Does the EU Effect the Climate Policy Efforts of Its Member States?

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Abstract

The European Union perceives itself as a leader to curb global climate change. This necessitates that ambitious intra-EU policies are implemented by its member states to lend credibility to its claim. On the one hand, research on Europeanization has adopted the "top-down" approach by focusing on how the EU matters - rather than answering the question to what extent the EU matters. On the other hand, research on the compliance record with EU environmental legislation does not relate compliance with EU law to domestic policy outcomes. This article elucidates whether the EU governance system has an *additional* effect beyond what member states would have undertaken in the absence of EU policies and whether the EU's non-compliance system, prior national climate policies, and the use of the Kyoto mechanism induces higher or lower EU effectiveness. Our empirical focus are the measures taken by the EU and 14 of its members states to comply with their respective obligations under the Kyoto Protocol for the period 2008-2012.

We develop a measurement concept for the effect of EU governance on its member states. Subsequently, we explain the variation in the effectiveness variable by focusing on the impact of the EU non-compliance procedure, pre-Kyoto national emission reduction goals, and the planned use of Kyoto flexible mechanisms. Our time-series cross-sectional analyses show that the non-compliance procedure has no effect, a moderate use of the Kyoto mechanisms increases the degree of EU effectiveness, and moderate national pre-Kyoto policy ambitions on climate change mitigation strengthen EU effectiveness, while ambitious pre-Kyoto targets undermine EU effectiveness.

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1. The Challenge

The European Union perceives itself as a leader in curbing the threats posed by global climate change. This necessitates that ambitious EU policies are implemented by its member states to lend credibility to the reputation of a leader. The question arises, whether the EU has an additional - positive or negative - effect *beyond* what member states would have undertaken in the absence of EU policies. This article will provide answers whether and on which group of member states the EU has an effect in curbing carbon emissions.

Research on Europeanization has adopted the so called "top-down" approach by focusing on *how the EU matters*, rather than answering the question *to what extent* it matters (Haverland 2007, 67). While the European Commission notes that "the environmental objectives will be realized only through the proper implementation of the acquis" (European Commission 2007, 16), the literature analyzing the explanation of poor compliance records with EU environmental legislation does not pay attention to whether and to what extent *compliance with EU law* leads to advanced domestic policy outcomes (Knill and Lenschow 2005, Falkner et al. 2004, Börzel 2000, Pridham 1996, La Spina and Sciortino 1993). As a consequence, "many studies carry the danger to be biased towards the causal importance of the EU policies and underappreciate the effect of domestic factors on the policy performance of member states" (Haverland 2007, 67).[1] Firmer evidence regarding the effect of domestic factors on domestic policy performance can be found in the classical comparative environmental policy literature (Liefferink et al. 2009, Jacob and Volkery 2006, Scruggs 1999, Jahn 1998, Crepaz 1995). These studies, however, neglect the effect of EU policies and the related compliance record of member states on domestic policy performance.

This article combines aspects of the Europeanization literature with the comparative environmental policy approach by focusing on the question to what extent the EU matters with respect to its member states. In particular, we will elucidate which domestic climate change policy outcomes would have occurred in the absence of EU policies and which were achieved by way of the EU's effects on its member states.

This article makes three contributions. First, we introduce and adapt a measurement procedure from the international regimes literature to the EU level to capture the degree to which the EU governance system adds or

[1] Liefferink et al. (2009) deal with the relative causal importance of both the EU policy and the domestic factors, and they conceive of EU membership as an independent variable.

subtracts from the domestic policy performance of members countries beyond what EU member states would do in the absence of EU policies. Second, to the best of our knowledge, we simultaneously compute year- and country-specific policy effectiveness scores for the first time. Third, this measure of EU effectiveness serves as the dependent variable in an assessment of the effect of the EU non-compliance procedure, the use of the Kyoto mechanisms, and pre-Kyoto national targets.

We check the robustness of our findings by controlling for a range of political economy variables and illustrate our contributions by empirically focusing on the policies aimed at honoring the emission reduction goals of the EU as part of the first compliance period under the Kyoto Protocol to curb greenhouse gas emissions during 2008-2012.

The article proceeds as follows. In Section 2, we review the pertinent literature on domestic policy performance, followed by an overview of our research design, the methodology to derive the EU effectiveness score (our dependent variable), and the specific hypotheses in Section 3. Subsequently, we report our statistical analyses of the determinants of variation in EU effectiveness in Section 4, followed by a concluding section.

2. Explaining Domestic Policy Performance

Much of the literature on explaining environmental domestic policy performance in the EU focuses on domestic factors and the motivations driving domestic policy performance in the field of climate change. Employing a range of qualitative or quantitative methods, these empirical studies suggest a wide range of explanatory factors related to the domestic economy, the national institutional framework, and the political framework.

2.1 Methodological Approaches

Empirical research has adopted various measurement methods for environmental performance, focusing either on the environmental policy (output) chosen or greenhouse gas emissions (outcome). These studies use a variety of explanatory variables and differ in the methods chosen. The majority of the studies that explain the variations in domestic policy outputs mainly employ case studies and argue that, inter alia, economic development, neo-corporatism, dominant religion, green coalitions, political capacity, the presence and visibility of specific problems, and the industry structure primarily account for the pioneering behavior of countries in terms

of environmental policy output (Jänicke and Jörgens 2006, Lenschow, Liefferink and Veenman 2005, Jänicke 2005, Börzel 2002, Vogel 2003).

