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The Political Economy of Renewable Energies

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THE POLITICAL ECONOMY OF RENEWABLE ENERGIES[1]

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ABSTRACT

This paper empirically analyzes how political factors affect the deployment of renewable energy (RE) sources and compares it to other economic, energy and environmental drivers that have received greater attention in the literature so far. The sample encompasses the EU countries bound to attain the target of 20% share of gross final energy consumption by 2020. The panel data analysis shows that lobbying by the agricultural industry negatively affect RE deployment, whereas standard measures of government quality show a positive effect; furthermore left-wing parties promote the deployment of RE more than right wing ones, but this effect is reduced when the governing coalition is highly concentrated. Among the control variables, economic growth shows a positive impact on RE deployment.

JEL classification codes: Q28, H54, H87, D72, D73, D78

Keywords: renewable energy sources, energy policy, quality of government, lobbying, political ideology

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1. *Introduction*

The deployment of renewable energy sources (RE) is, first and foremost, a political decision. Governments invest public resources in RE reacting to the pressure of lobbies which demand their deployment, like the environmentalists and the green energy industry; to lobbies which oppose such deployment, like the nuclear and the oil based industries; in response to policy decisions taken by other countries and supranational institutions that seek to minimize cross border externalities stemming from conventional energy sources. Most of all, governments invest in RE provided that it yields a positive rate of return in terms of expected votes. Moreover, as the transition from oil-based to REs is a long term process, governments engage more successfully in it when the institutional framework where they operate allows them to credibly and steadily commit to long term policy decisions. Certainly, investing public resources in REs also responds to economic and environmental factors; but while these have been thoroughly studied in the economic literature, the role played by political and institutional drivers has so far received lesser attention; at least as far the specific decision of deployment of REs is concerned. This paper aims at filling this lacuna.

To pursue this end we collapse the political, the economic and the environmental drivers of REs deployment into a single empirical model, to assess the *relative* explanatory power of politico-institutional factors in this policy domain. This comparison is not inconsequential, since some determinants may be interconnected: left wing governments are for instance more likely to implement environmental and energy policies based on state regulations rather than on the creation of markets; likewise, the influence of lobbies is conditional on the price of oil based energy sources.

The deployment of REs is indeed an important and 'hot' topic. Faced with the combined needs of reducing its energy dependency and of protecting the quality of the environment, the EU Commission has set a series of targets that member countries must reach by 2020 (Directive 2009/28/EC); among those, a share of REs in gross final energy consumption of at least 20%. The task is daunting, as considerable differences exist in RE gross final energy consumption within the EU27 countries: from a nil value in Malta to 43% in Sweden, with a mean value of 12.5% and a variance of 6.9% (table A1 in the appendix gives data by country). Such large cross country differences among a group of rather homogeneous and closely integrated economies cast doubts on models that explain them considering only the economic, energy and environmental factors. Political drivers may also play a role.

The rest of the paper is organized as follow. Section 2 presents the theoretical and empirical backgrounds of the relationships between political economy variables and energy policy decisions. Section 3 presents the data and the estimated model. Section 4 discusses the main results, while section 5 concludes.

2. Literature review

Both at the theoretical and at the empirical level, the political economy of energy and environmental policy decisions has mainly focused on two types of determinants: the quality of government, including the institutional framework where energy and environmental policy decisions are implemented; and the ideology of the incumbent government. Here we will consider these literature strands in turn.

<u>2.1. Quality of governance.</u> The inverted Kutznets curve is the theoretical framework whereby the relationship between the economic performance, the quality of governance and the quality of the environment is studied. The idea is that in poor countries people value material well-being more than environmental amenities; yet, once a country reaches a sufficiently high per capita income, citizens pay greater attention to the environment. Economic growth thus causes environmental degradation at low levels of per capita income, but once a certain threshold is attained, further growth is beneficial for the quality of the environment. Insofar as policies respond to people's preferences, we should observe that in poor countries they tend to sacrifice the environment at the expense of development, while the opposite occurs in rich countries (Arrow *et al*. 1995). Corruption, a standard measure of governance quality, reduces the responsiveness of policies to citizens' preferences. It should therefore change the income level at which environmental protecting policies are adopted, leaving the underlying relationship unaltered. Lopez (2000) reaches this conclusion concludes simulating a model of the environmental consequences of government corruption and rent-seeking, where both cooperative and non-cooperative forms of interaction between the government and the private sector are considered. Likewise, Fredriksson and Svenssson (2003) study both theoretically and empirically the effects of political instability and corruption on the implementation of environmental policies. Using a trade policy model *à la* Grossman and Helpman (1994), they predict that corruption reduces the "stringency" of environmental regulations, i.e., the efficiency of implementation of such policies. Political instability should however offset this effect, as it lowers the rate of return on corrupt practices. A cross section analysis on 63 countries broadly confirms these theoretical results.

Fredriksson *et al.* (2004) extend this analysis to the combined effects of corruption and of industry size – a proxy for lobbying efficiency - on the outcomes of energy policy in the OECD countries. Their theoretical structure builds on the menu auction model and generates quite many predictions disaggregated at the industry level, namely, that (*i*) greater corruptibility reduces the stringency of energy policy; (*ii*) higher costs of lobby coordination cause energy policy to become more stringent; (*iii*) when the effect of energy policy on wages is large (small), the influence of worker coordination costs on the stringency of energy policy is also large (small), whereas the effect on capital owners' coordination costs is small(large). The empirical results, based on sectorial data from 12 OECD countries over the period 1982-1996, are generally consistent with these theoretical predictions. A number of other empirical studies (Fredriksson, Vollebergh, 2009; Morse 2006; Welsh, 2004) broadly confirm these theoretical predictions using different samples, measures of governance quality and estimating techniques.

2.2. Political ideology. Government ideology is another political factor that potentially affects the environmental quality and the stringency of energy policies. Potrafke (2010) investigates the hypothesis (among others) that market oriented and rightwing governments have been more active at deregulating product markets – the market for energy being one. His results confirm the hypothesis that rightwing governments promote deregulation of the energy market. The concentration of the government majority seems to positively affect market deregulation, while the institutional constraints, captured by the comprehensive Henizs index, appear not to play a major role. Chang and Berdiev (2011) focus on the effects of government ideology and of other political factors on the market for energy alone. Their results confirm that left-wing governments favor regulation in the energy sector, with the fragmentation of government again playing a partly offsetting role. More stringent institutional constraints seem to favor the deregulation of the sector. On the other hand, market-oriented, rightwing governments endorse energy deregulation, although the link between environmental policy and government ideology in this case is less evident. Finally, Neumayer (2003) advances the relevant point that left wing governments may find themselves in an ambivalent position *vis à vis* the protection of the environment, which he measures by the level of air pollution. The idea is that policy decisions aimed at protecting the environment can be costly in terms of employment in heavily-polluting industrial sectors, which generates a conflict in the political objectives of leftwing parties when they run the government. Neumayer's (2003) empirical analysis indeed confirm such an ambivalence, even though a subsequent textual analysis of party manifestos from 25 OECD countries over the period 1945-1998 suggests that left-wing parties declare themselves to be more pro-environment than their right-wing counterparts (Neumayer, 2004).

