns across the globe have led to lower consumption of energy and hence lower CO_2 emissions but the low consumption is not substantial enough to offset the overall greenhouse gas emitted in the atmosphere. In other words, a lower level of energy consumption is insignificant to achieve target emissions set by individual governments.

The current literature extensively shows the significance of Sustainable Development Goals in attaining long term economic growth. In other words, the current growth should not be achieved by consuming or destroying the resources meant for the consumption of future resources. In other words, the ways to achieve growth should be sustainable in a sense that we do not end up consuming the resources which should be made available for the future generations.

The technological developments which employ renewable energy sources permit policymakers to fill energy deficit and energy demand through expansion of energy securities. This would also reduce the nation's dependence on traditional energy sources such as coal. In fact, International Energy Agency (IEA) of United States (US) argues that the use of renewable energy sources is the only way to decrease dependency on conventional energy sources. The renewable source of energy is currently advocated to be a mode that can bring long term benefits by lowering the dependence on traditional fuels, improving climatic conditions (air quality) and lowering medical complications due to better air quality. Shifting from non-renewable energy sources to renewable energy sources also increases the amount of energy available at a lower cost and hence provides more employment opportunities, and helps in achieving a higher level of economic development.

Given the mounting evidence on the positive effects of renewable energy on the level of economic growth in a country, many emerging countries have started forming a steering committee on pushing the sustainable agenda of adopting renewable energy sources for meeting energy demands. These countries are developing their economic policies around the climate change agenda and have also executed experimental policies. By 2013, many countries introduced renewable energy specific policies clearly outlining the outreach to the households, corporates etc., and providing incentive structures that should be designed to

onboard these critical players. Some of these policies include investments in developing structure for renewables, green certifications, CO2 emission allocations, carbon credits, tax incentives etc. These policies have had a strong effect on the adoption of renewables amongst key players such as government institutions, industry players, corporates and Non-Governmental Organizations (NGOs). However, there are still gaps to fill before the success of these can be celebrated. Most notably, the lack of credit related to the adoption of renewables is still a major hurdle in widespread adoption of alternative energy amongst key players such as government institutions, industry players, corporates, and the Non-Governmental Organizations (NGOs). Not to mention, these issues are prevalent and severe in developing nations and hence the role of commercial lending banks is very critical to the success of policies related to the adoption of alternative energy as other sources of funds in the emerging markets are almost non-existent. Even within countries where we do have alternative sources of funds, given the fact that most of registered firms are categorized under the Micro, Small & Medium Enterprises (MSMEs) category, they find it particularly challenging to get access to funds through banks let alone other sources such as capital market.

The reforms in the monetary and the fiscal policies in Vietnam can be traced back to mid-70s which also coincides with the year of state reintegration. However, there are several mistakes that were made which the current Vietnamese government should avoid repeating. The fundamental flaw is the creation of a new banking system without giving up the command-and-control-system (Vuong, 1986). The main criticism of that move was that it opened doors for costly government interventions (Nguyen et al., 2019).

The issue of attracting bank deposits and the development of the interbank and the money market was tackled with the tight control over the interest rates. The economy of Vietnam continued to function through cash only (Tran, 2013). The attainment of a higher level of sustained economic development was made possible through significant policy reforms that led to high level of local savings and domestic investment. These savings and investments are utilized perfectly for the production purposes and incentivizing the small businesses (Suzuki et al., 2013). On the economic policy fronts, the monetary policies transformation mechanism was done through increasing the interest rates (real) to net positive, devaluation of the local currency to what it is operating in the shadow economy to stabilize the local currency market and form an integrated foreign exchange market (Busch, 2017).

Economic growth in the country was primarily a result of the liberalization of its economy which attracted Foreign Direct Investment (FDI) inflows and portfolio investments. The major investments came from South Korea, Singapore, and Taiwan (Vo et al., 2012). However, there is lot of policy uncertainty since then and it remains to be seen as to how long Vietnam can sustain its growth. However, the good news is that China is increasingly becoming more and more expensive, be it in form of wages or operating cost. Individual companies have already started to move out of China and relocate to other Southeast Asian countries to save cost. This provides a good opportunity for Vietnam to devise policies that provide good incentive structures for firms to move to Vietnam.

In addition to that, the global issue of not being able to meet the long-term energy demand are intractably related to the level of technological advancements in a country (Kaygusuz, 2012). However, more than 7 billion people living on this planet cannot be simply divided based on the continent or nation they reside in but based on their education, income, social trust, and the quality of life.

