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Does the Type of Renewable Energy Matter for Economic Growth? An International Study

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Abstract. This paper analyzes the effects of different sources of renewable energy on economic growth utilizing a panel of 210 countries and territories between 1965 and 2021. The focus lies on five renewable energy sources: solar, wind, hydraulic, biofuel, and geothermal. Findings reveal that geothermal and hydraulic energies impact positively economic growth, while solar, wind, and biofuel energies negatively impact it. Consequently, the study suggests that policymakers should prioritize the development and investment in hydraulic and geothermal energy, while reconsidering support for solar, wind, and biofuel sources. The efficiency and cost of each energy type may vary based on factors such as location, technology, and available resources.
Keywords: *Economic growth; Renewable energy; Source-wise analysis; panel econometrics.*

1. Introduction

The recent surge in renewable energy sources can be attributed to the escalating demand, technological advancements, and the implementation of public policies fostering their development (Sarsar & Echaoui, 2023). In the contemporary global economic context, countries strive to foster industrial production to stimulate job creation, enhance national income, and promote widespread economic development (Sarsar & Echaoui, 2024a). However, this pursuit is not without consequences, as industrial expansion generates substantial energy demand, primarily met by well-known fossil fuels. The persistent use of fossil fuels has significant environmental implications, contributing to greenhouse gas emissions and climate change (Masson-Delmotte *et al.*, 2021). Despite the environmental challenges, finding a delicate balance between improving economic conditions and preserving environmental integrity is crucial for long-term planetary survival (Stern, 2007).

Examining the 1970s oil crises highlights the vulnerability of our dependence on fossil fuels, showcasing the economic instability caused by abrupt increases in crude oil prices (Hamilton, 2013). Recent events, such as the conflict between Ukraine and Russia, underscore the need to transition away from fossil fuel dependence to ensure long-term energy security (IEA, 2022). Renewable energy sources emerge as a central player in the quest for sustainable energy supply, offering an effective means to reduce greenhouse gas emissions, foster sustainable economic growth, ensure energy independence, and secure future resources (IRENA, 2020).

The pivotal role of renewable energy in economic growth has gained prominence, positioning itself as a crucial determinant alongside other production factors (Fakher *et al.*, 2023). This transition is not merely an evolution but an imperative to shape a better future for the planet and its inhabitants (UN, 2015). Renewable energy technologies, such as wind, solar, and hydroelectric power, have made significant strides in efficiency and cost reduction, making them increasingly competitive with traditional fossil fuels (IRENA, 2021). Furthermore, public policies and international agreements, such as the Paris Agreement (2015), have been instrumental in driving the adoption of renewable energy (UNFCCC, 2015). As nations continue to embrace renewable energy, they contribute to a more resilient and sustainable global economy, ensuring that economic growth does not come at the expense of environmental health (Canton, 2021).

Anchored in the four hypotheses articulated by Ozturk (2010), our focus primarily centers on the growth hypothesis. This hypothesis explores the unidirectional impact of renewable energy consumption on economic growth, a concept supported in prior research but marked by divergent results, possibly stemming from the oversight of different renewable energy types in aggregated data.

The distinctive contribution of our paper lies in its meticulous examination of the growth hypothesis, considering both positive and negative unidirectional impacts. We emphasize the critical importance of distinguishing between various renewable energy sources, a facet often disregarded in prior studies relying on aggregated data or focusing on a singular type, such as biomass. Conversely, our study takes a thorough approach in bridging this research gap by meticulously examining the contribution of each individual renewable energy source to economic growth across 210 countries and territories over the period from 1965 to 2021. Renewable energy sources, characterized by their immediate availability and rapid regeneration, encompass biomass, hydropower, geothermal, wind energy, and solar energy.

Our paper's study focus is on the significance of tracking and analyzing how renewable energy policies affect economic growth. The empirical findings can assist policymakers in identifying any unexpected consequences and informing any necessary future policy revisions. Depending on the kind of renewable energy, authorities should continually examine and adjust their renewable energy laws to guarantee efficacy and connection with more general economic goals.