To sum up, all studies in these different literature strands share two drawbacks. First, they focus on a single type of political economy determinants: either the quality of governance or the political ideology of the government. None compares the relative importance of the political drivers of RE deployment with alternative types of determinants. Second, although some of these studies exploit panel data, the large majority of them fails to explore the dynamic properties of each relationship, treating them to be either contemporaneous or equilibrium values.[3]

3. Data and model specification

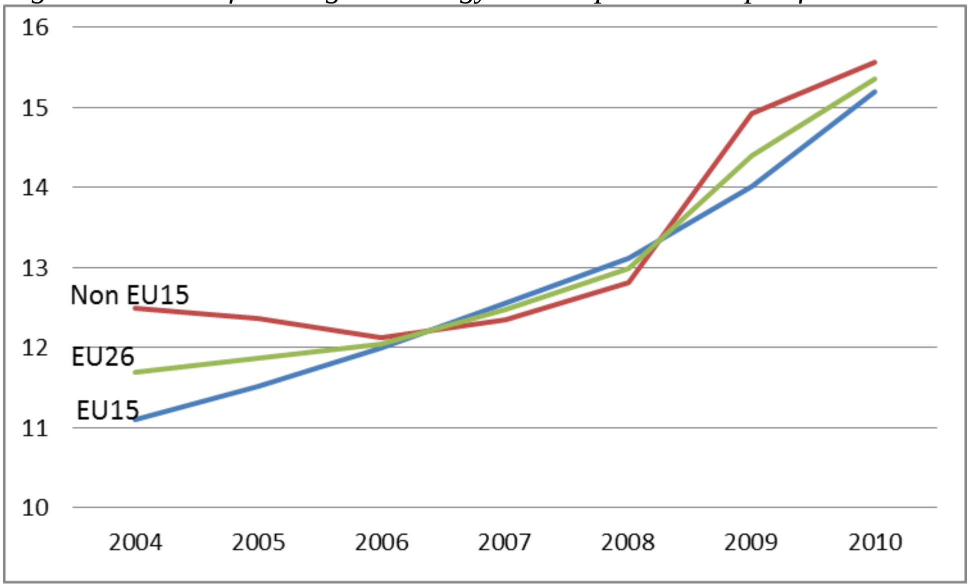
3.1. The dataset. Taking into account the contributions of these literature strands, our empirical analysis focuses the factors that determine the share of RE in gross energy consumption in a sample of 26 EU countries over the period 2004-2010. The time series of our panel starts in 2004 because Eurostat, our data source, started to collect coherent data about the dependent variable only in that year. The dataset excludes Malta because the share of RE in gross energy consumption is zero over the entire period. For the rest, the dataset includes 21 OECD countries, the EU15 countries plus the Czech Republic, Estonia, Hungary, Poland, Slovakia and Slovenia, and five non OECD countries which are closely integrated with the OECD group, namely Bulgaria, Cyprus, Romania, Latvia and Lithuania. We identify the EU15 members (EU15) by a specific dummy.

The choice of the dependent variable is the share of RE in gross final energy consumption, since it is the closest proxy to the indicator actually referred to in Directive 2009/28/EC. As such, the dependent variable implicitly measures the stringency of the environmental policy decisions of each country. Figure 1 describes the evolution of the average share of RE in gross energy consumption in the EU countries for the EU26, the EU15 and the non-EU15 member countries from 2004 to 2010. From 2004 until 2007 the RE use in non-EU15 countries decreases; since 2006-2007, however, the share of RE in final gross consumption

[3] The only possible exceptions are Marques et al. (2010) and Potrafke (2010). They first use a FEVD model to distinguish between time varying and time invariant covariates. As we shall see in section 3.2., this estimator is subject to critiques. Potrafke (2010), on the other hand, adopts to a least squares dummy variable estimator for dynamic panel data, where the dependent variable is lagged and economic variables enter as rate of growth. He limits the analysis to a small set of covariates, without considering the significance of more than one lags.

both in the non-EU15 and in the EU15 countries basically follows the same upward trend. Hence, despite the financial and economic crisis, the EU countries continue their progress toward the 20% target set by the Commission[4].

Figure 1. Share of RE in gross energy consumption. Groups of EU countries, 2004-2010



Source: Eurostat

3.2. Model specification and estimation procedures. To allow the interpretation of the estimated coefficients (wherever possible) as elasticities, we express the dependent variable in natural logarithms, (*logRE*). We then estimate the following model:

$$logRE_{it} = \alpha_i + \delta t + \beta \boldsymbol{X}_{it} + \gamma_1 \boldsymbol{Z}_{it} + \gamma_2 \boldsymbol{W}_{it} + \varepsilon_{it} \qquad (1)$$

The equation is estimated with country specific effects α_i and, due to the relatively short time dimension, a deterministic trend δt to take account of technological progress (Fredriksson, 2009). Vectors $\boldsymbol{X}$, $\boldsymbol{Z}$ and $\boldsymbol{W}$ include the three categories of explanatory variables considered: the economic variables $\boldsymbol{X}$, the energy and environmental variables $\boldsymbol{Z}$, and the political economy variables $\boldsymbol{W}$. All arguments of these vectors are also expressed in logs, with the exception of the variables in shares and growth rates.

[4] The EC Renewable Energy Progress Report, 2013/175 however indicates that the economic crisis is now affecting the RE sector and that further efforts and measures are needed to achieve the 2020 target.

Before describing the explanatory variables, three important estimation issues must be clarified. The first relies to the dynamic specification of the model. The share of RE in gross energy consumption varies with the investment in the production of RE and with energy consumption. Some economic variables, like the price of energy, may have both short term effects on the consumption of RE and long term ones on investments in RE deployment. Other time variant variables, like the proxies for governance quality and some institutional factors, should instead produce no contemporaneous effects, only delayed ones through the energy and the environmental policies adopted. To disentangle the short from the long run effects, Antweiler *et al.* (2001) linked the concentration of pollutants (their dependent variable) to a contemporaneous measure of economic activity, but also to a one-period lagged, three-year moving average of per capita income, to account for the slow response of the regressand to the anti-pollution policies. We select a more straightforward approach, in that we introduce the variables referring to economic activity and to energy prices both in simultaneous values and with lags, while the other time variant variables are all specified with lags. We have tested various lag structures[5]; yet, because of the rather short time dimension of our sample, we present the results with a maximum of three lags[6]. Finally, it must be emphasized that we are interested in the dynamics of the specific relationship between each independent variable and the dependent one. The presence of variables that remain constant or show very little time variance over the sample period, especially among the political economy determinants, prevent us from estimating a fully dynamic model with the lagged dependent variable, because the interpretation of the estimated coefficients that relate the lagged covariates to the dynamically specified regressand would be very difficult.

