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Analyzing the Impact of FDI, Government Debt, and Economic Indicators on Renewable Energy Development

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ABSTRACT

The current research examines the effect of FDI, government debt (GD), and economic indices (GDP, INF, and GNI) on the consumption of renewable energy in Nordic European nations between 1993 and 2022. Data was collected from reputable databases, such as World Bank Open Data (WBOD), and Our World in Data (OWD). Using the ARDL method, the findings demonstrate that FDI has a short-term but positive influence on renewable energy consumption. In contrast, GD has a favorable and significant influence on green energy in the long term, suggesting that increasing GD is associated with greater consumption of renewable energy. There is also a large and continuous positive effect of economic development measures (GDP, INF, and GNI) on renewable energy consumption. GNI stands out as the most significant of these. To promote sustainable growth, policy implications emphasize the necessity of efforts that enhance economic development and maximize energy tax laws. Furthermore, it is crucial to increase investors' and individuals' ability to embrace renewable energy technologies. These results expand the existing literature on sustainable energy transitions and could be useful in other developed economies with comparable circumstances. It is recommended that future studies examine the connections between macroeconomic variables and renewable energy in various economies, paying special attention to exchange rate effects and income levels.

INTRODUCTION

In response to changes in the climate, the entire globe is experiencing environmental problems. This becomes a central issue for governments, economists, activists for the environment, and policymakers globally (Przychodzen and Przychodzen, 2020). The growth of economies throughout the world characterized by fast modernization and population expansion, has fueled an increase in energy demand. Over the years, humanity has relied heavily on fossil fuels to satisfy its needs, which is the primary factor contributing to rising carbon dioxide (CO2) levels (Samour et al., 2023). This brings global warming and, consequently, accelerating changes in the environment. To reduce the detrimental effects of conventional energy

sources that use fossil fuels on the environment, moving to greener and more sustainable energy sources is vital. The use of renewable power, which includes wind, hydropower, and solar, provides a replacement for fossil fuels to significantly lower greenhouse gas emissions and adapts to a more ecologically and sound economy (Ali and Seraj, 2022; García-Álvarez et al., 2016). However, by 2050, green sources of energy might provide up to half of the global energy requirements, and therefore searching for sustainable energy is an important goal (Krewitt et al., 2007).

Moreover, a potential future transition to a sustainable economy requires the switch from traditional sources of energy to renewable power sources (Jiang et al., 2018; Karim et al., 2023). Environmental protection, exploiting resources, welfare in society, and sustainability all depend heavily on energy production and consumption, which guarantees that these processes of change appear at both political and social levels (Aguirre and Ibikunle, 2014). Yu et al. (2023) also argue that utilizing renewable energy sources that avoid to use of natural resources benefits both the environment and the economy. According to Rahman et al. (2017) greenhouse gases have dropped due to using biofuels and clean energy. Recent investigations have demonstrated the strong and detrimental connection between alternative energy sources and environmental risks, and they have also identified the most effective ways to adopt sustainability practices (Islam et al., 2022; Samour et al., 2023). Hence, Governments, policymakers, and regulators need to swiftly convert from the current power system to a more practical one. By transforming their energy infrastructure, developed countries are leading the way in a more sustainable economic path.

There are some elements that significantly influence the adoption of environmentally friendly sources. These factors include FDI, government debt, and some economic parameters. FDI serves as critical for transferring knowledge, technology, creativity, and financing renewable energy plans, particularly in nations with low levels of national capital investment (Samour et al., 2023). In addition, debt from the government may have a significant effect on a nation's ability to make investments in long-term initiatives including infrastructure for making green energy and its affordability (Qamruzzaman, 2022). From this perspective, Auteri et al. (2024) government participation in outside funding, particularly through debt financing, may be a viable alternative for implementing sustainability or renewable energy goals. On the contrary, if the debt levels are high, national economies may suffer because of the related expenses. Investment also could decline due to high debt levels that cause higher spending (Karim et al., 2023; Böcskei and Hágen, 2017). Economic factors such as GDP, inflation, and Gross National Income (GNI) provide valuable information about how economic development and stability affect countries' capacity and desire to seek renewable energy sources (Deka et al., 2022; Tudor and Sova, 2021; Wei et al., 2022).

