Political Economy of Climate Change Policy

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Abstract

Anthropogenic climate change poses a threat to all people and governments, but the response to that threat varies enormously across countries. Some adopt politically costly and economically challenging climate change mitigation policies, while others deny that climate change is occurring. Why do some countries adopt effective climate change policies while others do not? To answer this fundamental question, this paper analyses the political economy determinants of climate change policy around the world. In order to measure climate change policy, we introduce a new index, the 'Climate Laws, Institutions and Measures Index' (CLIMI), the first systematic attempt to measure countries' policy responses to the risk of climate change. CLIMI covers all the relevant institutions and sector-specific policies in 95 countries, representing 90% of the world's GHG emissions. We then use CLIMI to examine the political and economic factors that determine countries' choices to implement policies to tackle climate change. We find that the level of democracy alone is not a major driver of climate change policy adoption, but that public knowledge of climate change is. Not surprisingly, a high concentration of carbon-intensive industry in the economy hinders the adoption of climate change policy. Countries in which the citizenry has a better public awareness of climate change have more effective climate policies regardless of the presence of democratic institutions.

1 Introduction

There is a consensus in the scientific community that humanity will be adversely affected by anthropogenic climate change unless worldwide emissions of greenhouse gases are cut dramatically in the next 40 years (IPCC, 2007). Although climate change has moved to the top of the global political agenda over the past two decades, national mitigation policies remain a subject of intense debate (Stern, 2007; Giddens, 2009).

Scientists are still uncertain about the exact size and distribution of the long-term economic damages resulting from climate change (IPCC, 2007). As a result, policymakers in some countries remain reluctant to introduce aggressive climate

* This paper draws heavily on the Chapter 4 of the Low Carbon Transition Report (EBRD, 2011), which we co-authored with Daniel Treisman. We would like to thank Alex Chirmiciu, Grzegorz Peszko, Jeromin Zettelmeyer and Robert Hahn, and all participants at the EBRD OCE and the Smith School seminars for their invaluable comments, which greatly improved this working paper. We would also like to express special thanks to Kamila Kavankova and Stefan Sulek for their tireless research work during the preparation of the CLIMI.
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change mitigation policy (Giddens, 2009). However, many countries have – often unilaterally – cut their emissions over the past twenty years.
Given the scale of emission reductions the world needs to achieve to keep global warming in check, it is important for policymakers and academics to focus on how future emission reductions will be brought about. However, this is a public goods problem, so voluntary reductions are unlikely to be sufficient. Moreover, it is uninformative to measure a country's commitment to emission reduction by looking at its current emissions, which are affected by a variety of factors including economic conditions and trade. Substantial long-term reductions in emissions can only be achieved if most countries adopt effective emission reduction *policies*.

As this paper shows, many countries have already introduced climate change mitigation policies. However, measuring and comparing their quality and effectiveness across countries is fraught with difficulties. First, no two policies are the same because they usually arise through different legislative processes. Second, it is unclear to what extent the laws in the book are actually implemented in practice. Third, evaluating policies separately may miss out on important synergies that make policy packages more effective.

This paper proposes a new and simple ranking of national legislative, fiscal and institutional frameworks that can make a long-term impact on emission reduction: the Climate Laws, Institutions and Measures Index, or CLIMI. Unlike most climate policy indices CLIMI focuses on policy *inputs* – climate laws, institutions and measures – rather than policy *outcomes*, viz., emissions. This is the first index that takes into account all major sectoral and cross-sectoral policies and measures as well as all government institutions focussed on climate change for 95 countries. A country that scores highly on CLIMI is not only committed to reducing emissions today, but is also building the institutional capacity to reduce emissions in the future.

CLIMI, while imperfect, allows us to understand how and why climate change policy is made.[3] We first set out a stylised model of climate change policymaking, drawing from the larger literature on the political economy of reform. We then use this model to propose some hypotheses about the key obstacles to climate change policy adoption, and test these hypotheses drawing on a variety of data sources.

