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The impact of feed-in tariffs and power purchase agreements on public investments in renewable energy

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Abstract. The transition to renewable energy has become a grave global priority, with governments relying on financial instruments such as feed-in tariffs (FiTs) and power purchase agreements (PPAs) to stimulate public investments. Despite their widespread adoption, evidence regarding their effectiveness across different contexts remains fragmented. This study aims to evaluate whether FiTs and PPAs significantly drive public investments in renewable energy, using a cross-country perspective. The analysis provides panel data from 59 countries, combining information on FiTs and PPAs with public investment data complemented by macroeconomic and energy consumption indicators. The empirical framework employs a Seemingly Unrelated Regression panel model with Driscoll–Kraay standard errors to account for cross-sectional dependence and heteroskedasticity. The findings reveal that the effectiveness of FiTs and PPAs varies substantially across renewable energy sectors. For instance, FiTs for wind energy ($\beta = 0.15$, $p < 0.01$) and hydropower PPAs ($\beta = 0.22$, $p < 0.001$) emerge as strong positive drivers of investment. In contrast, PPAs for solar ($\beta = -0.13$, $p < 0.05$) and geothermal energy ($\beta = -0.08$, $p < 0.05$) show adverse and significant effects. Bioenergy FiTs, meanwhile, indicate a weak negative impact ($\beta = -0.10$, $p \approx 0.06$). Additionally, macroeconomic factors such as energy consumption per capita ($\beta = 0.34$, $p < 0.01$) also play a decisive role, while GDP per capita exerts no consistent effect. These results suggest that FiTs and PPAs remain important but unevenly effective tools, requiring careful calibration that is both sector-specific and country-specific.

Keywords: energy policy, feed-in tariffs, power purchase agreements, public investments, renewable energy, panel data analysis.

JEL Classification: Q42, Q48, O13, C33

1. INTRODUCTION

The shift to renewable energy has become a cornerstone of global energy and climate strategies, reflecting both environmental imperatives and socio-economic opportunities. According to the International Energy Agency (IEA, 2023), meeting net-zero targets requires a tripling of annual investments in renewable energy by 2030, with public investments playing a critical catalytic role in mobilising private finance. Instruments such as feed-in tariffs (FiTs) and power purchase agreements (PPAs) have long been employed to de-risk renewable projects by guaranteeing stable revenues and encouraging large-scale deployment. Their relevance remains high as countries seek to balance energy security, affordability, and sustainability in a volatile geopolitical environment.

The European Commission (2021) has emphasised that FiTs and PPAs remain among the most effective policy tools for providing certainty to investors, particularly in emerging technologies such as offshore wind and solar PV. Within the European Union's Green Deal and the Fit for 55 packages, the Commission emphasises that stable and predictable support mechanisms must underpin the expansion of renewable energy to achieve the 2030 target of 42.5% renewable energy. However, the design of these instruments has been evolving, with greater emphasis on competitive auctions, market-based mechanisms, and integration into electricity markets, which poses important questions about the continued role of FiTs and PPAs in shaping public investment.

At the global level, the World Bank (2023) and the International Renewable Energy Agency (IRENA, 2023) emphasise that FiTs and PPAs remain crucial in developing and transition economies, where high financing costs and policy uncertainty hinder the uptake of renewable energy. By offering predictable cash flows, these mechanisms reduce perceived risk and enhance the bankability of renewable projects, thereby supporting public investment decisions and fostering blended finance approaches. For example, IRENA (2023) estimates that well-designed FiTs contributed to more than 50% of the global solar PV capacity additions during the 2010s, demonstrating their historical and ongoing significance.

Recent geopolitical and economic shocks, including the war in Ukraine and energy price volatility, have underscored the need for secure and diversified energy systems. The IEA (2023) and the European Commission (2021) note that stable contractual frameworks, such as PPAs, have gained renewed importance for ensuring long-term price stability and shielding consumers and governments from fluctuations in fossil fuel prices. At the same time, the EU increasingly advocates for a transition towards carbon pricing and emission trading as complementary or alternative instruments. This shifting policy landscape underscores the need to reassess the impact of FiTs and PPAs on public investments in renewable energy, not only in terms of past performance but also in light of their role in a rapidly evolving global energy governance system.

2. LITERATURE REVIEW

The global shift towards renewable energy is deeply intertwined with sustainability, governance, and economic transformation. Research consistently underlines that renewable energy policies and fiscal strategies are not merely environmental tools but also drivers of broader socio-economic development. Green fiscal instruments, such as subsidies and targeted reforms, have been found to reduce carbon emissions while significantly promoting energy efficiency (Bai et al., 2024; Balcerzak et al., 2024). The European Union's evolving climate goals reflect this trajectory, emphasising energy mix diversification, policy reforms, and coordinated strategies for the decarbonisation of national economies (Kawecka-Wyrzykowska, 2025; Streimikiene, 2025; Vasa et al., 2024). At the same time, volatility in electricity prices highlights both the chances and dares associated with renewable energy generation, as demonstrated in studies of European electricity markets (Bank & Badyda, 2024).

Beyond policy frameworks, financing mechanisms play a decisive role in shaping the renewable energy transition. FiTs and PPAs continue to be recognised as catalysts for mobilising investments, particularly by reducing risks for private and institutional investors (Lyeonov et al., 2025; Shcherbakova, 2025). In various forms, green finance has been shown to expand the opportunities for renewable energy adoption and enhance resilience to climate risks (Habib et al., 2025). In parallel, instruments such as collateral-based monetary policies and public financial support schemes are critical in unlocking private capital for green projects (Wang & Lu, 2024; López-Cózar-Navarro et al., 2025). Studies emphasise that the success of these financial instruments depends on context-specific institutional conditions, with recent research pointing to critical accomplishment factors that determine the efficacy of renewable energy projects (Kozhakhmetova et al., 2024) and the role of green finance within the European Green Deal (Streimikiene et al., 2024). Complementary evidence from Indonesia underscores the connection between green financial practices and long-term competitive advantage (Nohong et al., 2024), while corporate governance and investment decisions in financial institutions also influence outcomes (Noor et al., 2024).

Bibliometric evidence highlights the growing research landscape around such instruments, with bibliometric mapping revealing the intensification of scholarly attention towards financial-fiscal tools supporting renewables (Moroz & Lyeonov, 2024; Krause et al., 2024). This trend reflects the effectiveness of reforms designed to eliminate barriers to sustainable energy development in diverse countries (Dobrovolska et al., 2024b) and the expanding space for clean energy equity markets, including nuclear investments (Tudor, 2024). Moreover, new forms of finance, such as peer-to-peer lending, are explored for their potential to channel capital into renewable projects, although investor rationality and regulatory oversight remain critical (Legenzova & Leckė, 2024).

At the sectoral level, multiple studies highlight the intersection of renewable energy with health, agriculture, and industry. Transitioning to renewables directly reduces air pollution and improves public health, linking environmental and healthcare policies (Badreddine & Cherif, 2024; Huzenko & Kononenko, 2024). Energy poverty remains a key challenge, particularly in rural and agricultural households, with evidence from Poland underscoring its socio-economic effects (Piwowar, 2025). In agriculture, bioenergy and sustainable practices are tied to health outcomes and economic stability, particularly in transition economies such as Ukraine (Dankevych et al., 2023). Similarly, the adoption of renewable energy in manufacturing and heavy industry has been linked to structural reforms and compliance with international environmental standards (Tömöri et al., 2025; Marišová et al., 2024).

Technological and entrepreneurial dimensions add further complexity. Start-ups and entrepreneurship in renewable energy are increasingly positioned as engines of innovation, yet they face barriers related to financing, minority investor protection, and regulatory frameworks (Dobrovolska et al., 2024a; Halynskyi & Telizhenko, 2024; Myroshnychenko et al., 2024). Clean energy projects also intersect with digitalisation and Industry 4.0, where ICT and AI-powered innovations reshape both business models and consumer engagement (Kuzior & Lobanova, 2020; Behar Villegas et al., 2024; Piwowarski, 2024). Adoption scenarios of energy management systems highlight that the digital and behavioural aspects of consumption must complement financial incentives (Gualandri & Kuzior, 2023). While some research investigates AI applications in the energy transition, insights from other fields, such as pharmaceutical research, also reveal how investors and researchers view the role of AI in accelerating R&D, which may have transferable implications for renewable energy innovation (Kritikos et al., 2025).

Geopolitical, regional, and cultural contexts also shape energy transition. Evidence shows that renewable energy enhances energy security, particularly in turbulent geopolitical environments such as Eastern Europe, while reducing vulnerabilities associated with fossil fuel dependence (Havrylenko & Myroshnychenko, 2025; Wołowiec et al., 2022). Integration efforts, such as the Belt and Road Initiative, position renewable energy as a strategic tool for cross-border cooperation and sustainable development (Abuselidze, 2025; Vakulenko & Rekunenko, 2025). Case-specific studies, from ASEAN to India, from Nordic countries to transition economies, illustrate that policy efficiency, financing capacity, and social acceptance vary considerably across contexts, highlighting the uneven pace of global energy transformation (Bui & Nguyen, 2025; Fernandes et al., 2025; Georgescu et al., 2024; Štreimikienė, 2024; Triantafyllidou et al., 2024).

Broader sustainability and governance considerations position renewable energy as an environmental priority and integral to a systemic transformation. Organisational values and leadership have been shown to drive sustainable practices across industries (Alemu, 2025; Dyduch et al., 2024). Ethical leadership, risk management, and fair governance are increasingly recognised as essential prerequisites for ensuring that renewable energy transitions align with the principles of equity and resilience (Prokopenko et al., 2025; Ghimire et al., 2025). The EU-Ukraine context illustrates how sustainability benchmarks and integration policies influence the expansion of renewable energy (Makarenko & Vorontsova, 2024), while studies on ecological governance confirm the pivotal role of environmental regulation (Wang et al., 2024). At the same time, the energy crisis has forced policymakers to reassess the balance between short-term resilience and long-term sustainability (Shtunder et al., 2022). Evaluations of EU policies highlight a growing reliance on market-based instruments, with emissions trading systems gaining prominence over direct subsidies such as FiTs and PPAs (Juracka et al., 2024; Mentel et al., 2020).

The literature landscape reveals a multidimensional picture: renewable energy transitions are influenced by fiscal instruments, financial market structures, health and agricultural linkages, entrepreneurial ecosystems, geopolitical contexts, and governance practices. While evidence underscores the effectiveness of targeted policies and financial incentives in accelerating the adoption of renewable energy, challenges remain in balancing economic, social, and environmental objectives across diverse regional contexts. This synthesis provides the foundation for examining how FiTs and PPAs specifically shape public investment in renewables within a comparative international framework.

The aim of this research is to empirically assess the effectiveness of feed-in tariffs and the duration of power purchase agreements in promoting renewable energy deployment across a diverse panel of countries, while controlling for economic and energy consumption factors.

3. METHODOLOGY

This study employs an econometric panel data approach to investigate the effects of FiTs and PPAs on public investments in renewable energy across different countries. The empirical analysis is based on a balanced dataset covering the period 2000–2019, which enables the assessment of both cross-country heterogeneity and temporal dynamics in renewable energy policies.

Data and variables

The dependent variables represent public investments in renewable energy generation by technology (wind, solar, geothermal, bioenergy, hydropower, marine energy, and multi-renewable energy projects). Explanatory variables include policy instruments (FiT and length of PPA), which are coded by renewable energy technology, as well as control variables such as GDP per capita (in current US dollars) and electricity consumption per capita (in kWh). These variables and their respective data sources are presented in Table 1. Policy data were derived from the CEIC (n.d.) and official websites of authorities in various countries, with macroeconomic variables sourced from the World Bank's World Development Indicators.

Table 1

Variables and their sources.

Variable	Indicator	Sources
FiT_wind	Wind means feed-in tariff	CEIC (n.d.); Bashiri and Hosseinioun (2020), CEB (n.d.), EWSRC (2021), Energy Charter Secretariat (2012), ERA (n.d.), IrREA (n.d.), IRENA (2021), Liu et al. (2019), MEMR (n.d.), Norton Rose Fulbright (2017), PURC (n.d.), FERK (n.d.), R2E2 (n.d.), SEDA (n.d.), and World Bank (n.d.-a)
PPA_wind	Wind length of the power purchase agreement	
FiT_solar	Solar PV mean feed-in tariff	
PPA_solar	Solar PV length of power purchase agreement	
FiT_geo	Geothermal mean feed-in tariff	
PPA_geo	Geothermal length of the power purchase agreement	
FiT_bio	Biomass means feed-in tariff	
PPA_bio	Geothermal length of the power purchase agreement	
FiT_waste	Waste means feed-in tariff	
PPA_waste	Waste length of the power purchase agreement	
FiT_hydro	Small hydro means feed-in tariff	
PPA_hydro	Small hydro length of the power purchase agreement	
FiT_marine	Marine mean feed-in tariff	
PPA_marine	Marine length of the power purchase agreement	
Inv_wind	Public investments in wind energy	Energydata.Info. (2024)
Inv_solar	Public investments in solar energy	
Inv_geo	Public investments in geothermal energy	
Inv_bio	Public investments in bioenergy	
Inv_hydro	Public investments in hydropower	
Inv_marine	Public investments in marine energy	
Inv_mult	Public investments in multiple renewable energy	
EPC_pc	Electric power consumption (kWh per capita)	World Bank. (n.d.-b)
GDP_pc	GDP per capita (current US$)	

The empirical sample comprises 59 countries spanning diverse geographic regions, income levels, and energy profiles. It includes advanced economies such as Austria, Belgium, Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States, alongside emerging economies such as Brazil, China, India, Indonesia, Mexico, and South Africa, as well as smaller transition economies like Armenia, Bosnia and Herzegovina, North Macedonia, and Moldova. The dataset also incorporates countries from Africa (e.g., Ghana, Kenya, Morocco, South Africa), the Middle East (Iran, Israel, Jordan, Saudi Arabia), and Latin America (Argentina, Chile, Dominican Republic, Ecuador). The sample of countries is constrained by the availability of information on FiTs and PPAs (CEIC, n.d.) and public investments in renewables (Energydata.Info, 2024), which restricted coverage to those states with sufficiently reported data. Including different countries ensures a broad representation of institutional, economic, and energy system characteristics. This diversity enhances the robustness and generalizability of the analysis, as it captures the heterogeneous effects of renewable energy policies across countries with varying levels of economic development, governance capacity, and resource endowments.

The analysis covers the period from 2000 to 2019, which reflects the availability of consistent data on FiTs and PPAs from CEIC (n.d.). To ensure comparability across countries and technologies, the panel is bounded to 2000–2019. This temporal window reflects the last year for which CEIC provides harmonised, cross-country series on feed-in tariffs and power-purchase-agreement characteristics; more recent observations are not uniformly available under our licence terms. All outcome and control variables were synchronised to this window so that estimation draws on a consistent, fully observed panel (CEIC, n.d.). While this timespan allows for a robust long-term assessment, it also imposes certain limitations. Recent developments, such as the war in Ukraine, have significantly reshaped global and regional energy markets, introducing new geopolitical risks and energy security challenges not captured in the present dataset. Furthermore, employing the European Union's "Fit for 55" package (a comprehensive policy framework designed to accelerate decarbonisation) may substantially alter the design and effectiveness of renewable energy support schemes in the years ahead. It should also be noted that, within the EU, the policy discourse has increasingly supported replacing traditional instruments, such as FiTs and PPAs, with a strengthened system of tradable emission quotas, shifting the emphasis towards market-based mechanisms. These structural shifts imply that the results of this study should be interpreted within the historical context of 2000–2019, acknowledging that current and future policy and geopolitical dynamics could lead to different outcomes.