The second issue is the choice of the estimation method. As already mentioned, equation (1) includes explanatory variables that are time invariant (or that change very slowly), as well as others that are instead characterized by a high degree of time variability. To capture this rich dynamics, we follow Greene (2011) and proceed in two steps: first, we apply a LSDV estimator that excludes the time invariant variables; second, we regress the vector of the fixed effects on the time invariant/rarely changing variables via an OLS method with Eicker-White robust covariance matrix.

[5] Our dataset includes data over the period 2000-2010 for time variant explanatory variables.

[6] The results with alternative lag structures do not yield qualitatively different results. These estimates are available upon request.

We complement our analysis by estimating equation (1) also via the Fixed Effects Vector Decomposition model (FEVD), again to distinguish the coefficients of time invariant variables from those on variables that change more often (Plümper and Troeger, 2007). Although Breusch et al. (2011) and Greene (2011) have criticized this estimator, still the FEVD coefficients on the time invariant variables provide interesting insights about the relationships between these covariates and the dependent variable, as well as a first check of the stability of the results to changes in the estimation techniques[7]. Finally, both the Greene procedure and the FEDV estimator assume that the explanatory variables are uncorrelated with the individual unobserved effect. To control for this and, at the same time, to further check robustness of our results, we provide estimates via two more methods that consider random individual effects, namely, the GLS estimator with random individual unobserved effects and the Hausman-Taylor estimator. The latter in particular allows accounting for the correlation between the individual specific unobservable effects and some explanatory variables.

Thirdly, in order to assess the relative explanatory power of the political variables with respect to those normally considered in the literature we adopt a sequential strategy to estimate equation (1), in that we first introduce the economic variables of vector $\boldsymbol{X}$**,** then the energy and environmental ones of vector $\boldsymbol{Z}$, and in a third step the covariates related to the political economy of RE deployment of vector $\boldsymbol{W}$. Our strategy of estimation is based on standard significance tests and on constraints on the values of the coefficients.

3.3. Explanatory variables. Coming to the explanatory variables, vector $\boldsymbol{X}_{it}$ represents the benchmark of the analysis, as it comprises the basic economic variables, namely, the level of GDP per capita (GDP) and its growth rate (GDP_GROWTH). To capture the dynamics of these relationships, we introduce them with up to three lags. Data are from the PWT 7.1[8]; in particular, GDP per capita is expressed in PPP converted (Chain Series) values, at 2005

[7] Technically, the FEVD estimator decomposes the unit fixed effect in an unexplained part, plus a part explained by the time invariant and/or rarely changing variables. The FEVD works in three steps: 1) It applies a LSDV estimator that excludes time invariant variables; 2) It regresses the fixed effects vector on the time invariant/rarely changing variables with an OLS method; 3) It estimates the pooled OLS model by including all explained variables and the unexplained part of the fixed effects vector. A similar approach was used in the literature by Carley (2009), Marques et al. (2010), Heinemann et al. (2013).

[8] Heston, A., Summers, R., & Aten, B. (2012). Penn World Table Version 7.1. University of Pennsylvania: Center for International Comparisons of Production, Income and Price .

constant prices. The expected sign on this covariate is a typical Slutsky equation issue: through an income effect, a higher per capita GDP should stimulate energy consumption, including that produced through RE sources; on the other hand, peaks of demand that are endemic to energy consumption may trigger the substitution of RE-based energy, which is still erratic and difficult to stock, with energy produced through other sources, such as nuclear, oil, or imports (Marques *et al.*, 2010). Which of the two effects dominates eventually determines the sign of the coefficient on per capita GDP. Its past growth, on the other hand, should generate more resources to be invested in RE deployment, so the expected sign on GDP_GROWTH is positive.

Vector $\boldsymbol{Z}_{it}$ captures the effects of energy and environmental variables, which the studies of Carley (2009) and Shrimani and Kniefel (2011) have found to be important drivers of RE deployment in the context of the 50 U.S. States. The first argument of $\boldsymbol{Z}_{it}$ is the real price of energy end use (PRICE)[9] from IEA statistics. As for GDP per capita, we test different lags for this variable. In a contemporaneous setting, a price increase should depress energy demand including RE. With time, however, higher energy prices should promote policy choices aimed at reducing energy intensity and dependency; moreover, higher prices may make RE more economically viable, thereby encouraging investments in RE (Carley, 2009). We also consider the energy dependency ratio (DEP_ENERGY) and a measure of the environmental degradation, namely (CO2_ELEC). Energy dependency refers to the extent to which a country relies upon imports to meet its energy needs. Following Eurostat, this indicator is calculated as the net imports of energy divided by the sum of gross inland energy consumption plus bunkers. As for environmental degradation, in line with Marques et al. (2010) and Marques, Fuinhas (2011), we use CO2 emissions from electricity and heat production (as a percentage of total final combustion) from the World Bank. Both energy dependency and CO2 emissions should lead the EU countries to promote the development of REs. Finally, we consider some (time invariant) environmental policy controls. The first captures the commitment of each EU country to the target share of RE in gross final energy consumption for 2020, set by the directive 2009/28/EC. This variable, called TARGET, is actually the share of RE in gross final energy consumption actually assigned to the country by the Commission, reported in table 1; it should have a positive coefficient. The second control

[9] The average of this variable for OECD countries that are not EU15 members is used to proxy the value of this variable for EU countries that are not OECD members, namely, Bulgaria, Cyprus, Romania, Latvia and Lithuania.

identifies to the policy approach that each EU country has adopted to achieve its target, either a market approach, based mainly on tradable green certificates TGC, or a more interventionist approach, relying more on feed-in tariffs FIT (Nielsen, Jeppesenb, 2003; Fouquet, Johanson, 2008; Schallenberg-Rodrigueza, Haasb, 2012) . To this end we create a dummy variable TGC, equal to 1 when the country mainly applies the TGC system and 0 when it relies on the FIT.[10] This dummy allows us to verify whether FIT-based policies create more incentives to deploy RE than TGC-based ones.

