Er, Bünyamin; Güneysu, Yusuf; Ünal, Hüseyin

Article

Financing renewable energy projects : an empirical analysis for Turkey

Reference: Er, Bünyamin/Güneysu, Yusuf et. al. (2018). Financing renewable energy projects : an empirical analysis for Turkey. In: International Journal of Energy Economics and Policy 8 (6), S. 180 - 185.
doi:10.32479/ijeep.7025.

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2018, 8(6), 180-185.

Financing Renewable Energy Projects: An Empirical Analysis for Turkey

Bünyamin Er*, Yusuf Güneysu, Hüseyin Ünal

Faculty of Business and Economics, Karadeniz Technical University, Turkey. *Email: ber@ktu.edu.tr

Received: 09 August 2018 **Accepted:** 16 October 2018 **DOI:** https://doi.org/10.32479/ijeep.7025

ABSTRACT

The main purpose of this study is to estimate the impact of foreign direct investment (FDI) inflows and stock market capitalization on the renewable energy consumption (REC). In addition, the study aims to ivestigate the impact of financial development (FD) and research-development expenditures (R and D) on the REC. The study utilizes annual data from 1990 to 2015 in Turkey using the autoregressive distributed lag (ARDL) approach. The findings show that, based on the ARDL estimates, there exist long-run equilibrium relationships among the variables. The results of this study also indicate that the REC is mainly determined by FDI inflows, FD and research-development expenditures in the long run.

Keywords: Renewable Energy, Foreign Direct Investment, Stock Market Capitalization, ARDL Approach
JEL Classifications: C51, G10, Q42

1. INTRODUCTION

The energy sector is directly linked to the sustainability and vitality of a country's economy. Major decisions made about the energy sector have a ripple effect throughout the economy. Renewable energy investments are evaluated in the same way as others. However, these investments have some characteristics that require a different understanding (Donastorg et al., 2017).

As one of the fastest growing sectors in the world economy, renewable energy has both financial and environmental precaution. This has emerged as a consequence of concerns about energy sustainability and climate change and increasing technological developments (Crampton, 2015). Many developing countries have taken measures to reduce carbon emissions. Renewable energy conversion steps have been taken for this purpose. However, the financial constraints that countries face are making this transition more difficult and costly (Donastorg et al., 2017). Along with the effects of pollution and the need for alternative fuels, the interest in renewable energy has increased. This interest will continue to increase investments (Crampton, 2015).

The basic concept to understand the economic competitiveness of any energy project is the true cost of the project against the benefits obtained throughout the life cycle, regardless of whether it is a fossil or a renewable resource. This concept is either based on many investment decisions or the financial costs of the project. Therefore, financial resources in terms of energy projects and the cost of these resources have a lot of precaution. Financial instruments for financing energy projects can be created, designed and implemented by the private or public sector. However, private sector participation in energy conversion programs in countries is a necessity rather than an option. Because energy sector provides strong benefits not only for the country but also for non-state enterprises. In this context, an appropriate financial and political framework should be established for private sector cooperation in renewable energy projects (Donastorg et al., 2017).

In developing countries, the renewable energy investments are especially predominated by the state. However, renewable energy investments by the private sector are well below the expected levels. The main causes of this situation described by Griffith-Jones et al. (2012) are economics of renewable energy, access to finance, uncertainty and risk. It is also argued that, as the production costs per unit of energy are usually higher than fossil fuels, the economics of renewable energy is generally not competitive (Griffith-Jones et al., 2012). Furthermore, researchers indicate that, because of the higher costs of the renewable energy investments compared to the fossil fuels, the investment return periods are overlong and this negatively affects the uncertainty and risk level of the investments in question.

“Risk and return” are the key terms in understanding any financial and investment decision. Financial institutions want to obtain a risk-proportional return that they undertake. From this point of view, the more risk, the greater expectation of a return. Different financial institutions have a wide portfolio of investment portfolios, such as the high risk level for investing in new technology companies and the lower risk level for investing in more mature technologies. Renewable energy investments have also a wide spectrum of risk-return. All financial actors have to understand the risks they face and have to create the tools necessary to manage or to minimize these risks (Hamilton and Justice, 2009).

The finance sector has a similar approach to renewable energy investments, as it does with other investments. Renewable energy investments, however, have certain characteristics that require an additional level of understanding. These include different topics, policies and regulations on the feasibility of an investment (Hamilton and Sophie, 2009).