The rest of this paper is organised as follows. In Section 2 we introduce the Climate Laws, Institutions and Measures Index (CLIMI). For the sake of brevity, we relegate most of the methodology and sensitivity testing to the Appendix. Section 3 sketches out our political economy approach to climate change policy and proposes several hypotheses about the relationship between different actors in the formation of national climate change policies. Section **Error! Reference source not found.** presents the empirical testing of the hypotheses from the

[3] In this paper we use the terms 'climate change policy' and 'climate policy' interchangeably. Unless otherwise specified, we use these terms to denote policies designed to *mitigate* climate change (and thus global warming), as opposed to policies for *adaptation* to the impacts of climate change.

model, including a number of alternative specifications. Section 6 summarises the findings and suggests several directions for further work.

2 Measuring climate change policy

To understand the factors driving emissions outcomes around the world, it is important to understand to what extent and in which ways climate change policy varies across countries. A number of international measures of climate change *outcomes*, such as CO_2 emissions or carbon-intensity, already exist. However, the transmission mechanism from a government intention to CO_2 emissions reductions is through climate change *policies and measures*. Policies and measures are based on, and embodied in, *laws and institutions*. There are no internationally comparative measures of climate change policies, which motivated us to construct CLIMI: Climate Laws, Institutions and Measures Index.

2.1 Policy commitments versus outcomes

In order to tackle climate change, global cooperation is necessary. No single country can cut its emissions quickly and deeply enough to prevent the concentration of CO_2 in the atmosphere from rising to dangerous levels. Yet focussing solely on emissions, neglects *how* governments are trying to mitigate climate change. The relationship between emissions and policy commitment is not straightforward for several reasons:

- Emissions may rise despite good climate change policy due to economic development objectives. This is particularly the case in some developing countries with effective governments, which are struggling to contain emissions produced by rapid fossil fuel-based electrification and urbanisation despite some excellent mitigation measures.

- Climate change policy may not be well implemented because of overall government ineffectiveness. This does not mean that the government is shirking from climate change effort. Instead, improving overall institutional capacity of the government will improve the implementation of climate change policies and measures.

- Some countries have multiple objectives when they adopt emission reduction policies. For example, some countries seek to influence climate change policy in other countries through negotiations. On one hand, Costa Rica may lead by example aiming to decarbonise the economy fully within 20 years. On the other, during the 15th session of the Conference of Parties (COP) in Copenhagen, China refused to negotiate unless the EU agreed on CO_2 reduction of 20% by 2020, which was *less* ambitious than the 30% cut EU had been prepared to accept (*Guardian*, 2009).

- There is a great variety of possible climate change mitigation policies. Policies that relate directly or, more often, indirectly to CO_2 emission reductions are often adopted within other legislative documents, and the mandate for

promoting them may not lie with a single authority. A plethora of policies, in areas such as energy security or urban transport sustainability, can have positive climate change effects. It is therefore important to set out comparable benchmarks for all key carbon-related sectors and check to what extent various government climate change policies have met them.

- Good policies have a long-run effect on emissions. Several economies with high per capita emissions, such as Germany, have adopted aggressive carbon reduction policies that are likely to lead to a significant reduction in emissions in the next decade. Many developing countries do not even have a long-term strategy even for reducing carbon intensity per unit of GDP and their emissions will increase significantly, even though they may be easily preventable in the context of rapid economic development.

These concerns identify a considerable gap in the measurement of climate change policy commitments and outcomes, which the CLIMI is designed to fill. It may be useful not only for policy-makers, but also for the analysis of the drivers of emission trends: climate change policies and the political economy aspects of climate change. It is important to underline that CLIMI is not merely an improvement on an existing index; it offers an entirely new and objective measure of climate change policies around the world.

2.2 National Communications and data sources

Comparing the quality, breadth and depth of climate policies, measures, laws and institutions across a wide range of countries is neither a simple nor an uncontroversial task. First, the range of government policies and measures that can influence climate change is vast.[4] It is therefore necessary to select, *ex ante*, from the universe of government policies and measures those that are directed towards and are most effective in reducing carbon emissions and therefore mitigating global climate change.