Finally, the vector $\boldsymbol{W}_{it}$ includes the political economy variables, the main interest of our analysis. We consider measures of the quality of governance, of the influence of lobbies, of government ideology, as well as indicators of the institutional framework where RE deployment decisions are taken. As already seen in the literature review, a higher quality of governance, proxied by lower levels of corruption, should result in more stringent energy and environmental policies, and by that in a higher share of RE. We use three alternative measures of governance quality, to ensure the comprehensiveness and the robustness of the results: *a*) the Corruption Perception Index CPI, which measures the perceived levels of public sector corruption in a very broad sense, from Transparency International[11]. The scale is [0, 10], where higher scores mean lower corruption; *b*) The Control of Corruption Index (WBGI_CCI), from the World Bank's World Governance Indicators (Kauffman, Kraay, Mastruzzi, 2009). The scale is [-2.5, 2.5], with a normally distributed score with a zero mean and a standard deviation of one. This indicator measures corruption perceptions too, but in a slightly different way, as in this variable corruption is defined as the exercise of public power for private gain. Higher values again indicate a better control of corrupt practices. *c*) The ICRG index of the quality of government[12] (ICGR_QOG), which assesses the diffusion of corruption within the political system. The scale is [0, 1], where higher values also indicate a better quality of governance.

As for government ideology, leftwing governments should be less market oriented than rightwing ones and prefer more market regulation, also in the domain of environmental policy; yet, as Neumeyer (2003) points out, the overall result could be ambiguous due to conflicts between the environmental and employment concerns of left wing parties. To try to

[10] Data are drawn from the Renewable Energy Policy Country Profiles report available at www.reshaping-res-policy.eu

[11] http://www.transparency.org/research/cpi/overview

[12] http://www.qog.pol.gu.se.

sort out these conflicts and have estimates of government ideology as precise as possible, we have refined the standard representation of government ideology in three ways. First, we have conditioned the government ideology by the cohesion of the government majority. The idea is that more cohese left wing government are better able to adopt (and stick to) long run policy decisions, such as RE deployment, than governments of similar ideology but with a weaker parliamentary support. Incidentally, they may also be more resilient to the influence of lobbies. To control for the concentration of the ruling coalition we adopt the standard Herfindal index calculated as the sum of the squared seat shares of all parties in the government (from the Database of Political Institutions of Beck, Groff, Keefer, Walsh, 2001). It ranges between 0 and 1, where 1 denotes single party government, i.e., the highest possible concentration of the ruling coalition. Secondly, we similarly interact government ideology by the type of government system (parliamentarian vs. presidential) to account for the different decision making costs that the two institutional frameworks engender. There is no clear theoretical prior on this point, as it has never been explored in the case of RE deployment. The standard political economy theory, however, maintains that presidential systems, where the government is directly elected in a national constituency, should be better able to implement policies of national scope (Persson and Tabellini, 2001); the deployment of RE is certainly one of such policies. The dummy PARLIAMENTARY is also taken from the Database of Political Institutions. Finally, the third step is introducing a dummy for center governments too, which are usually more ideologically neutral with respect to environmental issues, and might insert noise in the estimates in the case when they are associated with either right or left wing governments. These three dummies, LEFT, RIGHT and CENTER, are drawn from the Database of Political Institutions, which classifies governments as rightwing when they are supported by parties defined as conservative, Christian democratic, or right-wing; as left wing when they are supported by parties defined as communist, socialist, social democratic, or left-wing; and as center, when the supporting parties advocate strengthening private enterprise in a social-liberal context.[13] Finally, following Fredriksson, Vollebergh (2009), Marques et al. (2010) and Marques and Fuinhas (2011), we examine also the effects of lobbying activities on RE end use. So far, the empirical literature has considered only the lobbying activities of capital owners in the energy industry, usually proxied by the value

[13] A potential problem is that there are very few countries with a government that DPI defines as a centre: only Luxembourg, Finland and Ireland and only for short periods. The variable CENTRE has very few 1 values in our dataset.

added of the energy industry as a percentage of GDP. Higher ratios are associated with higher penetration by the energy industry lobby, which is expected to decrease the deployment of alternative RE energy sources. Yet theory (Friedriksson et al., 2004) has shown that the effects of lobbying on environmental policies is far more complex, as the relative size of the energy industry and the relative lobbying efficiency of workers and capital owners should be considered as well. To make an advance in this direction, we examine the lobbying activities of the manufactory sector, of total industry and of the agricultural sectors. This not only gives an idea of the relative lobbying strengths of the three main sectors of the economy, but it also accounts for the fact that, since energy is an input in all productive processes, the higher end use prices that RE likely engender may be resisted by all sectors of the economy. Hence we include the value added of each sector as a percentage of GDP.

The descriptive statistics are presented in tables 1a-1c, while the correlations are shown in table 2. We note that the three scores of quality of governance are highly correlated, with higher values in the EU15 member countries than in the non-EU15 ones. The left-wing parties are represented in both groups (EU15 and Non EU15) and they constitute approximately 30% of the total observations related to government ideology.

Table 1a. Variable definitions and summary statistics 2004-2010

Series	Obs.	Definition	Source	Variable type	Time Var.	Mean	Std Error	Min.	Max.
RE	182	Share of Renewable Energy in gross final consumption	EUROSTAT	Cont.	Var.	13,38	10,72	0,90	48,10
logGDP	182	GDP per Capita (log)	Penn World Table	Cont.	Var.	10,10	0,49	8,95	11,29
GDP GROWTH	182	Growth rate of GDP per capita	Penn World Table	Cont.	Var.	1,80	4,62	-17,55	12,85
logPRICE	182	Index of energy end use real price (log)	IEA Statistics	Cont.	Var.	4,65	0,08	4,46	4,84
DEP_ENERGY	182	Energy Dependency	Eurostat	Cont.	Var.	54,65	29,06	-50,90	102,49
CO2_ELEC	182	CO2 emissions from electricity and heat production, (% of total fuel combustion)	World Bank - WDI database	Cont.	Var.	41,97	14,01	10,51	80,40
VA_AGR	176	Agriculture, value added as % of GDP)	World Bank - WDI database	Cont.	Var.	2,78	2,05	0,30	14,33
VA_MAN	167	Manufacturing, value added as % of GDP	World Bank - WDI database	Cont.	Var.	16,93	5,31	3,75	29,92
VA_INDUS	176	Value added of Industry as % of GDP	World Bank - WDI database	Cont.	Var.	27,49	5,77	12,45	39,03
TGC	182	RE Support mechanism	RE-SHAPING project	Bin.	Invar.	0,23	0,42	0,00	1,00
TARGET	182	Target 2020 - RE	DIRECTIVE 2009/28/CE	Cont.	Invar.	21,85	9,69	11,00	49,00
CORRUPT	182	Corruption perception Index	Transparency International	scaled [0-10]	Invar.	6,43	1,85	3,45	9,40
ICRG_QOG	182	ICGR indicator of Quality of Government	PRS Group	scaled [0 ; 1]	Invar.	0,74	0,17	0,42	1,00
WBGI_CCE	182	Control of Corruption	World Bank - WGI Database	scaled [-2.5 ; 2.5]	Invar.	1,14	0,83	-0,36	2,45
LEFT	182	Left wing government	World Bank - DPI	Bin.	Var.	0,29	0,46	0,00	1,00
HERGOV	181	Herfindhal Index	World Bank - DPI	Cont.	Var.	0,62	0,25	0,22	1,00