Model specification

To capture the relationships between policy instruments and public investments in renewable energy, both individual fixed-effects models for each renewable technology and a system of seemingly unrelated regressions (SUR) were estimated to account for potential cross-equation error correlations. The baseline specification is as follows:

$$RE_{ijt}=a_i+\beta_1 FiT_{ijt}+\beta_2 PPA_{ijt}+\beta_3 GDPpc_{it}+\beta_4 EPCpc_{it}+\gamma_t+\epsilon_{ijt},$$

where RE_{ijt} denotes public investments in appropriate technology of the renewable electricity *j* in country *i* at time *t*, FiT_{ijt} and PPA_{ijt} capture policy instruments, $GDPpc_{it}$ and $EPCpc_{it}$ are control variables, α_i denotes country fixed effects (captures unobserved, time-invariant characteristics of each country), and γ_t represents year dummies to control for unobserved time-specific shocks, β_1-β_4 are coefficients measuring the effect of appropriate variables, ϵijt – error term capturing unobserved influences specific to country *i*, technology *j*, and time *t* not captured within the set of explanatory variables.

Estimation procedure

Panel fixed-effects regressions are first estimated separately for each renewable technology to assess technology-specific effects. To ensure robust inference in the presence of heteroskedasticity, serial correlation, and cross-sectional dependence, Driscoll and Kraay standard errors are applied. Subsequently, the SUR model is estimated using a system of seven equations to capture contemporaneous correlations across renewable energy technologies, providing a more efficient estimation framework.

Robustness checks

Robustness checks are performed by comparing fixed-effects and SUR estimates, and applying Driscoll–Kraay standard error corrections to test the sensitivity of the results to alternative error structures. Additional checks include lagged specifications of policy instruments and alternative scaling of macroeconomic controls to ensure consistency of findings.

4. EMPIRICAL RESULTS AND DISCUSSION

The dataset comprises 1,200 observations across 60 countries between 2000 and 2019 (Table 2). For FiTs, average values are very low, ranging from 0.02 (marine) to 0.10 (solar). The medians for all FiTs are zero, showing that no support scheme was implemented in most country–year cases. Nevertheless, some countries introduced high tariff levels, with maximums of 0.87 for solar, 0.73 for wind, 1.13 for waste, 1.11 for small hydro, and 0.71 for marine. The high skewness and excess kurtosis (e.g. waste FiT skewness 7.23, kurtosis 71.65) reveal that FiT distributions are strongly non-normal and dominated by zeros with occasional significant outliers.

The power purchase agreement (PPA) lengths also exhibit skewed distributions. Median values are zero for all technologies, yet maximums reach 25 years for most renewables and 35 years for small hydro. These figures suggest that while many countries had no PPA schemes, some adopted long-term contractual commitments.

Public investment variables are even more heavily dispersed. Mean values range from $0.01 million in marine to $38 million in wind. However, standard deviations are considerable compared with the means, and the median is zero for all investment categories. Maximum public investments vary widely, ranging from $ 724 million USD in geothermal to more than $ 10,000 million USD in hydropower. Skewness and kurtosis values are extremely high (e.g., skewness of 20.28 and kurtosis of 460.34 for hydropower), indicating the presence of outliers and highly unbalanced public investment distributions.

The control variables also display substantial heterogeneity. Electricity consumption per capita averages 5,640 kWh, ranging from a minimum of 109 kWh to a maximum of 55,085 kWh. GDP per capita averages $ 18,958 but ranges from $ 254 to $ 103,554, reflecting substantial regional disparities.

Table 2

Descriptive statistics of main variables (2000–2019)

Variable	Obs.	Mean	SD	Median	Min	Max	Skewness	Kurtosis
FiT_wind	1200	0.05	0.10	0.00	0.00	0.73	4.38	24.46
PPA_wind	1200	6.99	8.68	0.00	0.00	25.00	0.62	-1.29
FiT_solar	1200	0.10	0.18	0.00	0.00	0.87	2.09	3.65
PPA_solar	1200	6.96	9.09	0.00	0.00	25.00	0.69	-1.26
FiT_geo	1200	0.03	0.06	0.00	0.00	0.33	2.55	6.50
PPA_geo	1200	3.62	7.02	0.00	0.00	25.00	1.63	1.12
FiT_bio	1200	0.04	0.06	0.00	0.00	0.26	1.41	0.84
PPA_bio	1200	6.04	8.48	0.00	0.00	25.00	0.86	-0.97
FiT_waste	1200	0.04	0.10	0.00	0.00	1.13	7.23	71.65
PPA_waste	1200	4.81	7.72	0.00	0.00	25.00	1.18	-0.19
FiT_hydro	1200	0.04	0.11	0.00	0.00	1.11	6.59	54.24
PPA_hydro	1200	6.98	9.61	0.00	0.00	35.00	0.97	-0.33
FiT_marine	1200	0.02	0.06	0.00	0.00	0.71	5.01	32.89
PPA_marine	1200	2.14	5.71	0.00	0.00	25.00	2.51	4.92
Inv_wind	1200	38.18	189.67	0.00	0.00	2463.46	7.69	70.30
Inv_solar	1200	21.24	106.01	0.00	0.00	1462.55	8.19	82.19
Inv_geo	1200	5.26	43.70	0.00	0.00	724.02	11.35	145.95
Inv_bio	1200	8.58	67.01	0.00	0.00	1467.50	16.56	329.19
Inv_hydro	1200	37.60	391.58	0.00	0.00	10005.30	20.28	460.34
Inv_marine	1200	0.01	0.34	0.00	0.00	11.67	33.23	1126.33
Inv_mult	1199	25.56	103.54	0.00	0.00	1387.85	6.42	51.79
EPC_pc	1200	5640.39	6755.86	4072.90	109.06	55085.17	4.24	23.96
GDP_pc	1200	18958.07	18783.16	11425.49	253.75	103553.84	1.31	1.38

Note: Values are reported in millions of USD for public investments, kWh per capita for EPC_pc, and USD for GDP_pc.
Source: authors' calculations in R Studio.

The descriptive results confirm that most variables are zero-inflated, heavily skewed, and leptokurtic. Variables should be transformed to reduce bias and improve the reliability of regression analysis.

Given the zero-inflated nature of several variables, the Yeo–Johnson transformation was selected as the most appropriate normalisation technique. Unlike the Box–Cox transformation, which requires strictly positive values, the Yeo–Johnson approach can accommodate zeros and negative values without arbitrary adjustments. It provides a flexible, data-driven method by estimating each variable's optimal transformation parameter (λ), thereby improving normality and reducing skewness. This makes it the best general option for the dataset, where feed-in tariffs, power purchase agreement lengths, and public investment variables contain a substantial number of zero observations.

The system-level results (Table 3) demonstrate that the SUR model provides a statistically significant and meaningful fit to the data. The overall McElroy-R^2 of 0.386 indicates that the included explanatory variables account for approximately 39% of the variation across all investment equations. This provides a reasonable explanation for the cross-country energy public investment data. The OLS-based R^2 of 0.368 is slightly lower but still confirms the relevance of the joint estimation approach. At the equation level, explanatory power varies considerably. The solar and geothermal models perform strongest, with adjusted R^2 values of 0.43 and 0.42, respectively, followed by bioenergy (0.35), wind (0.27), and hydropower (0.30). The marine energy equation performs poorly, with an adjusted R^2 close to zero, reflecting limited explanatory power and potentially greater data noise or missing drivers for this technology. By contrast, the equation for multiple renewable sources yields the highest explanatory capacity (adjusted $R^2 \approx 0.58$), consistent with the view that aggregated portfolios of technologies are better captured by the chosen determinants.

Table 3

System fit results of the method SUR.

	N	**DF**	**SSR**	**detRCov**	**OLS-R2**	**McElroy-R2**	
system	8393	7798	5002.44	0.025596	0.368474	0.385581	
Equation	**N**	**DF**	**SSR**	**MSE**	**RMSE**	**R2**	**Adj R2**
wind	1199	1116	812.930	0.728432	0.853482	0.319177	0.269153
solar	1199	1116	633.538	0.567686	0.753450	0.471514	0.432683
geo	1199	1116	649.826	0.582281	0.763073	0.458002	0.418178
bio	1199	1114	722.774	0.648810	0.805487	0.397110	0.351649
hydro	1199	1116	773.695	0.693275	0.832631	0.350186	0.302440
marine	1199	1116	1119.988	1.003573	1.001785	0.065898	-0.002737
mult	1199	1104	289.692	0.262402	0.512252	0.609026	0.575736

Source: authors' calculations in R Studio.

The covariance matrix of residuals (Table 4) and their correlations (Table 5) confirm the presence of statistically relevant interdependencies between public investment equations, thereby justifying the use of a system-based SUR approach instead of isolated regressions. Positive covariances are especially notable between wind, bioenergy, and hydro, while solar moderately correlates with wind and multiple renewable energy sources. These associations suggest that shocks to public investment in one technology tend to be reflected in others, consistent with the complementary nature of renewable policy support and capital flows. By contrast, marine energy displays weak or negative correlations with most technologies, reinforcing the earlier finding that this segment remains structurally distinct and less predictable.

Table 4

The covariance matrix of the residuals used for estimation

	wind	**solar**	**geo**	**bio**	**hydro**	**marine**	**mult**
wind	0.7282558	0.0854644	0.04505683	0.0966683	0.07808862	-0.02087284	0.03215121
solar	0.0854644	0.5676385	0.02957379	0.0225022	0.02180351	-0.01639267	0.04310462
geo	0.0450568	0.0295738	0.58225303	0.0490577	0.05467532	0.00826658	0.01384554
bio	0.0966683	0.0225022	0.04905767	0.6485805	0.04942063	0.07082677	0.03341341
hydro	0.0780886	0.0218035	0.05467532	0.0494206	0.69319037	-0.01530822	0.00320567
marine	-0.0208728	-0.0163927	0.00826658	0.0708268	-0.01530822	1.00357204	-0.01615768
mult	0.0321512	0.0431046	0.01384554	0.0334134	0.00320567	-0.01615768	0.26211782

Source: authors' calculations in R Studio

Table 5

The covariance matrix of the residuals used for estimation

	wind	**solar**	**geo**	**bio**	**hydro**	**marine**	**mult**
wind	1.0000000	0.1348255	0.0694064	0.1418814	0.11141345	-0.0248645	0.07813803
solar	0.1348255	1.0000000	0.0509381	0.0369061	0.03524107	-0.0218542	0.11829479
geo	0.0694064	0.0509381	1.0000000	0.0810169	0.08734011	0.0107428	0.03712279
bio	0.1418814	0.0369061	0.0810169	1.0000000	0.07560173	0.0880814	0.08309344
hydro	0.1114134	0.0352411	0.0873401	0.0756017	1.00000000	-0.0184565	0.00974546
marine	-0.0248645	-0.0218542	0.0107428	0.0880814	-0.01845646	1.0000000	-0.03191744
mult	0.0781380	0.1182948	0.0371228	0.0830934	0.00974546	-0.0319174	1.00000000

Source: authors' calculations in R Studio.

The results indicate that public investment in renewable technologies is shaped by technology-specific drivers and shared macroeconomic or policy factors, with stronger explanatory power for solar, geothermal, and bioenergy than for wind and hydro. The strong performance of the multiple renewables specification highlights the importance of treating energy transition public investments as part of a broader portfolio rather than in strict technological silos.

The results of the SUR estimation for wind public investment (Table A1, Appendix A) indicate that the direct effects of FiTs and the length of PPA are statistically insignificant. Both coefficients are small in magnitude and associated with relatively high standard errors, implying that these policy instruments, in isolation, did not exert a strong or consistent influence on public investment in wind power across the sampled countries. Similarly, macroeconomic controls such as GDP per capita and electricity consumption per capita do not show significant explanatory power in this specification, suggesting that other contextual factors or policy frameworks may be more decisive in shaping wind investment patterns.

By contrast, country and year fixed effects capture substantial heterogeneity. Several countries, including Brazil, China, Germany, India, Poland, Spain, Türkiye, and the United Kingdom, exhibit large and highly significant positive coefficients, signalling that these markets attracted markedly higher wind public investment after controlling for FiT, PPA, and macroeconomic variables. These findings are consistent with the view that broader policy frameworks, industrial capacity, and institutional quality are crucial in scaling up wind energy public investment. The year dummies also highlight distinct periods of global expansion, particularly 2009–2014 and 2016–2017, when public investment levels were significantly higher, reflecting stimulus measures following the financial crisis and subsequent policy momentum for renewable energy. The overall explanatory power of the model is moderate (adjusted $R^2 \approx 0.27$), which is reasonable given the complexity of public investment decisions and underscores the need to examine wind energy within the broader policy and institutional context.

The SUR estimates for solar public investments (Table A2, Appendix A) demonstrate that FiTs have a strong and statistically significant positive impact on public investment. The estimated coefficient for FiT is 0.134 ($p < 0.01$), confirming that tariff-based price support mechanisms effectively stimulate capital inflows into solar projects. By contrast, PPAs display a negative but insignificant association, suggesting that in the case of solar energy, guaranteed long-term contracts alone may not provide sufficient incentive for investors once FiT schemes are in place. Among the control variables, electricity consumption per capita is positively and significantly correlated ($p < 0.05$), suggesting that countries with higher electricity demand tend to attract more solar public investment. In contrast, GDP per capita shows no significant effect. These results highlight the primacy of targeted policy incentives over broader macroeconomic conditions in shaping public investment patterns in the solar sector.

Substantial cross-country heterogeneity emerges in the fixed effects. Several emerging economies (most notably India, Morocco, Brazil, Indonesia, Ghana, Jordan, Kenya, Mexico, Chile, and South Africa) exhibit large and highly significant positive coefficients, signalling stronger-than-average solar public investment performance after accounting for FiTs, PPAs, and macroeconomic drivers. Conversely, several high-income European countries, including Austria, Belgium, Germany, Finland, Sweden, the Netherlands, and the United Kingdom, are characterised by significant adverse effects, which may reflect market saturation, shifts away from FiT regimes, or stricter regulatory frameworks. Year effects also capture temporal public investment waves, with the period from 2010 to 2019 exhibiting a sequence of significant positive coefficients, particularly from 2015 to 2019. This pattern is consistent with the global boom in solar deployment following falling technology costs and post-crisis stimulus measures. The model achieves an adjusted R^2 of 0.43, indicating a relatively high explanatory power within the SUR framework and underscoring that public solar energy investment is powerfully shaped by policy design and country-specific structural factors.

The SUR estimates for geothermal public investments (Table A3, Appendix A) suggest that FiTs and PPAs do not have a statistically significant influence on public investment levels. FiT and PPA coefficients are positive but insignificant, suggesting that geothermal development may not be primarily driven by policy through conventional price support mechanisms, unlike solar or wind energy. Instead, electricity consumption per capita emerges as the strongest and most significant driver (coefficient = 1.095, $p < 0.001$), indicating that geothermal projects are more likely to be developed in countries with high electricity demand and a need for baseload generation. GDP per capita again shows no significant effect, reinforcing that sector-specific demand and infrastructure conditions are more relevant than general macroeconomic wealth levels in shaping geothermal public investment flows.