The Vietnamese financial market has drastically changed in the recent past. More precisely, the financial market has reduced its exclusive dependence on the banking sector and has availed the stock market for its development. Even the banking system has improved a lot over the years, and this is reflected in the loan quality of Vietnamese banks. For instance, the total credit by banks has decreased but the quality of this financing has significantly improved indicating Vietnamese banks preferring quality over quantity. Given the above arguments, the objective of this paper is to analyze the nexus between banking development, economic growth, and energy consumption.

To achieve the objective, the data of banking development, economic growth and energy consumption is sourced for Vietnam. The data is collected from World Development Indicators (WDI). The data spans from 1995 to 2019 and covers the period of 20 years. Given the time series nature of the data, the paper uses the approach of Autoregressive Distributed Lag (ARDL).

The findings suggest that banking development, economic growth and energy consumption in Vietnam is cointegrated, suggesting a long run relation amongst the three variables. Along the similar lines, the paper finds positive impact of energy consumption on the economic growth. These results are in line with the (Aslan et al., 2014; Omer, 2008; Ozturk, 2010; Ozturk et al., 2010). The positive association between the energy consumption and economic growth has been termed as the *"Growth led hypothesis"*. The growth hypothesis argues that a higher level of energy consumption leads to more economic output and hence economic growth. The research findings of this paper have several policy implications for Vietnam. The positive effect of energy consumption on the economic development of Vietnam suggest that the country is making efficient use of its energy consumption. Nevertheless, Vietnam must adopt a cautious approach while harnessing energy consumption and continuously evaluate the channels while doing so.

On the other hand, the positive effect of banking development is also in line with findings in the extant literature. For instance, the seminal work of King et al. (1993) is one of the first ones to empirically highlight a positive association between bank development and economic growth. Similar results are reported by Beck et al. (2004). The positive effect between banking development and economic growth can be attributed to the importance of having a sound banking structure to spur growth. The households and businesses in the emerging markets face serious hurdles with regards to access to finance. A developed banking system can remove this burden and provide better access to finance for both the household as well as the businesses. Easier access to finance assists the households in meeting their consumption needs and this can stimulate demand for more goods and services. Similarly, this increased demand can be met by businesses by having lower

barriers to finance. This phenomenon is going to improve the overall level of economic growth in a country. This hypothesis has been put forth as a *"Finance led growth"*.

Additionally, the findings indicate that even in the short run, banking development and energy consumption positively affect the economic growth. These findings have several implications. For instance, the policymakers can make use of energy consumption and banking development to fuel economic growth in Vietnam. The existing paper utilizes the linear cointegration approach whereby the findings from such methodological approach cannot tell us the about the possible non-linearity between the variables. For instance, the non-linear ARDL (NARDL) approach proposed by Shin et al. (2014) can tell whether an increase or decrease in banking development and energy consumption have a similar impact on the economic growth or of an increase or decrease in banking development and energy consumption has an asymmetric effect such that the increase is accompanied with a positive effect whereas the decrease has no or negative effect.

In the next section that follows, the paper organizes the existing work. The section has two sub-sections. The first section outlines the overview of energy consumption and economic growth whereas the second section provides an overview of energy consumption and financial development. In Section 3 (i.e., the research and the methodology section), the paper provides a brief overview of the methodological approach of ARDL. Moreover, it also provides the empirical model, information of the used variables as well as the source of these variables. In Section 4, the paper discusses the results and the findings and provides the underlying reasons for the results. Finally, Section 5 concludes with a brief overview of the paper as well as the implications and the limitations of the current study.

2.   Literature review

2.1   Economic growth and energy consumption

The findings of existing literature are conflicting and there are mainly three strands in the literature: positive, negative, and insignificant. The strand supporting a positive link argues that energy consumption positively influences the level of economic development (Apergis et al., 2009; Aslan et al., 2014). However, there are others who argue that economic growth positively affects energy consumption (Huang et al., 2008; Kasman et al., 2015; Narayan et al., 2010). This is referred to as conservative hypothesis. On the other hand, one strand argues for the presence of feedback hypothesis. The feedback hypothesis presents the findings of bi-directional causality between energy consumption and economic growth. In other words, the hypothesis argues that economic growth positively effects energy consumption (Belke et al., 2011; Coers et al., 2013; Costantini et al., 2010). Finally, one strand demonstrates an insignificant association between energy consumption and economic growth (Kahsai et al., 2012; Śmiech et al., 2014; Wolde-Rufael, 2009). These diverse findings can be attributed to different samples (individual countries and the regional countries), different data structure (time series, panel and cross-sectional), different time periods and different methodological approaches etc.

