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EXPLAINING VARIATION IN MEETING KYOTO PROTOCOL TARGETS AMONG
ANNEX I DEMOCRACIES

КИОТО ХАТТАМАСЫНЫҢ ДЕМОКРАТИЯЛЫҚ МҮШЕЛЕРІНІҢ
АРАСЫНДАҒЫ ПАРНИКТІК ГАЗДАРДЫҢ ШЫҒАРЫНДЫЛАРЫН РЕТТЕУ
АЙЫРМАШЫЛЫҚТАР МӘСЕЛЕСІН ТҮСІНДІРУ

ОБЪЯСНЕНИЕ ВАРИАЦИИ В ВЫПОЛНЕНИИ ОБЯЗАТЕЛЬСТВ ПО
УМЕНЬШЕНИЮ УРОВНЯ ВЫБРОСОВ ПАРНИКОВЫХ ГАЗОВ СРЕДИ
ДЕМОКРАТИЧЕСКИХ СТРАН-ЧЛЕНОВ КИОТСКОГО ПРОТОКОЛА

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Abstract

One of the most orthodox wisdoms among scholars studying compliance with international environmental agreements (IEAs) is that democratic states are far better compliers compared to autocracies. However, such focus on comparison of these two regimes has in many ways neglected the variation in meeting treaty commitments among democracies themselves. In fact, the case study of the Kyoto Protocol not only demonstrates that such variation exists, but also provides specific conditions under which democracies do not comply with international agreements. In this context, the main goal of this research was to investigate why even the most developed industrialized democracies like Australia, Norway and Japan sometimes do not fulfill their commitments to IEAs. The research theorized that this might happen due to increased unexpected costs, particularly during oil price shocks, when governments reconsider the opportunity cost of compliance and are more inclined to take advantage of higher oil prices by producing more petroleum goods. This in turn leads to the increase of greenhouse gases (GHGs) emissions. The findings of the statistical analysis of the changes in GHGs emission levels among Annex I member-states of the Kyoto Protocol from 1990 to 2015, support the main hypotheses associating oil price shocks with higher amounts of CO₂ emissions and greater probability of non-compliance.

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Chapter 1. Introduction

In the context of dramatic growth of the number of international organizations and regimes, the issue of compliance has become a topic of hot debates among IR scholars. Interestingly, the most general wisdom among them is that democracies are better compliers compared to autocracies and reasons for that are various starting from shared norms encouraging democracies to keep their promise and ending up with better institutional capability (Bernauer et al 2012; Cole 2015; Ho 2002). Nevertheless, if we look at compliance level of Annex I group of the Kyoto Protocol in 2008, where 35 out of 36 signatories are industrialized democracies – not all of them have met required greenhouse gases emissions (GHGs) targets (see Table 1).

Table 1. Meeting Kyoto Protocol targets by Annex I Parties in 2008.

Complied (24)		Did not comply (13)	
Belgium	Germany	Australia	Japan
Bulgaria	Hungary	Austria	Liechtenstein
Croatia	Latvia	Greece	New Zealand
Czech Republic	Lithuania	Iceland	Norway
Denmark	Luxembourg	Ireland	Portugal
Estonia	Monaco	Italy	Slovenia
EU	Netherlands	Spain	
Finland	Poland		
France (KP)	Romania		
Sweden	Russian		
Switzerland	Federation		
Ukraine	Slovakia		
United Kingdom			

Source: UNFCCC

Unfortunately, the literature on compliance mostly differentiates between different regime types failing to compare within democracies themselves. Hence, the aim of this paper is to answer why are even the most developed democracies sometimes unable to fulfill their commitments to international environmental treaties?

Answering this question is important at least for two reasons. First, democracies often stand as initiators of international agreements especially in such issues as environmental problems and one would expect their compliance in the first place. Identifying the factors undermining the compliance of the most capable countries would help to improve environmental treaties' design leading to a better and more effective cooperation in the future. Second, the problem of climate change is becoming more and more threatening in our days and it is critical to know all potential factors that might turn into an obstacle to world community's attempt to tackle global warming. Hence, the paper is driven not only by academic but by normative concerns of the author too.

The main argument of the research is that the variation in compliance level among democracies in the Kyoto Protocol is the result of price shocks in the market of petroleum resources. The logic behind is that such dramatic changes in prices tend to increase unexpected costs making the state leaders to reconsider their previous intention to decrease GHGs amount.

The paper consists of four main sections. The first part evaluates the existing literature on compliance with environmental treaties. The next section is devoted to the theory and main hypotheses. The third part of the paper presents the research design. Finally, the last section discusses the empirical results and provides the conclusion.

Chapter 2. Literature Review: compliance with IEAs in international relations

Generally, we can divide the literature on states' compliance with international environmental agreements into six main categories based on explanatory factors chosen by scholars. These major independent variables are: a) reputation; b) international pressure; c) presence of environmental non-governmental organizations (ENGOs); d) treaty design characteristics e) regime type; f) domestic constraints and state capacity. Definitely, these variables are interrelated and none of them can explain compliance separately. For instance, concepts such as international pressure and reputation are highly related to each other because states can be wary of their reputation due to pressure from the global community. Also the presence of ENGOs is in many cases conditioned by the regime type of a country, with democracies being more open to non-governmental organizations. However, we decided to look at each variable separately to make them clearer for the reader and to avoid confusion. In addition, such categorization, despite its arbitrariness, allows us to grasp the vast literature devoted to each factor.

2.1 Reputation costs

When someone asks why states comply with international agreements the most intuitive answer is that they care about their reputation. In fact, vast literature has been stressing the importance of reputational consequences of noncompliance for the states. The main logic is that countries would not want to have a negative reputation because this can hurt their mutually beneficial cooperation with other states, especially in terms of economic interests (Keohane 1984; Milgrom et al 1990; Garrett and Weingast 1993). However, Downs and Jones (2002) claim that it is not simple as that and reputation per se cannot ensure compliance. According to the authors, not every defection can hurt countries' reputation because it depends on the size of the agreement and its importance for other states. More interestingly, Downs and Jones (2002, 98-113) propose that states develop multiple

reputations in different areas, so not complying in one of them will not significantly affect trust in other multilateral agreements. This can be a good explanation why countries do not comply with environmental treaties. The reason could be that they care less about their reputation related to the issue of climate change because it is not as important as, for instance, bilateral investment treaties which are believed to have higher audience costs (Elkins, Guzman and Simmons 2006).