Table 1b. Quality and Ideology of Government EU15 / Non EU15 - summary statistics 2004-2010

Series	Obs.	Definition	Source	Variable type	Time Var.	Mean	Std Error	Min.	Max.
CORRUPT EU15	105	Corruption perception Index EU15	Transparency International	scaled [0-10]	Invar.	7.56	1.53	4.23	9.40
CORRUPT NonEU15	77	Corruption perception Index Non EU15	Transparency International	scaled [0-10]	Invar.	4.90	0.94	3.46	6.47
ICRG_QOG EU15	105	ICGR indicator of Quality of Government EU15	PRS Group	scaled [0 ; 1]	Invar.	0.83	0.14	0.56	1.00
ICRG_QOG NonEU15	77	ICGR indicator of Quality of Government Non EU15	PRS Group	scaled [0 ; 1]	Invar.	0.62	0.11	0.42	0.83
WBGI_CCE EU15	105	Control of Corruption EU15	World Bank - WGI Database	scaled [-2.5 ; 2.5]	Invar.	1.70	0.57	0.49	2.45
WBGI_CCE Non EU15	77	Control of Corruption Non EU15	World Bank - WGI Database	scaled [-2.5 ; 2.5]	Invar.	0.37	0.39	-0.36	0.96
LEFT EU15	105	Left wing government EU15	World Bank - Database of Political Institutions	Bin.	Var.	0.30	0.46	0.00	1.00
LEFT Non EU15	77	Left wing government Non EU15	World Bank - Database of Political Institutions	Bin.	Var.	0.29	0.45	0.00	1.00

Table 1c. Quality and Ideology of Government EU15 / Non EU15 - summary statistics 2004-2010

Variability	Total	Within	Between
logRE	151,9	3,50%	96,50%
logGDP	42,61	1,50%	98,50%
GDP GROWTH	3858,39	88%	12,00%
logPRICE	1,08	88%	12,00%
DEPENERGY	152873,3	2,50%	97,50%
CO2_ELEC	35545,81	1,50%	98,50%
VA_AGR	749	10,50%	89,50%
VA_MAN	6331,89	4,00%	96,00%
VA_INDUS	6030,69	7%	93,00%

Table 2. Correlation between the quality of governance indicators

	CORRUPT	ICRG_QOG	WBGI_CCE
CORRUPT	1	0.97	0.95
ICRG_QOG		1	0.93
WBGI_CCE			1

4. *Estimation results*

The results of the estimates of equation (1) via the Greene (2011) estimation technique are presented in tables 3a-3b. Table 3a illustrates the results of stage one, which applies a LSDV estimator to the "time variant" variables; table 3b reports the results of the LS regression of the fixed effects vector on the time invariant/rarely changing variables based on the best fitting estimates. The second stage models of the LSDV estimates make use of the most parsimonious first stage specification, i.e., the one including only the variables and lags found to be statistically significant.

Table 3a. Estimates of Equation (1) Stage One Greene – within estimator

Dependant variable : log Share of renewable energy in gross final energy consumption						
	(1)	(2)	(3)	(4)	(5)	(6)
logGDP(t-1)	-2.682*	-2.623*	-1.205***	-1.304***	-1.303***	-1.255***
	(1.518)	(1.487)	(0.161)	(0.164)	(0.163)	(0.171)
logGDP(t-2)	2.202	1.607				
	(2.553)	(1.622)				
logGDP(t-3)	-0.583					
	(1.818)					
GDP GROWTH	-0.009***	-0.009***	-0.008***	-0.009***	-0.009***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
GDP GROWTH(t-1)	0.020	0.019	0.004***	0.006***	0.006***	0.005***
	(0.015)	(0.015)	(0.002)	(0.002)	(0.002)	(0.002)
GDP GROWTH(t-2)	-0.010	-0.004				
	(0.020)	(0.006)				
GDP GROWTH(t-3)	0.007					
	(0.006)					
TREND	0.041**	0.043**	0.054***	0.061***	0.060***	0.057***
	(0.017)	(0.017)	(0.014)	(0.014)	(0.014)	(0.014)
LogPRICE	-0.112	-0.154				
	(0.167)	(0.169)				
LogPRICE(t-1)	0.200	0.192				
	(0.189)	(0.191)				
LogPRICE(t-2)	0.889***	0.824***	0.760***	0.731***	0.741***	0.761***
	(0.237)	(0.239)	(0.232)	(0.231)	(0.228)	(0.228)
LogPRICE(t-3)	-0.125					
	(0.262)					
DEP_ENERGY(t-1)	0.001	0.001				
	(0.002)	(0.002)				
DEP_ENERGY(t-2)	0.002	0.002				
	(0.002)	(0.002)				
DEP_ENERGY(t-3)	0.003	0.002	0.004**	0.005**	0.005**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
CO2_ELEC(t-1)	0.003	0.004				
	(0.004)	(0.004)				
CO2_ELEC(t-2)	0.000	0.000				
	(0.004)	(0.004)				
CO2_ELEC(t-3)	0.013**	0.013**	0.011**	0.010**	0.010**	0.011**
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
AGR_VA(t-1)	0.001	0.000				
	(0.011)	(0.011)				
AGR_VA(t-2)	0.008	0.008				
	(0.012)	(0.013)				
AGR_VA(t-3)	-0.034***	-0.028***	-0.026***	-0.027***	-0.026***	-0.025***
	(0.012)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)

Dependant variable : log Share of renewable energy in gross final energy consumption						
	(1)	(2)	(3)	(4)	(5)	(6)
LEFT(t-1)				0.012	0.014	
				(0.059)	(0.059)	
LEFT(t-2)				0.088	0.097	0.096*
				(0.068)	(0.063)	(0.058)
LEFT(t-3)				0.018		
				(0.054)		
HERGOV*LEFT(t-1)				-0.072	-0.078	
				(0.085)	(0.084)	
HERGOV*LEFT(t-2)				-0.096	-0.085	-0.118
				(0.086)	(0.083)	(0.075)
HERGOV*LEFT(t-3)				0.011		
				(0.065)		
Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.992	0.992	0.992	0.992	0.992	0.992
N	178	180	182	179	180	181

Heteroscedasticity-Consistent (Eicker-White) Standard Errors

Table 3b. Stage 2 - Greene : LS estimator on estimated individual fixed effect in Stage 1 – Model 6