Prior research examined the connection between FDI and renewable sources (Karim et al., 2023; Wei et al., 2022), and few between governmental debt and renewable energy (Auteri et al., 2024; Karim et al., 2023), and also between economic development and adoption of clean energy (Tudor and Sova, 2021). However, no study has been found to investigate the impact of these factors together on adopting renewable energy sources. Additionally, studies to explore the above connection among the Nordic European countries are exceedingly rare. Therefore, an empirical investigation needs to be conducted in Nordic countries to determine how FDI, government debt, and economic indicators affect clean energy sources. Moreover, the Nordic nations have been historically innovators in alternative energy sources and sustainable growth. It is critical for these countries to comprehend the complicated relationships of governmental funds, FDI, and economic parameters on the adoption of green energy. In order to maximize utilization of resources, drive sustainable investment, and facilitate the shift to green energy, such studies can help and guide decisions about a low-carbon economy. Hence, this research can be used as a framework by other countries interested in finding a balance between sustainable development or sustainable environment and economic expansion.

1. LITERATURE REVIEW

1.1 FDI and renewable energy

Foreign direct investment (FDI) is a stream that has historically been connected to the movement of technology, managerial methods, and expertise from home nations to their destination nations and become a multinational corporation. According to Abdouli and Hammami (2017) FDI is considered to be

crucial for boosting financial stability because of its positive impact on economic expansion and the preservation of the environment. Although FDI offers investors savings, accessibility to markets, and diversity, it also carries hazards, such as regulatory difficulties and political unpredictability. Moreover, when host nations benefit from increased capital, employment, and technology, they may also experience economic reliance, profit outflows, and foreign companies' dominance of the market (Lu et al., 2020; Fazekas and Becsky-Nagy, 2015).

There have been conflicting results from studies on the link between FDI and utilization of energy. For instance, Doytch and Narayan (2016) collected data from 74 countries around the world for a prolonged period from 1985-2012 and found that FDI serves to reduce non-renewable energy consumption. Likewise, Fan and Hao (2020); Rezagholizadeh et al. (2020) explored the effect of FDI on energy consumption and they demonstrated that FDI has a considerable influence on sustainable development and energy from renewable sources. However, some other investigations have reported an opposite relationship between FDI and the installation of sustainable energy. From this point of view, Sbia et al. (2014) investigated the relationship between the use of energy, economic progress, FDI, and greenhouse gases using data from the United Arab Emirates between 1975-2011. Their results display that energy consumption is reduced by both FDI and carbon emissions. Tariq et al. (2023) illustrated that FDI hindered the use of clean energy in the short run. However, Sadorsky (2010) used a GMM technique to examine how FDI and equity market growth influence the consumption of energy in a group of 22 developing nations. The author finds no evidence of the connection between FDI and energy demand while demonstrating a strong and favorable correlation between energy use and the growth of the stock market.

1.2 Government debt and renewable energy

The effect of public debt on the low-carbon economy or green energy is a complicated and often contentious topic. There have been conflicting findings in the scientific community about the effect of government debt on the adoption of green energy. Research by Auteri et al. (2024) argues that the efforts at the national level to implement and advance green power can be financed in part by government loan. Nonetheless, since government debt is linked to rising payment commitments, Sun and Liu (2020) believe that it serves as an obstacle to green energy. Moreover, focusing on 20 developing economies and collecting data from 1990-2016, Hashemizadeh et al. (2021) found that government debt positively influences the adoption of renewable energy. Similarly, Qamruzzaman (2022) applied data from 1990-2020 and showed that there is an asymmetric link between government debt and renewable energy power. More recent studies by Auteri et al. (2024) examined data from 1990-2021 for G7 countries and illustrated that increasing debt levels can make it more difficult to make investments in infrastructure for green power, while more renewable energy can improve the dynamics of public debt.