Therefore, our research interest underscores the importance of continually monitoring and evaluating the impact of renewable energy policies on economic growth. The empirical results derived from this study can furnish policymakers with valuable insights to identify any unintended consequences, enabling them to make informed adjustments to policies. Policymakers are encouraged to regularly review and update their renewable energy policies, tailored to the specific types of energies involved, to ensure efficacy and alignment with broader economic goals.

Thus, we will utilize panel data from 210 countries and territories spanning the years 1965 to 2021 using the Cobb-Douglas mode and control variables will be incorporated to ensure the robustness of our results. The robust least squares (RLS) estimation method will be employed to account for potential outliers in the data.

The remainder of the paper is structured as follows: Section two will review the literature examining the impact of renewable energy on economic growth, Section three will outline the research design including the model, data, and variables used in the analysis, and Section four will present and discuss the empirical results.

2. Literature review

Over the past few years, numerous studies have explored the correlation between the adoption of renewable energy sources and economic growth, placing particular emphasis on addressing environmental concerns and mitigating the impact of climate change (Kim & Park, 2023; Fakher *et al.*, 2023). Another facet of this exploration involves scrutinizing the intricate link between renewable energy consumption and economic growth, an aspect that our study specifically focuses on. The existing body of literature on this subject has produced conflicting results regarding the direction of causality, attributed to variations in the time period studied, country characteristics, econometric methodologies, and considered variables.

In the realm of the connection between energy consumption and economic growth, Ozturk (2010) has formulated four hypotheses of notable consequence for energy policy. Among these hypotheses is the growth hypothesis. This hypothesis suggests that the consumption of renewable energy has an impact on economic growth (Qudrat-Ullah and Nevo, 2021; Shidong *et al.*, 2022; Chang and Fang, 2022; Wang *et al.*, 2023). The conservation hypothesis, on the other hand, reveals the impact of economic growth on renewable energy consumption (Kassi *et al.*, 2020; Uzar, 2020; Chang and Fang, 2022; Rahman and Sultana, 2022). The feedback hypothesis verifies bidirectional causality between the two variables (Aydin, 2019; Koengkan *et al.*, 2020; Zhang and Zhang, 2021). Lastly, the neutrality hypothesis indicates no causality between them (Ozcan and Ozturk, 2019; Tuna and Tuna, 2019; El-Karimi & El-Houjjaji, 2022).

Recent studies predominantly support the notion that economic growth influences renewable energy consumption, forming a consensus in the literature. Our study centers on the growth hypothesis, investigating the unidirectional impact of renewable energy consumption on economic growth. Notably, we acknowledge the divergent findings in previous research, emphasizing the need to consider different types of renewable energy sources in our analysis. While past studies often employed aggregated data, our research uniquely contributes by assessing the distinct effects of each renewable energy type. This approach aims to bridge a significant research gap, as previous attempts only explored the impact of a specific type, such as biomass. Our comprehensive analysis covers a large sample of 210 countries and territories over an extensive period from 1965 to 2021.

3. Methodology

a. Sample and variables

Our study utilizes panel data spanning the period 1965-2021, encompassing 210 countries and territories (Appendix 1). The selection of countries in the panel is based solely on the availability of data on key variables, specifically economic growth and the production of renewable energy per source. Countries lacking data on renewable energy production and economic growth are excluded from the sample selection. This approach minimizes the selection bias in our empirical analysis. Furthermore, the chosen time span, from 1964 to 2021, reflects the period for which comprehensive statistics on the production of various sources of renewable energies are available.

The primary explanatory variables pertaining to renewable energies are gauged by the volume of electricity generation from five distinct sources measured in terawatt-hours (TWh) per year. These sources encompass solar energy (SE), wind energy (WE), hydraulic energy (HE), biofuel energy (BE), and geothermal energy (GE). Data for these variables are sourced from the BP Statistical Review of World Energy, acquired through Our World In Data. As for the dependent variable, Economic Growth (EG) is employed where its data is extracted from the World Bank.