By contrast, the studies by Jacob and Volkery (2006), Liefferink et al. (2009), as well as a survey conducted by the European Bank for Reconstruction and Development (EBRD) provide quantitative evidence. Only the survey of Liefferink et al. (2009) includes EU membership among the explanatory variables and serves as a proxy of the EU's impact on domestic policies. This survey demonstrates that the EU membership variable turns out to be the most important factor. The positive impact of EU membership on domestic environmental policies is highlighted by EBRD, according to which Northern EU countries with high income received high scores on the Climate Laws, Institutions and Measures (CLIM) Index (EBRD 2011, 61).

Empirical studies that investigate the link between specific domestic factors and environmental policy outcomes mainly adopt quantitative methods. These studies demonstrate that energy consumption, the share of the manufacturing sector per GDP, and geographic size of a country are associated with increasing emissions, while income per capita, population density, and the degree of neo-corporatism are strong predictors of emissions reductions. Although, the findings about the linkage of electoral support for specific parties with environmental policy performance are ambiguous, membership in environmental NGOs is positively correlated with environmental policy outcomes (Scruggs 1999,1-31, Jahn 1998, 110-113, Crepaz 1995, 400-403).

Explanations employing domestic factors can be grouped into the following three categories (i) problem pressure and demand for more advanced environmental policies, (ii) creating and/or securing competitive advantage for domestic industries, and (iii) influencing the content of the EU environmental legislation (Liefferink et al. 2009, 678-679). In addition, we also focus on the literature on the link between compliance and effectiveness..

2.2 Problem Pressure And Demand For Ambitious Environmental Policies

A strong domestic green coalition, encompassing green NGOs, public awareness of the environment, and the green business sector, have all widely been considered to increase the domestic demand for the adoption of ambitious environmental measures and to create favorable conditions for

the implementation of costly policies (Jacob and Volkery 2006, 80, Scruggs 1999,18-21).

Neo-corporatism is considered to be an important domestic characteristic, which translates cooperative interest group representation and public demand into the design of environmental policies (Crepaz 1995, 391). As Liefferink et al. note "collective action problems inherent in environmental policy can be solved more easily in neo-corporatist 'closed shops' based on trust and long-term reciprocity" (Liefferink et al. 2009, 692). Some authors, however, argue that the privileged position of economic interest groups in neo-corporatist systems may impede the adoption of innovative environmental measures (Crepaz 1995, 394, Liefferink et al. 2009, 692).

Moreover, it is assumed that structural factors such as population density, geographical size of a country and climate conditions change the demand for emissions reductions and have important effects on environmental performance. More specifically, some authors argue that the exposure of the population to pollution is higher in densely populated countries and, thus, leads to increased pressure on policy-makers to enforce pollution-control policies (Liefferink et al. 2009, 692, Scruggs 1999, 21, Jahn 1998, 116). The geographic size of a country, controlling for population size, increases transport emissions, while harsher climates lead to higher energy demand (Jahn 1998, 116-117). Empirical findings point to a negative correlation between the size of a country and emission reductions, while there is no significant correlation between pollution and population density (ibid).

2.3 Creating And/Or Securing Competitive Advantage For Domestic Industries

The introduction of strict environmental standards and regulations increases production costs, especially for energy-intensive sectors. In turn, this may erode their economic competiveness (Börzel 2002, 204). This is the main argument behind the well-known "pollution haven – race to the bottom" hypothesis, according to which countries that are open to international trade tend to adopt less strict environmental regulations because of their aim to enhance or secure their international competitiveness (De Santis 2011, 2).

This hypothesis, however, has been widely challenged by many researchers who argue that environmental policies do not necessarily pose competitive disadvantages for domestic industries. On the contrary, as Lenschow et al. note, "we may witness an international trend towards the top if high

regulating states make a credible threat of closing their markets to products of lower standard" (Lenschow et al. (2005, 807). Hence, temporary import barriers imposed on products not complying with domestic environmental standards may not only secure the competitiveness of domestic products but they also may induce further harmonization of environmental standards (Vogel 2003, 565).[2] Furthermore, according to the so called "Porter hypothesis," stringent environmental regulations can improve the competitive position of a country by stimulating innovations that offset the compliance costs. Moreover, domestic industry may create or enhance its competitive advantage in the emerging market of environmental technologies and it may benefit from increasing demand for environmental technology in low regulating countries (Porter and Linde 1995). It is worth noting that the empirical findings about the causal relationship between trade and environmental performance are ambiguous (Van Beers and Van Den Bergh 1999, 29-46, Liefferink et al. 2009, 693).

Furthermore, it is commonly accepted that high-income countries can offset the adaptation costs for domestic industries and provide a business environment for exploiting new emerging opportunities (Liefferink et al. 2009, 690, Börzel 2002, 208-209, Scruggs 1999, 19, Crepaz 1995, 402-405). According to the so-called environmental Kuznets curve, beyond a certain level of economic development, the relationship between income and environmental quality becomes positive (Lieb 2003, 2).

2.4 Influencing the Contents of EU Environmental Legislation

The possibility that domestic policy is created to influence European and international regulations and thereby lower long-term domestic compliance costs is prominently reflected in the literature. Scholarly research offers firm evidence about the strategies followed by the green pioneers especially in the EU (Liefferink and Andersen 1998, Börzel 2002, Liefferink et al. 2009). More specifically, those EU member countries that traditionally act as leaders in environmental policy tend to adopt stringent environmental policies and, sometimes, unilateral actions with the view to act as "first movers" or "pushers by example" to promote their own regulatory framework at the European level. This strategy serves a dual goal. Firstly, the harmonization of regulations among EU countries minimizes the competitive disadvantages for domestic industries among first movers, and, secondly, it reduces the transboundary flows of pollution, enabling the achievement of

[2] The GATT/WTO rules and its dispute settlement system hitherto limit the use of domestic trade barriers for environmental purposes.

domestic environmental targets (Liefferink and Andersen 1998, 255-257, Héritier 1996, 151-154).