Another quest is made by Florea et al. (2021) to explore how state budgets affect renewable energy consumption. They utilize two financial metrics (budget deficit and government borrowing) to analyze 11 nations in the European Union. Based on their findings, renewable energy consumption is positively altered by both public financing strategies. However, Katırcıoğlu and Çelebi (2018) assert that using foreign debt to finance economic expansion and consumption of energy can worsen the environmental harm.

1.3 Economic indicators and renewable energy

Sustainable development is affected by economic patterns through an increase in GDP, inflation control, human development, and stock market improvement. Sustainable development is impacted by economic intermediation through the business cycle, demand curve, buyer influence, and stock exchange effect. Several investigations examined the connection between economic progress and renewable energy demand by employing multiple types of econometric techniques, but the findings remain inconsistent. Çoban and Topcu (2013) reached the conclusion that economic expansion significantly benefits energy consumption. In a further investigation, Islam et al. (2013) examined the effect of financial development. Their findings demonstrated that sustainable energy demand is favorably influenced by economic development in Malaysia. In a similar context, Inglesi-Lotz (2016) used a sample of 34 countries that were members of the OECD from 1990 to 2010, and the findings indicated that renewable sources of energy are positively impacted by economic expansion.

Furthermore, Ullah et al. (2024) discovered how the utilization of hydroelectric power affects economic growth. The findings showed that hydropower significantly affects financial development and economic expansion. In contrast to the above argument, Tiwari et al. (2022) studied how economic growth affected Asian nations' use of renewable energy. Their findings concluded that the quantity of economic development is negatively related to the utilization of clean energy. However, Ozturk et al. (2010) claimed that there is no meaningful relationship between energy demand and economic prosperity.

2. METHODOLOGY

2.1 Data

The data in this investigation is gathered primarily from reputable databases, such as World Bank Open Data (WBOD), and Our World in Data (OWD). Five Nordic nations (Denmark, Finland, Iceland, Norway, and Sweden) constitute the study sample. The study period, which runs from 1993 to 2022, includes a time when these countries experienced substantial changes in their energy and economic policies. Since this study examines the effect of FDI, government debt, and economic indicators on renewable energy, the dependent (explained) variable is renewable energy. Moreover, FDI, government debt, and economic indicators work as independent (explanatory) variables. Table 1 shows the definition of the study variables.

Table 1. Data summary

Variable	*Status*	*Notation*	*Unit*	*Source*
Renewable energy consumption	Dependent	RenCo	kWh, per capita	OWD
Foreign direct consumption	Independent	FDI	Net inflows (% of GDP)	WBOD
Government debt	Independent	GD	Central government debt, total (% of GDP)	WBOD
Economic indicator: Gross domestic product	Independent	GDP	GDP growth (annual %)	WBOD
Inflation	Independent	INF	Inflation, consumer prices (annual %)	WBOD
Gross national income	Independent	GNI	GNI per capita	OWD

Source: Own elaboration

2.2 Method and model

In this investigation, secondary data at the country level released by reputable databases, such as WBOD and OWD is analyzed quantitatively. Exploring the suggested link is performed using an explanatory research design. The study focuses on both short-term and long-term relationships after illustrating the cointegration test between the variables. To achieve this objective, Autoregressive distributed lagged (ARDL) is applied in this study. The method was initially proposed by (Pesaran et al., 1999) and they determined both short and long-run values in empirical evaluation. According to Tariq et al. (2023) ARDL approach has the benefit of producing an accurate figure despite the size of the sample, which sets it apart from normal cointegration testing. Banerjee et al. (1993) also noted that a dynamic error correction model can be obtained from the ARDL by performing an ordinary linear conversion. These attributes make the ARDL method frequently utilized by previous investigations (Qamruzzaman, 2022; Samour et al., 2023; Tariq et al., 2023; Wei et al., 2022). Based on the above arguments, this study will apply the ARDL method and the equation was formulated as follows:

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{j=0}^{q} \gamma_j X_{t-j} + \epsilon_t$$