In addition to the main variables, we incorporate various control variables to enhance the robustness of our analysis. These include Gross Formation of Capital (GCF), Labor (LAB), Industrialization Rate (IND), Openness Rate (OP), Institutional Quality (IQ), and Energy Dependency (ED). Gross Formation of Capital (GCF) is included because it represents investment in an economy, which is a crucial driver of economic growth. Labor (LAB) is a fundamental factor of production, and its availability and productivity directly impact economic output. Industrialization Rate (IND) measures the extent of industrial activity, which is often a significant contributor to economic growth. Openness Rate (OP) reflects the degree of trade openness and economic integration with the global economy, influencing growth through trade and foreign investment. Institutional Quality (IQ) is included as it affects economic performance by shaping the business environment, legal frameworks, and governance structures. Energy Dependency (ED) indicates the reliance on external energy sources, which can impact economic stability and growth due to vulnerabilities in energy supply.

b. Model

In our pursuit to discern the impact of renewable energies on economic growth, we formulate a comprehensive hypothesis employing the Cobb-Douglas production function[1]. This model enables us to assess the responsiveness of economic growth to each specific type of renewable energy, incorporating insights from various studies (Bhattacharya *et al.*, 2016; Belloumi, 2009; Chen *et al.*, 2007; Destek, 2016; Dogan *et al.*, 2020; Dogan, 2016; Ghali and El-Sakka, 2004; Lee and Chang, 2007; Menegaki, 2011, Sarsar & Echaoui; 2024b, 2024c).

The structure of our empirical model is outlined as follows:

$$EG_{it} = A.GFC_{it}^{\beta_1}.L_{it}^{\beta_2}.SE_{it}^{\beta_3}.WE_{it}^{\beta_4}.HE_{it}^{\beta_5}.BE_{it}^{\beta_6}.GE_{it}^{\beta_7}.IND_{it}^{\beta_8}.OP_{it}^{\beta_9}.IQ_{it}^{\beta_{10}}.ED_{it}^{\beta_{11}}.\mu_{it}$$

After the logarithmic transformation[2]:

$$EG_{it} = \alpha_{it} + \beta_1 Log(GFC)_{it} + \beta_2 Log(L)_{it} + \beta_3 Log(SE)_{it} + \beta_4 Log(WE)_{it} + \beta_5 Log(HE)_{it} + \beta_6 Log(BE)_{it} + \beta_7 Log(GE)_{it} + \beta_8 Log(IND)_{it} + \beta_9 Log(OP)_{it} + \beta_{10} Log(IQ)_{it} + \beta_{11} Log(ED)_{it} + \varepsilon_{it}$$

where EG_{it} denotes the annual variation in percentage of the GDP of country i in year t; GFC_{it} denotes the volume of the Gross Fixed Capital in millions of USD in country i in year t; L_{it} denotes the number of labor supply in country i in year t; SE_{it} refers to the annual production of electricity from solar energy, measured in terawatt-hours (TWh) per year t in country i; BE_{it} refers to the annual production of electricity from biomass energy, measured in terawatt-hours (TWh) per year t in country i; WE_{it} refers to the annual production of electricity from wind energy, measured in terawatt-hours (TWh) per year t in country i; HE_{it} refers to the annual production of electricity from hydraulic energy, measured in terawatt-hours (TWh) per year t in country i; GE_{it} refers to the annual production of electricity from geothermal energy, measured megawatts per year t in country i; IND_{it} denotes the added

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[1] The choice of the Cobb-Douglas model is based on the endogenous growth framework which is justified as it incorporates technological advancements and innovation as key drivers of growth. By integrating renewable energy production into this framework, we can analyze how shifting toward renewable technologies influence long-term economic growth through enhanced innovation and increased capital efficiency.