According to a report published by NREL (National Renewable Energy Laboratory), meeting the financing needs resulting from significant expansion of renewable energy facilities will require access to a wide range of new financial capital resources. In the same report, it was stated that more capital market opportunities would have different consequences such as reducing and accelerating the cost of renewable energy technologies, expanding market opportunities and promoting scale economies (Mendelsohn and Feldman, 2015).

This study examines the relation between renewable energy investments and the indicators to be taken as alternative financial tools that could be used in the financing of renewable energy projects.

The rest of the paper is organized as follows: Section 2 covers a brief review of literature on renewable energy, Section 3 and 4 presents the econometric methods and empirical findings, and the final section provides the result and evaluation.

2. FINANCING ALTERNATIVES FOR RENEWABLE ENERGY INVESTMENTS AND RELATED LITERATURE

The report prepared by EESI (Environmental and Energy Study Institute) describes three different methods for the financing of renewable energy projects: Master limited partnerships, real estate investment trusts, and crowdfunding. Master limited partnerships are taxed as partnerships but are traded on stock exchanges and can sell shares similarly to C-corporations (Blaise, 2012). Real estate investment trusts are companies that own, and often manage, income-producing properties and are publicly traded as liquid stocks on major exchanges (Blaise, 2012). Through investment funds, investors can provide financial support to these projects by investing in capital market instruments of companies with renewable energy projects.

On the other hand, crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business venture. For entrepreneurs who do not have adequate support from traditional sources of funding, crowdfunding platforms can be a solution. Through these platforms, entrepreneurs can make public invitations and raise funds by calling on people and publishing visual materials prepared by their projects through platforms. Crowdfunding can also be an important funding method for Industry 4.0. As industry 4.0 projects are costly, entrepreneurs can benefit from crowdfunding platforms and provide the financing needed for their projects.

In terms of companies, there are two main different options that a renewable energy company can provide financing. One is borrowing from banks and the other is providing capital from private equity companies in exchange for their shares.

Banks lend loans to renewable energy projects and focus on repaying these loans. Private equity companies provide support to projects with higher risks through partnership method. After the partnership, they aim to achieve higher returns with different exit strategies such as public offering. In private equity companies, the risk side of the equation is important. Because many of the projects that have high risks can result in failure.

For renewable energy investments, there are limited opportunities to raise funds from capital markets. In this sense public resources are often less costly. In terms of capital market resources, the supply of capital is very limited and the limited supply is provided by a small number of suppliers. For this reason, access to capital market resources is difficult in terms of renewable energy projects. The situation is not different in terms of individual investors. Renewable energy investment opportunities for individual investors are limited to investments in publicly traded companies. In other words, individual investors can give financing support to the renewable energy projects by investing in a publicly traded company (Schwabe et al., 2012). For this reason, capital markets and especially the initial public offering (IPO) market need to be developed to increase access to financing resources of renewable energy projects. The development of capital markets, together with the IPO, will increase the pool of potential investors and reduce resource and transaction costs for renewable energy projects.

However, funding alone is not enough to scale energy efficiency and renewable energy investments. The most effective way of encouraging new generation investment activities and opening up the development of secondary markets is access to public capital markets (NIBS, 2015). The development of capital markets will reveal special investments such as securities investment funds focused on energy investments. These investments will provide opportunities for strengthening private capital, creating scale economies for project implementation and development, and reducing the need for direct government subsidies. This makes advanced energy financing strategies extremely important for economic development (NIBS, 2015).

Since the renewable energy sector has become one of the priorities of the economic and environmental world in recent years (Mendelsohn and Feldman, 2015), different researches are being made on this topic. The majority of these surveys (Apergis and Danuletiu, 2014; Bakırtas and Cetin, 2016; Apergis and Payne, 2010; Pao and Fu, 2013; Lin and Mourabak, 2014) were made on the relationship between renewable energy consumption (REC) and economic development. In the studies on renewable energy financing (Lyu and Anna, 2018; Donastorg et al., 2017; Griffith-Jones et al., 2012), different financial alternatives have been examined.