Where, Y_t represent the dependent (explained) variable; Y_{t-i} denotes lagged values of the dependent variable (considered as independent variables); X_{t-j} is the independent (explanatory) variables, both present and lagged value; α is constant; β_i, γ_j represents coefficients of lagged dependent and independent

variables; ϵ_t is the standard error. Considering the variable definitions provided in table 1, the dynamic model appears as follows.

$$RenCo_t = \alpha + \sum_{i=1}^{p} \beta_i RenCo_{t-i} + \sum_{j=0}^{q_1} \gamma_j FDI_{t-j} + \sum_{j=0}^{q_2} \gamma_j GD_{t-j} + \sum_{j=0}^{q_3} \gamma_j GDP_{t-j} + \sum_{j=0}^{q_4} \gamma_j INFL_{t-j} + \sum_{j=0}^{q_5} \gamma_j GNI_{t-j} + \epsilon_t$$

3. RESULTS AND DISCUSSION

3.1 Statistical overview

Table 2 shows the overall information on the parameters we employ in this investigation, including mean, range, and standard deviation. The mean value of RenCo is considerably high at 10.19, with a deviation of 1.18 for the sample of Nordic countries. This illustrates how strongly the region is committed to energy from renewable sources. The lowest and highest values of RenCo are 6.92, and 11.92, respectively. The mean values of FDI and GD are 3.19, and 55.47 with a standard deviation of 5.59, and 27.43, respectively. The minimum and maximum values of FDI are -28.30 and 31.73 respectively, while the lowest and highest values of GD are 18.53, and 156.09, respectively. The range and standard deviation show that over the sample period, there were both incredibly high and low investment activities. The mean value of FDI indicates large inflows during times. The arithmetic values of the GDP and INF are relatively low, which are 2.34 and 2.30 respectively with a deviation of 2.72 and 2.02. Additionally, the mean value of GNI is 10.77 with a low standard deviation of 0.20. The minimum and highest values of GNI are 10.23 and 11,14, respectively. Overall, the statistical results show that, despite their common dedication to financial stability and consumption of renewable energy, the Nordic nations exhibit notable variation in key economic metrics, which reflects various fiscal strategies and regional growth trends.

Table 2. Summary Statistics

	RenCo	*FDI*	*GD*	*GDP*	*INF*	*GNI*
Mean	10.193	3.191	55.471	2.346	2.303	10.774
Std. Dev.	1.188	5.594	27.431	2.726	2.023	0.203
Minimum	6.922	-28.307	18.532	-8.074	-0.494	10.233
Maximum	11.929	31.738	156.092	8.881	12.694	11.144
Obs.	150	150	150	150	150	150

Source: Author's computation using EViews

Moreover, according to Hágen and Ahmed (2024) the residuals are typically assumed to be normal in regression analysis. Table 3 shows the normality test based on the Jarque-Bera test and the result displays that the p-value is significantly above the 5% level, implying that the data in this study exhibit normal distribution.

Table 3. Test of normality

Groups	*Type of test*	*Chi-Square*	*Probability*
All countries	Jarque-Bera	0.838	0.657

Source: Author's computation using EViews

3.2 Pearson correlation

The correlation matrix presented in table 4, gives an in-depth comprehension of the connections between the variables examined in this research. The results show some noteworthy trends. The correlation

between FDI and RenCo is negative but statistically insignificant. However, GDP has a favorable influence on RenCo, again the result is statistically not significant. In addition, a moderate positive association is noticed between GD and INF with RenCo. The relationship between GD, GDP, and GNI with FDI is weak and positive. However, in the case of GD, and GNI, the results are statistically not significant. GDP and GNI have a negative effect on GD, but a positive in the case of INF. Both INF and GNI have weak and adverse correlations with GDP.

Moreover, a correlation matrix can be used to test multicollinearity issues. According to Ahmed et al. (2023) in a regression model, multicollinearity occurs when explanatory variables show significant relationships with one another. Because the findings in Table 4 show that there is not a strong relationship among the independent variables (all of them are much lower than 0.70), this study does not have a problem with multicollinearity. The above conclusion is secured by the test of Variance Inflation Factor (VIF) as demonstrated in Table 4. A study released by Newbold et al., (2013) argues that the acceptable value for VIF should be less than 10. The findings of table 4 illustrate that the highest VIF value is 1.412. Hence, multicollinearity is absent from our investigation.