Extensive literature on the topic surfaced only after 2010. For instance, no significant evidence between economic growth and the energy consumption is found in Indonesia (Jafari et al., 2012). On the other hand, no evidence of significance is found between energy consumption and economic growth (Menegaki et al., 2016). Similarly, a bidirectional association is found between the GDP per capita and energy consumption (Ouedraogo, 2013). Similarly, a bidirectional association is also found between energy use and GDP growth in the Asian region (Nasreen and Anwar, 2014).

On the other hand, unidirectional association from energy consumption to GDP growth is reported in West Africa (Dogan, 2016). Similarly, a unidirectional relationship is also reported in Turkey (Acaravci et al., 2015). Similarly, unidirectional results running from energy consumption to economic growth are reported in the case of India (Masih et al., 1996). Similarly, evidence of growth hypothesis has also been confirmed by the study of Fatai et al. (2004). Conversely, the findings pointing to feedback hypothesis between GDP and energy use is reported in Turkey (Dogan, 2016) . Along the same lines, the evidence of feedback hypothesis is also found in Belgium (Dogan, 2016). Similarly, feedback results are also found in case of Japan (Furuoka, 2016). Alon the same lines, Shahbaz et al. (2016) also support the feedback evidence between the association between energy use and GDP growth. Correspondingly, a feedback hypothesis is confirmed for the case of India (Paul et al., 2004).

On the other hand, GDP growth is found to cause energy consumption in Asian countries (Fang et al., 2016). Conversely, a uni-directional relationship is found in case of China running from energy consumption to GDP growth (Furuoka, 2016). Similar unidirectional results running from GDP to energy consumption are found in case of India (Ghosh, 2002).

More recent works have explored the relationship between renewable energy consumption and economic growth (Edenhofer et al., 2013; Kander et al., 2014; Marques et al., 2016),

2.2   Economic growth and financial development

The association between financial development and economic growth has been a subject of numerous studies. It bears to note that most of the literature argues that financial institutions are the backbone of any country in that a well-functioning financial sector is good for long run economic growth. This strand is referred to as *"Finance led Growth"*. There is extensive evidence of empirical support in favor of tis strand. Mostly notably, King et al. (1993) and (Beck et al., 2004) are the most important evidence available in support of this strand. Similarly, Demirguc-Kunt (2008) argue that an efficient financial system reduces the transaction costs, and this is precisely the channel through which finance improves economic development. Similar results are also reported by Bittencourt (2012) and Murari (2017). However, the other strand questions the hypothesis that "*finance is good for growth*". In fact, they argue that the relevance of finance is overemphasized. For instance, the evidence provided demonstrates no significant evidence between economic growth and financial development (Demetriades et al., 2011; Gries et al., 2009). In fact, some of the studies show a negative relationship between GDP growth and the level of financial development (Iheanacho, 2016). Some of the more recent studies have shown a non-linear relationship between financial development and economic growth (Baloch et al., 2019; Nain et al., 2014).

3. Data and methodology

3.1 Data

The data pertaining to banking development, energy consumption and economic growth is collected from the World Development Indicators (WDI) from 1995 to 2019. Banking development is measured by domestic credit to private sector as a percentage of GDP. Energy consumption is measured by energy use – kilogram of oil equivalent per capita. Finally, economic growth is measured by the Real GDP per capita. The data of energy consumption is only available up to 2013 in WDI. The remaining six years of data is extrapolated from the available data on energy consumption. The data collection is dictated by the consistent availability of the data. The year 1995 is selected as the starting point for the measurement of banking development employed.

3.2 Methodology

In this section, the paper provides an overview of the methodological approach of ARDL proposed by M Hashem Pesaran et al. (1997) and the M. Hashem Pesaran et al. (2001). The main advantage of ARDL over other cointegration method is that the RDL approach can be used even in case where variable series are the combination of different integrating orders. For instance, ARDL approach can handle the modelling even if the series are the combination of I(0) and I(1). In case of frequently adopted method such as Engle et al. (1987), it is necessary for all variables to be integrating order of 1, that is, I(1). The approach proposed in Engle et al. (1987) is not suited for modelling if the variables are I(0) and I(1). Moreover, the methodology is inappropriate in case of multivariate variables. The approach of Søren Johansen (1988) and Soren Johansen et al. (1990) is better and found to be more efficient in case of multivariate series. First, the variables need not be I(1) such that ARDL approach can even handle variables with I(0) and I(1) (M Hashem Pesaran et al., 1997). Second, ARDL can even work with small sample size and still produce efficient and consistent results (Ghatak et al., 2001). Third, the approach of ARDL overcomes the issue of non-stationary series as opposed to other approaches (Laurenceson et al., 2003).