	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)	(6.6)
Constant	8.090***	8.033***	8.040***	7.970***	8.554***	8.507***
	(0.232)	(0.219)	(0.268)	(0.261)	(0.169)	(0.169)
TGC	-0.177		-0.187		-0.206	
	(0.162)		(0.156)		(0.156)	
TARGET	0.075***	0.075***	0.079***	0.079***	0.077***	0.077***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
CORRUPT	0.128***	0.132***				
	(0.041)	(0.041)				
ICRG_QOG			1.058**	1.103**		
			(0.466)	(0.468)		
WBGI_CCE					0.280***	0.283***
					(0.088)	(0.090)
R2	0.844	0.837	0.819	0.812	0.844	0.835
Ns	26	26	26	26	26	26

Heteroscedasticity-Consistent (Eicker-White) Standard Errors

4.1. The role of economic factors. The consideration of the GDP-related variables yields the first innovative results. The literature survey indicates that there is no conclusive empirical evidence of an impact of economic variables on the deployment of RE in electricity production. We, however, evaluate the effect of economic variables on the share of RE in gross consumption. This lack of statistical evidence might be due to a misspecification of the dynamics of these relationships. Following the statistical significance tests, the estimates include three lags of GDP per capita, while its rate of growth enters in contemporaneous values and with up to three lags. This enables us to obtain a pattern of statistically significant results in all models, namely that lagged per capita GDP and its contemporaneous growth are negatively correlated with the share of RE consumption. This suggest that when economic activity increases, the greater energy consumption that the increased production requires is not immediately met by RE, but rather by other, more elastic energy sources, like fossil based ones that can be more easily stocked and/or imported. Hence the ratio of RE consumption on gross energy consumption decreases. On the other hand, this greater energy demand stimulates greater investment in RE production, which explains why the lagged growth rate of GDP per capita shows instead a significant and positive effect on the share of RE. In particular, an increase of 1 percentage point of the GDP growth rate results in a 0.6% increase of the share of RE the following year. Presumably, economic growth implies that more resources become available to implement environmental policies and consequently RE deployment. The rather small estimated coefficients suggest that a share of the normal investment in RE may be captured by the TARGET variable, whilst GDP growth captures variations around this normal increase. Furthermore, the linear trend, introduced as in Fredriksson (2009) to proxy the effects of technological progress on RE consumption, has always the expected positive coefficient and it is statistically significant in all specifications, with values ranging from 0.041 to 0.061. The presence of the variable TARGET among the rarely changing ones excludes the possibility that the linear trend captures the country's progressive approaching to the target set by the EU Commission.

This rather complex but stable pattern of results demonstrates the importance of investigating the dynamics of the relationship between economic state variables and RE deployment. Previous studies failed to properly do so, which resulted in an excessive aggregation bias.

4.2. The impact of energetic and environmental factors. Among the energy and environmental factors $\boldsymbol{Z}_{it}$ we focus first on energy prices. We consider the energy end-use price, which is linked to the prices of fossil-based fuels and provides the basis for the price for energy consumers. We verify both the contemporaneous effects of energy prices on RE energy consumption and, with delays linked to investment, on energy production as well. For instance, the use of RE to product electricity becomes more competitive when the prices of fossil-based fuels are higher; an increase of energy prices should then favor the substitution from fossil-based fuels towards RE with some delay.

The results of the estimates show that, on the one hand, energy prices have a significant and positive effect on the share of RE in gross consumption with a two period delay. The price elasticity varies between 0.74 and 0.89, depending on the specifications. An increase of the energy prices makes RE more economically viable and promotes its deployment with a delay of 2-3 years. On the other hand, looking at the short run, consumption driven effects of energy prices on RE deployment appear negligible. This result extends to the case of RE what has already been found in the literature for other energy sources, especially fossil ones, where inelastic short run responses of energy consumption, production and R&D appear to be quite common (Wong *et al.*, 2013).

As for the other energy and environmental factors considered, four more results are worth noting. First, a 1 percentage point increase of the energy dependency ratio will induce a 0.5% increase of the share of RE with a stable three years delay, in all specifications – with some slight collinearity with non-significant earlier lags that disappears when these are removed from the specification. This result is especially interesting in light of the EU energy policy aimed at reducing the energy dependency ratio of the member countries, at increasing their energy efficiency and at reducing the imports of fossil-based fuels. Second, environmental degradation, measured as the level of CO2 emissions from electricity and heat production, also trigger a substitution of standard energy sources by RE ones, as the (expected) positive coefficient on the third lag of the CO2_ELEC variable confirms. Third, as for the type of energy and environmental policy used by each country, we have never been able to find any statistically significant difference between TGC and FIT (of any kind). Finally, and not surprisingly, countries with a higher target for RE deployment in 2020 are also characterized by a higher share of RE than countries with lower targets. This variable, however, poses concerns of potential endogeneity, at least for two reasons: first, TARGET is highly correlated with the dependent variable, the share of RE in gross final energy consumption (coefficient of correlation r=0.95); second, it is conceivable that the EU commission fixed a target for each country on the basis of the characteristics of its energy sector. We need to treat this potential problem specifically. Table 3c shows that the estimated coefficients on the TARGET variable are not sensible to changes of the estimation methods, including the Hausman-Taylor estimator, which is explicitly a GLS-IV estimator that generates instruments for the covariates. This suggests that endogeneity should not be an issue. Other independent variables, on the other hand, are not likely suspects of endogeneity, either because they enter with lags, or because, like the indicators of corruption, it is really difficult to imagine how a larger share of RE in gross final energy consumption could affect the country's perceived corruption. All in all, the results of table 3c, where equation (1) is estimated with different estimation techniques, confirms our previous conclusions about the determinants of the share of RE.

Table 3c. Estimates of Equation (1) by alternative estimators. Robustness tests – Model (6)

Dependant variable : log Share of renewable energy in gross final energy consumption