On the one hand, in light of existing works it is difficult to deny that reputation can be important to maintain states' compliance with international regimes. In addition, due to increased attention of international community to the issue of climate change, states also might feel extra pressure in cases where they fail to put into practice their commitments. On the other hand, we also have to admit that it is difficult to quantify such abstract concept as reputation. Hence, this kind of arguments need more in depth analysis using qualitative methods such as interviews with ex-policy makers and politicians to be able to see what happens behind the scenes.

2.2 International pressure

Another important factor closely related to reputation might be international pressure. For instance, powerful states might be interested in promoting multilateral legal cooperation not only to create stronger global civil society but also because of their ability to influence treaty terms and promote their own interests (Milewitz and Snidal 2016). In addition, while some scholars listed below emphasize the crucial role of domestic factors on compliance with international agreements (such as regime type, domestic constraints or state capacity), others claim international factors to be more important. In particular, Bernauer and his colleagues (2010) after studying ratification behavior of 180 countries vis-a-vis 255 global environmental treaties insist that variables such as policy diffusion, trade and number of

international organizations have greater influence on cooperation than variables like democracy and income. In addition, increased attention of press and television can create a positive external context and momentum which in turn might have positive influence on implementation and compliance process (Jacobson and Weiss 1995).

2.3 *ENGOS*

The third perspective is mainly defended by constructivists who emphasize the role of ENGOS. Many constructivists claim that ENGOS can positively influence cooperation by creating new norms, encouraging states to negotiate international treaties and enhance their ratification and enforcement by using their lobbying, organizational and technical abilities (Bernauer et al 2012, 89). Also, ENGOS are believed to diffuse ideas, standards of appropriate behavior motivating governments' compliance with international regimes (Simmons 1998). An additional form of pressure maintained mainly through mass media is the tactics of "naming and shaming". According to some authors such public criticism of "bad behavior" can alter states' policies towards increased compliance with international treaties (Hafner-Burton 2008, 690). Moreover, higher levels of ENGOS' access to participation in official negotiations are associated with positive effect on states' environmental commitments and depth of cooperation (Bohmelt and Betzold 2013). Finally, environmental groups can provide policy-makers with alternative explanations of the costs and benefits of joining international regimes thus increasing states' participation (Bernhagen 2008).

While ENGOS are widely appreciated for increasing participation and compliance with international agreements their presence does not provide any guarantees. In particular, the same scholars argue that high numbers of ENGOS can actually hurt states' commitment (Bernauer et al 2012; Bohmelt and Betzold 2013). Bernauer et al (2012) claim that the

positive effect of ENGOs diminishes with the increase in their numbers due to collective action problems and competing interests. Bohmelt and Betzold (2013) confirm this caution agreeing that despite conventional wisdom “more is not necessarily better” because different environmental interests groups might pursue different aims (129).

2.4 Treaty design

The fourth group of scholars emphasizes more the importance of institutional design for states' compliance with international treaties (Mitchell 1994; Chayes and Chayes 1995; Downs, Rocke and Barsoom 1996; Weiss 1999; Von Stein 2008; Cole 2015; Linos and Pegram 2016). One of such factors is the ambiguity and indeterminacy of treaty language that might leave members an opportunity to ignore their commitments (Chayes and Chayes 1995). For instance, Mitchell's (1994) comparison of two distinct international oil pollution regulating treaties showed that treaties with more concrete regime design are more successful both in terms of compliance and decrease of the amount of oil pollutants. Linos and Pegram (2016) in their recent attempt to investigate the relationship between language precision and compliance found out that both autocracies and democracies in various parts of the world followed strong recommendations of the Paris principles. At the same time, the same states paid little attention to weak recommendations of the treaty. In addition, Von Stein (2008) claims that flexibility mechanisms can become a solution to the dilemma between participation and behavior improvement. In particular, her analysis of the Kyoto Protocol showed that inclusion of carbon sink mechanism into treaty provisions encouraged ratification of the treaty by Annex I (most industrialized) countries in spite of generally harsh requirements.

While the representatives of the managerial school such as Chayes and Chayes (1995) do not see the violations of the treaties as an intentional calculated exploitation, adherents of

the enforcement school such as Downs, Rocke and Barsoom (1996) argue that states assess the costs and benefits of treaties and do not comply with agreements that require radical departures from their policies due to potential losses. Not surprisingly, this school claims that non-compliant behavior is the result of the absence of enforcement mechanisms in most treaties. Therefore, they are critical of managerial ways of increasing compliance such as inclusion of dispute resolution procedures or financial and technical assistance. In turn, they propose implementation of costly punishing mechanisms for defectors (Downs, Rocke and Barsoom 1996, 381). Examples of such coercive measures in environmental treaties could be increased taxation, trade sanctions, withdrawal of certain privileges of membership etc. (Weiss 1999).

Of course, treaty design matters a lot, especially in legally binding regimes because countries will carefully assess the requirements before they sign the agreement in order to be able to meet their commitments. However, despite the fact that such arguments explain well why countries sign and ratify treaties (for example, because of the flexibility mechanisms or financial and technical assistance), the same arguments do not answer why states fail to comply with the treaty after their legal membership.

2.5 Regime type

While the previous explanations focus more on international factors, their opponents stress the criticalness of domestic characteristics of the signatories. Primarily, almost in any scholarly work the regime type is treated as one of the most important variables explaining variation in states' compliance with international treaties. In particular, most of the researchers tend to believe that democratic states are more likely to commit to international law than autocracies mainly because of their developed institutions and shared democratic principles and norms (Simmons 1998; Ho 2002). For instance, there is a belief that

democracies tend to be more open to non-governmental organizations (NGOs), especially in environmental issues, which reinforce the state's compliance efforts (Jacobson and Weiss 1997).

However, it is not a given fact, that democracies are always better compliers. In particular, the plurality of interest groups appreciated in democratic states in fact can negatively affect their compliance with environmental treaties if they hurt powerful interest groups (Weiss 1998). In addition, it is important to note that while democracies might have higher political commitment levels to climate change mitigation, it is not necessarily true that they will have better policy outcomes. In particular, democracies might fail to comply in terms of decreasing emission levels (Battig and Bernauer 2009). An important implication here is that the regime type based explanations cannot account for all forces within and outside the country that influence states' compliance behavior. Therefore, while the regime type should be considered as an important factor in any research concerned with compliance, it should not be treated as the main explanatory factor due to its unpredicted effect.

2.6 State capacity and domestic constraints

The next portion of literature connected to the state capacity and domestic constraints is very closely related with the works stressing the regime type as the main explanatory factor. However, despite this similar focus on institutions, these studies give more detailed description of the reasons why states might fail to put their commitments into practice (Cole 2015, 406). According to the literature, there are at least two obstacles to states' implementation of the terms of the treaties – their capacity and presence of domestic constraints in the face of opposing interest groups.