Table 4. Correlation matrix

	RenCo	FDI	GD	GDP	INF	GNI	VIF
RenCo	1	-0.029	0.194**	0.092	0.334***	0.201**	1.143
FDI	-0.029	1	0.103	0.297***	0.176**	-0.101	1.412
GD	0.194**	0.103	1	-0.001	0.327***	-0.428***	1.109
GDP	0.092	0.297***	-0.001	1	-0.005	-0.096	1.183
INF	0.334***	0.176**	0.327***	-0.005	1	-0.003	1.276
GNI	0.201**	-0.101	-0.428***	-0.096	-0.003	1	1.143
Mean							1.225

Note(s): ***p < 1%; **p < 5%

Source: Author's computation using EViews

3.3 Ramsey RESET test

Ramsey RESET Test was conducted to verify that a regression model is appropriately defined. As indicated in table 5, the p-value is larger than 5% significant level, thus, it can be concluded that no important variables are omitted from the model. In other words, the fitted panel ARDL method is suitable and does not violate any assumptions. Hence, the model and method are accurately described.

Table 5. Ramsey RESET Test

	Value	*Prob.*
t-statistic	0.886	0.376
F-statistic	0.785	0.376

Specification: RenCo RenCo(-1) FDI GD GDP INF GNI C

Source: Author's computation using EViews

3.4 Unit root test

Panel data stationarity test indicates robustness to heterogeneity, as illustrated in Table 6. To exploit any potential hidden characteristics, this study considers an estimation of individual intercepts and trends. When the variables are analyzed at their level form, there is not enough data to rule out the null hypothesis that there is non-stationarity. This suggests that the variables may not be stationary in their original form, which would suggest the existence of unit roots. As shown in table 6, all variables were integrated of order one, I(1) (first difference). As a result, the study is able to capture the short- and long-run relationship between FDI, GD, GDP, INF, and GNI with RenCo.

Table 6. Panel data stationarity test

Variables	ADF I(0)	ADF I(1)
RenCo	17.689	53.790***
FDI	13.387	50.787***
GD	11.840	18.052***
GDP	35.933**	72.685***
INF	8.722	31.704***
GNI	9.911	24.770***

Note(s): ***p < 1%
I(0) represent the level; I(1) represent the first difference
Source: Author's computation using EViews

3.5 Cointegration test

After verifying that the factors were stationary at their first difference, the long-term relationship between the variables was evaluated using a panel cointegration test. The outcomes of the panel cointegration test are summarized in Table 7.

Table 7. Cointegration test

Panel	*Panel v*	*Panel rho*	*Panel PP*	*Panel ADF*
Stat.	-1.013	1.424	-1.505*	-0.548
Stat.	-1.796	0.707	-5.951***	-2.609***
Group				
Stat.		1.579	-6.690***	-2.863***

Series: RenCo FDI GD GDP INF GNI
Note(s): ***p < 1%; *p < 10%
Source: Author's computation using EViews

The outcomes show that the series for different panel groupings are cointegrated with RenCo serving as an explained variable and statistical evidence refusing the null hypothesis of no cointegration. In other words, the p-value at the 5% significance level indicates that the null hypothesis is invalidated. This finding strongly supports the co-integration of the variables under investigation. Thus, a long-term link between the components under research might be inferred.