As mentioned before, private equity investments, capital markets, and the banking system play an important role in financing of renewable energy investments. Foreign direct investments (FDI) are made within the scope of investments in equity investments such as private equity fund, venture capital (Ptaceka et al., 2015), and sovereign wealth funds (Ramamurti, 2011). Therefore, it can be said that there is a correlation between FDI and private capital investments. In this study, FDI were taken as a demonstration of private capital investments and the effect on the financing of renewable energy investments was investigated.

The source of FDI is multinational companies. In international climate change negotiations, technology and finance sectors have emerged as critical sectors due to low carbon emissions (Hanni et al., 2011). The renewable energy sector, however, is also considered in this context due to its advanced technology and low carbon emissions.

FDI is a source of finance that allows businesses to grow. FDI can also be a source of innovation that promotes energy efficiency (Doytch and Narayan, 2016). In the literature, renewable energy and FDI relation have been investigated in different aspects.

Hanni et al. (2011) investigated the impact of FDI on renewable energy. The findings suggest that those governments seeking to target FDI as a source of external climate change finance must be mindful in particular of the motivations of the investors they are targeting, as well as the state of their domestic energy policies. Mert and Boluk (2016) investigated the effects of FDI and REC on carbon dioxide emissions. Researchers have reached the conclusion that REC reduces carbon emissions. Doytch and Narayan (2016) investigated the relationship between FDI and energy demand in their research. The results of the study point broadly to an energy consumption-reducing effect with respect to non-renewable sources of energy and an energy consumption-augmenting effects with respect to renewable energy.

Another source of funding for renewable energy investments is capital market. Based on the classical theory of international trade, capital moves across international boundaries until marginal productivity of capital is equal in all markets (Strickland and Homaifar, 1990). Therefore, capital flows through international markets through indirect foreign investments, which constitute another pillar of foreign investments. Capital markets offer opportunities both initial funding of renewable energy investments and refinancing at later stages of the investment. Kutan et al. (2018) studied the effects of FDI and stock market development on REC for Brazil, China, India and South Africa. As a result of the research, both FDI flows and stock market development have had a significant effect on REC. Paramati et al. (2017) reached the conclusion that stock market development has reduced carbon emissions.

In this study, stock market capitalization (SMC) value is taken as an indicator to evaluate the situation of financing of renewable energy investments of capital markets and it is included in the research model.

The banking system is another important option for the financing of renewable energy investments. The credit capability of the banking system is directly related to financial development (FD). With FD, credit costs are reduced and access to financial resources is facilitated. In addition, the effects of FD on electricity consumption were investigated, mainly in studies on energy and FD (Sadorsky, 2010; Sadorsky, 2011; Islam et al., 2013; Chang, 2015; Komal and Faisal, 2015). In this study, the effect of FD on renewable energy investments will be investigated.

According to the scenario of the international energy agency (IAE), renewable energy can cover nearly half of the global energy demand by 2050. Because there is a serious technology in the background of renewable energy investments, the availability of more of the potential of renewable energy resources depends on technological developments. Technology can be produced on the basis of research and development studies. Research and development with a medium and long-term perspective is needed to underpin long-term improvements in renewable technologies and enables breakthroughs that could give such technologies a decisive advantage in energy markets (ISPRE, 2009). From this point of view, public support can also be an alternative to financing of renewable energy investments. Therefore, research and development investments are used as another independent variable in this study.

3. DATA AND METHODOLOGY

In this study, the effects of SMC, direct foreign investments, financial-development and research-development expenditures on REC in Turkey were investigated using annual data from 1990 to 2015. The selection of the sample period was restricted by the availability of the REC and SMC data. The variables of the study are as follows: REC (% of total final energy consumption), FDI, net inflows (% of GDP), SMC (% of GDP), FD (domestic credit to private sector, % of GDP) and finally research and development expenditure (R and D) (% of GDP). Data were obtained from the world development indicators published by the world bank, IEA, and OECD. All data was converted into natural logarithms, before beginning the empirical analyses.

To define the stationary of variables is important in order to avoid spurious regression in time series. In this context, first, the stationary levels of the series were determined by using Augmented Dickey and Fuller (1981) and Phillips and Perron (1988) unit root tests and the lag lengths were determined by using akaike information criterion criterion. Then, F-test was applied to the first term lags of dependent and independent variables in order to determine the existence of cointegration relationship. Finally, autoregressive distributed lag (ARDL) model was estimated to examine short-run and long-run relationships among the variables.