As Börzel (2002,196) notes, EU members "differ in their capacity to engage successfully in the European policy contest." Thus, country strategies are dictated by policy preferences, effectiveness of governance, and the level of economic development. In line with this approach, Jacob and Volkery (2006) find a positive correlation between national governmental effectiveness and environmental policy performance.

2.5 Explaining Non-Compliance with EU Legislation

The literature of non-compliance with EU environmental legislation focuses mainly on explaining the variations of non-compliance records with EU law (Knill and Lenschow 2005, Falkner et al. 2004, Börzel 2000, Pridham 1996, La Spina and Sciortino 1993). More specifically, the poor compliance records of the Southern member countries - Greece, Italy, Portugal, and Spain - are attributed to the inherent characteristics of their political, social and administrative institutions. The so-called "Mediterranean Syndrome" refers to the following deficiencies that are believed to undermine the compliance with EU environmental legislation: poor administrative capacity, absence of "civic culture", clientelism, corruption, as well as fragmented, re-active and party-dominated legislative processes (La Spina & Sciortino 1993, Börzel 2000, Koutalakis 2003). Many authors, however, criticize this approach, arguing that poor compliance is "not part of a homogenous phenomenon or a disease called the Mediterranean syndrome" (Börzel 2000) and prefer to go beyond this North–South dichotomy. Other authors attribute domestic resistance to change to the high degree of misfit between European legislation and the fundamental reforms of domestic policy required by it (Falkner et al. 2004).

It is widely accepted that EU policy affects domestic politics by prescribing concrete institutional requirements which member states must comply with (Knill and Lemkuhl 1999). Nevertheless, this part of the literature does not attend to whether and to what extent to whether *compliance with EU law* leads to ambitious domestic policy outcomes. Firmer evidence about the linkage of compliance and effectiveness is provided by the literature on international environmental agreements.

As Mitchell (2008) reminds us, compliance with legal obligations may be considered a prerequisite to achieve ambitious policy outcomes, yet compliance and effectiveness (impact generated by the outcomes) should not

be confused. In effect, compliance is neither a necessary nor a sufficient condition for policy effectiveness as compliance with unambitious goals may require little policy change. In all likelihood, very ambitious policy goals with expected, profound environmental impacts are likely to require major policy changes and respond to the environmental challenges that gave rise to the creation of international policy regimes (Bernauer 1995, Mitchell 2003, Bernauer and Siegfried 2008).

3. Research Design & Hypotheses

This article elucidates to which degree the EU governance system impacts the national EU15 emissions reductions in conjunction with the first compliance period under the Kyoto Protocol during 2008-2012, i.e., the effectiveness of EU policies (see 3.1).

According to the prevailing literature, EU policy affects domestic politics by prescribing concrete institutional requirements with which member states shall comply (positive integration) and by altering the domestic opportunity structures (negative integration) (Knill and Lemkuhl 1999). In order to explain the variation of the EU policy impact on the domestic performance during 2008-2012, we include three core explanatory variables: the non-compliance mechanism of EU, the planned used use of the Kyoto mechanisms, and pre-Kyoto national emission reduction goals. The Kyoto (or flexible) mechanisms reflect the ability to purchase pollution reductions abroad rather than generate them at home. To elucidate the effect of these three variables, we control for a wide range of domestic factors proposed in the literature.

3.1 Dependent Variable

Our central aim is to explain variation in the degree to which the EU governance system has an impact on domestic emissions in the context of EU efforts to comply with its obligations during the first Kyoto Protocol compliance period. To this effect, we will adjust a concept originally developed by Helm and Sprinz (2000) for the measurement of the effect of international treaties.

Helm and Sprinz (2000) conceive of international treaty effects as the increment in improvement of actual policies (AP) beyond those that would occur in the absence of such treaties, the no-regime counterfactual (NR) which serves as the logical lower bound. To allow for standardized

comparisons, the space for improvements was bound by a logical upper bound, the so-called "collective optimum" (CO) which is the counterfactually best policy performance under an ideal treaty regime. The resulting effectiveness score E relates the distance traveled by actual policies (AP-NR) to the theoretically possible improvement (CO-AP) on a common dimension of assessment (e.g., emissions reductions) (see Figure 1). The degree of effectiveness can be computed at the level of each country as well as an aggregate score for all countries. The measure was debated in the international relations literature and found a range of extensions (Young, 2001, Young, 2003, Grundig, 2006, Rieckermann et al., 2006, Bernauer and Siegfried, 2008).

Figure 1 about here

In the context of our research, we adapt the effectiveness score to the EU governance system for compliance with its obligations under the Kyoto Protocol during 2008-2012. Unlike Helm and Sprinz (2000), we allow for negative values and positive effectiveness scores, as well as scores beyond |1|. Absent an ex post analysis of the effectiveness of the EU climate policy regime for 2008-2012, we reconceptualize the effectiveness measurement procedure to be compatible with ex ante computations of policy measures commissioned by the European Commission to the National Technical University of Athens (NTUA) (European Commission 1999)[3] as follows.

First, NTUA (European Commission 1999) provides projections for the emissions under a business-as-usual scenario from 1990 until 2010, thereby providing ex ante (NR) inputs. Second, the Kyoto Protocol obligations for the period 2008-2012 stipulate an emission reduction of 8% from 1990 levels for the EU-15 at large. Under an optimal carbon tax regime, NTUA provides country-level emissions projections for the minimum EU-15 wide tax that is needed to comply with the average 8% emission reductions needed during 1990-2010 (CO), with the year 2010 serving as the mid-point for the Kyoto Protocol compliance period of 2008-2012.[4] Third, actual carbon emissions (AP) can be taken from the European

[3] The use of ex ante effectiveness scores was originally outlined in Sprinz et al. (1997).