A second major methodological problem relates to the availability of reliable data on climate change policies and measures that are comparable across countries. While there are a large number of country studies on the quality of individual countries' climate change policies, there are no available cross-country comparative assessments of climate change policies with global coverage.

We therefore chose to use the most systematic information on countries' climate change mitigation policies and measures that is publicly available: National Communications to the United Nations Framework Convention on Climate Change (UNFCCC). The National Communications include detailed accounts of climate change mitigation and adaptation policies and measures adopted by national governments.

[4] For example, minimum energy-efficiency standards in residential building regulations can have a significant impact on carbon emissions, whether or not the consequence is intended.

National Communications must be submitted by all countries, which have signed the UNFCCC. Under Article 4.1(b) "all parties… shall…formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol…" All countries, which signed the UNFCCC, except the United States, subsequently signed and ratified the Kyoto Protocol[5] (UNFCCC, 1998), which expired in 2012. The Protocol divided countries into developed countries, which had legally binding emissions commitments for the period 2008-2012 (Annex I), and developing countries, which did not (non-Annex I).

The Protocol also elaborated the reporting requirements: Article 10(b) states that "all parties…shall…formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change … (i) [s]uch programmes would, inter alia, concern the energy, transport and industry sectors as well as agriculture, forestry and waste management." Since, under Article 4 of the Protocol, "[e]ach Party included in Annex I shall incorporate in its annual inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol", Annex I countries also tend to update their policies and measures every year. Non-Annex I countries publish their National Communications considerably less regularly, but by January 2011 only 13 out of 153 non-Annex I countries had not submitted a National Communication.[6]

National Communications offer an excellent starting point for a comparative understanding of the breadth and quality of climate change mitigation policies. First, countries have a clear incentive to report all the policies and measures that they are taking. Therefore it is unlikely that countries would intentionally omit any of their significant legislation or programmes which address climate change mitigation. To prevent misreporting based on exaggeration, the relevant policies were cross-checked with existing databases of climate change policies, using national legislation as well as expert and UNFCCC country focal point consultations (see Appendix 7.7 for a full list of sources). Second, National Communications are systematic. UNFCCC prepared detailed and standardised guidelines for reporting policies and measures in the National Communications for Annex I (UNFCCC, 2000) and non-Annex I countries (UNFCCC, 2003, *inter alia*). The sectoral structure of the guidelines is particularly reflected in two out of the four parts of CLIMI.

2.3 Country coverage

We cover all countries which submitted a National Communication to the UNFCCC between 1 January 2005 (the year the Kyoto Protocol came into force)

[5] The Protocol became legally binding on all signatories on 16 February 2005 after Russia ratified it in November 2004.

[6] These are: Angola, Brunei Darussalam, Cyprus, Equatorial Guinea, Iraq, Kuwait, Liberia, Libya, Myanmar, Oman, Qatar, Somalia, Timor-Leste.

and 15 January 2011.[7] We also include China, India, South Africa, the Republic of Korea, Turkey and Azerbaijan, in order to represent the largest and fastest growing emitters.[8] This allows CLIMI, unlike previous indices of its kind, to offer extensive country coverage, including developing countries and small-island states. Appendix 7.2 includes a full list of countries.

CLIMI thus provides an objective comparative assessment of the breadth and quality of climate change mitigation legislation, policies, measures and institutions in 95 countries (including all countries in the EU, all post-communist transition economies, all large developing countries, many least developed countries and small island states), covering 91 per cent of global emissions and 73 per cent of the world's population.

2.4 Structure

CLIMI measures the breadth and quality of four main policy areas: international cooperation and policy; domestic institutions and national climate change mitigation policy; sectoral policies; and cross-sectoral policies. The components of CLIMI follow the standardised structure of the National Communications, which was designed to highlight the most important areas of climate change mitigation policies and measures. CLIMI therefore has 12 constituent variables grouped into four key policy areas:

1. **International cooperation**: how quickly a government ratified the Kyoto Protocol and whether it developed the institutional capacity to participate in the flexible mechanisms (host projects under Joint Implementation (JI) or the Clean Development Mechanism (CDM)).[9]

2. **Domestic climate framework**: this includes broad climate change laws and targets, as well as the levels of institutional engagement in climate change (ministerial level, independent committees, etc.).