The country effects reveal stark geographical asymmetries. Indonesia and Kenya stand out with substantial and highly significant positive coefficients, consistent with their geological advantages and strong geothermal potential, as well as sustained policy support and international financing in recent decades. Other countries with positive public investment deviations include India, China, Mexico, Türkiye, Ghana, and Morocco, reflecting the expansion of geothermal initiatives in emerging economies. By contrast, most high-income countries, particularly those in Europe and North America, exhibit significantly adverse effects, including Austria, Belgium, Canada, France, Germany, Finland, Sweden, the Netherlands, and the United States. These results likely capture both the maturity of their markets, where opportunities for new geothermal capacity are limited, and a shift in policy towards wind and solar. The year dummies are insignificant, suggesting that geothermal public investments have not followed a global time-trend boom comparable to solar; instead, they appear highly concentrated in a few geologically favourable contexts. The model's adjusted R^2 of 0.42 confirms a solid explanatory power, though slightly lower than that for solar, consistent with the more location-specific nature of geothermal resources.

The SUR estimates for bioenergy public investments (Table A4, Appendix A) show that neither FiTs nor PPAs for bioenergy and waste exert statistically significant effects on public investment. The coefficients for FiT and PPA variables are small in magnitude and insignificant, suggesting that direct financial incentives play a weaker role in stimulating bioenergy compared to other renewables such as solar or wind. Similarly, GDP and electricity consumption per capita do not show significant effects, highlighting that bioenergy public investment is less tied to macroeconomic development or demand-side drivers. This may reflect the dependence of bioenergy projects on local resource availability (such as agricultural residues or municipal waste) rather than on broad economic conditions or generalised policy frameworks.

Country-level effects, however, reveal distinct geographical patterns. Brazil, China, and India stand out with highly significant positive coefficients, indicating that bioenergy public investment is concentrated in large emerging economies with abundant biomass resources and supportive domestic policies. Other countries also exhibit significantly higher-than-average public investments in bioenergy, including Argentina, Armenia, Bosnia and Herzegovina, Chile, Ecuador, Finland, Indonesia, Moldova, Sweden, and the United Kingdom. By contrast, most advanced economies in Western Europe and North America exhibit insignificant or negative deviations, suggesting that bioenergy is not a dominant focus in their renewable energy portfolios, possibly due to sustainability concerns and competition with solar and wind energy. These country effects highlight the resource- and policy-specific character of bioenergy deployment.

Temporal dynamics further differentiate bioenergy from geothermal and solar. Unlike geothermal public investments, which lacked significant year effects, bioenergy shows clear time trends. From 2009 onwards, many year dummies become highly significant and positive, especially between 2009 and 2016, signalling a global wave of bioenergy expansion. This coincides with the post-financial crisis green stimulus packages and heightened international interest in waste-to-energy and biomass as transitional solutions. The absence of significant effects before 2009 suggests that bioenergy growth was not a priority in its early stages, but rather a response to policy and environmental imperatives. The model's adjusted R^2 of 0.35 is moderate, slightly lower than geothermal, suggesting that while temporal and country effects are important, unexplained heterogeneity remains consistent with bioenergy's fragmented and resource-dependent nature.

The results indicate that FiTs and PPAs are not statistically significant drivers of hydro power public investments (Table A5, Appendix A), as both coefficients are small and insignificant. Instead, macroeconomic conditions emerge as the most important determinants. GDP per capita has a positive and significant effect, suggesting that public investments in hydro are more likely to occur in wealthier economies with greater financial capacity for large-scale infrastructure. Conversely, electricity consumption per capita shows a significant negative association, indicating that countries with high consumption may rely less on expanding hydro capacity, possibly due to saturated potential or environmental constraints. This finding suggests that hydro power is a capital-intensive option that relies more on long-term economic development than targeted support instruments.

The country-level effects reveal a strong geographical divide. Brazil, China, and India show significantly positive coefficients, confirming their status as leaders in hydro development, driven by abundant water resources and supportive national policies. By contrast, most European countries, North America, and many smaller economies display significantly negative coefficients, suggesting either mature hydroelectric sectors with limited scope for expansion or policy priorities shifting towards solar and wind energy. The temporal dimension provides further insight: unlike bioenergy, the year dummies for hydro are essentially insignificant, indicating the absence of a global expansion wave during the observed period. This stability may reflect the mature status of hydro technology and the long construction lead times associated with such projects. The model's adjusted R^2 of 0.30 is moderate, underscoring that structural and geographical differences explain more variation in hydro public investments than policy instruments or short-term shocks.

The estimates suggest that FiTs and PPAs have no statistically significant effect on marine energy public investments (Table A6, Appendix A). Both coefficients are nearly zero and highly insignificant, indicating that policy support mechanisms that play a role for solar or wind have not yet translated into measurable effects in the marine sector. Likewise, GDP and electricity consumption per capita are insignificant, implying that neither macroeconomic wealth nor energy demand drives public investments in this technology. This is unsurprising, given the experimental and pre-commercial nature of marine energy, which still relies on research funding and pilot projects rather than standardised public investment frameworks.

Country- and year-specific effects reinforce this interpretation. Finland is the only country showing a positive and significant coefficient, consistent with its leading role in wave and tidal energy research and demonstration projects. For all other countries, coefficients remain insignificant, suggesting that there is no systematic cross-country pattern of marine public investment beyond isolated cases. The temporal dummies reveal only one significant year (2016), which may indicate a clustering of pilot initiatives or EU-funded projects during that period. The very low R^2 (0.07) and negative adjusted R^2 indicate that marine public investment variation is only weakly explained by the model, underlining the immaturity and unpredictability of this sector compared with more established renewable technologies. Marine energy public investments appear to be driven by country-specific research agendas and demonstration projects rather than conventional public investment drivers or policy incentives.

The results for the multi-renewable public investment model (Table A7, Appendix A) highlight that policy support instruments exert differentiated effects across technologies. Feed-in tariffs for wind energy have a strong and positive impact on aggregated renewable public investment, suggesting that wind FiTs remain one of the most effective tools for mobilising sector capital. In contrast, solar energy power purchase agreements (PPAs) display a significant negative association with overall renewable public investment. This indicates that such contracts may displace or crowd out other forms of support, possibly due to rigid contract structures or public investment competition across technologies. Interestingly, PPAs for waste and hydro are positively associated with public investments, suggesting that long-term contractual certainty encourages capital inflows into these resource bases. Other support mechanisms, such as FiTs for bioenergy or geothermal energy, appear less influential, with only weak or insignificant effects on aggregate outcomes.

Beyond policy drivers, macroeconomic and structural factors also play a role. Electricity consumption per capita has a positive and significant effect, highlighting the importance of rising energy demand as a key driver of public investment diversification across renewable sources. Conversely, GDP per capita has a negative, though marginally insignificant, coefficient, which may suggest that wealthier economies channel public investment into mature technologies or energy efficiency rather than diversifying into multiple renewable energy sources simultaneously. The significance of the time dummies from 2009 onwards reflects a temporal clustering of public investments, coinciding with the global post-crisis stimulus packages, falling renewable technology costs, and international policy initiatives such as the Paris Agreement period.

Country fixed effects reveal wide heterogeneity. Large developing economies such as Brazil, China, India, Mexico, and Türkiye show highly significant and positive coefficients, underscoring their role as dynamic hubs of multi-technology renewable public investment. Several developing economies, including Ghana, Kenya, Jordan, and Morocco, appear to be active destinations for public investment, likely reflecting donor support and regional energy security agendas. By contrast, a group of advanced economies (e.g., Canada, Czech Republic, Estonia, Iceland, Israel, Russia, Sweden, United States) report significantly negative coefficients, suggesting lower relative activity in multi-technology portfolios, possibly due to reliance on mature single-resource strategies or saturation of renewable capacity.

The model accounts for a considerable proportion of variance (adjusted $R^2 \approx 0.58$), indicating that targeted policies, electricity demand growth, and national conditions drive public investment in renewables.

Results highlight the strong role of wind FiTs and hydro/waste PPAs in fostering diversified renewable portfolios, with expansion concentrated in fast-growing economies rather than evenly across all countries.

The system of equations jointly estimated public investment in renewable energy technologies as a function of FiTs, PPAs, GDP per capita, and electricity consumption per capita. The SUR framework enabled contemporaneous correlation across the error terms of the different public investment equations, thereby improving efficiency compared to separate OLS estimation.

Across the models, coefficients on FiTs and PPAs for wind, solar, hydro, biomass, geothermal, waste, and marine energy frequently showed statistically significant positive effects, indicating that higher tariff levels and longer guaranteed purchase contracts are associated with greater public investment in the respective technologies. This confirms the role of price support mechanisms in mitigating investor risk and encouraging capital flows into renewable energy.

The control variables, GDP per capita and electricity consumption per capita, were also positively related to public investment in most cases, indicating that wealthier countries with higher energy demand tend to attract larger public investment volumes. However, the size and significance of these effects varied across technologies. For example, public investments in solar and wind energy displayed stronger sensitivity to FiT and PPA design. At the same time, geothermal and marine energy were more weakly explained, reflecting their smaller market penetration and higher technological risks.

The residual diagnostics indicated that correlations across the public investment equations were non-negligible, justifying the use of the SUR specification. This implies that unobserved shocks affecting one renewable technology's public investment will likely spill over into others, consistent with shared policy frameworks, financing environments, or broader macroeconomic conditions.

The SUR estimates highlight that feed-in tariffs and purchase agreements remain key policy instruments driving public investment in renewable energy, though their effectiveness differs across technologies. The results also confirm interdependencies across renewable energy sectors, meaning that policy shocks or financial constraints in one area can influence public investment patterns in other areas. This underscores the value of modelling renewables jointly rather than in isolation.

As a robustness check, the multi-renewables model was re-estimated using Driscoll–Kraay standard errors, which correct for heteroskedasticity, autocorrelation, and cross-sectional dependence. The main findings remained consistent, particularly the significance of FiT for wind and PPAs for hydro and waste, confirming the robustness of our results.

The results for the wind public investment equation (Table B1, Appendix B), estimated with Driscoll–Kraay standard errors, indicate that neither FiTs nor PPAs exert a statistically significant direct effect on wind-related public investment. Both coefficients carry the expected signs (FiTs are slightly positive and PPAs are slightly negative), but their magnitudes are small, and their p-values exceed conventional thresholds. This suggests that, in the case of wind power, financial incentives in the form of tariffs or long-term contracts may not be sufficient on their own to trigger substantial public investment responses, even when controlling for country and year effects. Similarly, macroeconomic drivers such as GDP per capita and electricity consumption per capita do not significantly impact wind public investment, indicating that structural and policy-related factors may dominate broader economic conditions in explaining observed public investment patterns.

By contrast, the time dummies reveal a strong temporal effect. From 2004 onwards, most year coefficients are positive and statistically significant, reflecting a clear upward trajectory in wind public investment that aligns with the global acceleration of renewable deployment. Powerful effects are visible from 2009 to 2014 and again after 2015, with coefficients exceeding 0.5 and highly significant at the 1% level. This trajectory aligns with the policy waves of renewable energy adoption, the EU's 2020 climate and energy package, and global responses following the financial crisis and the Paris Agreement negotiations.

The findings suggest that wind public investment dynamics are more strongly associated with policy regimes and international momentum than direct financial incentive variables alone.

The Driscoll–Kraay corrected estimates confirm the robustness of the time pattern in wind public investment growth, while questioning the direct causal role of FiTs and PPAs. This suggests a public investment environment where the credibility of long-term policy frameworks, technological learning effects, and global renewable energy commitments outweigh the marginal impacts of individual national support schemes.

The Driscoll–Kraay corrected results for solar energy public investments (Table B2, Appendix B) reveal several noteworthy patterns. Among policy variables, FiT for solar energy exert a positive and statistically significant influence (Estimate = 0.1205, $p < 0.05$), suggesting that FiT mechanisms effectively stimulate solar public investments. In contrast, PPAs for solar are negative but insignificant, indicating that in the examined countries, PPAs may not yet serve as a consistent driver for solar deployment. Beyond policy instruments, energy per capita (EPC) exhibits a substantial and significant positive impact (Estimate = 0.4511, $p < 0.01$), indicating that higher energy consumption levels are associated with greater public investment in solar capacity, likely due to increased demand pressures. GDP per capita, however, does not exhibit a significant effect.

Time dynamics are equally important: year dummies highlight strong temporal effects, with especially pronounced positive and significant coefficients from 2010 onwards, peaking in 2016 (Estimate = 0.7780, $p < 0.001$). This indicates a structural upward trend in solar public investment, aligned with international policy momentum following the Paris Agreement and declining costs of solar technology. The combination of significant FiT effects, rising EPC, and persistent year effects suggests that policy incentives and broader structural energy transitions jointly shaped solar public investment trajectories in the panel under study.

The SUR estimation for geothermal energy public investments (Table B3, Appendix B) indicates that most policy variables (FiT_geo and PPA_geo) are not statistically significant, suggesting that feed-in tariffs and power purchase agreements have a limited direct influence on geothermal public investment. This may reflect the higher capital intensity and longer lead times of geothermal projects, which reduce investors' sensitivity to short-term policy incentives. Similarly, GDP per capita does not play a significant role, while energy per capita (EPC_pc_yj) exerts a strong and highly significant positive effect ($\beta = 1.09$, $p < 0.001$). This indicates that geothermal development is strongly tied to broader energy demand and consumption patterns, rather than to financial or contract-based policy instruments.

The year effects reveal pronounced temporal dynamics. Several early years, particularly 2001–2003, show strongly negative and highly significant coefficients, reflecting structural barriers to geothermal public investment in the early 2000s. Adverse effects persist intermittently until 2013, after which the influence of time dummies becomes weaker. A notable exception is 2015, where a positive and significant coefficient emerges ($\beta = 0.283$, $p < 0.01$), suggesting a temporary period of favourable conditions for geothermal expansion, possibly linked to international renewable energy initiatives or falling drilling costs. The findings highlight that public geothermal investments depend more on structural drivers of energy consumption and long-term technological conditions than on short-term renewable energy policy instruments that effectively stimulate wind or solar power. This underscores the need for dedicated sector-specific support mechanisms tailored to the unique risks and financing challenges of geothermal projects.

The SUR estimation for bioenergy public investments (Table B4, Appendix B) shows mixed results regarding the influence of policy instruments and macroeconomic controls. The coefficient for FiT_bio is negative and only marginally significant ($\beta = -0.096$, $p \approx 0.057$), suggesting that feed-in tariffs may not consistently encourage public investments in bioenergy and, in some contexts, could even have unintended adverse effects. Power purchase agreements (PPA_bio) are positive but insignificant, indicating that guaranteed off-take contracts alone are not a decisive driver of public investment in this sector. Similarly, GDP per capita is positive yet insignificant, suggesting that overall economic development does not automatically translate into higher public investment in bioenergy. Energy consumption per capita (EPC_pc_yj) is harmful but insignificant, which may reflect structural differences in how bioenergy fits into national energy mixes.

By contrast, the year dummies reveal a strong temporal pattern. The early 2000s show mostly weak or adverse effects, consistent with the limited maturity of bioenergy markets during this period. From 2009 onwards, however, the year effects become strongly positive and highly significant, peaking between 2010 and 2015 (e.g., 2010: $\beta = 0.528$, $p < 0.001$; 2015: $\beta = 0.615$, $p < 0.001$). This indicates a substantial acceleration of bioenergy public investment during the post-2008 financial crisis years, coinciding with increasing international commitments to renewable energy and the implementation of supportive EU directives. While the significance of year effects diminishes slightly after 2017, positive coefficients remain robust, signalling sustained sectoral development.

These results suggest that bioenergy public investments are shaped less by direct policy incentives such as FiTs or PPAs and more by broader structural and temporal dynamics, including global and regional renewable energy policy frameworks. The findings highlight the path-dependent nature of bioenergy development, where technological maturity and cumulative policy momentum drive public investment more than short-term financial instruments.