[4] Optimal allocation of efforts according to the full flexibility scenario (i.e., potential for emission trading across Member states, sectors and pollutants). The least-cost optimum scenario assumes that the EU member states achieve the 8% reduction target jointly. See Capros, Kouvaritakis, and Mantzos L. (2001, 77) for details. For the collective optimum, we use the 2010 simulations results uniformly for the years 2008 through 2012.

Environment Agency (EEA GHG viewer).[5] The differences between AP and NR are partially driven by unforeseen changes in GDP – not least because of the financial crisis beginning in 2007. To correct for differential effects across the EU-15, we adjust the EEA carbon emissions as follows for each member state

$$\text{adjusted (actual) } CO2_t \text{ emissions} = \text{Actual CO2 emissions}_t * (GDP_{t,\,projected} / GDP_{t,\,actual}).$$

To accomplish the adjustment of CO2 emissions as if the economic turbulences from 1990-2010 were perfectly foreseen by NTUA in 1999, we multiply the actual emission with (GDP projected / GDP actual), i.e., if the GDP unexpectedly went below (above) those originally projected, then the resulting emissions will be corrected upward (downward). Put differently, we multiply the originally projected GDP with the actual carbon emissions per GDP.

As 1990 serves as the universal point of departure for all computations and in order to avoid level effects, we corrected actual carbon emissions and GDP developments to start at the respective levels foreseen by NTUA (European Commission 1999) for 1990 and employ first differences (yearly changes) from the original EEA and OECD sources to compute our yearly, adjusted (actual) CO2 emissions. Figure 2 illustrates the effect of the adjustment procedure.

Figure 2 about here

The projected CO2 emissions in yellow serve as our no-regime counterfactual for EU policies (NR), the green trajectory of (unadjusted) actual emissions shows substantially lower emissions since 2000, with particularly large deviations beginning in 2007. Once the emissions data are corrected (black line), we arrive at a more modest deviation from the projected NR emissions as we adjust for deviations of actual GDP developments from projected GDP trajectories. The differences between unadjusted and adjusted actual emissions vary considerably across member states [see Appendix 6].

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[5] Emissions reported by the EEA at the Annual European Union greenhouse gas inventory 1990–2012 (GHG viewer) neither take into account carbon sinks from LULUCF activities, nor the additional use of flexible mechanisms. See European Commission (2014) *Greenhouse gas inventory 2014,* Technical report No. 09/2014, Executive summary p. vi

3.2 Independent Variables

Non-compliance with EU legislation

Non-compliance records are defined as infringements cases of EU climate change regulation (detected and active) during the period 2008-2012. For the ranking of the member states according to their *non-compliance* records, we created a list of EU climate change legislation measures, including directives, regulations and decisions, with a transposition deadline starting in 2002 (i.e., after the signing of Kyoto Protocol) until 2012 and reported in the European Commission annual report "Progress towards achieving the Kyoto Objectives" (European Commission 2011a, 11-16). Based on this catalogue, a database of the infringement proceedings that the European Commission launches against member countries was developed which draws on the Annual Reports of the Commission on the implementation of EU law and includes all the reasoned opinions sent to each member-country for non-communication of national measures as well as for non-conformity and incorrect national application of EU law (European Commission 2013a, European Commission 2012, European Commission 2011b, European Commission 2010, European Commission 2009).[6]

This newly developed non-compliance database encompasses five policy sectors relevant to climate policy (horizontal issues, energy production and consumption, industry & waste, transport, and agricultural development) and cuts across EU Commission Directorates. It is worth mentioning that the infringement cases reported by the Commission constitute the most widely used measure of non-compliance, even though it is commonly accepted that these data do not necessarily include all cases of non-compliance in the member countries, either because of insufficient information provided by member governments or because of the Commission's political discretion (Börzel and Knoll, 5-11).

For the influence of EU non-compliance procedures, we hypothesize;

H1: The higher the number of non-compliance cases with EU climate change legislation (in terms of open infringement cases), the lower is the impact of the EU governance system on its member states.

6 We measured compliance based on the open infringement cases during the period 2008-2012.

Use of Kyoto (flexible) mechanisms

The Kyoto Protocol offers signatories to use a range of market-based approaches to achieve compliance with its emission-reduction goals, such as emissions trading, creation of emission bubbles (such as the EU), or joint investment projects (joint implementation or Clean Development Mechanism). Collectively, these measures are referred to as Kyoto or flexible mechanisms. Embarking on plans for their use, esp. in early periods, can be interpreted as the inability or unwillingness to use domestic mitigation measures to achieve emission reduction goals, or as a measure to avoid non-compliance.

We use the decisions of member states from 2005 (i.e., well before the 2008 start of the Kyoto Protocol compliance period) to use flexible mechanisms during 2008-2012 (EEA 2005, 25, EEA 2006, 30-31, EEA 2007, 86). Countries are grouped in three categories based on their projected emissions reduction to be achieved by way of the use of flexible mechanisms [see Appendix 3]. We hypothesize that

H2: The higher the share of emission reductions to be accomplished by Kyoto (flexible) mechanisms, the lower is the impact of the EU governance system on its member states.

Pre-Kyoto ambitions of member countries

It is widely accepted that the EU environmental lead countries tend to adopt stringent environmental policies and, sometimes, unilateral actions with the view to act as "first movers" or "pushers by example." In order to capture the effect of domestic policy output and national predispositions to curb emissions *before* the adoption of EU policy, we use their pre-Kyoto ambitions to control for the effect of the EU governance system on CO2 emission reductions. These pre-Kyoto ambitions are measured as the unilateral CO2 emission targets adopted before the adoption of EU policy and the signing of the Kyoto protocol (IEA and OECD 1994) [see Appendix 4].