	FEDV	GLS	HT	FEDV	GLS	HT	FEDV	GLS	HT
	(6.7)	(6.8)	(6.9)	(6.10)	(6.11)	(6.12)	(6.13)	(6.14)	(6.15)
logGDP(t-1)	-1.255***	-1.005***	-1.170***	-1.255***	-0.881***	-1.097***	-1.255***	-0.998***	-1.142***
	(0.185)	(0.167)	(0.177)	(0.185)	(0.160)	(0.170)	(0.185)	(0.171)	(0.175)
GDP GROWTH	-0.008***	-0.007***	-0.008***	-0.008***	-0.006***	-0.007***	-0.008***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
GDP GROWTH(t-1)	0.005**	0.003	0.005*	0.005**	0.002	0.004*	0.005**	0.003	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TREND	0.057***	0.054***	0.057***	0.057***	0.051***	0.055***	0.057***	0.054***	0.056***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
logPRICE(t-2)	0.755***	0.720***	0.735***	0.755***	0.717***	0.737***	0.755***	0.720***	0.735***
	(0.257)	(0.258)	(0.250)	(0.257)	(0.261)	(0.248)	(0.257)	(0.258)	(0.250)
DEPENERGY(t-3)	0.004**	0.004***	0.004***	0.004**	0.004**	0.004**	0.004**	0.004***	0.004***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
CO2_ELEC(t-3)	0.011***	0.010***	0.010***	0.011***	0.011***	0.011***	0.011***	0.010***	0.010***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
AGR_VA(t-3)	-0.025*	-0.021	-0.023*	-0.025*	-0.020	-0.023*	-0.025*	-0.021	-0.023*
	(0.014)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.014)	(0.013)	(0.013)
LEFT(t-2)	0.097*	0.088	0.095*	0.097*	0.082	0.090	0.097*	0.089	0.094*
	(0.058)	(0.058)	(0.056)	(0.058)	(0.059)	(0.056)	(0.058)	(0.058)	(0.056)
HERGOV*LEFT(t-2)	-0.118	-0.099	-0.113	-0.118	-0.087	-0.104	-0.118	-0.100	-0.112
	(0.076)	(0.076)	(0.074)	(0.076)	(0.077)	(0.073)	(0.076)	(0.076)	(0.074)
TARGET	0.075***	0.078***	0.063***	0.079***	0.082***	0.074***	0.077***	0.080***	0.069***
	(0.008)	(0.008)	(0.016)	(0.008)	(0.007)	(0.018)	(0.008)	(0.007)	(0.014)
CORRUPT	0.131**	0.073	0.132*						
	(0.058)	(0.052)	(0.069)						

ICRG_QOG				1.102*	0.22	0.80			
				(0.635)	(0.524)	(0.751)			
WBGI_CCE							0.283**	0.149	0.247*
							(0.130)	(0.117)	(0.145)
Constant	8.058***	6.047***	7.600***	7.994***	5.037***	6.862***	8.532***	6.244***	7.747***
	(2.100)	(1.983)	(2.070)	(2.070)	(1.911)	(2.007)	(2.194)	(2.092)	(2.148)
N	182	182	182	182	182	182	182	182	182
R2	0.992			0.992			0.992		
First Stage F(9,161)			12.93***			9.80***			16.54***
Sargan-Hansen P-value*			0.445			0.298			0.351
DWH P_Value**			0.15			0.79			0.24

*Test of overidentifying restrictions

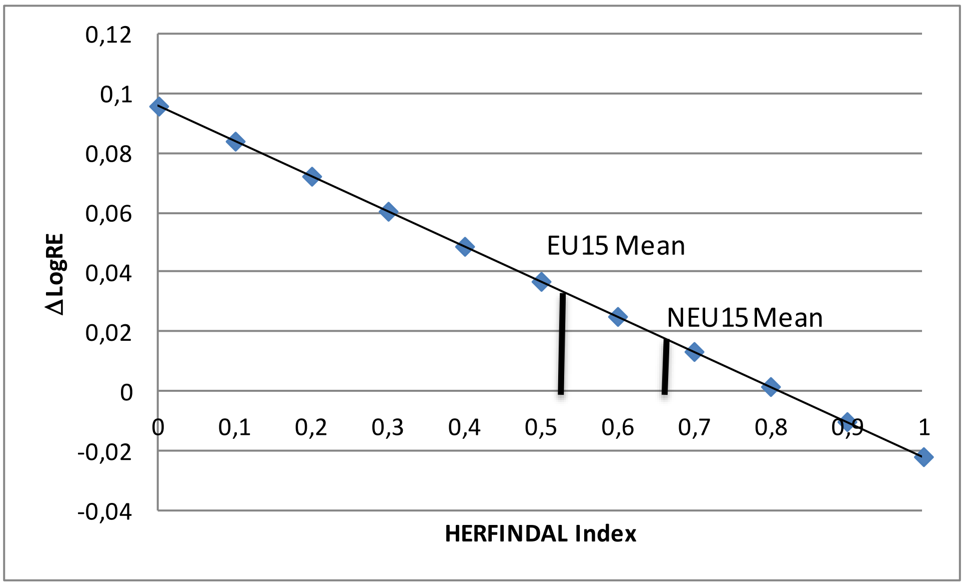
**Durbin Wu Hausman test for exogeneity

4.3. Political economy variables. Finally, vector ***W*** features the political economy covariates, the principal interest of our analysis. Starting from the lobbying variables, apparently only the pressure from the agricultural sector provides a noticeable resistance to the deployment of RE, with a 3 years delay. We have considered also the share of value added of the manufactory sector and of the overall industrial sector (table A2a in the appendix), without ever finding significant effects[14]. This result is consistent with Olson's logic of the collective action, which predicts that smaller interest groups, like the agricultural sector in this case, are more efficient at lobbying because of lower free riding costs. Another possible interpretation is that the agricultural sector is more opposed to environmental regulations in general, of which RE deployment is an important part. Coming to the ideology of the government majority, we find some evidence that left wing governments tend to promote higher consumption of RE, compared to center and right wing ones. This effect appears with a two year delay – a fairly standard policy implementation lag – but it is significant only at the 10% level. To investigate the causes of this rather low statistical significance, we have interacted the LEFT variable with the indicators of the concentration of the governing majority and of the country's institutional framework, to verify whether these acted as conditioning phenomena. As this never appears to be the case[15], the contrasting concerns of left wing parties in term of protection of the environment and of maximization of the employment level appear the most likely explanation for the low levels of significance found on the LEFT covariate alone. Figure 2, which reports the marginal effects on RE deployment of different levels of government fragmentation for left-wing governments, confirms this interpretation.

[14] We have also tried to consider only the energy industry, but neither the KLEMS database, nor OECD data provide a sufficient coverage for our sample.

[15] Or the evidence is very weak. The coefficient on the HERFGOV*LEFT variable lagged twice in Model (6) table 3a has a 11% level of statistical significance.

*Figure 2. Marginal effect of LEFT-wings parties**



*Calculated with estimated coefficient from Model (6) table 3a

The marginal effects decrease as the leftwing government coalitions become more homogeneous. This suggests that environmental concern prevail when leftwing parties must ally themselves with green ones in order to have the majority to form the government. When they do not need this external support, like when the Herfindahl index approaches 1, leftwing governments appear less effective at promoting RE deployment, if at all. Moreover, leftwing governments of non-EU 15 countries appear on average more involved in RE deployment than those of the EU15 group: the marginal effect is 16% in EU15 countries, while it climbs to 36% in non EU15, where institutions (and possibly the common currency) constrain the government action less.