Regarding the state's capacity, group of scholars relate states' non-compliant behavior to governments' institutional inability to commit to their international obligations. Hence,

compliance strategies with a specific agreement will depend not only on intentions but also on state's capacity (Weiss 1999, 1588). When it comes to empirical studies, Jacobson and Weiss (1995, 1997) in their examination of nine countries' compliance with five environmental treaties concluded that administrative capacity has been a vital variable. According to the authors, administrative capacity consists of domestic legal authority, financial resources, professional skills of personnel responsible for environmental policy and access to relevant information. Moreover, Cole (2015) argues that membership in an international regime alone does not alter states' behavior if not conditioned with the capability to implement treaty terms.

Nevertheless, it might be the case that a state will fail to comply or even sign an agreement, despite its high institutional, economic and administrative capacity to implement the terms due to other domestic constraints. Here, we can think of the relevance of Putnam's (1988) two level game approach. State is a complex organization where it is not an independent decision-maker because of its accountability before variety of influential domestic groups who try to protect their interests. Therefore, compliance with international treaties also depends on domestic groups (Underdahl 1998, 14). In particular, states have to think about the reaction of powerful economic players who might be against participation or compliance with an international regime especially if it can hurt their interests (Mitchell 2003).

Summary

Overall, if we try to summarize the whole literature on compliance, no matter which factors international or domestic prevail, the general wisdom will be that democracies are less prone to non-compliant behavior and there are several reasons for that. First, if look at the reputation literature, democratic states are believed to care more about their reputation

because they seek cooperation in the future. The literature on state capacity also supports democracies due to their stronger institutions and prosperity. Finally, democracies are appreciated because of their shared norms and openness to non-governmental organizations.

Nevertheless, the case of Kyoto Protocol presents a situation where even the most developed industrialized democracies such as Australia and Norway exceeded their GHGs emissions targets and the literature does not provide comprehensive explanation for that. In addition, while the literature on compliance is vast, not enough attention has been paid to the post-ratification behavior of the states. The works which address this question often distinguish between democracies and autocracies and fail to compare democratic states among themselves. Nevertheless, this stage should be the most important one if we want to know why even the most capable countries fail to comply with the treaty, despite they have agreed with its terms.

In this context, the primary aim of the current research is to add to the existing literature addressing the gaps mentioned previously. Moreover, studying compliance with Kyoto Protocol will increase our knowledge about the effectiveness of environmental treaties contributing to the debate between grand IR schools on overall relevance of international treaties. In addition, the Kyoto Protocol is one of the largest (if not the largest) legally binding environmental treaties signed by more than 150 countries. Hence, its closer examination should give more detailed insights on additional factors that can affect states' compliance behavior. As the research will show, one of such additional factors might be unanticipated economic shocks that make states more prone to non-compliance due to pressure from domestic groups.

Chapter 3. Theory: The effect of unanticipated price shocks on states' behavior

3.1 Compliance by industrialized democracies

Compliance as Young (1979) suggests occurs “when the actual behavior of a given subject conforms to prescribed behavior, and noncompliance or violation occurs when actual behavior departs significantly from prescribed behavior.” In the case of the Kyoto Protocol the prescribed behavior means that first, Parties included in Annex I do not exceed required emission targets, second – they follow the methodological and reporting requirements for greenhouse gas inventories, third – the Parties meet the eligibility requirements under the flexibility mechanisms. If a Party's emissions are still greater than its assigned amount after 100 days after the expert's decision, the enforcement branch will declare the Party to be in non-compliance (UNFCCC).

One of the most difficult things in analysis of compliance is impossibility to objectively distinguish between states' intentions and willingness to comply with the terms of the treaty (Laugen 1995). On the one hand, a state might ratify a treaty because of good intentions but lack capacity and as a result fail to comply. On the other hand, it might have an ability to meet the requirements but still do not comply because compliance goes against its interests. In order to avoid such confusion between willingness and states' intentions, one of the main assumptions in this research is that a state's signature in a treaty implies both its capability and intention to comply afterwards no matter what led to such decision.

This limits the theoretical bounds of this paper because in order for this assumption to be justified we will focus only on developed industrialized democracies which are believed to be more capable to commit to international treaties due to their stronger institutions and economic prosperity. Of course, one might argue that such focus can hurt the generalizability of the argument. However, first, investigating this limited group of states will increase our

knowledge about puzzling variation in compliance among industrialized democracies. Second, we would rather prefer to explain less, but be sure that these explanations are relevant at least to this limited group of states.

More importantly, focusing on developed states also helps us to justify our next assumption that states are rational actors who able to calculate the costs and benefits of ratifying the agreement. In this sense, industrialized democracies in general have strong capabilities in terms of resources and institutions to take into account all “pros” and “cons” of signing and ratifying a treaty. Hence, we can be more confident that when such states decide to ratify the treaty, they do so because they have found out that new conditions will make them better off compared to their status quo. Of course, in case of environmental treaties, it is too ambitious or naive to expect that they will boost economic development but at least they should not hurt signatories’ interests too much.

Based on these assumptions we can construct the main steps of the compliance mechanism. First, states as rational actors calculate possible costs and benefits of signing a treaty. Here, we need to specify that states are not unitary actors as some rationalists would claim, because as we can see from the literature, domestic politics always plays an important role when states decide whether to comply with a treaty. Second, after these calculations of the costs, states decide to ratify the agreement. Finally, in the post-ratification period, the signatories eventually decide whether to meet their treaty commitments or not.

In order to answer why states comply or not with environmental treaties we should focus on post-ratification process and mainly on costs of ratification because until this point, the member states believed that they can meet the agreement terms. One of the possible indicators showing states’ intention to comply in the last stage is their initial acceptance of the costs of ratification. For instance, in order to ratify MARPOL, the International

Convention for the Prevention of Pollution from Ships, the signatories had to increase the equipment standards by introducing new technologies. In addition, the new regime required policy reforms at local level in order to improve pollution-controlling mechanisms (Mitchell 1994). In the case of the Kyoto Protocol, even at early stages of ratification, states had to provide various reports to relevant institutions to prove the level of current carbon emissions in order to be assigned allowed GHGs targets (UNFCCC). In other words, given the fact that previously states have accepted all financial and time costs, we have to explain why they have changed their preferences.