The approach of ARDL essentially comprises of the following stages. The first step involves testing for the order of series by conducting unit root tests. The unit root tests are conducted by using Dickey Fuller (proposed by Dickey et al. (1979)), Augmented Dickey Fuller (proposed by Dickey et al. (1979)) and the Phillips and Perron (Phillips et al. (1988)). The second step involves testing for the existence of cointegration between the variables. The test is conducted by following the bound estimating process. This cointegration test can tell us the existence of log term relationship between the variable's understudies.

To unit root tests and the ARDL estimation, the paper uses following equations:

$$EG_t = \alpha + \beta BD_t + \gamma EC_t + \varepsilon_t \tag{1}$$

In the equation (1), EG is the economic growth in Vietnam at time 't'. BD is the banking development of Vietnam at time 't'. EC is the banking development of Vietnam at time 't'. ß and the γ are the coefficients of banking development and energy consumption, respectively. The significance of the coefficients ß and γ indicates significant association between economic growth, banking development and energy consumption.

The ARDL model of the above equation can be written as follows:

$$EG_t = \alpha + \sum_{i=1}^n \beta BD_{t-i} + \sum_{i=1}^n \gamma EC_{t-i} + \sum_{i=1}^n \phi \Delta BD_{t-i} + \sum_{i=1}^n \lambda \Delta EC_{t-i} + \varepsilon_t \tag{2}$$

In the above equation 2, the paper uses the bound testing approach to assess the long run association.

Once, the paper establishes a long run cointegration among the variables, the paper estimates following equation to estimate the long run coefficients:

$$EG_t = \alpha + \sum_{i=1}^n \beta BD_{t-i} + \sum_{i=1}^n \gamma EC_{t-i} + \varepsilon_t \tag{3}$$

In the above equation 3, ß and γ indicates long run associations. The lag selection criteria were selected based on the Akaike Information Criterion (AIC). The AIC is suitable to find the appropriate lags.

In the above equation, different lags are used for different variables. As mentioned above, the lag selection was determined using the method of AIC. The estimated ß and γ would reveal the sign, significance, and the magnitude of the long run associations between the variables. The positive and significant ß and γ would imply that the BD and the EC as an impact on EG which is not just positive but also significant. The above equation is further augmented to included error correction term. The estimated coefficient of error correction and the coefficients of differenced form of independent variables would enable us to assess the short run relationship among the variables.

The equation 2 is augmented and written down as follows:

$$EG_t = \alpha + \sum_{i=1}^n \phi \Delta BD_{t-i} + \sum_{i=1}^n \lambda \Delta EC_{t-i} + \mu ECT_{t-1} + \varepsilon_t \tag{4}$$

In the above equation 4, ECT is the error correction term. ECT is also referred to as the speed of adjustment. The coefficient of the error correction term enables the researcher the time it takes for the equation to return to its equilibrium in case of shocks to the system. On the other hand, φs and the λs are the short run coefficients. The significant of these coefficients would enable the researchers to know whether the BD and the EC have short term effects on the EG or not.

4. Results and discussion

To test the stationarity and the integration of the variables, unit root tests of DF, ADF and the PP are conducted. The results of unit root tests are provided in the Table 1 below.

Table 1. Unit Root Tests based on Augmented Dickey Fuller and the Phillips-Perron tests

Variables	ADF		PP	
	Level	First Difference	Level	First Difference
EG	3.67161	-3.9267**	5.6719***	-4.7818***
BD	1.9191	-4.7851***	1.2281	-3.9991***
EC	0.4861	-4.2892***	0.6671	-3.7761***

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

The findings based on unit root test (Table 1) suggest that the variables are I(1) except for economic growth. The unit root tests of economic growth are conflicting as the ADF test indicates that the variable is I(1) whereas the PP test

suggests that it is I(0). Even if economic growth is I(0), the approach of ARDL employed in this paper is capable of handling the mix of I(1) and I(0) variables.

Table 2. Bound tests to assess cointegration

Cointegration tests	F-statistics	t-statistics	p-values
F (EG|BD|EC)	6.8871***	-4.8856	0.002

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

The second step in the time-series estimation is the test of cointegration among the variable's understudies. The test seeks to investigate if there is a long run relationship between the variables or not. The bound tests to assess the cointegration between the variables are provided above in the Table 2. The significance of F-statistics at 1% significance level suggests the existence of cointegration among the variables. In other words, the findings indicate that there is a long run association between economic growth, banking development and energy consumption.