The results for hydropower public investments (Table B5, Appendix B) show that feed-in tariffs (FiT_hydro) and power purchase agreements (PPA_hydro) do not exhibit a statistically significant effect, with both coefficients being small and insignificant. This indicates that direct tariffs and contractual mechanisms have not been strong predictors of public investments in hydropower over the studied period.

By contrast, macroeconomic and energy context variables play a more substantial role. GDP per capita (GDP_pc_yj) is positively associated with hydropower public investments and statistically significant at the 5% level, suggesting that higher income levels create conditions for greater public investment flows. Meanwhile, energy consumption per capita (EPC_pc_yj) exerts a negative and significant influence, implying that countries with higher per-capita energy demand tend to invest relatively less in hydropower, possibly favouring other renewable or conventional energy sources to meet consumption needs.

The time effects show strong dynamics. In particular, the early 2000s (2002–2006) display significant negative coefficients, pointing to periods of contraction or reallocation of public investments away from hydropower. In some later years, such as 2008–2009 and 2019, weakly negative associations are also observed, although at the 10% significance threshold. Conversely, 2001 had a strong positive effect, reflecting an exceptional peak in public investments in hydropower. The time dummies highlight that hydropower financing has been cyclical, influenced by broader global and national energy transitions rather than tariff schemes alone. These findings suggest that hydropower public investments have been more responsive to macroeconomic capacity and broader energy demand patterns than to FiTs or PPAs. This distinguishes hydropower from other renewable technologies, such as solar, where tariff mechanisms tend to play a stronger role.

The results for the marine energy equation show that neither policy instruments nor macroeconomic controls exert a statistically significant influence on deployment outcomes. The coefficients for FiT_marine_yj and PPA_marine_yj are small in magnitude and statistically insignificant, suggesting that these mechanisms have not been effective in stimulating marine energy adoption in the observed period. Similarly, GDP and energy per capita consumption (EPC_pc_yj) are not directly associated with marine energy development, reflecting the technology's niche status and limited market penetration.

In contrast, the time dummies provide important insights. For most years, the coefficients are positive but insignificant, indicating incremental changes without robust statistical evidence of systematic growth. The only notable deviation is in 2016, which shows a large and highly significant positive coefficient

(Estimate = 0.73, $p < 0.001$), indicating a temporary surge in marine energy activity during that year. This may reflect project-specific dynamics, regulatory pilots, or public investment spikes rather than long-term structural factors. The evidence suggests that marine energy remains relatively underdeveloped in terms of integration into renewable energy policy frameworks compared to wind, solar, and hydro. Its development appears driven more by isolated projects and experimental phases than by consistent economic or policy drivers. This highlights the need for targeted and stable support mechanisms if marine energy is to progress beyond the demonstration stage and make a meaningful contribution to the renewable energy mix.

The results highlight that FiTs and PPAs exert mixed and energy-source-specific effects on renewable deployment. Among the significant results, FiT for wind energy shows a positive and significant effect (Estimate = 0.1516, $p < 0.01$), indicating that FiTs are an effective policy instrument for stimulating wind power adoption. In contrast, the PPA variable for wind energy is negative but not statistically significant, suggesting limited support for PPAs in this sector. FiT is positive but insignificant for solar energy, whereas the PPA coefficient is negative and significant (Estimate = –0.1284, $p < 0.05$), pointing to potential inefficiencies or limited uptake of PPAs in solar markets. The FiT for geothermal energy is insignificant, but the PPA effect is negative and statistically significant (Estimate = –0.0769, $p < 0.05$), suggesting that PPAs may not be conducive to geothermal public investment. Bioenergy FiTs and PPAs are negative but insignificant, indicating a minimal observable effect in this sector. Hydropower FiT is insignificant, while the PPA coefficient is strongly positive and highly significant (Estimate = 0.2187, $p < 0.001$), underscoring PPAs as a critical driver of hydropower development. For marine energy, neither FiTs nor PPAs show significant impacts.

Beyond policy instruments, economic and structural factors also play a substantial role. GDP per capita exerts no significant influence, while electricity consumption per capita (EPC) is positively and significantly associated with renewable deployment (Estimate = 0.3357, $p < 0.01$), suggesting that energy demand pressures support the integration of renewables.

The time dummies exhibit a strong temporal trend, with most years after 2006 showing significant and positive coefficients, particularly high magnitudes between 2010 and 2019. This indicates that renewable energy deployment increased markedly in the post-2010 period, reflecting the impact of global climate policies (e.g., the Paris Agreement and EU directives) and advancements in technology. The most substantial yearly effects occurred between 2013 and 2017, confirming that structural transformations in the energy mix were consolidated during this period. The findings suggest that FiTs are most effective for wind energy, while PPAs are particularly successful in supporting hydropower. However, for solar and geothermal energy, PPAs may even hinder development. Structural drivers, particularly energy demand, significantly influence renewable deployment, exhibiting a robust upward trend since 2010.

5. DISCUSSION

The results of the empirical analysis provide evidence that both FiTs and the length of the PPAs significantly influence public investment in renewable energy. However, their effects vary across technologies and country groups. The findings confirm the positive role of FiTs, particularly in stimulating investment in solar and wind energy, with coefficients indicating robust and statistically significant relationships. For instance, the SUR model results in Table B7 demonstrate that FiTs are associated with increases of 0.27–0.35 percentage points in public investment share, depending on the renewable segment considered. PPAs also exhibit a positive but somewhat less pronounced effect, particularly for bioenergy and hydropower projects, where coefficients of around 0.18–0.21 were recorded.

These outcomes align with earlier findings on the efficacy of financial-fiscal instruments in promoting alternative energy, such as the evidence that FiTs unlock green finance and mobilise institutional investors

(Shcherbakova, 2025; Lyeonov et al., 2025). They are consistent with research highlighting that government expenditure and fiscal support catalyse renewable expansion and economic growth (Fernandes et al., 2025; Bai et al., 2024). However, the results show heterogeneity across technologies. For example, while FiTs have a substantial impact on solar and wind investments, their effect on marine energy is weaker, confirming the view that not all renewable sources respond equally to uniform policy tools (Balcerzak et al., 2024; Štreimikienė, 2024).

The results further confirm that policy reforms and supportive frameworks are crucial for overcoming barriers in renewable energy markets. Countries with institutional support and reduced regulatory obstacles experience more substantial positive effects of FiTs and PPAs, echoing findings on the effectiveness of structural reforms in energy markets (Dobrovolska et al., 2024b; Myroshnychenko et al., 2024). Furthermore, the study confirms that financial depth and sustainable finance enhance the impact of public policies, supporting the argument that financial instruments and banking sector development play an enabling role in accelerating the green transition (Streimikienė et al., 2024; Nohong et al., 2024).

Nevertheless, the empirical findings also suggest that reliance solely on FiTs and PPAs may not be sufficient in the long term. In the European Union, for instance, there is growing recognition that emissions trading systems and market-based quota mechanisms should gradually replace guaranteed-price schemes, in line with new RES directives and climate goals (Kawecka-Wyrzykowska, 2025; Streimikienė, 2025). This shift reflects concerns that, while FiTs are effective in scaling up investment, they may distort competition or lead to higher electricity prices if maintained indefinitely, a concern also noted in energy price analyses (Bank & Badyda, 2024).

The evidence presented here extends the scholarly debate by underlining the dual function of FiTs and PPAs; they are effective in initiating renewable transitions and mobilising investment. However, they must be complemented by market-oriented mechanisms and institutional reforms to ensure long-term sustainability.

This study has several limitations. The analysis spans the period from 2000 to 2019, reflecting the availability of data on FiTs, PPAs, and renewable energy investments. While it is long enough to capture structural trends, it omits recent shocks, such as the war in Ukraine and the EU's "Fit for 55" package, which may reshape policy effectiveness. Available data also constrain the sample of countries from CEIC (n.d.) and Energydata.Info (2024), which may limit generalisability and underrepresent emerging economies. Consequently, the estimates should be interpreted as a historical baseline for 2000–2019; policy effects may differ in the subsequent period as market design, contract structures, and support instruments evolve (CEIC, n.d.).Moreover, the econometric models capture FiTs and PPAs as recorded. However, they cannot fully reflect variations in tariff levels, contract design, or interactions with other instruments, such as carbon taxes or renewable portfolio standards. Finally, as EU discourse shifts towards market-based mechanisms such as emission quotas, the findings should reflect the historical policy environment rather than future trajectories.

6. CONCLUSION

This study aimed to examine whether feed-in tariffs FiTs and PPAs stimulate public investments in renewable energy, using a cross-country sample covering the period 2000–2019.

To achieve this aim, a balanced panel of 60 countries was constructed, and panel data econometric techniques, including fixed effects and seemingly unrelated regression models, were employed. Information on FiTs and PPAs was obtained from Global Economic Data, Indicators, Charts & Forecasts, complemented with renewable energy investment data from Energydata.info and macroeconomic controls from the World Bank.

The results provide mixed evidence across renewable energy types. For solar energy, FiTs exhibited a significant and positive effect ($\beta = 0.12$, $p < 0.05$), while PPAs showed no statistical significance. In the case of geothermal energy, electricity production per capita (EPC) was the primary determinant ($\beta = 1.09$, $p < 0.001$), with FiTs and PPAs remaining insignificant. Bioenergy was only weakly linked to FiTs ($\beta = –0.096$, $p \approx 0.057$), whereas hydropower investments were strongly influenced by both GDP per capita ($\beta = 0.41$, $p < 0.05$) and EPC ($\beta = –0.39$, $p < 0.01$). Policy instruments were generally insignificant for marine energy, although EPC exerted a minor adverse effect. The complete SUR model highlighted significant roles of FiTs in wind energy ($\beta = 0.15$, $p < 0.01$) and hydropower PPAs ($\beta = 0.22$, $p < 0.001$), while EPC was a robust driver across several technologies ($\beta \approx 0.34$, $p < 0.01$). These findings suggest that FiTs and PPAs are not universally effective but exert technology-specific impacts.

The policy implications are threefold. First, FiTs remain an effective mechanism for supporting capital-intensive technologies, such as solar and wind, where long-term price stability is essential for investor confidence. Second, PPAs are more targeted, particularly for hydropower, where project-specific contracts are the dominant form. Third, the consistent significance of EPC underscores the importance of energy consumption structures, indicating that renewable policies must be embedded in broader energy transition strategies. Policymakers should adopt differentiated approaches, including FiTs for scaling solar and wind, PPAs for dispatchable sources like hydropower, and complementary instruments such as carbon pricing or green certificates, to align incentives across markets. Finally, given the evolving context of the European Union’s Fit for 55 package and the structural disruptions caused by the war in Ukraine, future policy frameworks may increasingly rely on emission trading systems to replace direct subsidies, demanding flexibility and long-term vision in renewable energy governance.

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APPENDIX A

Table A1

The results of the SUR estimation for wind energy investments

SUR estimates for 'wind' (equation 1)
Model Formula: Inv_wind_yj ~ FiT_wind_yj + PPA_wind_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)

	Estimate	Std. Error	t value	Pr (>|t|)
(Intercept)	-1.15406952	0.34154175	-3.37900	0.00075264***
FIT_wind_yj	0.03031279	0.06349990	0.47737	0.63319352
PPA_wind_yj	-0.07052674	0.06906942	-1.02111	0.30742169
GDP_pc_yj	-0.09211452	0.14936250	-0.61672	0.53754663
EPC_pc_yj	-0.15694949	0.20034223	-0.78291	0.43384740
factor(country)Algeria	0.21294691	0.30306037	0.70266	0.48241725
factor(country)Argentina	0.91977921	0.29240458	3.14215	0.00172128**
factor(country) Armenia	-0.01829113	0.27480745	-0.06652	0.94697302
factor(country)Austria	1.62590794	0.50242941	3.23589	0.00124825**
factor(country)Belgium	1.43962043	0.50040791	2.87490	0.00411834**
factor(country)Bosnia and Herzegovina	0.41949333	0.29085212	1.49361	0.13556044
factor(country)Brazil	2.04315203	0.28213443	7.24177	<0.0001***
factor(country)Bulgaria	0.17990447	0.32947550	0.54739	0.58421973
factor(country)Canada	0.75996187	0.57393691	1.32243	0.18629437
factor(country)Chile	0.54633992	0.30793113	1.77423	0.07629810.
factor(country)China	1.23760357	0.27999506	4.42025	<0.0001***
factor(country)Croatia	0.56290650	0.31970361	1.76624	0.07762924.
factor(country)Cyprus	0.39791191	0.35474492	1.12140	0.26235759
factor(country)Czech Republic	0.36723622	0.39636299	0.92651	0.35437877
factor(country)Denmark	1.15856159	0.48147132	2.40629	0.01627704*
factor(country)Dominican Republic	0.44241972	0.28146813	1.57183	0.11627453
factor(country)Ecuador	0.46736472	0.29242911	1.59822	0.11027811
factor(country)Estonia	0.76527902	0.39051652	1.95966	0.05028432.
factor(country)Finland	0.93735931	0.56589529	1.65642	0.09791824.
factor(country)France	0.49071900	0.47147563	1.01960	0.30813772
factor(country)Germany	1.49366985	0.46411610	3.19676	0.00142880**
factor(country)Ghana	-0.19407166	0.35811149	-0.54193	0.58797434
factor(country)Greece	0.61379991	0.37333713	1.64409	0.10043922
factor(country)Hungary	0.43039001	0.32135727	1.33929	0.18074956
factor(country)Iceland	0.72850523	0.71663331	1.01657	0.30958015
factor(country)India	1.21573984	0.33077726	3.67540	0.00024876***
factor(country)Indonesia	0.36573563	0.30912774	1.18312	0.23701303
factor(country)Iran	0.13673489	0.27574313	0.49588	0.62007831
factor(country)Ireland	1.04059235	0.47647380	2.18394	0.02917395*
factor(country)Israel	0.40277299	0.43711842	0.92143	0.35702634
factor(country)Italy	0.50313795	0.39885214	1.26146	0.20740503
factor(country)Jordan	0.69005275	0.27202866	2.49993	0.01256443*
factor(country)Kazakhstan	0.43394402	0.31934804	1.35884	0.17447074
factor(country)Kenya	0.89516666	0.42733851	2.07135	0.03855569*
factor(country)Latvia	0.13918244	0.30192988	0.46098	0.64490562
factor(country)Lithuania	0.17204274	0.31030860	0.55442	0.57939933
factor(country)Malaysia	0.15700989	0.30754120	0.51053	0.60978146
factor(country)Malta	0.26966109	0.36208757	0.74474	0.45658573
factor(country)Marocco	0.95499990	0.29850846	3.19924	0.00141671**
factor(country)Mauritius	0.05128489	0.28920144	0.17733	0.85927921
factor(country)Mexico	0.73246600	0.29086542	2.51823	0.01193364*
factor(country)Moldova	0.12402005	0.28405398	0.43661	0.66248060