3. **Sectoral fiscal or regulatory measures or targets**: these include targets and regulations in each of the sectors identified in the reports of the Intergovernmental Panel on Climate Change, apart from waste, as detailed in Appendix 7.3.

4. **Cross-sectoral fiscal or regulatory measures**: these include carbon taxes and emission-trading schemes.

Most scores are assigned on a three level scale: 0/0.5/1. There are two exceptions within the International Cooperation policy area: Kyoto Protocol ratification is assigned on a linear scale and JI/CDM project existence is a binary measure. A score of 1 is supposed to signify worldwide best practice – not the best conceivable policy. A score of 0.5 means that significant mitigation measures

[7] We exclude Liechtenstein, Luxembourg, Monaco and San Marino.
[8] For these two countries, we used a large number of sources to obtain the information that is normally provided in the National Communications.
[9] See Dolsak (2009) for a similar approach.

have been intentionally taken, but they fall considerably short of best practice. A score of 0 means the institution or policy is non-existent, insignificant or its stated function is deceptive. Appendix 7.3 describes in detail how the scores are assigned and provides examples of typical policy measures.

Weights are used to reflect, broadly, the contribution of each of the sectoral policy areas to possible carbon emission reductions. The weights are assigned in the following way: half of the CLIMI score is assigned to national institutions and nationwide policies and targets, and half of the score is assigned to sectoral and cross-sectoral policies. Within the sectoral policies, different sectors are assigned weights according to their contribution to worldwide emissions measured by IPCC (2007). Subcomponents in other policy areas are weighted equally. Appendix **Error! Reference source not found.** summarises these key components and shows how they are weighted.

Finally, it is worth noting that CLIMI has not introduced any controversial ways of measuring climate change policy. As the references indicate, most subcomponents have been used in other indices or as proxies for climate change cooperation. The uniqueness of CLIMI is that it only takes into account policies and measures, it does so objectively, and it does not mix policies with outcomes.

Before we describe the results of the CLIMI, it is worth reiterating what CLIMI is *not*. Importantly, CLIMI does *not* include an assessment of outcomes (e.g. emissions), implementation quality or adaptation measures. Thus, it is possible that emissions may be on a rising trend in countries that have a high score on CLIMI. For example, China's industrial growth puts pressure on emissions, but its mitigation policies (which limit emissions that would not have occurred anyway) are increasingly ambitious. In addition, CLIMI measures the policies that countries *have adopted* to mitigate climate change, but does not provide an assessment of the quality of *implementation* of those policies. Instead, it relies on an assessment of the extensiveness of policy measures. CLIMI does not claim to be comprehensive to climate change policy coverage: for example, we do not look at R&D policies due to serious data limitations. Finally, CLIMI looks only at climate change mitigation; it does not look at either adaptation or broader environmental policies, which are likely to have different political economy mechanisms from those we identify.[10]

2.5 Relationship between CLIMI and outcomes

The countries that score best on CLIMI tend to be northern European countries, mostly EU member states. The countries that score lowest on CLIMI tend to be low-income countries, predominantly located in sub-Saharan Africa, which have little pressure to reduce their relatively low emissions and low state capacity to design what are often legally and economically complex policies and measures. Indeed, there is a clear correlation between countries' per capita income and the adoption of good climate change policies, as highlighted in

[10] CLIMI does not attempt to measure waste sector policies and measures, due to a practical difficulty in their comparative ranking across countries. This is the smallest emissions sector in almost all countries, accounting for only 2.8% emissions globally (IPCC, 2007).

The full results of CLIMI are reported in Appendix 7.1.

3 How climate policy is made: a political economy approach

Why do some countries adopt ambitious climate change policies while others do not? The literature on the political economy of policy-making and reform suggests four sets of factors that are likely to be important. These relate to the international context, the structure of government, the degree of political accountability, and the characteristics of interest groups. The model presented in this section is highly stylized and focuses only on the national context. Its purpose is to shed some light on the complex political economy of climate change policy rather than make tight predictions.