The third step in the ARDL approach is to estimate the long run coefficients of the independent variables. The estimated coefficients from ARDL method are presented below in Table 3. The results show the positive effect of banking development and energy consumption on economic growth. These results are in line with the findings presented in the extant literature. For instance, the positive impact of energy consumption on economic growth can be attributed to the growth led hypothesis (Aslan et al., 2014; Ozturk et al., 2010). The growth hypothesis argues that a higher level of energy consumption leads to more economic output and hence, a higher level of economic growth.

Table 3. Estimated long run coefficients from ARDL approach

Variables	Coefficients	Standard errors	p-values
BD	0.8927***	0.2264	0.003
EC	1.8745***	0.2291	0.001
Constant	0.7331***	0.7627	0.056

*,**,*** *denotes significance at 10%, 5% and 1% respectively. The dependent variable is economic growth.*

On the other hand, the positive effect of banking development is also in line with the extant literature. For instance, the seminal work of King et al. (1993) is one of the pioneer studies to empirically highlight a positive association between bank development and economic growth. Similar results are reported by Beck et al. (2004). The positive effect between banking development and economic growth can be attributed to the importance of having a sound banking structure to spur growth. The households and businesses in the emerging markets face serious hurdles with regards to access to finance. A developed banking system can remove this burden and provide better access to finance to both, the households as well as the businesses. Easier access to finance assists the households in meeting their consumption needs and this can stimulate demand for more goods and services. Similarly, this increased demand can be met by businesses by having lower barriers to finance. This phenomenon is going to improve the overall level of economic growth in a country. This hypothesis has been put forth as a *"Finance led growth"*.

The final step in the ARDL approach is the estimation of the error correction term and the short run coefficients. The error correction results are presented in Table 4. The negative coefficient and the significance of error correction term reflects the time it takes for the variable to come back to equilibrium once shocked. In other words, error correction

term is the speed of adjustment taking place every period once the equation goes into disequilibrium. For instance, in this case, an error correction term of 0.11 indicates that 11% of the disequilibrium will be corrected in the current year. More importantly, all the coefficients are significant and like the long run coefficients. For instance, banking development and energy consumption have a positive and significant effect on the economic growth of the Vietnamese economy. These results indicate that banking development and energy consumption impact the economic development in Vietnam not only in the long run but also in the short run. Overall, findings indicate that energy consumption and banking development can be used as a policy measure to stimulate economic growth not only in the long run but also in the short run.

Table 4. Error correction model of the cointegrating variables

Variables	Coefficients	Standard errors	p-values
BD	0.6639	0.1987	0.058
EC	0.0546	0.2928	0.001
Constant	0.4899	0.3475	0.006
Error correction model (-1)	-0.1138	0.9191	0.001

*,**,*** *denotes significance at 10%, 5% and 1% respectively. The dependent variable is economic growth.*

5. Conclusion

The continuous expansion of economies globally has resulted in increased energy demand across the globe. The relationship is more closely linked in the case of emerging economies as they are growing faster than their developed counterparts. As banking development is key to economic growth as well as energy consumption, this study adds banking development to the nexus between economic growth and the energy consumption. Moreover, it has been argued that without the inclusion of banking development measures in the energy demand modelling, the prediction of economic growth is likely to be overestimated (Sadorsky, 2010). In essence, economic growth is strongly linked with the level of banking development as well as the energy consumption, especially for a developing country.

Given the above arguments, the objective of this paper is to analyze the nexus between banking development, economic growth, and energy consumption. The main objective of this paper is to investigate the nexus between economic growth, energy consumption and the banking development in a developing country. Vietnam is identified as a country of choice for this paper as Vietnam is one of the most important countries and emerging economies in the ASEAN region.

To achieve the objective of this paper, data on key parameters such as banking development, economic growth and energy consumption was sourced from the World Development Indicators (WDI). The data covers a period of 25 years, spanning from 1995 to 2019. As the current study is a single country study and based on macroeconomic data, the data collected forms a time series. Given the time series nature of the data, the paper uses the approach of Autoregressive Distributed Lag (ARDL). The study prefers the approach of ARDL as opposed to other approaches for several reasons. First, ARDL approach is suited to handle the variable of both I(1) and I(0) as opposed to Engle and Granger approach that can only handle the variables that have an

integrated order of 1, that is I(0). Second, the ARDL approach is known to better results in case of smaller samples.

The results of the ARDL approach indicate at least one cointegration between banking development, economic growth and energy consumption. The presence of cointegration indicates long run relationship between the variables. The estimation of long run coefficients indicates the presence of a significantly positive relationship between economic growth – energy consumption, and economic growth – banking development.

The significant and positive effect of energy consumption on economic growth indicates the presence of confirmation to "*Growth led hypothesis*". As per this hypothesis, a higher level of energy consumption signifies a higher economic output and hence higher economic growth. These findings are similar to findings by Aslan et al. (2014) and Ozturk et al. (2010).