The ARDL approach developed by Pesaran et al. (2001) has more advantages than the previous co-integration techniques such as Engle and Granger, Johansen, and Johansen and Juselius procedures. First, the ARDL procedure is statistically more significant approach than previous techniques to determine the cointegration relationship in small samples (Bekhet et al., 2017). Second, the approach which is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated (Pesaran et al., 2001). Third, the ARDL application allows the variables to have different optimal lags. Finally, the ARDL technique is suitable for predicting over a single reduced equation (Ozturk and Acaravci, 2011).

The ARDL approach involves estimating the conditional error correction (EC) version of the ARDL model for financing of REC and its determinants is as follows:

$$\Delta InREC_t = \beta_0 + \sum_{i=1}^{m}\beta_{1i}\Delta InREC_{t-i} + \sum_{i=0}^{n}\beta_{2i}\Delta InFDI_{t-i} + \sum_{i=0}^{p}\beta_{3i}\Delta InSMC_{t-i} + \sum_{i=0}^{q}\beta_{4i}\Delta InFD_{t-i} + \sum_{i=0}^{r}\beta_{5i}\Delta InR\&D_{t-i} + \beta_6 FDI_{t-1} + \beta_7 SMC_{t-1} + \beta_8 FD_{t-1} + \beta_9 R\&D_{t-1} + \varepsilon_t \quad (1)$$

In equation Δ represents the first difference operator, β_0 represents the constant term, $\beta_{1,2,3,4,5}$ represent the short-run coefficients, $\beta_{6,7,8,9}$ represent the long-run coefficients, ε_t is the white-noise error term, and m, n, p, q, r refer to the optimal lag length.

F-test is used for testing the existence of long run relationships. In this context, the null hypothesis of no cointegration among the variables in Eq. 1, and the alternative hypothesis are as follows:

H_0: $\beta_6=\beta_7=\beta_8=\beta_9=0$

H_1: $\beta_6\neq\beta_7\neq\beta_8\neq\beta_9\neq 0$

The calculated F-statistic value compared with the critical values provided by the Pesaran et al. (2001). If the F-statistic value is higher than the upper bound critical value, the null hypothesis can be rejected. Therefore, there is a long run relationship among variables. If the F-statistic value is smaller than lower bound critical value, then the null hypothesis cannot be rejected. If the F-statistic value lies between the bounds, an inference cannot be made about the relationship among the variables.

The long-term coefficients are estimated after the existence of the long-term relationship is decided, and then the EC model (ECM) is established as follows:

$$\Delta InREC_t = \lambda_0 + \sum_{i=1}^{m}\lambda_{1i}\Delta InREC_{t-i} + \sum_{i=0}^{n}\lambda_{2i}\Delta InFDI_{t-i} + \sum_{i=0}^{p}\lambda_{3i}\Delta InSMC_{t-i} + \sum_{i=0}^{q}\lambda_{4i}\Delta InFD_{t-i} + \sum_{i=0}^{r}\lambda_{5i}\Delta InR\&D_{t-i} + \gamma ECT_{t-1} + \mu_t \quad (2)$$

Where λ_0 represents the constant term, $\lambda_{1,2,3,4,5}$ denote the short-run coefficients, γ denotes the coefficient of the lagged error-correction term obtained from the long-run equilibrium relationship and μ_t is the white-noise error term.

4. EMPIRICAL FINDINGS

Unit root tests' results are presented in Table 1. Accordingly, both the PP and the ADF unit root test results indicate that the variables are stationary at the first order difference.

The cointegration relationship is presented in Table 2. Accordingly, the calculated F-statistic (F-statistic= 4.5296) is higher than the upper bound critical value at the 1% level of significance (3.29), using restricted intercept and no trend. This indicates that the null hypothesis of no cointegration can be rejected at the 1% level and therefore, there is a cointegration relationship among the variables.

To determine the appropriateness of the ARDL model, the diagnostic test is conducted. The diagnostic test examines the serial correlation, functional form, normality and heteroscedisticity associated with the model, and the results are presented in Table 2.