3.2 Compliance and unexpected costs

The explanation of noncompliance (not meeting assigned targets) proposed in this research is that after actual ratification of the treaty, the burden of compliance appeared to be much higher than it was calculated due to some *unexpected costs*. Indeed, the concept of unexpected cost is not something new in the history of international treaties and mainly it is integrated into the concept of uncertainty. Uncertainty is conceptualized as “random exogenous factors that might make the terms of the agreement increasingly undesirable over time, reducing the overall gains and altering the distribution of gains in unanticipated ways” (Thompson 2010, 272). Not surprisingly, risk-averse states want to decrease possible negative effect of uncertainty through softer legalization that allows actors to learn the effect of an agreement over time (Abbott and Snidal 2000, 423). In fact, some regimes provide parties with options to terminate or escape from treaty due to “domestic shocks that make terms politically difficult” (Helfer 2013, 186). In addition, certain options allow parties to deal with unanticipated shocks or unusual domestic circumstances without violation of treaty terms (Koremenos et al 2001, 773). A good example of such institutional design is GATT/WTO between 1947 and 1994 which allowed a signatory to suspend its obligation and

raise trade barriers to protect domestic producers when, “as a result of unforeseen developments” local firms suffer a “serious injury” from foreign imports (Helfer 2013, 187).

The Kyoto Protocol is not an exception and it has flexibility mechanisms designed to cut GHGs amounts in a cost-effective way. These mechanisms are the clean development mechanism (CDM), joint implementation (JI) and emission trading system (ET). In particular, CDM allows an Annex I signatory to earn additional certified emission reduction (CER) credits, each equivalent to one ton of CO₂ by implementing emission-reduction projects in developing countries. For instance, Australia can increase the amount of permitted GHG emissions by running a rural electrification project using solar panels in any developing country. The overall process is approved and controlled by the Designated National Authorities and CDM Executive Board (UNFCCC). In its turn, the JI mechanism also allows countries to get more CER credits, but the difference between CDM and JI is that in case of the latter the cooperation is between two developed states. The JI projects are approved by the Joint Implementation Supervisory Committee. The last mechanism - emissions trading - gives countries which do not use their permitted amount of GHG an opportunity to sell this excess capacity. This led to the creation of carbon market where signatories can buy units from other states and increase their allowed amount of CO₂ emissions (UNFCCC).

Nevertheless, while the flexibility mechanisms in the Kyoto Protocol help the signatories to meet required emission levels, there are no considerations of how states should behave in situations when the economy of the state experiences unexpected shocks. Hence, the variation in compliance among Annex I states can be explained exactly by this absence of mechanisms that provide its parties an opportunity to terminate the treaty during harsh times. In addition, the situation is also worsened by the weakness of the enforcement mechanisms that could punish violators, despite the existence of the Enforcement branch. The only

sanction that this branch can do is to “*declare that the Party is in non-compliance and require the Party to make up the difference between its emissions and its assigned amount during the second commitment period, plus an additional deduction of 30%.*” (UNFCCC). Overall, there are not many options or barriers that could restrain an Annex I party from non-compliance during shocks in a legal way.

3.3 The effect of oil price shocks

One of the potential scenarios that could lead to unexpected shocks in states' economies could be unexpected shocks in prices for natural resources and particularly for oil. We chose to focus on oil prices mainly for two reasons. First, there is a considerable body of literature emphasizing both positive and negative effect of fluctuations of oil-prices on the world economy which also claim that there is a strong relationship between oil prices and industrial growth output (Farzanegan and Markwardt 2009; Tang, Wu and Zhang 2010). Second, production of oil leads to extensive amounts of greenhouse gases emissions and according to the US Environmental Agency, 21% of global GHGs emissions in 2010 came from the industry sector. Thus, there is a strong relationship between oil prices and the amount of GHGs and consequently compliance with the terms of the Kyoto Protocol.

As it was mentioned before, when countries calculate costs of compliance, the policy makers and experts take into account global market trends including future broadcasts. However, sharp and unexpected increase in oil prices can alter states' behavior because of new opportunity costs. In particular, when the prices for natural resources shift upwards significantly, states who export these types of good are more interested in producing and extracting more amount of this commodity which consequently leads to higher amounts of GHGs. Therefore, such countries have more incentives to violate treaty terms. In addition, domestic groups representing related sectors of economy (for example, oil companies in case

of positive shock in oil prices) will demonstrate their discontent and push the state towards non-compliance because they also want extra revenue. This leads us to our general hypothesis which is:

H1: as the unexpected costs of compliance increase, the probability of compliance decreases. The next three hypotheses are derived from the main one and propose that:

H2: positive shocks in prices of oil negatively affect the probability of compliance; This means that:

H3: positive shocks in prices of oil positively affect the amount of GHGs emitted by the country. Consequently:

H4: the more dependent is a country on oil export, the higher will be the amount of GHGs emitted during shocks in oil prices.

Chapter 4. Research design and methods: the main variables and their measurements

In order to test the hypotheses empirically we use data on 36 developed industrialized Annex I countries of the Kyoto Protocol. The reason to focus only on this group of states is dictated by the fact that for them reduction of GHGs emissions was obligatory compared to non-Annex states which did not have concrete binding targets. The overall time frame is 1990-2015 which is conditioned with available data provided by UNFCCC. However, separate emphasis will also be made on the period between 2008 and 2012 which corresponds to the first commitment period under the Kyoto Protocol. The second commitment period is 2012-2020 but it has not entered into force due to objection by some Parties such as Japan. Moreover, the effect of Paris Agreement is also not included in our analysis because it was signed only in late 2015. Overall, the sample includes 829 observations and the unit of analysis is a state-year.

4.1 Dependent and independent variables

The main dependent variable is *compliance* which is measured in two different ways. In the first approach, we account for yearly changes in GHGs levels (in kilotons of GHGs). Analyzing compliance measuring variation in the amount of carbon emissions allows us to see more apparently how much each variable decreases or increases the state's amount of CO₂ emissions. Accordingly, the increase of GHGs amount means noncompliance because states are actually obliged to decrease CO₂ levels. The decrease of the amount of CO₂ means compliance or partial compliance because states can cut emissions but still not enough to reach their targets assigned by the treaty.

However, such method is less relevant if we want to stick to the specific definition of compliance in the Kyoto Protocol. In this case, using dichotomous variable seems to be more suitable because, according to the treaty, countries are declared non-compliers if they fail to

meet their emission targets. Therefore, in the second approach, compliance is a dichotomous variable where the value equals “1”, if a Party did not exceed allowed amount of carbon emissions in a given year, and “0” - if otherwise. The data both on actual emissions and assigned amounts for each state for the whole period is provided on the official site of UNFCCC.

The main independent variable is positive oil price shock which is a dummy variable coded “1” if there was a sharp increase in price of oil in a given year and “0” if otherwise. Unfortunately, the literature does not provide with an exact definition of what a price shock is in terms of concrete percentage changes. Therefore, the hypotheses are tested using different thresholds of 10%, 20% and 30% increase in price in one year. The data on global oil prices will be taken from the recent British Petroleum Statistical Review on World Energy 2017.