[2] We transform the Cobb-Douglas model into logarithmic form for econometric estimation to address potential issues with model specification and interpretation. Logarithmic transformation ensures that the coefficients estimated in the regression represent elasticities, making them more directly interpretable in terms of percentage

[2] We transform the Cobb-Douglas model into logarithmic form for econometric estimation to address potential issues with model specification and interpretation. Logarithmic transformation ensures that the coefficients estimated in the regression represent elasticities, making them more directly interpretable in terms of percentage changes. Additionally, logarithmic transformation can help linearize the relationship between variables, making it easier to satisfy the assumptions of linear regression, such as normality and homoscedasticity. This transformation also reduces the impact of outliers and stabilizes the variance of the error term, improving the reliability of the estimates.

value of industrial sectors in percentage of the GDP of country i in year t; OP_{it} denotes the openness rate as trade of goods in percentage of the GDP of country i in year t; IQ_{it} denotes the institutional quality score of country i in year t; ED_{it} denotes the energy dependency measured by net energy imports of country i in year t; α_t represents the specific fixed effect of each year to control for time-stable omitted factors, and εit is the normally distributed error term.

4. Results

Table 1 shows the substantial disparity between the mean and median values of the variables suggests a non-random distribution. This observation is further corroborated by the rejection of the null hypothesis through Jarque-Bera's statistic at the 1% significance level, affirming the non-normal distribution of the variables. Consequently, addressing both normality issues and heteroscedasticity becomes imperative. To handle these challenges effectively, the Recursive Weighted Least Squares (RWLS) estimation method is deemed suitable. RWLS not only accommodates non-normality concerns but also addresses heteroscedasticity, providing a robust approach for our analysis.

Moreover, the existence of minimum values below 1 in some variables raises a complication when considering logarithmic transformation. To circumvent this issue, we apply specific adjustments: adding +1 to SE, WE, HE, BE, GE, +14 to GCF, +18000 to ED, and +3 to IQ. This ensures that all values surpass 1 after transformation, enabling a smooth application of logarithmic operations. The utilization of RWLS, given its capacity to handle non-normality concerns, enhances the reliability of our estimation method, contributing to the robustness of the analytical framework.

Table 1: Descriptive statistics

	Mean	Median	Maximum	Minimum	St.Error	Jarque-Bera
EG	3,6421	3,7938	88,9577	-64,0471	6,0986	222106,10***
SE	0,7080	0,0000	327,0000	0,0000	7,7875	191000000,00***
WE	1,9204	0,0000	655,6000	0,0000	17,3625	84180601,00****
HE	18,7035	1,6750	1321,7100	0,0000	66,1558	5638774,00***
BE	18,5148	1,8704	424,4401	0,0000	56,1070	26490,83***
GE	416,0375	79,5000	3170,9600	0,0000	642,3593	607,73***
GCF	23,4549	22,7085	89,3811	-13,4053	8,9455	4757,07***
L	54,5093	59,2690	99,5900	1,0400	27,5790	379,28***
IND	27,0507	25,1614	90,5130	2,7586	12,5699	3480,20***
OP	60,8899	50,5436	957,7840	2,7226	48,2795	2408931,00***
IQ	-0,0323	-0,1803	2,4260	-2,4503	0,9925	150,24***
ED	-87,9992	20,6927	100,0000	-17632,7700	578,4322	38577843,00***

Source: Authors

*, **, *** indicate respectively a significant level at 10%, 5% and 1%.

Table 2 summarizes the empirical results where the intercept coefficient (C) in the model is statistically significant at the 1% level, indicating that there is a significant base level of economic growth that is not explained by the independent variables included in the model. The adjusted R-squared (R^2) value of the model is 0.683, indicating that about 68.3% of the variation in the dependent variable (EG) is explained by the independent variables. The adjusted Rw^2 value is 0.863, indicating that the model has good explanatory power of 86.3% even after accounting for the number of independent variables. The Rn^2 statistic is also statistically significant at the 1% level, indicating that the model as a whole is a good fit for the data.