We hypothesize:

H3: The more ambitious the unilateral national emission reductions targets adopted prior to Kyoto Protocol are, the lower is the impact of the EU governance system on its member states.

3.3 Control Variables

The literature suggests a range of variables to be included in the assessment of the effect of EU policies. In order to more clearly assess the effect of our aforementioned three variables, we introduce the following variables as control variables.

Domestic political factors

It is argued that neo-corporatist political systems take domestic industry interests and the implementation costs of environmental policy into account at an early stage of decision-making (Lenschow et al. 2005, 809-810, Crepaz 1995, 395). Policy decisions are based on negotiations and consensus among domestic actors. Therefore, decisions can be more easily implemented (Scruggs 1999, 30, Jahn 1998, 119-120). Our country ranking is based on Siaroff's (1999) corporatism scores and the more recent literature (Liefferink et al. 2009) [see Appendix 5]. We expect that countries with a neo-corporatist political system have higher environmental effectiveness scores compared with statist systems, as they have the capacity to exploit the new opportunities created by the EU policy regime and adopt less costly decisions for their own domestic industry. We hypothesize that higher scores on neo-corporatism lead to higher scores on EU effectiveness.

Furthermore, countries with high public spending on environmental R&D, measured as the percentage of total public spending, are expected to offer higher incentives for their domestic industry to implement environmental policies and have important competitive advantages in environmental technology (Porter and Linde 1995). High R&D spenders support the development of a strong domestic green industry which encourages the adoption and implementation of more advanced environmental measures (Jacob and Volkery 2006, 80, Scruggs 1999,18-21). As a consequence, these countries face decreased adaptation costs with EU regulation as compared to low R&D spending countries. As a consequence, we suggest that increases in national environmental R&D expenditures covary negatively with EU effectiveness.

In general, countries with high general governance effectiveness have the capacity to properly implement EU policies domestically and to exploit the new opportunities offered by the EU policy regime as compared to low performers. To this end, we use the World Bank indicator for the governance effectiveness which ranges from -2.5 (weak) to 2.5 (strong) governance performance. High governance effectiveness could impact EU

effectiveness in two directions: Governments might be better able to implement EU policies, but high national governance scores also enable successful resistance to EU measures by way of the opaque EU negotiation system.

Economic factors & domestic industry

Greenhouse gas-intensive sectors may lobby their governments and the EU not to initiate ambitious emission reduction goals (Jacob and Volkery 2006, 86). Since the EU Emissions Trading System has generated very low prices for carbon offsets, it is unclear which directional impact to expect. As energy-intensive industries form an important part of the policies needed for emissions reductions, we control for the projected (business-as-usual) carbon intensity provided by NTUA (projected CO2 / projected GDP).

Trade openness is often seen as a representation of international competitiveness, yet may also undermine the implementation of strict environmental standards (De Santis 2011, 2). For capturing the effect of trade openness, we control for the sum of exports and imports as a percentage share of GDP. Countries with high trade openness are expected to receive low EU policy effectiveness scores.

Economic wealth, traditionally measured as GDP, is both a driver of high emissions as well as a harbinger of potential solutions that lead to lower emissions (Grossman and Krueger, 1991, Grossman and Krueger, 1995). We both include the rate of projected change as well as the projected level of GDP as control variables.

In addition, the size of the renewable energy sector is likely to influence the effect the EU governance system on national policy performance. We therefore control for the renewable energy supply as percentage of total primary energy supply and expect a higher renewables share to negatively influence EU effectiveness as low levers of renewables often indicate unused potential.

Other structural factors, such as population density, geographical size of a country, and climate conditions that increase or decrease the demand for stricter environmental policy, were not included in the empirical analysis, as they are time-invariant variables. All descriptive statistics can be found in Appendix 1.

4. Data Analysis and Findings

The central aim of our analysis is to assess the effect of three core political variables on the degree to which the EU governance system impacts national CO2 emissions during the first Kyoto Protocol period. We employ linear regression with panel-corrected standard errors.

Diagnostic tests point to the violation of homoscedasticity assumption and, in some cases, cross-sectional correlation and/or serial correlation. We employ regression with panel-corrected standard errors (Beck and Katz, 1995), permitting heteroskedasticity, cross-sectionally correlated panels, as well as panel-specific autocorrelation of errors.

Our core political variables include both the EU non-compliance mechanism and climate-specific political variables, such as the degree of use of Kyoto (flexible) mechanisms, and the pre-Kyoto ambitions of member countries (see Table 2, model 1). Our analysis of 14 EU countries for the period 2008-2012 shows that the higher the number of infringement cases with EU climate change legislation is, the lower is the effect of EU policy on domestic emissions performance. By contrast, a moderate use of Kyoto (flexible) mechanisms mildly increases the degree of EU effectiveness, while a stronger ex ante intention to use these mechanisms reduces the effectiveness of the EU governance system on member states. Furthermore, moderate national, pre-Kyoto Protocol emission reduction targets increase the effect of the EU on its member states, while there is no statistically significant effect for those with ambitious pre-Kyoto Protocol national emission reduction targets.