The second independent variable is states’ dependence on fuel exports which is measured as a percentage share of fuel exports of a country’s total merchandise exports in a given year. The reason for including this variable is that the reaction of a Party to changes in oil prices should vary depending on the extent to which its economy relies on oil export. That is why we expect in H4 that oil-exporter countries will be more likely to violate treaty terms and exceed assigned GHGs levels. Relevant data on fuel exports is taken from the World Bank’s database .

4.2 Control variables

The research controls for several additional variables mentioned in the literature which could also affect countries’ compliance with the Kyoto Protocol.

The first control variable is *ENGO political leverage* which is measured in terms of the number of national ENGOs registered in a country in a given year (Bernauer et al 2013, 98). As it was already discussed in the literature review part, ENGOs are highly appreciated

for their positive influence on compliance. Hence, we find it relevant to include this variable into our model. The data on the number of national ENGOs between 1990 and 2015 are provided by the International Union for Conservation of Nature (IUCN) that unites national and international ENGOs, agencies and scientists from more than 180 world countries (ibid).

While the Kyoto Protocol was the largest binding international environmental treaty until it was superseded by the Paris Agreement, this does not mean that countries ignored the problem of increasing carbon emissions at state level. This means that reduction of GHGs is not only the effect of the Kyoto Protocol but also a result of domestic regulation. Therefore, we decided to control for the effect of domestic policies reducing the amount of CO₂ by counting their number. The data on the number of environmental laws for each state from 1990 to 2015 is taken from the database provided by the Grantham Research Institute on Climate Change and Environment established by the London School of Economics and Political Science.

Finally, we control for EU membership which is a dichotomous variable with values “1” and “0”. Taking into account EU membership is important for two reasons. First, the EU members had separate collective responsibility with a specific amount of GHG assigned under the Kyoto Protocol. Second, these countries have additional environmental policies passed by the EU legislation outside Kyoto Protocol. Overall, we should expect positive effect of EU membership on compliance with the treaty.

As a method of analysis, we use linear and logistic regression analyses with fixed country and year effects. The first one is used when our dependent variable is the amount of GHGs which is a continuous variable. The second method is needed to test our hypotheses when compliance is a dichotomous variable. These statistical approaches are chosen mainly because despite their relative simplicity, they demonstrate well the level of association

between variables so that we can see their quantified effect on outcome. In addition, such models allow including several independent variables simultaneously. The general model is as follows:

$$\widehat{\text{Compliance}}_i = \alpha + \beta_1 \text{Priceshock}_i + \beta_2 \text{Fuel export \%}_i + \beta_3 \text{Priceshock}_i * \\ \beta_2 \text{Fuel export \%}_i + \beta_4 \text{ENGO leverage} + \beta_5 \text{Laws} + \beta_6 \text{EUMembership}$$

However, there will be changes in it depending on which measurement of compliance we choose and what factors we want to analyze.

Chapter 5. Revealing the findings

5.1 Linear regression model

The results of the analysis are presented in Table 2 and Graphs 1-3 below and support most of our hypotheses. In particular, the evidence supports our main hypothesis that “as the unexpected costs of compliance increase, the probability of compliance decreases”. The second hypothesis proposing that “positive shocks in prices of oil negatively affect the probability of compliance” is also supported by the evidence. Also, the results confirm our third hypothesis associating “positive shocks in prices of oil with greater amount of GHGs emitted by a country”. At the same time, we found no significant relationship between countries’ oil dependence and price shocks which rejects our fourth hypothesis predicting “higher levels of carbon emissions in oil-exporting countries during price shocks”. The relationships between control variables and our dependent variable are also as expected, except for ENGO leverage.

As we have argued, states ratify international environmental treaties only when their cost calculation shows that new regulations will not hurt their interests too much. However, while they are definitely able to take into account actual and predictable costs, there can be “force majeure” situations which could increase the cost of complying with the treaty terms. In our case, this unforeseen situation is shock in oil price. As we can see from the Table 2, when there is at least 10 % price shock, Annex I states of the Kyoto Protocol tend to increase the amount of GHGs emissions by more than 5400 kilotons and the coefficient of the corresponding variable is positive and statistically significant. Nevertheless, when we increase the price shock threshold to 20% and 30%, the relationship between dependent and independent variables loses its statistical significance but the coefficient remains positive.

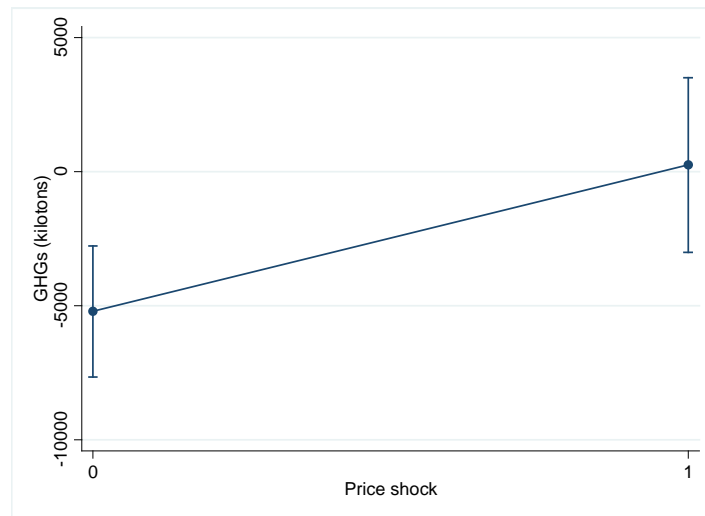
Table 2. Linear analysis of variation in GHGs emissions among Annex I countries in Kyoto Protocol, 1990-2015.