factor(country)Mongolia	0.62416212	0.28592566	2.18295	0.02924714*
factor(country)Netherlands	0.79958587	0.47700836	1.67625	0.09396907.
factor(country)North Macedonia	0.22436947	0.29709892	0.75520	0.45028761
factor(country)Norway	0.71591334	0.68089211	1.05144	0.29328340
factor(country)Poland	1.30111998	0.31496121	4.13105	<0.00001***
factor(country)Portugal	0.77907075	0.35932206	2.16817	0.03035665*
factor(country)Romania	0.83069354	0.28183843	2.94743	0.00327093**
factor(country)Russia	0.26941331	0.38775958	0.69479	0.48732353
factor(country)Saudi Arabia	0.42078433	0.47807377	0.88017	0.37895376
factor(country)Slovak Republic	0.23828143	0.35850475	0.80412	0.42149793
factor(country)Slovenia	0.37806992	0.42403998	0.89159	0.37280473
factor(country)South Africa	0.84308373	0.31843332	2.64761	0.00822043**
factor(country)Spain	1.31146400	0.39701747	3.30329	0.00098590***
factor(country)Sweden	1.33939963	0.55968669	2.48246	0.01319406*
factor(country)Türkiye	0.85236189	0.29360369	2.90481	0.00374726**
factor(country)United Kingdom	1.89527532	0.42000288	4.51253	<0.0001***
factor(country)United States	0.98767997	0.54287256	1.81936	0.06912456.
factor(year)2001	0.00888768	0.15593947	0.05699	0.95455983
factor(year)2002	0.00312212	0.15637580	0.01997	0.98407449
factor(year)2003	0.01852261	0.15910624	0.11642	0.90734332
factor(year)2004	0.14957379	0.16386776	0.91277	0.36155997
factor(year)2005	0.13967966	0.16933439	0.82487	0.40961898
factor(year)2006	0.13041164	0.17580037	0.74182	0.45835453
factor(year)2007	0.14406835	0.18777803	0.76723	0.44310893
factor(year)2003	0.28931934	0.19740212	1.46563	0.14302960
factor(year)2009	0.55182315	0.18745988	2.94369	0.00331042**
factor(year)2010	0.95807711	0.19263053	4.97365	<0.0001***
factor(year)2011	0.83138549	0.20336795	4.08809	<0.0001***
factor(year)2012	1.02137339	0.20049514	5.09425	<0.0001***
factor(year)2013	0.85793704	0.20539331	4.17704	<0.0001***
factor(year)2014	0.93687446	0.20614274	4.54479	<0.0001***
factor(year)2015	0.56327121	0.19514550	2.88642	0.00397163**
factor(year)2016	0.79726376	0.19614180	4.06473	<0.0001***
factor(year)2017	0.92760536	0.20291005	4.57151	<0.0001***
factor(year)2013	0.81818541	0.20980465	3.89975	0.00010204***
factor(year)2019	0.54872710	0.20941135	2.62033	0.00890373**
Residual standard error: 0.853482 on 1116 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1116 SSR: 812.930342 MSE: 0.728432 Root MSE: 0.853482 Multiple R-Squared: 0.319177 Adjusted R-Squared: 0.269153				

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table A2

The results of the SUR estimation for solar energy investments

SUR estimates for 'solar' (equation 2) Model Formula: Inv_solar_yj ~ FiT_solar_yj + PPA_solar_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)				
	Estimate	Std. Error	t value	Pr (>|t|)
(Intercept)	-0.09321211	0.30229529	-0.30835	0.75787519
FiT solar yj	0.13393978	0.04864953	2.75316	0.00599513**
PPA solar vj	-0.07216269	0.06103335	-1.18235	0.23731931
GDP pc yi	0.04937714	0.13247935	0.37272	0.70943032
EPC_pc_yj	0.44710740	0.18049867	2.47707	0.01339395*
factor(country)Algeria	0.74300588	0.26029426	2.85448	0.00439042**
factor(country)Argentina	1.08420745	0.25621798	4.23158	<0.00001***
factor(country)Armenia	0.34104646	0.24131702	1.41327	0.15795477
factor(country)Austria	-1.27496411	0.44680331	-2.85352	0.00440361**
factor(country)Belgium	-1.10591994	0.45026300	-2.45616	0.01419441*
factor(country)Bosnia and Herzegovina	0.06109747	0.24947669	0.24490	0.90657693
factor(country)Brazil	1.42526438	0.24985705	5.70432	<0.00001***
factor(country)Bulgaria	-0.32286896	0.28992248	-1.11364	0.26567392
factor(country)Canada	-1.43697965	0.51401585	-2.79559	0.00526929**
factor(country)Chile	0.81825789	0.27357643	2.99097	0.00294200**
factor(country)China	1.17583995	0.24664557	4.76733	2.1135Є-06
factor(country)Croatia	-0.51827675	0.28063582	-1.84679	0.06504150.
factor(country)Cyprus	-0.64992265	0.31278628	-2.07785	0.03795145*
factor(country)Czech Republic	-0.65850768	0.35167133	-1.87251	0.06139755.
factor(country)Denmark	-0.91844333	0.43003414	-2.13575	0.03291735*
factor(country)Dominican Republic	0.64995103	0.24858581	2.61459	0.00905372**
factor(country)Ecuador	-0.01090879	0.26502421	-0.04116	0.96717453
factor(country)Estonia	-0.75628948	0.34724072	-2.17800	0.02961503*
factor(country)Finland	-1.31361879	0.51154699	-2.56793	0.01035993*
factor(country)France	-0.64825098	0.41932480	-1.54594	0.12240257
factor(country)Germany	-0.97059318	0.41161264	-2.35803	0.01554419*
factor(country)Ghana	1.47469011	0.31973796	4.61218	<0.00001***
factor(country)Greece	-0.83148032	0.33003363	-2.51938	0.01139493*
factor(country)Hungary	-0.55587580	0.28428425	-1.95535	0.05079081.
factor(country)Iceland	-1.72720012	0.64744519	-2.66772	0.00774746**
factor(country)India	2.59735285	0.30060087	8.64054	<0.00001***
factor(country)Indonesia	1.29752027	0.27534666	4.71232	<0.00001***
factor(country)Iran	-0.24611279	0.24249954	-1.01490	0.31037345
factor(country)Ireland	-0.85722803	0.42907499	-1.99785	0.04597514*
factor(country)Israel	-0.63886969	0.39043872	-1.63629	0.10206155
factor(country)Italy	-0.30515327	0.35177942	-0.86746	0.38537854
factor(country)Jordan	1.18189154	0.24009027	4.92270	<0.00001***
factor(country)Kazakhstan	0.02536090	0.28337521	0.08950	0.92870393
factor(country)Kenya	1.95166175	0.38276799	5.09881	<0.00001***
factor(country)Latvia	-0.41672297	0.26575899	-1.56805	0.11715331
factor(country)Lithuania	-0.48068447	0.27521651	-1.74657	0.08098734.
factor(country)Malaysia	-0.08889940	0.27186621	-0.32700	0.74373157
factor(country)Malta	-0.64716033	0.32337352	-2.00128	0.04560421*
factor(country)Marocco	2.52144722	0.26443296	9.53530	<0.00001***
factor(country)Mauritius	-0.10221304	0.25586114	-0.39949	0.68961129
factor(country)Mexico	0.93553379	0.25722115	3.63708	0.00028834***
factor(country)Moldova	0.25234192	0.25088499	1.00581	0.31472637
factor (country)Mongolia	0.61633653	0.24787816	2.48645	0.01304786*
factor(country)Netherlands	-1.09247848	0.42254376	-2.58548	0.00985023**

factor (country)North Macedonia	-0.36924819	0.26187861	-1.41000	0.15881905
factor (country)Norway	-1.53314046	0.61407284	-2.49668	0.01267969*
factor(country)Poland	-0.48647778	0.28015571	-1.73646	0.08275937.
factor(country)Portugal	-0.79451533	0.31810450	-2.49766	0.01264490*
factor(country)Romania	-0.12986065	0.24941190	-0.52067	0.60270175
factor(country)Russia	-0.79935157	0.34720571	-2.30224	0.02150491*
factor(country)Saudi Arabia	-1.08299265	0.43009797	-2.51801	0.01194092*
factor(country)Slovak Republic	-0.76707739	0.31861581	-2.40753	0.01622231*
factor(country)Slovenia	-0.96258312	0.37839892	-2.54383	0.01109335*
factor(country)South Africa	1.03877517	0.28261860	3.67554	0.00024363***
factor (country)Spain	0.40068906	0.34962941	1.14604	0.25202455
factor(country)Sweden	-1.26546275	0.50403909	-2.51064	0.01219163*
factor(country)Türkiye	0.43408435	0.25307299	1.71525	0.08657634.
factor (country)United Kingdom	-0.81219470	0.37500782	-2.16581	0.03053716*
factor(country)United States	-1.06592654	0.48997613	-2.17547	0.02980452*
factor(year)2001	0.20259579	0.13767287	1.47157	0.14141793
factor(year)2002	0.11903833	0.13808426	0.86207	0.38383409
factor (year)2003	-0.00753385	0.14046591	-0.05363	0.95723579
factor(year)2004	-0.07983618	0.14468656	-0.55179	0.58120470
factor(year)2005	0.07588375	0.14955563	0.50739	0.61197308
factor(year)2006	-0.12191050	0.15529326	-0.78503	0.43260020
factor(year)2007	-0.12239279	0.16597943	-0.73740	0.46103578
factor(year)2008	-0.09070921	0.17449548	-0.51984	0.60328026
factor(year)2009	0.20769591	0.16556254	1.25449	0.20992802
factor (year)2010	0.34521704	0.16998319	2.03089	0.04250289*
factor(year)2011	0.29079704	0.17868298	1.62745	0.10392452
factor(year)2012	0.21716696	0.17633660	1.23155	0.21837748
factor (year)2013	0.28149864	0.18034486	1.56089	0.11883302
factor(year)2014	0.35050489	0.18093816	1.93715	0.05297875.
factor(year)2015	0.46408431	0.17171739	2.70261	0.00698424**
factor(year)2016	0.77891965	0.17296297	4.50339	<0.00001***
factor(year)2017	0.48193432	0.17914260	2.69023	0.00724691**
factor(year)2018	0.56197819	0.18543870	3.03053	0.00249746**
factor(year)2019	0.54467410	0.18510546	2.94251	0.00332296**
Residual standard error: 0.75345 on 1116 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1116 SSR: 633.538126 MSE: 0.567686 Root MSE: 0.75345 Multiple R-Squared: 0.471514 Adjusted R-Squared: 0.432683				

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table A3

The results of the SUR estimation for geothermal energy investments

SUR estimates for 'geo' (equation 3)
Model Formula: Inv_geo_yj ~ FiT_geo_yj + PPA_geo_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.7568885	0.3049451	2.48205	0.01320920*
FiT geo yj	0.0600716	0.0715740	0.83929	0.40143451
PPA geo yj	0.0436611	0.0497333	0.87790	0.33013463
GDP pc yj	-0.0528582	0.1331970	-0.39684	0.69155991
EPC_pc_yj	1.0950424	0.1791050	6.11397	<0.0001***
factor(country)Algeria	0.4772498	0.2552975	1.86939	0.06183069.
factor(country)Argentina	-0.4796791	0.2644717	-1.81373	0.06998845.
factor(country)Armenia	0.3286645	0.2441587	1.34611	0.17854031
factor(country)Austria	-2.1658332	0.4473201	-4.84180	<0.0001***
factor(country)Belgium	-2.0639301	0.4443450	-4.64488	<0.0001***
factor(country)Bosnia and Herzegovina	0.1273051	0.2521070	0.50496	0.61368335
factor(country)Brazil	0.0742668	0.2520532	0.29465	0.76831817
factor(country)Bulgaria	-1.0309622	0.2922238	-3.52799	0.00043576***
factor(country)Canada	-2.6539592	0.5134639	-5.16874	<0.0001***
factor(country)Chile	0.1427339	0.2742333	0.52048	0.60282982
factor(country)China	0.8416252	0.2494059	3.37452	0.00076487***
factor(country)Croatia	-0.7636456	0.2832469	-2.69604	0.00712243**
factor(country)Cyprus	-0.7528186	0.3164819	-2.37871	0.01754082*
factor(country)Czech Republic	-1.6715904	0.3552716	-4.70511	<0.0001***
factor(country)Denmark	-1.4787386	0.4303738	-3.43594	0.00061223***
factor(country)Dominican Republic	0.2915112	0.2503035	1.16463	0.24441733
factor(country)Ecuador	0.5146839	0.2680994	1.91975	0.05514418.
factor(country)Estonia	-1.6188740	0.3494042	-4.63324	<0.0001***
factor(country)Finland	-2.5537029	0.5039811	-5.06706	<0.0001***
factor(country)France	-2.0406963	0.4222292	-4.83315	<0.0001***
factor(country)Germany	-1.9972889	0.4187005	-4.77021	<0.0001***
factor(country)Ghana	1.1270259	0.3203344	3.51828	0.00045184***
factor(country)Greece	-1.3296561	0.3345019	-3.97503	<0.0001***
factor(country)Hungary	-0.8554949	0.2870335	-2.98047	0.00294042**
factor(country)Iceland	-2.6905256	0.6367904	-4.22514	<0.0001***
factor(country)India	1.1912615	0.2942102	4.04901	<0.0001***
factor(country)Indonesia	4.4422628	0.2778245	15.98945	<0.0001***
factor(country)Iran	-0.3566026	0.2486113	-1.43438	0.15174457
factor(country)Ireland	-1.3549891	0.4253741	-3.18541	0.00148556**
factor(country)Israel	-1.6821875	0.3899884	-4.31343	<0.0001***
factor(country)Italy	-1.3210201	0.3557124	-3.71373	0.00021432***
factor(country)Jordan	0.1105164	0.2420421	0.45660	0.64804751
factor(country)Kazakhstan	-0.7649236	0.2856202	-2.67811	0.00751251**
factor(country)Kenya	4.5176358	0.3807905	11.86384	<0.0001***
factor(country)Latvia	-0.5005986	0.2684588	-1.86471	0.06248397.
factor(country)Lithuania	-0.6555668	0.2767286	-2.36899	0.01800632*
factor(country)Malaysia	-0.8017726	0.2737785	-2.92854	0.00347471**
factor(country)Malta	-1.0448505	0.3218667	-3.24622	0.00120425**
factor(country)Marocco	0.8455830	0.2671137	3.16563	0.00158937**
factor(country)Mauritius	-0.0153695	0.2527378	-0.06081	0.95151986
factor(country)Mexico	0.5513510	0.2595066	2.12461	0.03383828*
factor(country)Moldova	-0.2265167	0.2539414	-0.89200	0.3725S315
factor(country)Mongolia	0.2891223	0.2468434	1.17128	0.24173653

factor(country)Netherlands	-1.7602965	0.4243335	-4.14838	<0.0001***
factor(country)North Macedonia	-0.3750947	0.2647151	-1.41698	0.15676925
factor(country)Norway	-2.9000366	0.6040844 -	-4.80071	<0.0001***
factor(country)Poland	-0.7330120	0.2804185 -	-2.61399	0.00906953**
factor(country)Portugal	-0.7971292	0.3209994 -	-2.48327	0.01316414*
factor(country)Romania	-0.3098077	0.2514356 -	-1.23216	0.21815055
factor(country)Russia	-1.5422282	0.3453720 -	-4.46541	<0.0001***
factor(country)Saudi Arabia	-2.1163930	0.4251154 -	-4.97840	<0.0001***
factor(country)Slovak Republic	-1.2968413	0.3222617 -	-4.02419	<0.0001***
factor(country)Slovenia	-1.7910251	0.3783318 -	-4.73401	<0.0001***
factor(country)South Africa	-0.9366364	0.2845977 -	-3.29109	0.00102923**
factor(country)Spain	-1.5142060	0.3696425 -	-4.09641	<0.0001***
factor(country)Sweden	-2.3963209	0.4969946 -	-4.82162	<0.0001***
factor(country)Türkiye	0.7433505	0.2582228	2.87872	0.00406913**
factor(country)United Kingdom	-1.2895438	0.3760358 -	-3.42931	0.00062722***
factor(country)United States	-2.3333214	0.4846612 -	-4.81433	<0.0001***
factor(year)2001	-0.1393163	0.1394367	-0.99914	0.31794502
factor(year)2002	-0.0963047	0.1399170	-0.68830	0.49140774
factor(year)2003	-0.2065249	0.1423147	-1.45118	0.14700954
factor(year)2004	-0.0071174	0.1465911	-0.04855	0.96123442
factor(year)2005	-0.0883441	0.1513701	-0.58363	0.55958737
factor(year)2006	-0.1683634	0.1570794	-1.07184	0.28402518
factor(year)2007	-0.2225990	0.1678679	-1.32604	0.18509890
factor(year)2003	-0.2886019	0.1761959	-1.63796	0.10171138
factor(year)2009	0.1617190	0.1668335	0.96934	0.33253332
factor(year)2010	-0.1449330	0.1712912	-0.84612	0.39766701
factor(year)2011	-0.1134898	0.1806343	-0.62828	0.52994605
factor(year)2012	-0.2915311	0.1787099	-1.63131	0.10310732
factor(year)2013	-0.1388333	0.1830912	-0.75827	0.44844701
factor(year)2014	0.0559501	0.1839871	0.30410	0.76111001
factor(year)2015	0.2846094	0.1743091	1.63279	0.10279625
factor(year)2016	-0.0593400	0.1753874	-0.33834	0.73517312
factor(year)2017	-0.0904554	0.1815096	-0.49835	0.61833506
factor(year)2013	-0.1367221	0.1875542	-0.72897	0.46617048
factor(year)2019	-0.0872693	0.1871600	-0.46628	0.64110494
Residual standard error: 0.763073 on 1116 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1116 SSR: 649.825727 MSE: 0.582281 Root MSE: 0.763073 Multiple R-Squared: 0.458002 Adjusted R-Squared: 0.418178				

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.
Source: authors’ calculations in R Studio.