Table 1: Unit root test results

Variable	PP		ADF	
	Intercept	Trend and intercept	Intercept	Trend and intercept
REC	−1,0448	−2.6532	−0.9023	−2.7041
FDI	−1,6082	−2.7931	−1.6554	−2.7931
SMC	−2,2481	−3.1047	−2.8726*	−0.4374
FD	0,3054	−1.2171	0.4774	−1.1128
R and D	−1,365	−3.3563*	−0.0695	−3.2903*
ΔREC	−6,7872***	−6,8002***	−6,2438***	−4.5989***
ΔFDI	−6.1124***	−5.9372***	−5.57***	−5.4446***
ΔSMC	−8.5529***	−17.6215***	−1.6423	−5.3801***
ΔFD	−3.6778**	−3.862**	−3.7306**	−3.9365**
ΔR and D	−6.6683***	−6.5381***	−6.8573***	−6.683***

*,** and *** indicate the rejection of the null hypothesis of a unit root at the 10%, 5% and 1% significance levels, respectively. FDI: Foreign direct investments, FDI: Foreign direct investments, SMC: Stock market capitalization, FD: Financial development, REC: Renewable energy consumption, ADF: Augmented Dickey-Fuller, PP: Phillips-Perron

Table 2: F-Statistic for cointegration relationship

Test Statistic	Value	k	Signif. (%)	Bound critical values	
				Lower I (0)	Upper I (1)
F-statistic	4.5296	4	10	2.20	3.09
			5	2.56	3.49
			1	3.29	4.37
Diagnostic test statistics			**Test-stats**	**P-Value**	
Serial correlation (χ^2_{BG})			0.2074	0.9015	
Functional form (χ^2_{RAMSEY})			0.2592	0.8013	
Normality (χ^2_{NORMAL})			1.3845	0.5004	
Heteroskedasticity (χ^2_{BPG})			8.5970	0.7369	

Critical values are obtained from Pesaran et al. (2001). K is the number of regressors

Table 3: ARDL (3,2, 1, 0, 2) model: Long-run estimates

Dependet variable: InREC		
Variable	**Coefficient**	**t-statistic**
C	0.7949***	3.4998
InFDI	−0.1012***	−3.8230
InFD	0.0749*	1.8920
InSMC	0.1175	0.9777
InR and D	−0.5806***	−4.4765
Diagnostic test statistics		
R-squared	0.9727	
Adj. R-squared	0.9398	
F-statistic (Prob.)	29.6697 (0.0000)	

EC = In REC - (−0.1012*in FDI + 0.0749*in FD + 0.1175*In SMC-0.5806*In R%D + 0.7949)

*, **, and *** represent 10%, 5% and 1% level of significance, respectively. Lag-length is selected on the basis of AIC, ARDL: Autoregressive distributed lag, FDI: Foreign direct investments REC: Renewable energy consumption, FD: Financial development, SMC: Stock market capitalization

Table 4: ARDL (3,2, 1, 0, 2) Model: ECM estimates

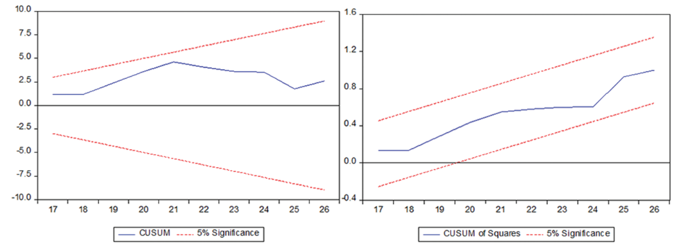
Dependet variable: ΔInREC		
Variable	**Coefficient**	**t-statistic**
C	1.1373***	5.3039
ΔInREC(−1)	0.1772	0.8818
ΔInREC(−2)	−0.3935**	−2.2802
ΔInFDI	−0.0189	−0.7866
ΔInFDI(−1)	0.0505*	1.8536
ΔInFDI	−0.2153**	−2.7861
ΔInSMC	0.1991***	3.7706
ΔInSMC (−1)	−0.1466***	−3.2654
ECT(−1)	−1.4308***	−5.3872

REC: Renewable energy consumption, FDI: Foreign direct investments

REC: Renewable energy consumption, SMC: Stock market capitalization

The long-run coefficients of ARDL model are presented in Table 3. The coefficients of FDI and R&D calculated as −0.1012 and −0.5806 are respectively and statistically significant. This implies that 1% increase in FDI and research-development expenditure will lead to respectively 0.10% and 0.58% decrease in the REC in the long-run. Similarly, the coefficient of FD is 0.0749 and it is statistically significant that implies 1% increase in domestic credit to private sector will lead to 0.07% increase in the REC in the long-run. Besides, the coefficient of SMC is 0.1175 but it is not statistically significant that implies the effect of SMC on REC is rather minimal in the long-run.