N = 829
R² = 0.05

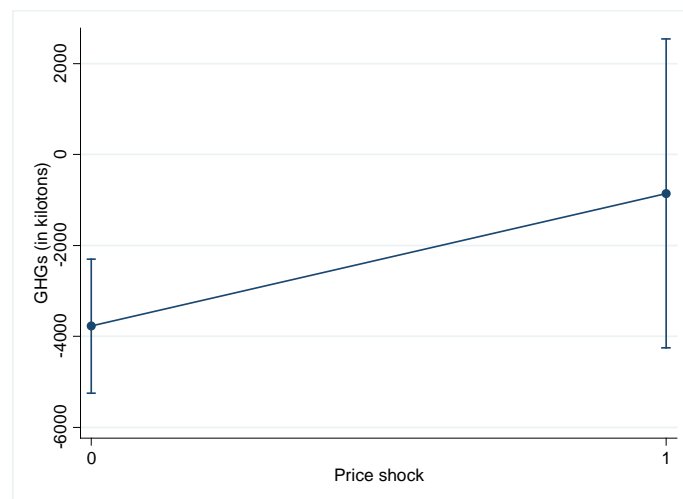
Variable	Estimated coefficients		
	10%	20%	30%
Price shock > than	10%	20%	30%
PRICE SHOCK	5454.6**	4065	3179
	(2380)	(1850)	(1691)
FUEL EXPORT %	158.2**	159**	162**
	(77)	(78)	(79)
PRICESHOCK*EXPORT%	324	286	345
	(361)	(293)	(313)
ENGO LEVERAGE	137	138	138
	(201)	(201)	(200)
LAWS	-1086**	-1115**	-1152**
	(497)	(504)	(513)
EU MEMBERSHIP	-1255	-1236	-1110
	(2116)	(2112)	(2052)
Constant	-3163	-2340	-1719

**p < 0.05

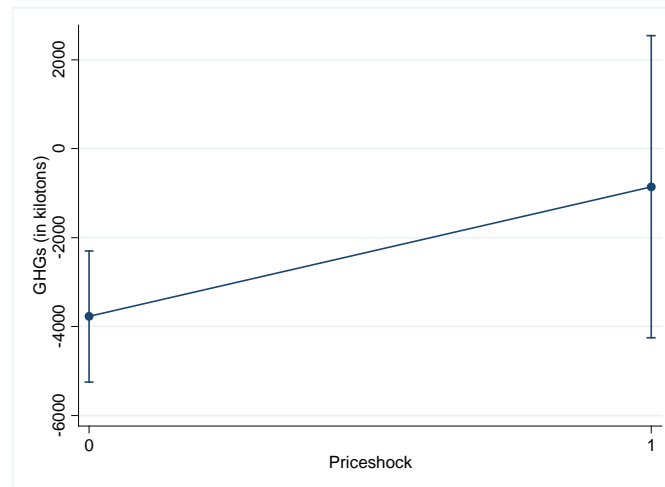
Graph 1. The effect of 10% price shock on GHGs level, 1990-2015.



Graph 2. The effect of 20% price shock on GHGs level, 1990-2015.



Graph 3. The effect of 30% price shock on GHGs level, 1990-2015.



While our interaction term ($Priceshock * Export\%$) testing the relationship between oil dependence and GHGs level during oil price shocks is positive, the coefficient is still not significant, hence the evidence does not fully support our fourth hypothesis. This can be explained by the presence of Russia in our sample because despite being a natural resource dependent country, according to our data, Russia managed to keep carbon emissions at allowed levels. At the same time, playing with price shock thresholds does not affect our *Fuel export %* variable which remains robust. The same is with the effect of environmental laws on the amount of GHGs emissions. The coefficient here is always negative and statistically significant even if we make stricter our price shock definition. This means that the higher is the number of existing national environmental regulations the less is the predicted amount of CO2 emissions. When it comes to the effect of EU membership, the estimated coefficient is negative as we expected due to additional regulations at EU level but not significant in all three models with different price shock criteria. Most surprisingly, the effect of ENGO leverage is not only not significant, but also positive, which is against our expectations. This finding could actually support arguments by Bernauer et al (2012) and Bohmelt and Betzold

(2013) who emphasized that higher numbers of ENGOs is not necessarily better for compliance due to possibility of collective action problems and competition for resources.

The supplementary graphs (1-3) are provided to vividly demonstrate the predicted effect of shocks in oil prices on emission of GHGs.

5.2 Logistic regression model

As a robustness check we also test our main hypotheses through another approach where compliance is a dichotomous variable. The results of the logistic regression are shown in Table 3 and Graphs 4-6 below, and also support our previous findings. However, in this case we analyze states' behavior between 2005 and 2015 due to availability of data and mainly because until 2005 the Annex I members of the Kyoto Protocol did not have exact emission reduction targets.

As you can see, price shock of at least 10% negatively affects the probability of compliance and the coefficient is statistically significant. When we change the price shock threshold to 20% the coefficient remains robust, but increasing it to 30% does not support our findings in terms of statistical significance. At the same time, using different measure of compliance does not affect the results on positive influence of national environmental regulations on probability of compliance – the coefficient remains statistically significant. Other variables (*Fuel Export%*, *Priceshock*Export%*, *ENGO leverage*, *EU Membership*) in our new model are not statistically significant.

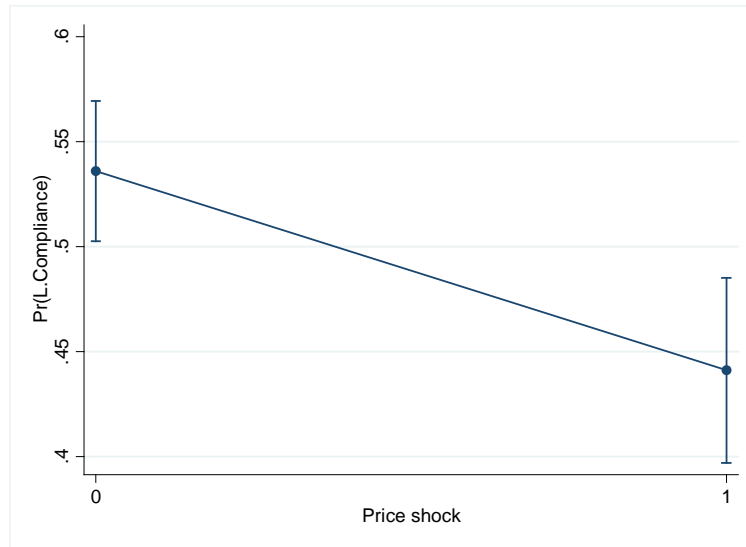
Table 3. Logistic analysis of variation in GHGs emissions among Annex I countries in Kyoto Protocol, 2005-2015.