Table A4

The results of the SUR estimation for bioenergy investments

SUR estimates for 'bio' (equation 4) Model Formula: Inv_bio_yj ~ FiT_bio_yj + PPA_bio_yj + FiT_waste_yj + PPA_waste_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept;)	-0.607133793	0.330260835	-1.83835	0.06627749.
FiT bio yj	-0.1161S9667	0.074059073	-1.56888	0.11696030
PPA bio yj	0.025596623	0.087713169	0.29181	0.77048935
FiT waste yj	0.000613795	0.036030578	0.01717	0.98630076
PPA waste yj	0.007637396	0.043278078	0.17647	0.85995473
GDP pc yj	0.132310279	0.142103728	1.28294	0.19978063
EPG_pc_yj	-0.196347677	0.195117600	-1.00630	0.31443774
(factor (country) Algeria	-0.238062264	0.284957065	-0.83543	0.40365363
factor(country)Argentina	0.728908395	0.277219342	2.62936	0.00867249**
factor(country)Armenia	0.615309014	0.263521109	2.33495	0.01972284*
factor(country)Austria	0.590332118	0.491755217	1.20046	0.23021622
factor(country)Belgium	-0.068398221	0.487446870	-0.14032	0.88843305
factor(country)Bosnia and Herzegovina	0.865958274	0.268174796	3.22908	0.00127815**
factor(country)Brazil	2.051886445	0.266115188	7.71052	<0.0001***
factor(country)Bulgaria	0.300469080	0.309584481	0.97056	0.33198010
factor(country)Canada	0.083444687	0.558283123	0.14947	0.88121251
factor(country)Chile	0.784180154	0.292987488	2.67650	0.00754884**
factor(country)China	2.612673860	0.266713591	9.79580	<0.0001***
factor(country)Croatia	-0.103127790	0.306656885	-0.33630	0.73671025
factor(country)Cyprus	-0.181188849	0.338698741	-0.53496	0.59278720
factor(country)Czech Republic	0.072538464	0.377037398	0.19239	0.84747129
factor(country)Denmark	-0.210354868	0.471554956	-0.44609	0.65562058
factor(country)Dominican Recublic	-0.168248821	0.267581368	-0.62878	0.52962442
factor(country)Ecuador	0.551048638	0.278066393	1.98172	0.04775651*
factor(country)Estonia	0.405288094	0.376338837	1.07692	0.28174765
factor(country)Finland	1.686931789	0.551903970	3.05657	0.00229220**
factor(country)France	0.763769001	0.458069504	1.66736	0.09572294.
factor(country)Germany	-0.009868299	0.439186840	-0.02247	0.98207748
factor(country)Ghana	0.511980473	0.344884943	1.48450	0.13796015
factor(country)Greece	0.019174595	0.358832751	0.05344	0.95739409
factor(country)Hungary	0.097093544	0.306933666	0.31633	0.75180830
factor(country)Iceland	0.109022397	0.703133864	0.15505	0.87680832
factor(country)India	1.494599734	0.321282627	4.65198	<0.0001***
factor(country)Indonesia	0.932369192	0.296301055	3.14670	0.00169507**
factor(country)Iran	-0.020237069	0.260675071	-0.07763	0.93813368
factor(country)Ireland	-0.217397274	0.459748305	-0.47286	0.63640462
factor(country)Israel	-0.082550334	0.425830530	-0.19386	0.84632300
factor(country)Italy	0.370345079	0.389460309	0.95092	0.34185192
factor(country)Jordan	-0.066373649	0.258263254	-0.25700	0.79722625
factor(country)Kazakhstan	0.044323599	0.303736661	0.14593	0.88400485
factor(country)Kenya	0.610184647	0.419931848	1.45306	0.14648972
factor(country)Latvia	-0.160502763	0.288121031	-0.55707	0.57759345
factor(country)Lithuania	-0.116196579	0.294864284	-0.39407	0.69360625
factor(country)Malaysia	0.029390423	0.291767614	0.10073	0.91978110
factor(country)Malta	-0.147200706	0.347840519	-0.42318	0.67224236
factor(country)Marocco	-0.018310944	0.284156225	-0.06444	0.94863168
factor (country) Mauritius	-0.059280105	0.267106523	-0.22193	0.82440569
factor(country)Mexico	0.420892079	0.274769231	1.53180	0.12585520
factor(country)Moldova	0.553806785	0.268040137	2.06613	0.03904660*

factor(country)Mongolia	0.019510202	0.260983520	0.07476	0.94042191
factor(country)Netherlands	-0.054183671	0.465502356	-0.11640	0.90735788
factor(country)North Macedonia	0.237274597	0.282168997	0.84090	0.40058702
factor(country)Norway	0.227295171	0.667205966	0.34067	0.73341839
factor(country)Poland	0.250782766	0.300251948	0.83524	0.40376107
factor(country)Portugal	-0.096633951	0.372604625	-0.25935	0.79541531
factor(country)Romania	-0.136420650	0.266462519	-0.51197	0.60877392
factor(country)Russia	0.065929859	0.373339631	0.17659	0.85985873
factor(country)Saudi Arabia	0.049025265	0.464789893	0.10548	0.91601525
factor(country)Slovak Republic	0.005103941	0.346604056	0.01473	0.98825376
factor(country)Slovenia	0.110777329	0.418547549	0.26467	0.79131201
factor(country)South Africa	0.275289484	0.304026131	0.90548	0.36540711
factor(country)Spain	0.413152067	0.388660373	1.06302	0.28800522
factor(country)Sweden	1.332707765	0.546302388	2.43951	0.01486257*
factor(country)Türkiye	0.174088301	0.273092109	0.63747	0.52394908
factor(country)United Kingdom	1.157834314	0.419661327	2.75897	0.00589330**
factor(country)United States	-0.070908157	0.529568008	-0.13390	0.89350733
[factor (year) 2001	-0.017915037	0.147163343	-0.12173	0.9031332S
factor(year)2002	0.023006606	0.147580232	0.15589	0.37614625
factor(year)2003	-0.009761720	0.150205497	-0.06499	0.94319434
factor(year)2004	-0.029905797	0.155020343	-0.19292	0.34706046
factor(year)2005	-0.039461468	0.160513178	-0.24585	0.80584700
factor(year)2006	0.099491377	0.166580839	0.59726	0.55045808
factor(year)2007	0.125960149	0.178742169	0.70470	0.48114236
factor(year)2003	0.171325922	0.187944862	0.91153	0.36218946
factor(year)2009	0.516966631	0.178217427	2.90076	0.00379571**
factor(year)2010	0.523751221	0.183831731	2.37623	0.00410063**
factor(year)2011	0.492337661	0.194237451	2.53407	0.01141080*
factor(year)2012	0.514340156	0.191510474	2.68570	0.00734532**
factor(year)2013	0.593235439	0.196232151	3.04361	0.00235326**
factor(year)2014	0.646253034	0.196902260	3.28213	0.00106225**
factor(year)2015	0.615510048	0.136442876	3.30133	0.00099279***
factor(year)2016	0.464024303	0.186952796	2.48204	0.01320979*
factor(year)2017	0.378105038	0.194033736	1.94315	0.05164741.
factor(year)2013	0.600130949	0.200590291	2.99182	0.00283420**
factor(year)2019	0.136370106	0.200096051	0.68152	0.49568213
Residual standard error: 0.805487 on 1114 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1114 SSR: 722.77406 MSE: 0.64881 Root MSE: 0.805487 Multiple R-Squared: 0.39711 Adjusted R-Squared: 0.351649				

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.

Source: authors' calculations in R Studio.

Table A5

The results of the SUR estimation for hydro power investments

SUR estimates for 'hydro' (equation 5) Model Formula: Inv_hydro_yj ~ FiT_hydro_yj + PPA_hydro_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept;)	0.94164031	0.33277387	2.32963	0.00474373**
FiT hydro yj	0.03093363	0.06737313	0.45914	0.64622329
PPA hydro yj	-0.05644467	0.07356677	-0.76726	0.44309062
GDP pc yj	0.43139093	0.14553138	2.96767	0.00306463**
EPC_pc_yj	-0.39498373	0.19473514	-2.02334	0.04276233*
(factor (country) Algeria	-1.36050314	0.28482605	-4.77661	<0.0001***
factor(country)Argentina	-0.74993512	0.28484600	-2.63277	0.00858605**
factor(country) Armenia	0.29468423	0.26649609	1.10577	0.26906303
factor(country)Austria	-0.78183844	0.48966278	-1.59669	0.11061349
factor(country)Belgium	-1.23177452	0.48790749	-2.52461	0.01172053*
factor(country)Bosnia and Herzegovina	-0.47987264	0.27437318	-1.74898	0.08056973.
factor(country)Brazil	0.85304174	0.27549274	3.09642	0.00200757**
factor(country)Bulgaria	-0.79867321	0.31880456	-2.50521	0.01237939*
factor(country)Canada	-1.02445262	0.55931223	-1.83163	0.06727311.
factor(country)Chile	-0.46097366	0.30192655	-1.52677	0.12710052
factor(country)China	0.57034966	0.27853279	2.04769	0.04032376*
factor(country)Croatia	-1.30816592	0.31078646	-4.20921	<0.0001***
factor(country)Cyprus	-1.52878985	0.34841934	-4.38779	<0.0001***
factor(country)Czech Republic	-1.02282088	0.39215772	-2.60819	0.00922383**
factor(country)Denmark	-1.38214256	0.47077108	-2.93591	0.00339387**
factor(country)Dominican Republic	-0.79807257	0.27315515	-2.92168	0.00355153**
factor(country)Ecuador	-0.05696221	0.27956477	-0.20375	0.83858353
factor(country)Estonia	-1.05284669	0.38134036	-2.76091	0.00535352**
factor(country)Finland	-0.81259442	0.55271771	-1.47018	0.14179492
factor(country)France	-1.01049629	0.45943729	-2.19942	0.02805247*
factor(country)Germany	-1.28361910	0.45278064	-2.83497	0.00466571**
factor(country)Ghana	-0.28761543	0.34706883	-0.82870	0.40745221
factor(country)Greece	-1.27790194	0.36448450	-3.50605	0.00047287***
factor(country)Hungary	-1.28464173	0.31389374	-4.09260	<0.0001***
factor(country)Iceland	-0.74326241	0.69715432	-1.06614	0.28659205
factor(country)India	1.56050062	0.46351463	3.36667	0.00078675***
factor(country)Indonesia	0.33070752	0.29931208	1.10489	0.26944455
factor(country)Iran	-0.84891355	0.26977149	-3.14679	0.00169446**
factor(country)Ireland	-1.71973688	0.46532623	-3.69577	0.00022987***
factor(country)Israel	-1.23977953	0.42860479	-2.89259	0.00339494**
factor(country)Italy	-0.79311523	0.38941633	-2.03668	0.04191808*
factor(country)Jordan	-1.13271846	0.26539317	-4.26808	<0.0001***
factor(country)Kazakhstan	-0.67640833	0.31228346	-2.16601	0.03052182*
factor(country)Kenya	-0.53263259	0.41083925	-1.29645	0.19508847
factor(country)Latvia	-1.20115434	0.29566823	-4.06251	<0.0001***
factor(country)Lithuania	-1.30108036	0.30385950	-4.28185	<0.0001***
factor(country)Malaysia	-0.90409458	0.29930391	-3.02066	0.00257967**
factor(country)Malta	-1.35113053	0.35428161	-3.81372	0.00014439***
factor(country)Marocco	-0.67737582	0.29165227	-2.32255	0.02038271*
factor(country)Mauritius	-1.43740855	0.28108694	-5.11375	<0.0001***
factor(country)Mexico	-1.19916809	0.28533928	-4.20260	<0.0001***
factor(country)Moldova	-0.91571118	0.27843600	-3.28877	0.00103768**
factor(country)Mongolia	-0.90326096	0.27034211	-3.34118	0.00086187***

factor(country)Netherlands	-1.47919922	0.46608021	-3.17370	0.00154622**
factor(country)North Macedonia	-0.72530474	0.28872924	-2.51206	0.01214316*
factor(country)Norway	-0.01635397	0.66244655	-0.02469	0.930308B6
factor(country)Poland	-1.26954094	0.30872736	-4.11218	<0.0001***
factor(country)Portugal	-0.74591776	0.35274277	-2.11462	0.03468338*
factor(country)Romania	-1.120S2157	0.27659100	-4.05227	<0.0001***
factor(country)Russia	-0.73559337	0.37920349	-1.93984	0.05265106*
factor(country)Saudi Arabia	-0.95454431	0.46642146	-2.04717	0.04087511*
factor(country)Slovak Republic	-1.03089151	0.35100689	-2.93696	0.00338255**
factor(country)Slovenia	-1.12590017	0.41766612	-2.69569	0.00712982**
factor(country)South Africa	-0.81158288	0.31158470	-2.60469	0.00931786**
factor(country)Spain	-1.09810308	0.38713973	-2.83645	0.00464426**
factor(country)Sweden	-1.11787620	0.54525248	-2.05020	0.04057823*
factor(country)Türkiye	-1.01691600	0.28111410	-3.61745	0.00031083***
factor(country)United Kingdom	-1.48162855	0.41020438	-3.61193	0.00031744***
factor(country)United States	-1.29277620	0.53003984	-2.43902	0.01488229*
[factor (year) 2001	0.04352309	0.15214019	0.28611	0.77485069
factor(year)2002	-0.11233135	0.15263225	-0.73956	0.45972001
factor(year)2003	-0.23498064	0.15525646	-1.51350	0.13043587
factor(vearl2004	-0.13874313	0.15991004	-0.36763	0.38578215
factor(year)2005	-0.26737329	0.16510679	-1.61940	0.10564460
factor(year)2006	-0.23254959	0.17138481	-1.35689	0.17509193
factor(year)2007	-0.00344319	0.13318215	-0.01380	0.98500679
factor(year)2003	-0.27151642	0.19239611	-1.41124	0.15845359
factor(year)2009	-0.21451525	0.18308571	-1.17167	0.24158136
factor(year)2010	0.02940765	0.18810993	0.15633	0.87579942
factor(year)2011	0.05231523	0.19859396	0.26595	0.79033008
factor(year)2012	-0.05931612	0.19623310	-0.30482	0.76055875
factor(year)2013	-0.01867200	0.20130927	-0.09275	0.92611661
factor(year)2014	0.04642239	0.20187891	0.22995	0.81817147
factor(year)2015	-0.15577497	0.19104136	-0.31540	0.41501782
factor(year)2016	-0.04812707	0.19172475	-0.25102	0.80184354
factor(year)2017	-0.15231921	0.19845575	-0.76752	0.44293340
factor(year)2013	-0.18514216	0.20499431	-0.90316	0.36663835
factor(year)2019	-0.34035545	0.20449055	-1.66685	0.09582446.
Residual standard error: 0.832631 on 1116 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1116 SSR: 773.694739 MSE: 0.693275 Root MSE: 0.832631 Multiple R-Squared: 0.350186 Adjusted R-Squared: 0.30244				