Similarly, the positive effect of banking development on economic growth is not surprising. This positive effect can be attributed to importance of good banking sector in a developing economy. Critical economic agents such as households and small businesses in the emerging markets are faced with many hurdles. One of the key challenges faced by households and the small businesses is the poor access to funds that can meet their needs vis-a-vis consumption and working capital. In an economy with well-functioning banking institutions, households and small businesses have easier access to funds. This access to funds makes it easier for households and small businesses to meet their consumption needs, stimulating demand for more goods and services. Similarly, this increased demand can be met by businesses by having lower barriers to finance. This phenomenon is going to improve overall level of economic growth in a country. This hypothesis has been put forth as a "*Finance led growth*". The findings presented in this paper are+ in line with the scholarly work of King et al. (1993) and Beck et al. (2004).

The results of the paper have significant implications for the Vietnamese economy. The positive effect of energy consumption on the economic development of Vietnam suggests that the country is making efficient use of its energy consumption. Nevertheless, Vietnam must take cautious approach while harnessing energy consumption and continuously evaluate the channels while doing so.

Moreover, the results suggest the presence of a short run relationship among economic development, banking development and energy consumption. Policymakers in the government can use the regressors as a policy variable to influence economic growth in the Vietnamese economy. This paper has employed the linear time series approach of ARDL. The results from such approaches are not able to determine whether the relationship between the dependent and the independent variables is non-linear or not. This is one of the major limitations of this paper. Future researchers should evaluate the non-linearity between the employed variables. This can be examined using the non-linear ARDL (NARDL) approach proposed by Shin et al. (2014).

References

Acaravci, A., Erdogan, S., & Akalin, G. (2015). The electricity consumption, real income, trade openness and foreign direct investment: The empirical evidence from Turkey. *International Journal of Energy Economics and Policy, 5*(4), 1050-1057.

Apergis, N., & Payne, J. E. (2009). Energy consumption and economic growth: Evidence from the Commonwealth of Independent States. *Energy Economics, 31*(5), 641-647. doi:https://doi.org/10.1016/j.eneco.2009.01.011

Aslan, A., Apergis, N., & Topcu, M. (2014). Banking development and energy consumption: Evidence from a panel of Middle Eastern countries. *Energy, 72*, 427-433. doi:https://doi.org/10.1016/j.energy.2014.05.061

Baloch, M. A., Danish, & Meng, F. (2019). Modeling the non-linear relationship between financial development and energy consumption: statistical experience from OECD countries. *Environmental Science and Pollution Research, 26*(9), 8838-8846. doi:https://doi.org/10.1007/s11356-019-04317-9

Beck, T., & Levine, R. (2004). Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance, 28*(3), 423-442. doi:https://doi.org/10.1016/S0378-4266(02)00408-9

Belke, A., Dobnik, F., & Dreger, C. (2011). Energy consumption and economic growth: New insights into the cointegration relationship. *Energy Economics, 33*(5), 782-789. doi:https://doi.org/10.1016/j.eneco.2011.02.005

Bittencourt, M. (2012). Financial development and economic growth in Latin America: Is Schumpeter right? *Journal of Policy Modeling, 34*(3), 341-355. doi:https://doi.org/10.1016/j.jpolmod.2012.01.012

Busch, M. (2017). The missing middle: A political economy of economic restructuring in Vietnam. Retrieved from http://hdl.handle.net/11540/7748

Coers, R., & Sanders, M. (2013). The energy–GDP nexus; addressing an old question with new methods. *Energy Economics, 36*, 708-715. doi:https://doi.org/10.1016/j.eneco.2012.11.015

Costantini, V., & Martini, C. (2010). The causality between energy consumption and economic growth: A multi-sectoral analysis using non-stationary cointegrated panel data. *Energy Economics, 32*(3), 591-603. doi:https://doi.org/10.1016/j.eneco.2009.09.013

Demetriades, P. O., & James, G. A. (2011). Finance and growth in Africa: The broken link. *Economics Letters, 113*(3), 263-265. doi:https://doi.org/10.1016/j.econlet.2011.08.007

Demirguc-Kunt, A. (2008). Finance, financial sector policies, and long-run growth.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association, 74*(366a), 427-431. doi:https://doi.org/10.1080/01621459.1979.10482531

Dogan, E. (2016). Analyzing the linkage between renewable and non-renewable energy consumption and economic growth by considering structural break in time-series data. *Renewable Energy, 99*, 1126-1136. doi:https://doi.org/10.1016/j.renene.2016.07.078