Figure 1: (a and b) Plot of cusum and cusum of squeres tests



The estimated short-run coefficients are given in Table 4. Accordingly, the coefficient of EC term (ECT_{t-1}) in the results is negative (−1.4308) and it is statistically significant at 1% level of significance. As stated in Narayan and Smyth (2006), if the value on the coefficient of the lagged EC term is between −1 and −2, the EC process converges to a long term equilibrium level fluctuatingly.

The last stage of ARDL estimation is to test the stability of the model. This study applies the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) techniques based on ECM of Eq. (2). As shown in Figure 1, the plots of CUSUM and CUSUMSQ statistics are within the critical bounds. This means that all the coefficients in the ECM model are stable.

4. CONCLUSION

This reserach paper examines the impact of FDI, SMC, FD and research-development expenditures on the REC for Turkey over the period of 1990-2015. The study implements ARDL model developed by Pesaran et al. (2001) to investigate the existence of a long-run relationship among the variables. The empricial results show that there is cointegration among the noted series. The findings also indicate that FDI inflows, research-development expenditures and FD play an important role on the REC in long-run in Turkey.

The empirical evidence from the ARDL approach shows that FD has a positive effect on the REC. Besides, FDI inflows and research-development expenditures have a negative effect on the REC during the period of the study. This is not an expected finding and it can be interpreted as FDI inflows and R and D investments have a lower share in renewable energy projects. The short-run relationships are estimated with the ECM model, that is because there is a cointegration vector among the underlying variables. The EC term (ECT_{t-1}) in the results is negative and statistically significant as expected. This implies that EC process converges to a long term equilibrium level.

REFERENCES

Apergis, N., Danuletiu, D.C. (2014), Renewable energy and economic growth: Evidence from the sign of panel long-run causality. International Journal of Energy Economics and Policy, 4(4), 578-587.

Apergis, N., Payne, J.E. (2010), Renewable energy consumption and growth in Eurasia. Energy Economics, 32(6), 1392-1397.