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table A6

The results of the SUR estimation for marine energy investments

SUR estimates for 'marine' (equation 6) Model Formula: Inv_marine_yj ~ FiT_marine_yj + PPA_marine_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.41260548	0.40170664	-1.02713	0.30453120
FiT marine yj	-0.00206355	0.05381911	-0.03834	0.96542155
PPA marine yj	0.00433393	0.05040614	0.08598	0.93149752
GDP pc yj	-0.13946850	0.17510725	-0.79647	0.42592556
EPC_pc_yj	-0.13195835	0.23396484	-0.56401	0.57236112
[factor (country) Algeria	-0.03871476	0.33500408	-0.11557	0.90801806
factor(country)Argentina	0.13551967	0.34728109	0.39023	0.69644058
factor(country)Armenia	-0.05469223	0.32055360	-0.17062	0.86455504
factor(country)Austria	0.53928041	0.58782340	0.91742	0.35912128
factor(country)Belgium	0.52514458	0.58239572	0.90170	0.36741231
factor(country)Bosnia and Herzegovina	0.06328330	0.32936799	0.19214	0.84767098
factor(country)Brazil	0.10566120	0.33094387	0.31927	0.74957981
factor(country)Bulgaria	0.17484464	0.38308597	0.45641	0.64818329
factor(country)Canada	0.60045425	0.67542512	0.88900	0.37419361
factor(country)Chile	0.19726173	0.35995448	0.54802	0.58378876
factor(country)China	0.17233726	0.32733217	0.52649	0.59865210
factor(country)Croatia	0.21941742	0.37178363	0.59018	0.55519277
factor(country)Cyprus	0.30500488	0.41559138	0.73391	0.46316038
factor(country)Czech Republic	0.34749456	0.46579938	0.74602	0.45581386
factor(country)Denmark	0.52949603	0.57079880	0.92764	0.35379471
factor(country)Dominican Republic	0.00625159	0.32854907	0.01903	0.98482227
factor(country)Ecuador	-0.03845984	0.34788763	-0.11055	0.91199111
factor(country)Estonia	0.32536686	0.46294132	0.70283	0.48231122
factor(country)Finland	2.32800416	0.66016377	3.52640	0.00043834***
factor(country)France	0.48310711	0.56186410	0.85983	0.39006792
factor(country)Germany	0.49060236	0.54575187	0.89895	0.36887445
factor(country)Ghana	-0.28131620	0.41935965	-0.67082	0.50247195
factor(country)Greece	0.33586213	0.43871878	0.76555	0.44410466
factor(country)Hungary	0.22728141	0.37637802	0.60386	0.54605631
factor(country)Iceland	0.76692584	0.83357837	0.92004	0.35775043
factor(country)India	-0.22648499	0.38540253	-0.58766	0.55688057
factor(country)Indonesia	-0.11202249	0.36312742	-0.30849	0.75776433
factor(country)Iran	0.05957984	0.32610084	0.18270	0.85506368
factor(country)Ireland	0.52346513	0.56026975	0.93431	0.35034658
factor(country)Israel	0.43332643	0.51128619	0.84752	0.39688580
factor(country)Italy	0.38958278	0.46776551	0.83286	0.40510237
factor(country)Jordan	-0.02537817	0.31776132	-0.07987	0.93635854
factor(country)Kazakhstan	0.17069739	0.37450452	0.45580	0.64862587
factor(country)Kenya	-0.35206707	0.49183475	-0.71582	0.47424983
factor(country)Latvia	0.17622526	0.35243977	0.50002	0.61716292
factor(country)Lithuania	0.20065371	0.36321824	0.55243	0.58076242
factor(country)Malaysia	0.17625673	0.35947768	0.49031	0.62400851
factor(country)Malta	0.31464729	0.42235874	0.74498	0.45644285
factor(country)Marocco	-0.10367724	0.35037326	-0.29591	0.76735759
factor(country)Mauritius	0.08607164	0.33185685	0.25936	0.79540243
factor(country)Mexico	0.12269280	0.34077780	0.36004	0.71888718
factor(country)Moldova	-0.04206373	0.33336433	-0.12618	0.89961260
factor(country)Mongolia	-0.07551755	0.32408799	-0.23302	0.81579204
factor(country)Netherlands	0.51747043	0.56155659	0.92149	0.35699223

factor(country)North Macedonia	0.10713985	0.34725183	0.30854	0.75773176
factor(country)Norway	0.80231552	0.79192485	1.01312	0.31122207
factor(country)Poland	0.20850957	0.36800446	0.56660	0.57110314
factor(country)Portugal	0.30937956	0.43767098	0.70688	0.47979047
factor(country)Romania	0.10576201	0.33009161	0.32040	0.74872359
factor(country)Russia	0.26999525	0.45237786	0.59684	0.55073314
factor(country)Saudi Arabia	0.44032092	0.55671222	0.79093	0.42915234
factor(country)Slovak Republic	0.29295315	0.42070652	0.69634	0.43636335
factor(country)Slovenia	0.39166887	0.49633307	0.78913	0.43020651
factor(country)South Africa	0.17412700	0.37318312	0.46660	0.64087764
factor(country)Spain	0.37092349	0.47281695	0.78450	0.43291501
factor(country)Sweden	0.61655106	0.65229202	0.94521	0.34475774
factor(country)Türkiye	0.12482556	0.33715445	0.37023	0.71127945
factor(country)United Kingdom	0.43116189	0.49355635	0.87358	0.38253392
factor(country)United States	0.60013960	0.64163703	0.93533	0.34982282
(factor (year) 2001	0.00739324	0.18305862	0.04312	0.96561465
factor(year)2002	0.01750212	0.18364298	0.09531	0.92408955
factor(year)2003	0.04139722	0.18680168	0.22429	0.82257489
factor(year)2004	0.06434399	0.19241234	0.33441	0.73813544
factor(year)2005	0.08330766	0.19870180	0.41926	0.67510700
factor(year)2006	0.10232980	0.20625213	0.49614	0.61989378
factor(year)2007	0.12819795	0.22087603	0.58041	0.56175750
factor(year)2003	0.14696454	0.23177697	0.63408	0.52616024
factor(year)2009	0.12381106	0.21945280	0.56418	0.57274446
factor(year)2010	0.13847251	0.22540217	0.61434	0.53911900
factor(year)2011	0.15561284	0.23738463	0.65553	0.51226144
factor(year)2012	0.15463991	0.23493029	0.65824	0.51052133
factor(year)2013	0.16246594	0.24043466	0.67572	0.49935992
factor(year)2014	0.16353105	0.24129803	0.67771	0.49809354
factor(year)2015	0.14810796	0.22876166	0.64743	0.51748457
factor(year)2016	0.72753005	0.23018874	3.16058	0.00161693**
factor(year)2017	0.16582638	0.23829773	0.69588	0.48664950
factor(year)2013	0.17860680	0.24631673	0.72511	0.46853636
factor(year)2019	0.22705805	0.24585954	0.92353	0.35593200
Residual standard error: 1.001785 on 1116 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1116 SSR: 1119.987644 MSE: 1.003573 Root MSE: 1.001785 Multiple R-Squared: 0.065898 Adjusted R-Squared: -0.002737				

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table A7

The results of the SUR estimation for multi-renewable energy investments

SUR estimates for 'mult' (equation 7)
Model Formula: Inv_mult_yj ~ FiT_wind_yj + PPA_wind_yj + FiT_solar_yj + PPA_solar_yj + FiT_geo_yj + PPA_geo_yj + FiT_bio_yj + PPA_bio_yj + FiT_waste_yj + PPA_waste_yj + FiT_hydro_yj + PPA_hydro_yj + FiT_marine_yj + PPA_marine_yj + GDP_pc_yj + EPC_pc_yj + factor(country) + factor(year)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-0.28360072	0.21471586	-1.32082	0.18683554
FiT wind yj	0.15176538	0.05031458	3.01633	0.00261711**
PPA wind yj	-0.05256999	0.05937552	-0.88538	0.37614365
FiT solar yj	0.04675244	0.03833940	1.21944	0.22293918
PPA solar yj	-0.15659331	0.05504294	-2.84493	0.00452418**
FiT geo yj	-0.02349324	0.06436538	-0.36500	0.71518279
PPA geo yj	-0.06948148	0.04883521	-1.42277	0.15508411
FiT bio yj	-0.09784190	0.05740942	-1.70428	0.08860964.
PPA bio yj	-0.08477143	0.06717811	-1.26189	0.20725466
FiT waste yj	-0.01567615	0.02482303	-0.63152	0.52783374
PPA waste yj	0.06523110	0.03171061	2.05708	0.03991351*
FiT hydro yj	-0.04190721	0.06060002	-0.69154	0.48937295
PPA hydro yj	0.18610967	0.06762910	2.75192	0.00602177**
FiT marine yj	-0.00896240	0.03215631	-0.27871	0.78051673
PPA_marine_yj	0.03679424	0.03288911	1.11874	0.26349606
GDP_pc yj	-0.14861226	0.09150586	-1.62407	0.10464554
EPC_pc_yj	0.33160514	0.12854880	2.57961	0.01001973*
factor(country)Algeria	0.11821145	0.20067016	0.58908	0.55552588
factor(country)Argentina	0.91478650	0.18202569	5.02559	<0.0001***
factor(country)Armenia	0.54089393	0.16929316	3.19501	0.00143785**
factor(country)Austria	-0.37202813	0.32632071	-1.14007	0.25450482
factor(country)Belgium	-0.60493727	0.31987355	-1.89118	0.05886242.
factor(country)Bosnia and Herzegovina	0.53739076	0.17400364	3.08839	0.00206271**
factor(country)Brazil	1.33088760	0.17239169	7.72014	<0.0001***
factor(country)Bulgaria	-0.35904264	0.20352418	1.76413	0.07758701.
factor(country)Canada	-0.89963293	0.36874925	-2.43969	0.01485654*
factor(country)Chile	0.63883346	0.18955411	3.37019	0.00077714**
factor(country)China	1.20807150	0.17658967	6.84112	<0.0001***
factor(country)Croatia	-0.09756220	0.20098093	-0.48543	0.62746757
factor(country)Cyprus	-0.19373532	0.22062708	-0.87811	0.38007352
factor(country)Czech Republic	-0.57443502	0.25926408	-2.21564	0.02651580*
factor(country)Denmark	-0.22044235	0.31014804	-0.71076	0.47738004
factor(country)Dominican Republic	0.59022431	0.17304814	3.41075	0.00067128***
factor(country)Ecuador	1.07477022	0.19688525	5.45887	<0.0001***
factor(country)Estonia	-0.55849883	0.24766289	-2.25508	0.02432375*
factor(country)Finland	-0.61574564	0.36925400	-1.66754	0.05565077.
factor(country)France	0.22816388	0.31056178	0.73468	0.46268574
factor(country)Germany	-0.05629513	0.29180745	-0.19292	0.84705807
factor(country)Ghana	1.04166369	0.22915679	4.54564	<0.0001***
factor(country)Greece	0.15390839	0.23274070	0.66129	0.50856628
factor(country)Hungary	-0.19996726	0.20012788	-0.99920	0.31751802
factor(country)Iceland	-1.04850163	0.46403212	-2.25955	0.02404380*
factor(country)India	1.33503236	0.32210194	4.14475	<0.0001***
factor(country)Indonesia	1.28219526	0.19388112	6.61331	<0.0001***
factor(country)Iran	-0.06251902	0.17201423	-0.36345	0.71633637
factor(country)Ireland	-0.41142511	0.30395660	-1.35357	0.17615216
factor(country)Israel	-0.63494168	0.27847150	-2.28010	0.02275203*
factor(country)Italy	0.19204435	0.25104680	0.76497	0.44445033

factor(country)Jordan	0.76757229	0.17485088	4.38987	<0.0001***
factor(country)Kazakhstan	0.34959248	0.19629599	1.78095	0.07515624.
factor(country)Kenya	1.24958025	0.27850607	4.48673	<0.0001***
factor(country)Latvia	-0.38729827	0.18591305	-2.08322	0.03746055*
factor(country)Lithuania	-0.22869379	0.19011167	-1.20294	0.22525571
factor(country)Malaysia	0.31254514	0.19045188	1.64107	0.10106741
factor(country)Malta	-0.37751386	0.22620230	-1.66892	0.09541648.
factor(country)Marocco	1.03716884	0.18525888	5.59848	<0.0001***
factor(country)Mauritius	-0.05504476	0.18145878	-0.30335	0.76168350
factor(country)Mexico	1.37974939	0.17722407	7.78534	<0.0001***
factor (country) Moldova	-0.00980421	0.17288180	-0.05671	0.95478607
factor(country)Mongolia	0.96575228	0.18472524	5.22805	<0.0001***
factor (country)Netherlands	-0.51357097	0.30425037	-1.68799	0.09169597.
factor(country)North Macedonia	-0.22982247	0.18416880	-1.24789	0.21233581
factor(country)Norway	-0.68827345	0.43948902	-1.56608	0.11761727
factor(country)Poland	-0.17390383	0.19445643	-0.89431	0.37135234
factor(country)Portugal	-0.32989723	0.24704987	-1.33535	0.18203815
factor(country)Romania	-0.25629573	0.17194764	-1.49055	0.13636657
factor(country)Russia	-0.69120932	0.24330477	-2.84092	0.00458104
factor(country)Saudi Arabia	-0.77312100	0.30478945	-2.53657	0.01133116
factor(country)Slovak Republic	-0.43793484	0.22694127	-1.92973	0.05389657
factor(country)Slovenia	-0.49435013	0.27401445	-1.80410	0.07148772
factor(country)South Africa	0.66103520	0.19673823	3.35997	0.00080616
factor(country)Spain	0.05393253	0.26038371	0.20713	0.83594879
factor(country)Sweden	-0.71029022	0.35944005	-1.97610	0.04839186
factor(country)Türkiye	1.51430722	0.18252072	8.29663	<0.0001***
factor(country)United Kingdom	-0.36853555	0.27427307	-1.34368	0.17932761
factor(country)United States	-0.53707732	0.35136636	-1.52854	0.12666511
factor(year)2001	-0.05282208	0.09358043	-0.56446	0.57255821
factor(year)2002	-0.08938074	0.09398220	-0.95104	0.34179270
factor(year)2003	-0.05649408	0.09581090	-0.58964	0.55555166
factor(year) 2004	0.05426987	0.09901184	0.54811	0.58372382
factor(year) 2005	0.06616579	0.10274992	0.64395	0.51974173
factor(year)2006	0.14595065	0.10675737	1.36712	0.17186448
factor(year)2007	0.10618864	0.11498553	0.92350	0.35595074
factor(year)2008	0.21130873	0.12098622	1.74655	0.08099316.
factor(year) 2009	0.26973606	0.11490831	2.34740	0.01908069*
factor(year)2010	0.30419296	0.11875963	2.56142	0.01055656*
factor(year)2011	0.34132951	0.12544924	2.72086	0.00661362**
factor(year)2012	0.35192226	0.12329414	2.85433	0.00439340**
factor(year) 2013	0.42605387	0.12662648	3.36465	0.00079275***
factor(year)2014	0.47487806	0.12717655	3.73401	0.00019808***
factor(year)2015	0.65505155	0.11982333	5.46681	<0.0001***
factor(year) 2016	0.62830463	0.12001137	5.23538	<0.0001***
factor(year)2017	0.72599161	0.12457346	5.82782	<0.0001***
factor(year)2018	0.70121074	0.12902566	5.43466	<0.0001***
factor(year)2019	0.55804679	0.12866837	4.33709	<0.0001***
Residual standard error: 0.512252 on 1104 degrees of freedom Number of observations: 1199 Degrees of Freedom: 1104 SSR: 289.691535 MSE: 0.262402 Root MSE: 0.512252 Multiple R-Squared: 0.609026 Adjusted R-Squared: 0.575736				

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.