The three indicators of governance quality that we consider - the ICRG index of the quality of governance, the Control of Corruption index and the Corruption Perception Index – are among the covariates that are time invariant or are characterized by low time variability. The estimates overall confirm the positive effect of the quality of governance on the deployment of RE, as all three indicators show a significant and positive correlation with the dependent variable. This result appears robust to changes of estimators and of the model specification. Yet, when this correlation is disaggregated between the EU15 and the non-EU15 countries (table 5), it appears that this effect is significantly larger in the EU15 subsample. The difference in the point elasticity calculated at the mean value is 0.22% for the ICRG_QOG score, 0.37% for the WBGI_CCI score, and 0.35% for the CORRUPT score.

This result seems to indicate that there are increasing returns to improving the quality of governance, at least in the environmental and energy policy domain. Increasing the efficiency and honesty of government at already high levels of governance quality has a relatively higher impact on RE consumption than when an equivalent improvement takes place at higher levels of corruption.

*Table 5. Quality of government: elasticities**

	ICRG_QOG	WBGI_CCE	CORRUPT
Mean All countries	0,74	1,14	6,43
Coefficient(Greene)	1,10	0,28	0,13
Elasticity	0,81%	0,32%	0,84%
Mean EU15	0,83	1,7	7,56
Coefficient(Greene)	1,10	0,28	0,13
Elasticity EU15	0,91%	0,48%	0,98%
Mean Non EU15	0,63	0,37	4,9
Coefficient(Greene)	1,10	0,28	0,13
Elasticity NEU15	0,69%	0,10%	0,64%

*Calculated with estimated coefficient from table 3b

Finally, there is some evidence that the effect of the quality of governance on RE consumption is (slightly) greater in parliamentary regimes; yet we propose this interpretation with caution because of the low level of statistical significance of the estimated coefficient (table A2a in the appendix).

5. Conclusion

The analysis presented in this paper highlights the role played by political factors in the deployment of RE, in the sample of the EU countries engaged to reach a target of 20% share of gross final energy consumption by 2020. Among the most clear-cut results, we find that the agricultural industry lobbying effectively retards the deployment of RE, whereas standard measures of governance quality show a positive effect, which is greater in countries of the EU15 group. Left-wing parties promote the deployment of RE more than right wing ones, but this effect is reduced when the governing coalition is highly concentrated and the government is supported only by a left wing majority. These results are robust to changes in the model specification and to controlling for the standard economic, energy and environmental covariates that have been usually considered in the literature.

Yet, our analysis also clarifies a series of unsettled issues in the literature on the drivers of environmental and energy policy choices. The panel data analysis shows that, while per capita income has a negative impact on RE deployment, economic growth has a positive effect. Higher energy process depress the contemporaneous consumption of RE, but stimulate future investment; furthermore, FIT tariffs seem to stimulate a quicker penetration of RE in gross final energy consumption than TGC based policies. These innovative results are mainly due to a careful consideration of the dynamic structure of the underlying relationship.

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APPENDIX

Table A1. RE share(%) of gross energy consumption, EU countries, 2004-2010.

Country	2004-2010 Mean	2010	Target 2020
Austria	26,1	30,4	34
Belgium	2,9	4	13
Bulgaria	10,2	13,4	16
Cyprus	3,4	4,6	13
Czech Republic	7,0	8,4	13
Denmark	18,0	22	30
Estonia	19,4	24,6	25
Finland	29,7	31	38
France	9,8	11,4	23
Germany	6,9	10,7	18
Greece	7,8	9,2	18
Hungary	5,7	7,6	13
Ireland	3,6	5,6	16
Italy	6,3	9,8	17
Latvia	31,7	32,5	40
Lithuania	17,4	19,8	23
Luxembourg	1,7	2,9	11
Netherland	2,5	3,3	14
Poland	7,4	9,3	15
Portugal	21,3	22,7	31
Romania	19,3	22,9	24
Slovakia	7,5	8,5	14
Slovenia	16,5	19,6	25
Spain	10,0	13,8	20
Sweden	43,0	47,9	49
United Kingdom	1,8	3,3	15
Mean	12,5	30,4	20

Source: Eurostat

Table A2a. Estimates of Equation (1) Stage One Greene – within estimator – other political economy variables

Dependant variable : log Share of renewable energy in gross final energy consumption – Stage 1 - Greene					
	(1)	(2)	(3)	(4)	(5)
logGDP(t-1)	-1.207***	-1.179***	-1.191***	-1.210***	-1.226***
	(0.187)	(0.183)	(0.195)	(0.186)	(0.166)
GDP GROWTH	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
GROWTH(t-1)	0.005**	0.004*	0.005**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TREND	0.057***	0.059***	0.060***	0.053***	0.053***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
LogPRICE(t-2)	0.742***	0.766***	0.774***	0.788***	0.783***
	(0.232)	(0.237)	(0.247)	(0.236)	(0.236)
DEP_ENERGY(t-3)	0.005**	0.004**	0.004**	0.005**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
CO2_ELEC(t-3)	0.011**	0.011**	0.010*	0.011**	0.011**
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
AGR_VA(t-3)	-0.023**			-0.021**	-0.021**
	(0.009)			(0.010)	(0.010)
LEFT(t-2)	0.072	0.090	0.101*		
	(0.062)	(0.060)	(0.059)		
HERGOV*LEFT(t-2)	-0.089	-0.099	-0.123*		
	(0.079)	(0.078)	(0.076)		
CENTER(t-2)	0.027				
	(0.261)				
HERGOV*CENTER(t-2)	-0.182				
	(0.675)				
MANU_VA(t-3)		0.000			
		(0.004)			
INDUSTRY_VA(t-3)			0.004		
			(0.008)		
HERFGOV(t-2)				-0.027	-0.018
				(0.115)	(0.115)
HERFGOV*PARL(t-2)				-0.055	-0.065
				(0.130)	(0.129)
HERFGOV*PARL-PR(t-2)				0.156	
				(0.352)	
Fixed effect	Yes	Yes	Yes	Yes	Yes
R2	0.992	0.992	0.992	0.992	0.992
N.	181	177	181	181	181

Heteroscedasticity-Consistent (Eicker-White) Standard Errors

Table A2b. Stage 2 - Greene : LS estimator on estimated individual fixed effect in Stage 1 – Model 5

Dependant Variable : fixed effect - stage 2			
	(5.1)	(5.2)	(5.3)
Constant	8.169***	8.175***	8.689***
	(0.212)	(0.308)	(0.226)
TARGET	0.074***	0.077***	0.083***
	(0.008)	(0.009)	(0.010)
CORRUPT	0.063		
	(0.062)		
CORRUPT*PARL	0.057		
	(0.037)		
ICRG_QOG		0.362	
		(0.691)	
ICRG_QOG*PARL		0.591*	
		(0.348)	
WBGI_CCEA			-0.324*
			(0.192)
WBGI_CCEA*PARL			0.542**
			(0.231)
R2	0.852	0.834	0.779
N.	26	26	26

Heteroscedasticity-Consistent (Eicker-White) Standard Errors