After commenting on the global significance of the model, we proceed then to the analysis of the explanatory variables as follows: The regression model shows that the logarithm of each type of renewable energy (SE, WE, HE, BE, and GE) has a statistically significant impact on economic growth at the 1% level. Specifically, the coefficients for SE, BE, and WE are negative, while the coefficients for GE and HE are positive. This suggests that an increase in solar, biofuel, and wind energy usage is associated with a decrease in economic growth, while an increase in geothermal and hydraulic energy usage is associated with an increase in economic growth.

In terms of the elasticity of their effects, Hydraulic energy (HE) has the largest positive elasticity of 1.01096, indicating that a one percent increase in hydraulic energy usage is associated with a 1.01096 percent increase in economic growth. Economic growth appears to be quite elastic in response to changes in hydraulic energy usage. Biofuel energy (BE) has a negative elasticity of -0.11152, suggesting that a one percent increase in biofuel energy usage is associated with a 0.11152 percent decrease in economic growth. Economic growth also appears to be somewhat inelastic in response to changes in biofuel energy usage. Solar energy (SE) has a negative elasticity of -0.09441, indicating that a one percent increase in solar energy usage is associated with a 0.09441 percent decrease in economic growth. Economic growth appears to be somewhat inelastic in response to changes in solar energy usage. Wind energy (WE) also has a negative elasticity of -0.81721, indicating that a one percent increase in wind energy usage is associated with a 0.81721 percent decrease in economic growth. Economic growth appears to be more elastic in response to changes in wind energy usage compared to solar and biofuel energy. Geothermal energy (GE) has a positive elasticity of 0.27889, suggesting that a one percent increase in geothermal energy usage is associated with a 0.27889 percent increase in economic growth. Economic growth appears to be somewhat elastic in response to changes in geothermal energy usage.

In addition, the regression results show that all control variables, including Gross capital formation (GCF), Labor (L), Industrialization rate (IND), Openness rate (OP), Institutional quality (IQ), and Energy dependency (ED), have statistically significant coefficients at the 1% level, except for IQ which is not significant. This suggests that these variables have a significant impact on economic growth. The coefficient for Gross capital formation (GCF) is positive and significant (9.91281), indicating that an increase in GCF is associated with an increase in economic growth. The coefficient for Labor (L) is also positive and significant (1.26845), suggesting that an increase in labor force is associated with an increase in economic growth. The coefficient for Industrialization rate (IND) is positive and significant (1.38175), indicating that an increase in industrial production is associated with an increase in economic growth. The coefficient for Openness rate (OP) is positive and significant (7.17759), suggesting that an increase in openness to international trade is associated with an increase in economic growth. The coefficient for Institutional quality (IQ) is not statistically significant (0.09280), indicating that institutional quality does not have a significant impact on economic growth in this model. Finally, the coefficient for Energy dependency (ED) is positive and significant (53.41657), suggesting that an increase in energy dependency is associated with an increase in economic growth.

Table 2: The effect of different sources of renewable energies on economic growth in the sample countries

	Coef.	St.Error.	Z statistic
C	-597,39460***	109,45150	-5,45808
LOG(GCF)	9,91281***	0,22540	43,97885
LOG(L)	1,26845***	0,05546	22,87309
LOG(SE)	-0,09441***	0,02936	-3,21530
LOG(WE)	-0,81721***	0,02598	-31,45716
LOG(HE)	1,01096***	0,02359	42,86534
LOG(BE)	-0,11152***	0,03053	-3,65272
LOG(GE)	0,27889***	0,02373	11,75100
LOG(IND)	1,38175***	0,16976	8,13954
LOG(OP)	7,17759***	0,13747	52,21177
LOG(IQ)	0,09280	0,29694	0,31250
LOG(ED)	53,41657***	11,16234	4,78543
R^2		0.717577	
Adjusted R^2		0.683438	
Rw^2		0.867911	
Adjusted Rw^2		0.863438	
Sample		12296	
Included Observations		103	
Rn^2 statistic		45847.62***	

Source: Author'' estimation.
Note: *, **, *** indicate respectively a significant level at 10%, 5% and 1%.