Table 2 about here

The coefficient estimates of these three core variable groups change once additional political control variables are added.[7] If the type of governance system (statist, liberal-pluralist, neo-corporatist), general government effectiveness, and issue-specific public R&D expenditures are included, a more nuanced perspective arises. First, the non-compliance procedure cedes to have any substantive effect on EU effectiveness on influencing national emissions reductions performance – which will also hold in subsequent specifications (see Table 2, model 2). A high degree of ex ante planned usage of the Kyoto (flexible) mechanisms reduces EU governance

[7] The number of observations oscillates between 56 and 70 observations as data for public policy expenditures on environmental R&D as well as renewable energy supply are missing for the year 2012.

effectiveness on national emissions reductions as do high ex ante climate change policy ambitions before the Kyoto Protocol was signed. Moderate pre-Kyoto Protocol emission reduction targets for CO2 still lead to increased EU effects on national emission reductions. Furthermore, a neo-corporative system of governance (as compared to statist governance system) and general governance effectiveness increase the effect of the EU governance system on national emission reductions during the first Kyoto Protocol period – while a liberal-pluralist governance system reduces EU effectiveness. Public spending on environmental R&D does not have a discernible effect regardless of specification.

As we embark on a broader political economy explanation of EU governance effectiveness on national climate policies, we add a range of economic control variables (Table 2, model 3). Compared to Model 2, Model 3 adds projected carbon intensity (projected carbon emissions / projected GDP), projected economic growth and projected per capita income, as well as trade openness.[8] This augmented specification further reduces the effect of the non-compliance mechanism of the EU, yet enhances the EU effect on countries with moderate intentions to use imported GHG offsets and those who have moderate pre-Kyoto intentions to reduce national emissions.

Increases in projected carbon intensity, per capita wealth, and renewable energy supply account for higher EU effects on restraining in its member countries GHG emissions, while economic growth and trade openness point in the opposite direction.

The results for our core variables are broadly robust to the omission of the variables on public spending on environmental R&D as well as renewable energy supply – with the exception of a mild EU effect on member states that have ambitious intentions to use the Kyoto mechanisms as well as a substantively and statistically non-significant difference of ex ante moderate pre-Kyoto emission reduction targets (see Table 2, model 4).

Concluding across specifications, the following "polarization" perspective emerges: First, the EU non-compliance procedure – the only policy instrument under the sole control of the European Commission – has no effect on the impact of EU policies on its member states. Second, the EU policies have much more of an effect on those countries with moderate intentions to purchase GHG offsets abroad as compared to those with ambitious intentions. Third, there is always a clear difference in EU effect on countries with pre-existing moderate vs. ambitious emission targets: Those with moderate targets will either experience a positive EU effect or none, those with ambitious ex ante national emission targets will always

[8] All "projected" metric are derived from business-as-usual computations.

experience no additional EU effects or be rather free from EU policy pressures (Table 2, models 3 & 4). Regardless of specification, the EU effect on national emission reduction achievements appears polarized.

5. Conclusions

Our analysis is focused on the core Western EU countries that took over joint obligations under the Kyoto Protocol for the period 2008-2012. Perhaps most surprising is that the only tool at the sole discretion of the European Commission, namely the EU non-compliance procedure, does not show signs of clout. Besides the type of political system – which takes considerable time to change - ex ante positioning on Kyoto (flexible) mechanisms and pre-Kyoto Protocol emission reduction goals determine whether the EU governance system will advance or retard national policy performance – besides prominent economic control variables. Both the ex ante plans to use the Kyoto mechanisms and the pre-existing national emission reduction goals are strictly exogenous and are at the discretion of the member states. As our results are broadly robust across specifications and particular methods used, the fine point emerges that it may be in the member states own hands to influence whether the EU governance system accelerates or retards their environmental policy performance. Nudging the moderates might work, but pushing ambitious members states might well be beyond the scope of the EU governance system.

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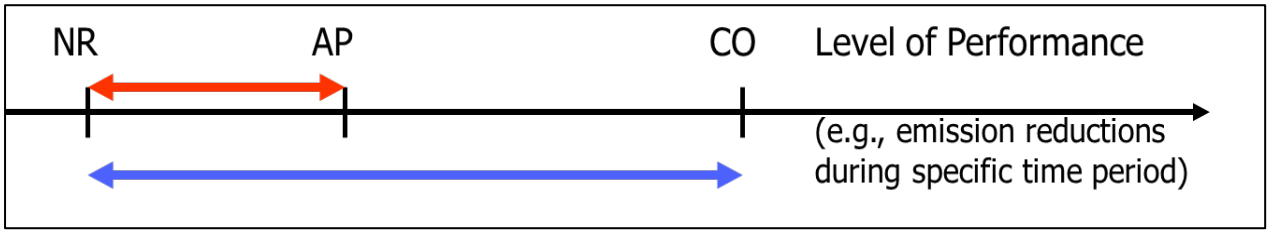
Figures