Edenhofer, O., Hirth, L., Knopf, B., et al. (2013). On the economics of renewable energy sources. *Energy Economics, 40*, S12-S23. doi:https://doi.org/10.1016/j.eneco.2013.09.015

Engle, R. F., & Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica, 55*(2), 251-276. doi:https://doi.org/10.2307/1913236

Fang, Z., & Chang, Y. (2016). Energy, human capital and economic growth in Asia Pacific countries — Evidence from a panel cointegration and causality analysis. *Energy*

Economics, 56, 177-184. doi:https://doi.org/10.1016/j.eneco.2016.03.020

Fatai, K., Oxley, L., & Scrimgeour, F. G. (2004). Modelling the causal relationship between energy consumption and GDP in New Zealand, Australia, India, Indonesia, The Philippines and Thailand. *Mathematics and Computers in Simulation, 64*(3), 431-445. doi:https://doi.org/10.1016/S0378-4754(03)00109-5

Furuoka, F. (2016). Natural gas consumption and economic development in China and Japan: An empirical examination of the Asian context. *Renewable and Sustainable Energy Reviews, 56*, 100-115. doi:https://doi.org/10.1016/j.rser.2015.11.038

Ghatak, S., & Siddiki, J. U. (2001). The use of the ARDL approach in estimating virtual exchange rates in India. *Journal of Applied Statistics, 28*(5), 573-583. doi:https://doi.org/10.1080/02664760120047906

Gries, T., Kraft, M., & Meierrieks, D. (2009). Linkages Between Financial Deepening, Trade Openness, and Economic Development: Causality Evidence from Sub-Saharan Africa. *World Development, 37*(12), 1849-1860. doi:https://doi.org/10.1016/j.worlddev.2009.05.008

Huang, B.-N., Hwang, M. J., & Yang, C. W. (2008). Causal relationship between energy consumption and GDP growth revisited: A dynamic panel data approach. *Ecological Economics, 67*(1), 41-54. doi:https://doi.org/10.1016/j.ecolecon.2007.11.006

Iheanacho, E. (2016). The Impact of Financial Development on Economic Growth in Nigeria: An ARDL Analysis. *Economies, 4*(4), 26. doi:https://doi.org/10.3390/economies4040026

Jafari, Y., Othman, J., & Nor, A. H. S. M. (2012). Energy consumption, economic growth and environmental pollutants in Indonesia. *Journal of Policy Modeling, 34*(6), 879-889. doi:https://doi.org/10.1016/j.jpolmod.2012.05.020

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2), 231-254. doi:https://doi.org/10.1016/0165-1889(88)90041-3

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and statistics, 52*(2), 169-210. Retrieved from https://digidownload.libero.it/rocco.mosconi/JohansenJuselius1990.pdf

Kahsai, M. S., Nondo, C., Schaeffer, P. V., et al. (2012). Income level and the energy consumption–GDP nexus: Evidence from Sub-Saharan Africa. *Energy Economics, 34*(3), 739-746. doi:https://doi.org/10.1016/j.eneco.2011.06.006

Kander, A., & Stern, D. I. (2014). Economic growth and the transition from traditional to modern energy in Sweden. *Energy Economics, 46*, 56-65. doi:https://doi.org/10.1016/j.eneco.2014.08.025

Kasman, A., & Duman, Y. S. (2015). CO2 emissions, economic growth, energy consumption, trade and urbanization in new EU member and candidate countries: A panel data analysis. *Economic Modelling, 44*, 97-103. doi:https://doi.org/10.1016/j.econmod.2014.10.022

Kaygusuz, K. (2012). Energy for sustainable development: A case of developing countries. *Renewable and Sustainable Energy Reviews, 16*(2), 1116-1126. doi:https://doi.org/10.1016/j.rser.2011.11.013

King, R. G., & Levine, R. (1993). Finance and Growth: Schumpeter Might Be Right*. *The Quarterly Journal of Economics, 108*(3), 717-737. doi:https://doi.org/10.2307/2118406

Laurenceson, J., & Chai, J. C. (2003). *Financial reform and economic development in China*: Edward Elgar Publishing.