N = 413
Pseudo R² = 0.39

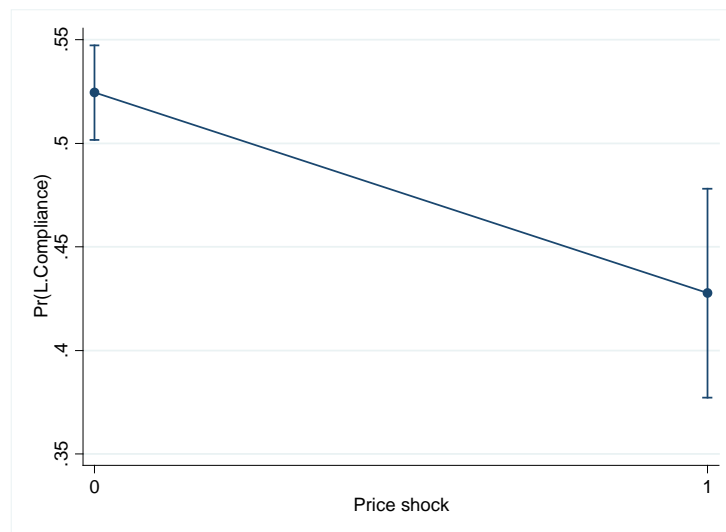
Variable	Estimated coefficients		
	10%	20%	30%
Price shock > than			
PRICE SHOCK	-0.86***	-0.702**	-0.506
	(.32)	(.28)	(.32)
FUEL EXPORT %	0.03	0.028	0.021
	(.13)	(.13)	(.12)
PRICESHOCK*EXPORT%	-.018	-.013	-.02
	(.01)	(.01)	(.01)
ENGO LEVERAGE	0.093	0.084	0.074
	(.14)	(.14)	(.14)
LAWS	0.28***	.29***	0.303***
	(.09)	(.09)	(.09)
EU MEMBERSHIP	-1.39	-1.45	-1.55
	(1.2)	(1.22)	(1.21)
Constant	0.272	0.603	0.993

p< 0.05; *p<0.01

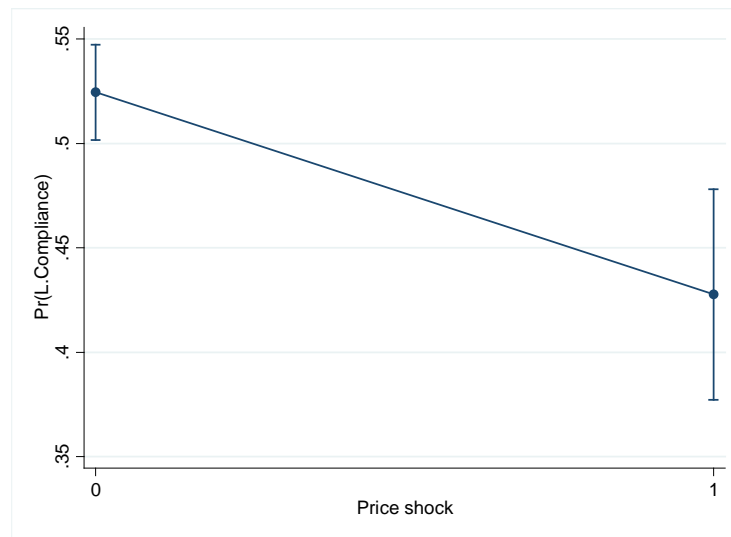
Graph 4. The effect of 10% price shock on GHGs level, 2005-2015.



Graph 5. The effect of 20% price shock on GHGs level, 2005-2015.

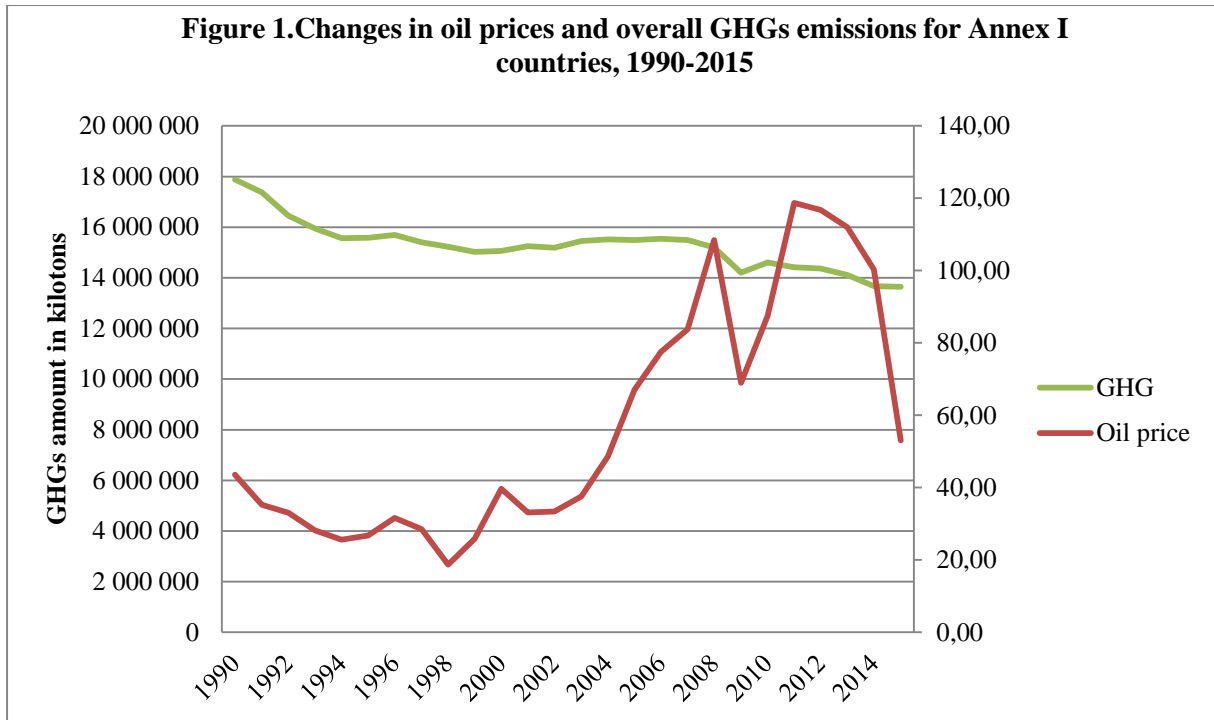


Graph 6. The effect of 30% price shock on GHGs level, 2005-2015.



6.3 Comparing pre-Kyoto and post-Kyoto periods

While the research tries to make more generalizable conclusions by extending the period of analysis (1990-2015) and combining different regression approaches, it is also important to analyze the Kyoto Protocol period (2005-2015) separately for at least three reasons. First, despite the fact that states started to address the problem of climate change far earlier in the beginning of 1990s (UNFCCC), only under the Kyoto Protocol they had a binding obligation to cut GHGs emissions. Second, the Kyoto Protocol entered into force exactly when there were highest fluctuations in oil prices: +37% in 2005, +30% in/ 2008, +27% in 2010 and +36% in 2011(see Figure 1). Therefore, it is interesting to observe the response from the states to these external shocks. Finally, comparing variation in emission levels under the Kyoto Protocol and before its ratification can give us more insight about the effectiveness of the treaty in tackling climate change.



Source: British Petroleum Statistical Review on World Energy 2017 and UNFCCC official website.