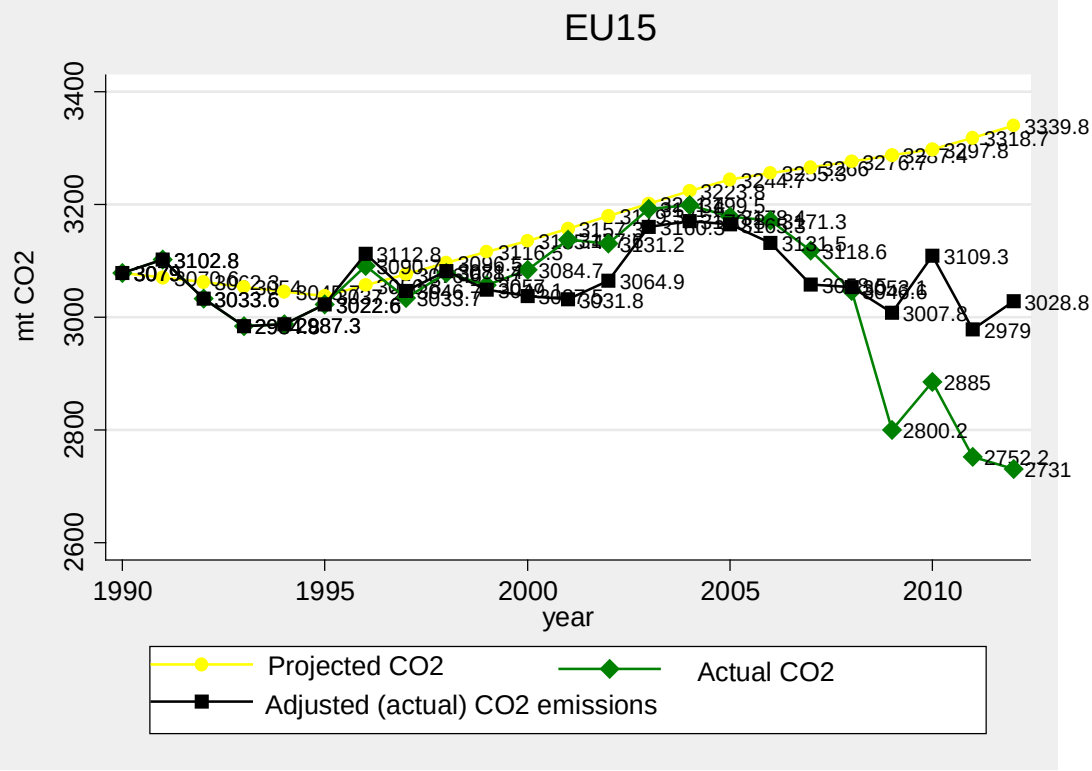
Figure 1: Effectiveness Score



Effectiveness Score E = (AP-NR) / (CO-NR)

Source: Helm and Sprinz (2000)

Figure 2: Projected CO2 emissions (NTUA), actual CO2 emissions (EEA) and actual CO2 emissions adjusted to the projected GDP



Source: own calculations

Tables

Table 1: Effectiveness score 2010 (EU-14)

Country	Projected Emissions [mt CO2]	Actual Emissions [mt CO2]	Actual Emissions Adjusted to Projected GDP [mt CO2]	Optimal Allocation of Emissions [mt CO2]	Effectiveness score (with adjustment)
Austria	54.8	64.2	66.6	48.9	-2.0
Belgium	124.0	99.9	107.9	114.1	1.6
Denmark	54.9	48.7	57.5	46.4	-0.3
Finland	73.6	57.5	60.9	62.9	1.2
France	389.7	343.2	374.8	352.4	0.4
Germany	827.5	757.4	873.2	741.3	-0.5
Greece	109.4	82.7	109.6	91.7	0.0
Ireland	42.8	38.3	45.5	37.5	-0.5
Italy	429.9	379.4	449.2	379.1	-0.4
Netherlands	205.6	174.2	188.7	184.7	0.8
Portugal	66.5	45.6	69.7	59.4	-0.5
Spain	274.1	248.8	255.8	239.7	0.5
Sweden	64.0	46.2	43.4	55.4	2.4
UK	572.3	483.4	486.0	509.2	1.4
EU15	3297.8	2885.0	3109.3	2931.2	0.5

Source: own calculations

Table 2: Drivers of EU Effectiveness

VARIABLES	model1	model2	model3	model4
EU Non- Compliance Procedure	-0.0741***	0.0496	-0.0233	-0.00178
	(0.0199)	(0.0465)	(0.0316)	(0.0221)
1. Moderate Intention to Use Kyoto (flexible) Mechanisms	0.258*	0.0375	0.664*	1.257***
	(0.134)	(0.187)	(0.362)	(0.184)
2. Ambitious Intention to Use Kyoto (flexible) Mechanisms	-0.897***	-1.212***	-0.150	0.259**
	(0.0916)	(0.0893)	(0.237)	(0.128)
1. Moderate Pre-Kyoto Emission Reduction Targets	1.364***	0.820***	2.405**	0.293
	(0.232)	(0.237)	(1.128)	(0.389)
2. Ambitious Pre-Kyoto Emission Reduction Targets	0.219	-0.826***	-0.0207	-2.559***
	(0.262)	(0.307)	(1.330)	(0.361)
1.Liberal- Pluralist vs. Statist		-0.629***	0.130	0.808***
		(0.222)	(0.600)	(0.212)
2.Neo-Corporatism vs. Statist		0.861***	1.200	2.354***
		(0.233)	(0.767)	(0.259)
General Governance Effectiveness		0.980***	-0.117	-0.233
		(0.216)	(0.282)	(0.273)
Public Spending on Environmental R&D		0.129	-0.0109	
		(0.0830)	(0.0920)	
Projected Carbon intensity			0.00525**	0.00238*
			(0.00211)	(0.00129)
Projected GDP growth			-0.884***	-1.032***
			(0.191)	(0.185)
Projected GDP per capita			5.98e-05	9.06e-05**
			(4.65e-05)	(4.10e-05)
Trade Openness			-0.0359**	-0.0544***
			(0.0142)	(0.00793)
Renewable energy supply			0.0455**	
			(0.0220)	
Constant	0.473**	-1.541***	-1.654	1.824*
	(0.229)	(0.551)	(2.321)	(1.088)
N cases	70	56	56	70
R-squared	0.480	0.696	0.887	0.863
N countries	14	14	14	14

Notes: Regressions coefficients with panel-corrected standard errors.
Models 1 & 2: disturbances are heteroskedastic and contemporaneously correlated.
Models 3 & 4: in addition: panel-specific AR1.