Bakırtas, I., Cetin, M.A. (2016), The relationship between renewable

energy consumption and economic growth: G-20 countries. Socioeconomic, 24(28), 131-145.
Bekhet, H.A., Matar, A., Yasmin, T. (2017), CO_2 emissions, energy consumption, economic growth and financial development in GCC countries: Dynamic simultaneous equation models. Renewable and Sustainable Energy Reviews, 70, 117-132.
Blaise, S. (2012), New Approaches in Renewable Energy Finance: Master Limited Partnerships, Real Estate Investment Trusts, and Crowdfunding. Environmental and Energy Study Isntitute (EESI) Issue Brief. Available from: https://www.eesi.org/files/IssueBrief_New_Approaches_Renewable_Energy_Finance_102412.pdf.
Chang, S.C. (2015), Effects of financial developments and income on energy consumption. International Review of Economics and Finance, 35, 28-44.
Crampton, J. (2015), How does the stock market value the renewable energy sector: A public announcement analysis and test of the efficient market hypothesis. Journal of Environmental and Resource Economics at Colby, 2(1), 6.
Dickey, A.D., Fuller, W.A. (1979), Distribution of the estimators for autoregressive time series with a unit root. Journal of American Statistical Association, 74, 427-431.
Donastorg, A., Renukappa, S., Suresh, S. (2017), Financing Renewable Energy Projects in Developing Countries: A Critical Review. 2nd International Conference on Green Energy Technology (ICGET 2017).
Doytch, N., Seema, N. (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.
Griffith-Jones, S., Ocampo, J.A., Spratt, S. (2012), Financing Renewable Energy in Developing Countries: Mechanisms and Responsibilities. New York: Columbia University Academic Commons.
Hamilton, K., Sophie, J. (2009), Private Financing of Renewable Energy: A Guide for Policymakers. Available from: https://www.chathamhouse.org/sites/default/files/public/Research/Energy%2C%20Environment%20and%20Development/1209_financeguide.pdf.
Hanni, M.S., Thomas, V.G., Ralf, K., Hafiz, M. (2011), Foreign Direct Investment in Renewable Energy: Trends, Drivers and Determinants, Transnational Corporations. New York: United Nations Publication. p28-65.
Islam, F., Shahbaz, M., Ahmed, U.A., Alam, M.M. (2013), Financial development and energy consumption nexus in Malaysia: A multivariate time series analysis. Economic Modelling, 30, 435-441.
ISPRE. (2009), Research and Development on Renewable Energies: A Global Report on Photovoltaic and Wind Energy. Paris: International Science Panel on Renewable Energies. Available from: http://www.staging.icsu.org/cms/2017/05/ISPRE_Photovoltaic_and_Wind.pdf.
Komal, R., Faisal, A. (2015), Linking financial development, economic growth and energy consumption in Pakistan. Renewable and Sustainable Energy Reviews, 44, 211-220.
Kutan, A.M., Sudharshan, R.P., Mallesh, U., Abdulrasheed, Z. (2018), Financing renewable energy projects in major emergin market economies: Evidence in the perspective of sustainable economic development. Emerging Markets Finance and Trade, 54, 1761-1777.
Lin, B., Moubarak, M. (2014), Renewable energy consumption - Economic growth nexus for China. Renewable and Sustainable Energy Reviews, 40, 111-117.
Lyu, X., Anna, S. (2018), Research on the renewable energy industry financing efficiency assessment and mode selection. Sustainability, 10, 222.
Mendelsohn, M., Feldman, D. (2013), Financing U.S. Renewable Energy Projects through Public Capital Vehicles: Qualitative and Quantitative Benefits. National Renewable Energy Laboratory, Technical Report NREL/TP-6A20-58315. Available from: http://www.nrel.gov/docs/fy13osti/58315.pdf.
Mert, M., Boluk, G. (2016), Do foreign direct investment and renewable energy consumption affect the CO_2 emissions? New evidence from a panel ARDL approach to Kyoto annex countries. Environmental Sciences Pollution Research International, 23(21), 21669-21681.
Narayan, P.K., Smyth, R. (2006), What determines migration flows from low income to high-income countries? An empirical investigation of Fiji-US migration 1972-2001. Contemporary Economic Policy, 24(2), 332-342.
National Institute of Building Sciences (NIBS). (2015), Financing Energy-Efficiency and Renewable-Energy Projects. Available from: https://www.cdn.ymaws.com/www.nibs.org/resource/resmgr/CFIRE/CFIRE_EnergyProjReport.pdf.
Ozturk, I., Acaravci, A. (2011), Electricity consumption and real GDP causality nexus: Evidence from ARDL bounds testing approach for 11 MENA countries. Applied Energy, 88, 2885-2892.
Pao, H.T., Fu, H.C. (2013), Renewable energy, non-renewable energy and economic growth in Brazil. Renewable and Sustainable Energy Reviews, 25, 381-392.
Paramati, S.R., Mo D., Gupta, R. (2017), The effects of stock market growth and renewable energy use on CO_2 emissions: Evidence from G20 nations. Energy Economics, 66, 360-371.
Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bound testing approaches to the analysis of level relationship. Journal of Applied Econometrics, 16(3), 289-326.
Phillips, P.C.B., Perron, P. (1988), Testing for a unit root in time series regression. Biometrika, 75(2), 336-346.
Ptaceka, O., Kaderabkovaa, B., Piechaa, M. (2015), Venture capital, private equity and foreign direct investment: Case study of the Czech Republic. Procedia Economics and Finance, 30, 680-689.
Ramamurti, R. (2011), New players in FDI: Sovereıign wealth funds, private equity, and emerging market multinationals. The Future of Foreign Direct Investment and the Multinational Enterprise Research in Global Strategic Management, 15, 137-165.
Sadorsky, P. (2010), The impact of financial development on energy consumption in emerging economies. Energy Policy, 38(5), 2528-2535.
Sadorsky, P. (2011), Financial development and energy consumption in central and eastern European frontier economies. Energy Policy, 39(2), 999-1006.
Schwabe, P., Mendelsohn, M., Mormann, F., Arent, D. (2012), Mobilizing Public Markets to Finance Renewable Energy Projects: Insights from Expert Stakeholders, National Renewable Energy Laboratory. Technical Report NREL/TP-6A20-55021. Available from: https://www.nrel.gov/docs/fy12osti/55021.pdf.
Strickland, T.H., Homaifar, G. (1990), Foreign direct investment: Evidence from capital market data. Global Finance Journal, 1(2), 153-162.