3.6 Regression analysis

Table 8 displays the ARDL estimation results for the panel of all countries based on the elasticity of RenCo regarding the input factors under investigation for both the short and long term. In the long run, FDI does not exhibit statistical significance, however, it does have a minor positive coefficient of 0.001. This means that if other factors remain constant, FDI in the long run does not have any influence on green energy. With a coefficient of 0.007 at the 1% confidence level, government debt (GD) significantly and positively affects RenCo, suggesting that increasing GD is linked to greater use of renewable power. Additionally, at the 5% level, GDP exhibits a significant connection with a value of 0.022, indicating that economic growth promotes the utilization of green energy. INF also has a considerable positive impact with a beta coefficient of 0.017. This implies that a unit rise in GDP and INF causes a 0.022 and 0.017 unit rise in the long-term adoption of renewable energy, respectively. GNI is essential for encouraging the consumption of green energy, as evidenced by its highest positive long-term impact and a significant coefficient of 0.893 at the 1% level. This shows that a one percent rise in GNI causes an increase in using renewable energy by 0.89 percent.

Moreover, the extent and importance of the interactions vary in the short term. FDI has an instant but little influence on using green power, as documented by the small and strong positive effect with a coefficient of 0.002 at the 5% confidence level. This suggests that a unit increase in FDI brings about a rise in

the adoption of sustainable energy by 0.002 units in the short term. There is no significant influence for other factors in the short run, such as (GD, GDP, INF, and GNI).

The above findings demonstrate the complex interplay between important economic variables and the short- and long-term use of green energy. According to the findings, governmental debt (GD), and economic development metrics including GDP, INF, and GNI are crucial in encouraging long-term utilization of renewable energy, with GNI having the most influence. This emphasizes how crucial GD and economic growth are to accelerate the switch to sustainable energy. In contrast, FDI does not appear to have a substantial impact over the long run, suggesting that it may not be able to entirely encourage the growth of renewable energy in the absence of additional supportive variables. Curiously, the analysis also shows that other determinants do not show meaningful short-term impacts, whereas FDI has a beneficial influence on short-term consumption of energy. These results imply that while long-term policy initiatives should concentrate on stimulating economic expansion and leveraging revenues to promote the utilization of clean energy, short-term benefits can need focused tactics to improve FDI's efficacy in renewable energy domains.

Table 8. Dynamic regression analysis

Explained Variable: D(RenCo)				
Variables	*Long run*		*Short run*	
	Coef.	Std. Error	Coef.	Std. Error
FDI	0.001	0.003	0.002**	0.001
GD	0.007***	0.001	0.001	0.002
GDP	0.022**	0.011	-0.002	0.004
INF	0.017**	0.008	0.003	0.005
GNI	0.893***	0.108	-0.547	0.797

Note(s): ***p < 1%; **p < 5%
Source: Author's computation using EViews

These outcomes are in line with the arguments of (Auteri et al., 2024; Florea et al., 2021; Hashemizadeh et al., 2021) who highlight a positive and significant correlation with government debt. Similarly, the results align with the investigation managed by (Rezagholizadeh et al., 2020), which identifies a long-term beneficial connection between FDI and green energy. Furthermore, the findings correspond to the studies by (Inglesi-Lotz, 2016; Islam et al., 2013; Ullah et al., 2024), which demonstrate the beneficial link between national economic improvement and the expansion of sustainable energy sources.

Moreover, according to the automated lag selection, the maximum dependent lag is 1 as presented in table 9. The criteria technique used in choosing a model are AIC. All variables employed in the model proved to have a significant impact on RenCo. These factors are especially crucial for comprehending dynamic behavior as their long-term elasticity coefficients outperform their short-term equivalents.