The Table 4 below presents the comparison of the results of linear regression analysis of Annex I countries' emissions during and before the Kyoto Protocol. The results in both periods support our main hypothesis, predicting higher amounts of GHGs during oil price shocks – the coefficients are positive and statistically significant. However, there are several striking differences in coefficients of the variables. First, the effect of price shock during the Kyoto Protocol is significantly higher compared to the pre-Kyoto period (7391 vs 3691). This is quite unexpected because treaty terms actually had to restrain member-states from emitting more GHGs. Possibly, we can explain that by the frequency of price shocks that provoked fuel-exporting countries to “hunt” for more income by raising the production of oil products and by that increasing GHG amount. Also, we remember from the theory part that the Kyoto Protocol lacked enforcement mechanisms which could punish states for non-compliant behavior. Another puzzling contrast concerns the effect of national environmental laws. For

Table 4. Linear analysis of variation in GHGs emissions among Annex I countries before and after Kyoto Protocol ratification (price shock is > 10%).

Variable	Estimated coefficients	
	Pre-Kyoto (1990-2005)	Kyoto (2006-2015)
PRICE SHOCK	3691** (1673)	7391** (3321)
FUEL EXPORT %	128 (155)	331 (235)
ENGO LEVERAGE	169 (148)	123 (121)
LAWS	425 (640)	-578** (247)
EU MEMBERSHIP	-794 (1716)	-3867 (2284)
Constant	-2725	-230

**p < 0.01

N = 484
R² = 0.08

the Kyoto protocol period, the coefficient is negative and statistically significant which meets expectations. However, for pre-ratification period the estimated coefficient is positive and not statistically significant. One of the possible explanations could be that from 1990 till 2005 there were far less national regulations especially in the beginning of 1990 when the scientific knowledge about climate change and the effect of GHG emissions was not so extensive. In addition, it might be the case that these environmental laws started to pay off later.

6.4 Discussion

Summarizing all the results of two different tests we can argue that the evidence confirms our main hypotheses associating shocks in oil prices with higher greenhouse gas emission rates. Moreover, the results partially support our argument that states with higher dependence on oil export tend to emit more GHG during price shocks which means that they are more prone to violate the Kyoto Protocol. Most importantly, our findings increase our knowledge about states' compliance with environmental treaties with specifying the conditions under which even the most industrialized democracies like Australia and Norway can violate treaty terms.

Nevertheless, we have to admit that several issues need to be addressed. First, we need to explain why the effect of shocks in oil prices became less obvious as we increased the threshold to 30%? Does that imply that there is a point after which states find it irrational to increase oil production even if the price for oil is so high? Second drawback of our model could be its emphasis on positive shocks. In fact, it would be interesting to see the reaction of states during unexpected price falls. Third, two of our control variables – *ENGO leverage* and *EU membership* – did not reach statistical significance in any of our regression models. Of course, this might be because they really did not affect compliance with the Kyoto Protocol or states' GHG emission levels. However, given the abundant literature on their vital role in

environmental politics it also might be due to our incorrect measurement. Finally, the model could be improved by adding more control variables which would increase our R^2 which is only 0.05 in the linear regression model. For instance, we could add variables such as regime type or include economic and demographic measures because the size of the country and its prosperity also might affect the level of GHGs.

Chapter 6. Conclusion

To conclude, the main goal of this paper was to investigate why even the most developed industrialized democracies like Australia, Norway and Japan sometimes do not fulfill their commitments to IEAs which in our case was the Kyoto Protocol. The argument of the paper was that during extreme economic shocks even the most democratic states appreciated for their compliance with international treaties can violate them due to recalculation of their opportunity cost and possibility to take advantage of the new conditions. In particular, the evidence from analysis of GHG emission levels of 36 Annex I countries of the Kyoto Protocol between 1990-1995, demonstrated that positive shocks in oil prices increase the probability of non-compliance.

The work contributes to the existing literature on the topic of compliance in at least two ways. First, it provides the reader with specific conditions under which even democratic states can violate environmental treaties – and this was not discussed by previous authors. Second, this paper contributes to the debate between managerial and enforcement schools. As the results in Table 4 show, even after ratification of the Kyoto Protocol states continued to emit more GHGs during price shocks. As we have mentioned, the treaty has many flexibility mechanisms such as the clean development mechanism (CDM), joint implementation (JI) and emission trading system (ET). However, possibly more enforcement mechanisms are needed to oblige member-states to meet their commitments.

In fact, this can also be an alarming signal for policy-makers. The results of the Kyoto Protocol can be a good lesson for the Paris Agreement. The latter is even looser because under this treaty states do not have binding emission targets. Another important implication from the results is the higher efficiency of domestic regulation in decreasing GHGs levels. Perhaps international policy makers should focus more on cooperation that would enhance

better domestic environmental laws. This can be done, for instance, through more intensive experience and technology exchange among member-states of the Paris Agreement. At the same time it is important to notice that despite some of its drawbacks discussed above, the Kyoto Protocol has managed to decrease the overall level of CO₂ emissions (see Figure 1). Hence, a more efficient international treaty regulating GHGs discharges has to deal with the states that violate treaty terms and make them comply even during harsh economic shocks.

Finally, while our sample included only democracies (except Russia), we would expect similar behavior from non-democracies. If the former group can violate treaty terms in spite of their higher institutional capabilities, stronger civil society and presence of ENGOs, what would constrain autocratic and less developed states from non-compliance? Nevertheless, this is only an expectation and reality can be completely opposite, especially if we look at Russia's good performance under the Kyoto Protocol. Despite this is out of the scope of the research, probably Russia is not the only non-democratic state that successfully met the Kyoto Protocol's GHGs targets. Hence, the future research can be devoted to the studies of non-democracies' attempts to address the problem of climate change. Perhaps, their approach to the problem will be more efficient. The last but not the least important contribution of the research is the puzzling finding on higher level of non-compliance under the Kyoto Protocol. Therefore, further studies should also address the following question: why was the negative effect of oil price shocks on compliance much higher under the Kyoto Protocol (3691 vs. 7391 kilotons, as shown in Table 4 above)?

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Links to databases

- 1) GHGs emissions assigned targets:

<http://unfccc.int/di/FlexibleCADQueries/Event.do?event=go>

- 2) Oil prices:

<https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html>

- 3) Fuel exports:

<https://data.worldbank.org/indicator/TX.VAL.FUEL.ZS.UN?view=chart>

- 4) Environmental laws data

<http://www.lse.ac.uk/GranthamInstitute/publication/2015-global-climate-legislation-study/>

- 5) ENGOs data

<http://www.ib.ethz.ch/data.html>