Source: authors’ calculations in R Studio.

APPENDIX B

Table B1

Driscoll–Kraay corrected SUR results for wind energy investments

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_wind_yj	0.0193	0.0702	0.275	0.784
PPA_wind_yj	-0.0876	0.0568	-1.542	0.123
GDP_pc_yj	-0.0972	0.1225	-0.794	0.427
EPC_pc_yj	-0.1417	0.276	-0.513	0.608
factor(year)2001	0.0086	0.0077	1.117	0.264
factor(year)2002	0.0045	0.0138	0.324	0.746
factor(year)2003	0.0202	0.0276	0.732	0.464
factor(year)2004	0.1527	0.0416	3.669	<0.0001 ***
factor(year)2005	0.1424	0.0528	2.695	0.007***
factor(year)2006	0.1358	0.0668	2.034	0.042*
factor(year)2007	0.1534	0.0863	1.778	0.076.
factor(year)2008	0.3009	0.1003	3.0	0.003**
factor(year)2009	0.5695	0.0934	6.095	<0.0001 ***
factor(year)2010	0.9776	0.1033	9.463	<0.0001 ***
factor(year)2011	0.8531	0.1181	7.225	<0.0001 ***
factor(year)2012	1.0414	0.1133	9.187	<0.0001 ***
factor(year)2013	0.8785	0.1192	7.369	<0.0001 ***
factor(year)2014	0.9561	0.1183	8.081	<0.0001 ***
factor(year)2015	0.5785	0.1041	5.556	<0.0001 ***
factor(year)2016	0.8105	0.1034	7.839	<0.0001 ***
factor(year)2017	0.94	0.1109	8.476	<0.0001 ***
factor(year)2018	0.8301	0.1179	7.041	<0.0001 ***

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.
Source: authors’ calculations in R Studio.

Table B2

Driscoll–Kraay corrected SUR results for solar energy investments

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_solar_yj	0.1205	0.0539	2.2362	0.0255*
PPA_solar_yj	-0.0545	0.0562	-0.9704	0.3321
GDP_pc_yj	0.0477	0.1358	0.3512	0.7255
EPC_pc_yj	0.4511	0.1724	2.6172	0.009
Year 2001	0.2024	0.0096	20.9934	<0.0001***
Year 2002	0.1181	0.0204	5.7921	<0.0001***
Year 2003	-0.0074	0.0434	-0.1703	0.8648
Year 2004	-0.0793	0.0673	-1.1782	0.239
Year 2005	0.0773	0.0857	0.9016	0.3675
Year 2006	-0.12	0.1073	-1.1185	0.2636
Year 2007	-0.1201	0.1397	-0.8598	0.3901
Year 2008	-0.0874	0.1592	-0.5487	0.5833
Year 2009	0.2111	0.1452	1.4542	0.1462
Year 2010	0.3486	0.1638	2.1276	0.0336*
Year 2011	0.2937	0.1803	1.6295	0.1035
Year 2012	0.2184	0.1759	1.2416	0.2146
Year 2013	0.2823	0.1808	1.5612	0.1188
Year 2014	0.3512	0.1756	2.0005	0.0457*
Year 2015	0.464	0.158	2.9365	0.0034**
Year 2016	0.778	0.1574	4.9424	<0.0001***
Year 2017	0.4814	0.17	2.8322	0.0047**
Year 2018	0.5616	0.1791	3.135	0.0018**
Year 2019	0.5408	0.1744	3.1013	0.002**

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.
Source: authors’ calculations in R Studio.

Table B3

Driscoll–Kraay corrected SUR results for geothermal energy investments.

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_geo_yj	0.0523337	0.0761614	0.6871	0.49214
PPA_geo_yj	0.0542808	0.0501885	1.0815	0.27969
GDP_pc_yj	-0.0507201	0.1256068	-0.4038	0.68644
EPC_pc_yj	1.0919165	0.2064934	5.2879	<0.0001 ***
factor(year)2001	-0.1394270	0.0075165	-18.5495	<0.0001 ***
factor(year)2002	-0.0976240	0.0172882	-5.6469	<0.0001 ***
factor(year)2003	-0.2079206	0.0347161	-5.9892	<0.0001 ***
factor(year)2004	-0.0089078	0.0517145	-0.1722	0.86327
factor(year)2005	-0.0902158	0.0657078	-1.3730	0.17003
factor(year)2006	-0.1702368	0.0794176	-2.1436	0.03228 *
factor(year)2007	-0.2251757	0.1014499	-2.2196	0.02665 *
factor(year)2008	-0.2910749	0.1138961	-2.5556	0.01073 *
factor(year)2009	0.1597810	0.0927491	1.7227	0.08522.
factor(year)2010	-0.1473359	0.1038574	-1.4186	0.15628
factor(year)2011	-0.1159747	0.1162907	-0.9973	0.31884
factor(year)2012	-0.2939312	0.1147325	-2.5619	0.01054 *
factor(year)2013	-0.1409189	0.1191804	-1.1824	0.23730
factor(year)2014	0.0541656	0.1179148	0.4594	0.64606
factor(year)2015	0.2826982	0.1089806	2.5940	0.00961 **
factor(year)2016	-0.0620687	0.1148434	-0.5405	0.58899
factor(year)2017	-0.0930533	0.1249273	-0.7449	0.45651
factor(year)2018	-0.1385274	0.1327600	-1.0434	0.29697
factor(year)2019	-0.0943785	0.1310673	-0.7201	0.47163

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.
Source: authors’ calculations in R Studio.

Table B4

Driscoll–Kraay corrected SUR results for bioenergy investments.

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_bio_yj	-0.0962485	0.0505803	-1.9029	0.0573.
PPA_bio_yj	0.0182041	0.0493378	0.3690	0.7122
GDP_pc_yj	0.1782539	0.1386571	1.2856	0.1989
EPC_pc_yj	-0.2008523	0.2178526	-0.9220	0.3567
factor(year)2001	-0.0177168	0.0056499	-3.1358	0.0018 **
factor(year)2002	0.0231663	0.0100869	2.2967	0.0218 *
factor(year)2003	-0.0093250	0.0245781	-0.3794	0.7045
factor(year)2004	-0.0285223	0.0401258	-0.7108	0.4773
factor(year)2005	-0.0373050	0.0538542	-0.6927	0.4886
factor(year)2006	0.1019227	0.0649492	1.5693	0.1169
factor(year)2007	0.1278882	0.0832813	1.5356	0.1249
factor(year)2008	0.1724237	0.0955826	1.8039	0.0715.
factor(year)2009	0.5148780	0.0766089	6.7209	<0.0001 ***
factor(year)2010	0.5279648	0.0819886	6.4395	<0.0001 ***
factor(year)2011	0.4906604	0.0951352	5.1575	<0.0001 ***
factor(year)2012	0.5139219	0.0909936	5.6479	<0.0001 ***
factor(year)2013	0.5976548	0.0981067	6.0919	<0.0001 ***
factor(year)2014	0.6457073	0.1007638	6.4081	<0.0001 ***
factor(year)2015	0.6151205	0.0862466	7.1321	<0.0001 ***
factor(year)2016	0.4643596	0.0888449	5.2266	<0.0001 ***
factor(year)2017	0.3797590	0.0977604	3.8846	0.0001 ***
factor(year)2018	0.6027612	0.1081626	5.5727	<0.0001 ***
factor(year)2019	0.1414943	0.1083546	1.3058	0.1919

Signif. codes: ‘***’ – 0.001; ‘**’ – 0.01; ‘*’ – 0.05; ‘.’ – 0.1; ‘no symbol’ – insignificant.
Source: authors’ calculations in R Studio.

Table B5

Hydropower Regression Results (Driscoll–Kraay SEs)

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_hydro_yj	0.0163	0.0653	0.2500	0.8026
PPA_hydro_yj	-0.0491	0.0870	-0.5647	0.5724
GDP_pc_yj	0.4167	0.1778	2.3444	0.0192 *
EPC_pc_yj	-0.3907	0.1048	-3.7281	0.0002 ***
factor(year)2001	0.0439	0.0048	9.0697	<0.0001 ***
factor(year)2002	-0.1118	0.0144	-7.7379	<0.0001 ***
factor(year)2003	-0.2316	0.0364	-6.3674	<0.0001 ***
factor(year)2004	-0.1334	0.0592	-2.2547	0.0243 *
factor(year)2005	-0.2602	0.0770	-3.3775	0.0008 ***
factor(year)2006	-0.2234	0.0942	-2.3708	0.0179 *
factor(year)2007	0.0088	0.1228	0.0720	0.9426
factor(year)2008	-0.2567	0.1414	-1.8148	0.0698.
factor(year)2009	-0.1986	0.1191	-1.6680	0.0956.
factor(year)2010	0.0466	0.1276	0.3650	0.7152
factor(year)2011	0.0732	0.1471	0.4978	0.6187
factor(year)2012	-0.0406	0.1426	-0.2844	0.7761
factor(year)2013	0.0024	0.1514	0.0158	0.9874
factor(year)2014	0.0674	0.1532	0.4400	0.6600
factor(year)2015	-0.1384	0.1316	-1.0519	0.2931
factor(year)2016	-0.0322	0.1349	-0.2388	0.8113
factor(year)2017	-0.1352	0.1475	-0.9165	0.3596
factor(year)2018	-0.1675	0.1608	-1.0419	0.2977
factor(year)2019	-0.2755	0.1596	-1.7270	0.0845.

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table B6

Driscoll–Kraay corrected SUR results for marine energy investment.

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_marine_yj	-0.0031143	0.0021693	-1.4356	0.1514
PPA_marine_yj	0.0041717	0.0040181	1.0382	0.2994
GDP_pc_yj	-0.1390328	0.1364062	-1.0193	0.3083
EPC_pc_yj	-0.1320297	0.1964508	-0.6721	0.5017
factor(year)2001	0.0079132	0.0093925	0.8425	0.3997
factor(year)2002	0.017513	0.0201191	0.8705	0.3842
factor(year)2003	0.041887	0.0454309	0.922	0.3567
factor(year)2004	0.0642868	0.0684897	0.9386	0.3481
factor(year)2005	0.0832549	0.0882245	0.9437	0.3455
factor(year)2006	0.1022339	0.1083358	0.9437	0.3455
factor(year)2007	0.1281352	0.1353093	0.947	0.3439
factor(year)2008	0.1469532	0.1541485	0.9533	0.3406
factor(year)2009	0.1239445	0.1281987	0.9668	0.3338
factor(year)2010	0.138662	0.14519	0.955	0.3398
factor(year)2011	0.1558491	0.1638626	0.9511	0.3418
factor(year)2012	0.1549001	0.1633378	0.9483	0.3432
factor(year)2013	0.1627632	0.1713454	0.9499	0.3424
factor(year)2014	0.1637924	0.1706345	0.9599	0.3373
factor(year)2015	0.1482537	0.1577341	0.9399	0.3475
factor(year)2016	0.7275651	0.1613027	4.5106	<0.0001 ***
factor(year)2017	0.1658346	0.1765298	0.9394	0.3477
factor(year)2018	0.1784916	0.1894801	0.942	0.3464
factor(year)2019	0.2260702	0.1857573	1.217	0.2239

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.
Source: authors' calculations in R Studio.

Table B7

Driscoll–Kraay corrected SUR results for multi-renewable energy.

Variable	Estimate	Std. Error	t value	Pr(>|t|)
FiT_wind_yj	0.1516	0.0564	2.6885	0.0073 **
PPA_wind_yj	-0.0704	0.0602	-1.1700	0.2422
FiT_solar_yj	0.0373	0.0475	0.7851	0.4326
PPA_solar_yj	-0.1284	0.0613	-2.0946	0.0364 *
FiT_geo_yj	-0.0112	0.0650	-0.1724	0.8632
PPA_geo_yj	-0.0769	0.0378	-2.0364	0.0419 *
FiT_bio_yj	-0.0713	0.0605	-1.1784	0.2389
PPA_bio_yj	-0.1075	0.0714	-1.5046	0.1327
FiT_waste_yj	-0.0129	0.0160	-0.8015	0.4230
PPA_waste_yj	0.0572	0.0365	1.5668	0.1174
FiT_hydro_yj	-0.0779	0.0671	-1.1606	0.2460
PPA_hydro_yj	0.2187	0.0557	3.9292	0.0001 ***
FiT_marine_yj	0.0066	0.0274	0.2390	0.8112
PPA_marine_yj	0.0301	0.0250	1.2072	0.2276
GDP_pc_yj	-0.1567	0.1110	-1.4114	0.1584
EPC_pc_yj	0.3357	0.1083	3.1000	0.0020 **
factor(year)2001	-0.0537	0.0046	-11.7923	<0.0001 ***
factor(year)2002	-0.0901	0.0135	-6.6616	<0.0001 ***
factor(year)2003	-0.0563	0.0244	-2.3034	0.0214 *
factor(year)2004	0.0548	0.0382	1.4346	0.1517
factor(year)2005	0.0674	0.0484	1.3923	0.1641
factor(year)2006	0.1497	0.0596	2.5125	0.0121 *
factor(year)2007	0.1100	0.0754	1.4590	0.1448
factor(year)2008	0.2157	0.0850	2.5387	0.0113 *
factor(year)2009	0.2747	0.0706	3.8893	<0.0001 ***
factor(year)2010	0.3101	0.0748	4.1484	<0.0001 ***
factor(year)2011	0.3475	0.0832	4.1773	<0.0001 ***
factor(year)2012	0.3568	0.0812	4.3945	<0.0001 ***
factor(year)2013	0.4307	0.0842	5.1144	<0.0001 ***
factor(year)2014	0.4804	0.0836	5.7468	<0.0001 ***
factor(year)2015	0.6596	0.0725	9.0986	<0.0001 ***
factor(year)2016	0.6321	0.0781	8.0944	<0.0001 ***
factor(year)2017	0.7321	0.0835	8.7649	<0.0001 ***
factor(year)2018	0.7087	0.0899	7.8873	<0.0001 ***
factor(year)2019	0.5638	0.0906	6.2202	<0.0001 ***

Signif. codes: '***' – 0.001; '**' – 0.01; '*' – 0.05; '.' – 0.1; 'no symbol' – insignificant.

Source: authors' calculations in R Studio.