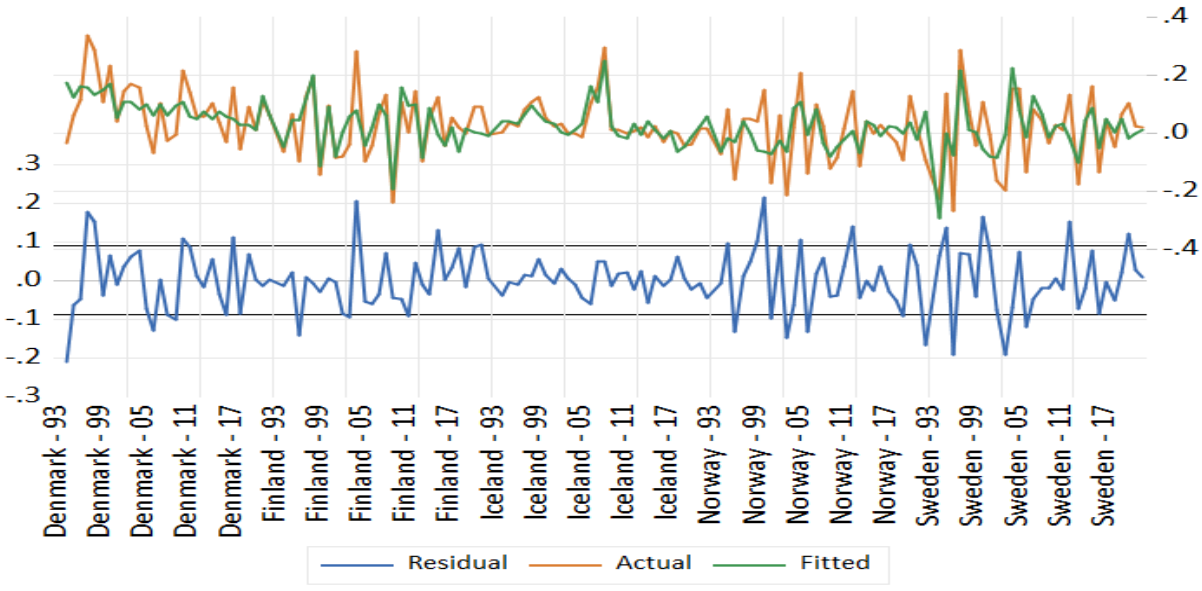
Table 9. Model selection

Model	LogL	AIC*	BIC	HQ	Specification
RenCo	181.514	-1.951	-1.130	-1.618	ARDL (1, 1, 1, 1, 1, 1)

Sample: 1993 – 2022
Source: Author's computation using EViews

The graphic illustration of residuals, fitted values, and actual values following regression is also shown in Figure 1. By lowering residuals, the apparent trend line and the near correspondence among the actual and fitted values improve homoscedasticity. Hence, the concept of homoscedasticity is supported by this pattern, which suggests no discernible heteroscedasticity.

Figure 1. Panel ARDL Model (RenCo)



Source: Author's computation using EViews

CONCLUSION

The main objective of the article is to provide an updated attestation by utilizing the bootstrap ARDL technique to evaluate the impact of FDI, government debt, and economic indicators on the use of renewable energy in Nordic European countries. Since the Nordic nations have been historically innovators in the use of alternative energy sources and sustainable growth, this investigation enriches the current literature to determine how FDI, government debt, and economic indicators affect green energy. Data were collected primarily from reputable databases, such as World Bank Open Data (WBOD), and Our World in Data (OWD) over 1993-2022. Five Nordic nations constitute the study sample. The results are checked for robustness using a variety of models and estimations.

The outcomes of the investigation illustrate that FDI has a weak and favorable influence on the utilization of green energy. However, this result is statistically significant in the short run only. There is also a strong and positive effect of GD on using green power, suggesting that increasing GD is associated with greater consumption of sustainable energy use in the long run. Metrics of economic development such as GDP, INF, and GNI are essential for promoting the long-term usage of renewable energy, with GNI having a major effect. This highlights how important growth in the economy is to hasten the transition to renewable energy. The results are attributable to the European Nordic nation's significant economic expansion and modern infrastructure, resulting in an increase in the use of green energy.

Policymakers in this nation are advised to focus on utilizing economic and energy resources to enhance sustainable growth. The study's outcomes show the need for policies and practices that assist in the sharing of energy consumption from renewable sources to support sustainable development. Improving the application of energy tax regulations and expanding the capacity of investors and individuals to utilize clean and sustainable energy options in their homes and companies.

These findings may be transferable to other developed economies with comparable circumstances to Nordic European countries, and further research should be performed on looking at how currency exchange rates are impacted by the installation of green power in both industrialized and less developed nations. In addition, future research is also encouraged to expand empirical studies to other economies around the world or to include global data from various nations while maintaining a focus on their income levels.

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