Marques, A. C., Fuinhas, J. A., & Menegaki, A. N. (2016). Renewable vs non-renewable electricity and the industrial production nexus: Evidence from an ARDL bounds test approach for Greece. *Renewable Energy, 96*, 645-655. doi:https://doi.org/10.1016/j.renene.2016.05.033

Masih, A. M. M., & Masih, R. (1996). Energy consumption, real income and temporal causality: results from a multi-country study based on cointegration and error-correction modelling techniques. *Energy Economics, 18*(3), 165-183. doi:https://doi.org/10.1016/0140-9883(96)00009-6

Menegaki, A. N., & Tugcu, C. T. (2016). Rethinking the energy-growth nexus: Proposing an index of sustainable economic welfare for Sub-Saharan Africa. *Energy Research & Social Science, 17*, 147-159. doi:https://doi.org/10.1016/j.erss.2016.04.009

Murari, K. (2017). Financial Development–Economic Growth Nexus: Evidence from South Asian Middle-income Countries. *Global Business Review, 18*(4), 924-935. doi:https://doi.org/10.1177%2F0972150917692245

Nain, M. Z., & Kamaiah, B. (2014). Financial development and economic growth in India: some evidence from non-linear causality analysis. *Economic Change and Restructuring, 47*(4), 299-319. doi:https://doi.org/10.1007/s10644-014-9151-5

Narayan, P. K., Narayan, S., & Popp, S. (2010). A note on the long-run elasticities from the energy consumption–GDP relationship. *Applied Energy, 87*(3), 1054-1057. doi:https://doi.org/10.1016/j.apenergy.2009.08.037

Nguyen, P. A., Abbott, M., & Nguyen, T. L. T. (2019). The development and cost of renewable energy resources in Vietnam. *Utilities Policy, 57*, 59-66. doi:https://doi.org/10.1016/j.jup.2019.01.009

Omer, A. M. (2008). Energy, environment and sustainable development. *Renewable and Sustainable Energy Reviews, 12*(9), 2265-2300. doi:https://doi.org/10.1016/j.rser.2007.05.001

Ouedraogo, N. S. (2013). Energy consumption and economic growth: Evidence from the economic community of West African States (ECOWAS). *Energy Economics, 36*, 637-647. doi:https://doi.org/10.1016/j.eneco.2012.11.011

Ozturk, I. (2010). A literature survey on energy–growth nexus. *Energy Policy, 38*(1), 340-349. doi:https://doi.org/10.1016/j.enpol.2009.09.024

Ozturk, I., Aslan, A., & Kalyoncu, H. (2010). Energy consumption and economic growth relationship: Evidence from panel data for low and middle income countries. *Energy Policy, 38*(8), 4422-4428. doi:https://doi.org/10.1016/j.enpol.2010.03.071

Paul, S., & Bhattacharya, R. N. (2004). Causality between energy consumption and economic growth in India: a note on conflicting results. *Energy Economics, 26*(6), 977-983. doi:https://doi.org/10.1016/j.eneco.2004.07.002

Pesaran, M. H., & Pesaran, B. (1997). Working with microfit 4.0. *Camfit Data Ltd, Cambridge*. Retrieved from https://proformas.ljmu.ac.uk/7515AE.pdf

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326. doi:https://doi.org/10.1002/jae.616

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335-346. doi:https://doi.org/10.1093/biomet/75.2.335

Sadorsky, P. (2010). The impact of financial development on energy consumption in emerging economies. *Energy Policy, 38*(5), 2528-2535. doi:https://doi.org/10.1016/j.enpol.2009.12.048

Shahbaz, M., Mallick, H., Mahalik, M. K., et al. (2016). The role of globalization on the recent evolution of energy demand in India: Implications for sustainable development. *Energy Economics, 55*, 52-68. doi:https://doi.org/10.1016/j.eneco.2016.01.013

Śmiech, S., & Papież, M. (2014). Energy consumption and economic growth in the light of meeting the targets of energy policy in the EU: The bootstrap panel Granger causality approach. *Energy Policy, 71*, 118-129. doi:https://doi.org/10.1016/j.enpol.2014.04.005

Tran, V. T. (2013). Vietnamese Economy at the Crossroads: New Doi Moi for Sustained Growth. *Asian Economic Policy Review, 8*(1), 122-143. doi:https://doi.org/10.1111/aepr.12012

Vo, T. T., & Nguyen, D. A. (2012). Experiences of Vietnam in FDI Promotion: Some Lessons for Myanmar. *Economic Reforms in Myanmar: Pathways and Prospects, edited by Hank Lim and Yasuhiro Yamada, BRC Research Report*(10). Retrieved from https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/10_04.pdf

Vuong, Q. H. (1986). The Vietnamese financial economy: reforms and development, 1986-2016. *Vuong, QH (2019)."The financial economy of Viet Nam in an age of reform, 2016*, 201-222. Retrieved from https://ssrn.com/abstract=3382798

Wolde-Rufael, Y. (2009). Energy consumption and economic growth: The experience of African countries revisited. *Energy Economics, 31*(2), 217-224. doi:https://doi.org/10.1016/j.eneco.2008.11.005