5. Discussion

Positive effects for geothermal and hydraulic energy suggest that investment and utilization of these types can promote economic growth, possibly due to factors such as lower production costs, higher efficiency, or advanced technology. On the other hand, negative coefficients for solar, biofuel, and wind energy imply that investing in and using these energy types could have unintended consequences, like increased costs or reduced productivity in some sectors, which may outweigh the benefits and result in decreased economic growth. The efficiency and cost of hydraulic, geothermal, solar, wind, and biofuel energies can vary based on factors like location, technology, and available resources. General trends show that hydraulic energy, often derived from hydroelectric power plants, is highly efficient and cost-effective, particularly in regions with abundant water resources and suitable topography. Large-scale hydroelectric plants can reach efficiency levels of up to 90%, making it one of the most efficient renewable energy types. Geothermal energy is also efficient and cost-effective in areas with high geothermal potential. Despite high initial investments for geothermal power plants, ongoing operational costs are typically low, and efficiency levels can vary between 70% and 80%. Solar energy has experienced significant improvements in efficiency and cost reduction in recent years due to advancements in photovoltaic (PV) technology. However, solar panel efficiency remains lower compared to hydraulic and geothermal energy, typically ranging between 15% and 25%. Solar energy costs continue to decrease but may still be higher than hydraulic and geothermal energy, particularly in areas with less sunlight. Wind energy efficiency depends on factors such as turbine design and wind conditions. Wind turbines can convert around 30-45% of the wind's kinetic energy into electricity, and the cost of wind energy has significantly decreased over the years. However, wind energy may be less cost-effective in regions with low wind speeds or intermittent wind resources. Biofuel energy efficiency depends on the feedstock and production process. Generally, biofuels are less energy-dense compared to fossil fuels, leading to higher costs and lower efficiency. However, future advancements in technology and feedstock development may improve biofuel energy efficiency and reduce costs. In summary, hydraulic and geothermal energy sources are often more efficient and less costly than solar, wind, and biofuel energies. Nonetheless, local conditions, technological advancements, and resource availability can significantly affect the efficiency and cost of each energy type.

6. Conclusion

Based on the results, decision makers should prioritize the development, investment, and usage of hydraulic and geothermal energy, as these renewable energy types have positive impact on economic growth. This could involve funding research and development, offering incentives for private sector investment, and simplifying permitting processes for new projects. Conversely, policymakers should reconsider support for biofuel, wind, and solar energies due to their negative effects on economic growth, by reevaluating subsidies, tax incentives, and other support mechanisms to ensure cost-effectiveness and prevent inadvertent economic hindrances. In addition, policymakers should aim to mitigate the negative effects of these renewable energy sources on economic growth by fostering technological advancements and encouraging research and development to improve efficiency and cost-effectiveness. Furthermore, policymakers can promote a diverse energy mix by implementing policies and incentives that encourage a balanced portfolio of renewable energy types, which could help offset any negative effects of specific energy sources.

The limitations of our study include the inability to generalize the results to all cases, as some countries or sectors may exhibit different outcomes than those presented in our findings. In other words, despite that hydraulic and geothermal energy sources are often more efficient and less costly than solar, wind, and biofuel energies, local conditions, technology advancements, and resource availability can significantly impact the efficiency and cost of each energy source.

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Appendix 1 : List of countries and territories

Afghanistan, Albania, Algeria, American Samoa, Angola, Antigua and Barbuda, Argentina, Armenia, Aruba, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, British Virgin Islands, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Cayman Islands, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Cote d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic Republic of Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faeroe Islands, Falkland Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Gibraltar, Greece, Greenland, Grenada, Guadeloupe, Guam, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kosovo, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macao, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Martinique, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Montserrat, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Niue, North Korea, North Macedonia, Norway, Oman, Pakistan, Palestine, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Reunion, Romania, Russia, Rwanda, Saint Helena, Saint Kitts and Nevis, Saint Lucia, Saint Pierre and Miquelon, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Korea, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Timor, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Turks and Caicos Islands, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Zambia and Zimbabwe.