Appendices

Appendix 1: Descriptive statistics: continuous variables

Variable	N	Mean	Std. Dev.	Min	Max
Effectiveness score	70	.3066666	1.052277	-2	2.4
Non-compliance	70	5.871429	4.488056	0	16
Public spending on environmental R&D	56	2.293393	1.095364	.04	5.52
Governance effectiveness	70	1.446286	.5342018	.29	2.26
Projected Carbon intensity	70	460.3057	173.0495	247.3	954.9
Trade openness	70	46.808	20.19228	22.17	96.21
Projected GDP per capita	70	21,791	5,996	9,116	31,066
Projected GDP growth	70	2.314286	.516478	1.6	3.6
RES supply	56	13.22338	9.719252	2.615	34.838
Flexible mechanisms	70	1	.8512565	0	2
Pre-Kyoto ambitions	70	1.214286	.6787212	0	2
Neo-corporatism	70	1.142857	.9213367	0	2

Appendix 2: Data measurement & Sources: continuous variables

Variable	Measurement	Sources
Effectiveness score	Effectiveness score (own computations)	European Commission (1999), EEA (2012) GHG viewer (data extracted on 2 Oct 2014), http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer, Capros P., Kouvaritakis N. & Mantzos L. (2001)
Non-compliance	Number of infringement cases	European Commission (2013a) European Commission (2012), European Commission (2011b), European Commission (2010), European Commission (2009)
Public spending on environmental R&D	% of total public spending	OECD, Green Growth indicators (data extracted on 07 Mar 2014) http://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH
Governance effectiveness	range from -2.5 (weak) to 2.5 (strong) governance performance	World Bank, Worldwide Governance Indicators http://info.worldbank.org/governance/wgi/index.aspx#reports
Projected Carbon intensity	Projected CO2 per projected GDP (t CO2/millon euro)	Capros P., Kouvaritakis N. & Mantzos L. (2001)
Trade openness	Average of total exports and imports as a percentage of GDP	UNCTAD, Trade Indicators: Goods and services trade openness indicators, annual, 1980-2013, (data extracted on 07 Mar 2014) http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx
Projected GDP per capita	Hundred euro per capita	Capros P., Kouvaritakis N. & Mantzos L. (2001)
Projected GDP growth	% annual change	Capros P., Kouvaritakis N. & Mantzos L. (2001)
RES supply	% of total primary energy source	OECD, Green Growth indicators (data extracted on 07 Mar 2014) http://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH
Flexible mechanisms	3 categories	EEA (2005), EEA (2006), EEA (2007)
Pre-Kyoto ambitions	3 categories	IEA & OECD (1994)
Neo-corporatism	3 categories	Siaroff (1999), Liefferink et al. (2009)

Appendix 3: Plans Before 2005 For Reducing Emissions Through the Use of Flexible Mechanisms

	Projected emission reductions 2008-2012 through the use of Kyoto mechanisms (mtCO2eq.), annual average	Kyoto target (mtCO2eq.) annual average 2008-2012	Share of Kyoto emissions target	Group #	Group Label
Austria	9.0	68.8	13%	2	A
Belgium	7.0	134.8	5%	1	M
Denmark	4.2	54.8	8%	2	A
Finland	2.4	71.0	3%	1	M
France		563.9		0	N
Germany		973.6		0	N
Greece		133.7		0	N
Ireland	3.6	62.8	6%	1	M
Italy	19.0	483.3	4%	1	M
Netherlands	20.0	200.3	10%	2	A
Portugal	5.8	76.4	8%	2	A
Spain	31.8	333.2	10%	2	A
Sweden				0	N
UK				0	N

A = Ambitious intention to use the Kyoto mechanisms
M = Moderate intention to use the Kyoto mechanisms
N = No intention to use the Kyoto mechanisms

Source: EEA (2005) *Greenhouse gases trends and projections in Europe*, p. 25, EEA (2006) *Greenhouse gases trends and projections in Europe*, p. 30-31, EEA (2007) *Greenhouse gases trends and projections in Europe*, p. 86.

Appendix 4: Unilateral CO2 emission targets adopted before signing of Kyoto Protocol (1997)

Country	Target	Year of decision	Cutoff year	Group #	Group Label
Austria	-20%	1992	2005	Group 2	A
Belgium	-5%	1991	2000	Group 1	M
Denmark	-20%	1990	2005	Group 2	A
Finland	0	1992	2000	Group 1	M
France	0	1991	2000	Group 1	M
Germany	-25%	1990	2005	Group 2	A
Greece				Group 0	No target
Ireland	25%	1993	2000	Group 1	Mt
Italy	-20%	1990	2005	Group 2	A
Netherlands	-8%	1990	2000	Group 1	M
Portugal				Group 0	No target
Spain	25%	1992	2000	Group 1	M
Sweden	0	1993	2000	Group 1	M
UK	-5%	1994	2000	Group 1	M

A = Ambitious target
M = Moderate target
N = No target

Source: IEA & OECD (1994) *Climate Change Policy Initiatives. 1994 Update. OECD Countries*, Vol. 1

Appendix 5: Type of Governance System

Country	Type of Governance System	Group #
Austria	Neo-corporatist	Group 2
Belgium	Neo-corporatist	Group 2
Denmark	Neo-corporatist	Group 2
Finland	Neo-corporatist	Group 2
France	Statist	Group 0
Germany	Neo-corporatist	Group 2
Greece	Statist	Group 0
Ireland	Liberal-pluralist	Group 1
Italy	Statist	Group 0
Luxembourg	Statist	Group 0
Netherlands	Neo-corporatist	Group 2
Portugal	Statist	Group 0
Spain	Statist	Group 0
Sweden	Neo-corporatist	Group 2
UK	Liberal-pluralist	Group 1

Source: Siaroff (1999), Liefferink et al. (2009)