First, the international context will affect how governments approach climate policy. The making of such policy can be thought of as a two-level interaction (cf. Putnam, 1988). At the higher level, the world's governments interact strategically, each seeking to benefit from the global climate change regime while reducing their costs. Since there is no international authority with strong sanctioning power, this can be considered a "game" of voluntary contributions to a public good: climate stabilisation. At the lower level, climate policies are formulated and implemented within each country by national governments once the international level is settled.

While the international bargaining game is important, this paper focuses on the domestic level. We take international agreements as given and ask why some governments do far more than others to rapidly concretise and implement their international commitments. Under international agreements such as the Kyoto Protocol, countries do pledge to meet certain carbon-reduction targets. These pledges then serve as the background rather than a credible commitment to the game of domestic policy-making.

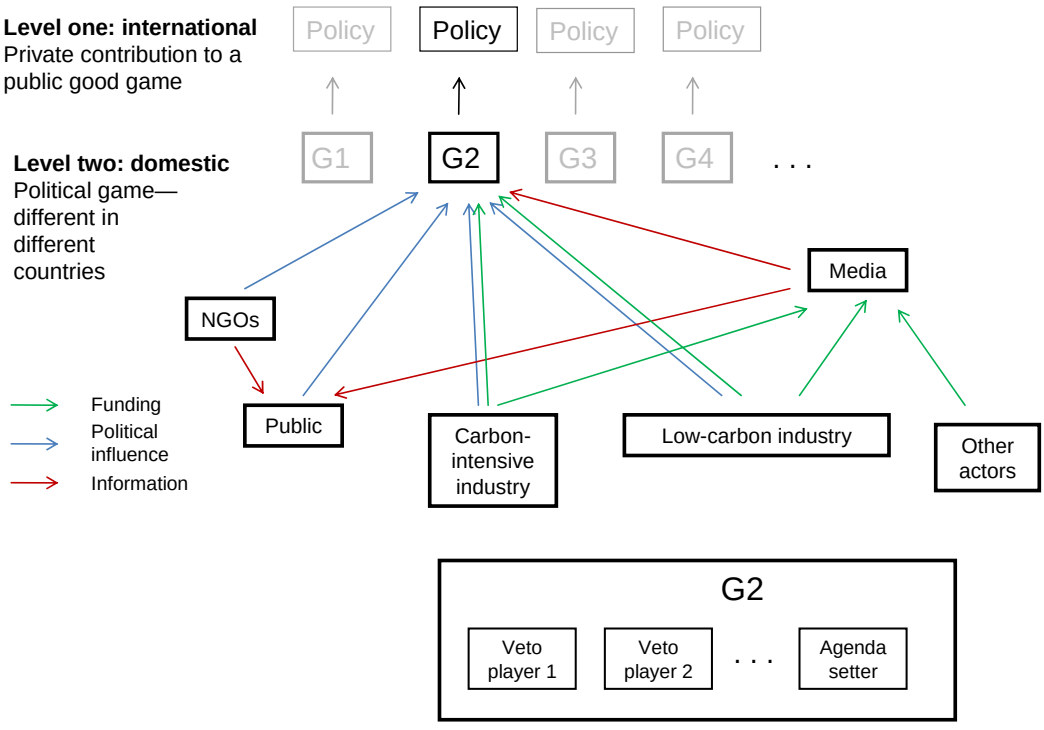
Domestic policy-making depends in the first instance on the structure of government. Governments differ in the number of institutional veto players – or actors whose agreement is necessary for policies to be enacted – that they contain (Tsebelis, 2002). The number of veto players depends on whether the parliament consists of two chambers, each with strong powers; whether there is a president; and whether the constitution is federal in the sense of granting veto-power over central policy to regional governments or their representatives. In addition, the number of veto players will depend on the number of parties in the ruling coalition, since defection by a coalition member can preclude a bill's passage. The more veto players there are and the more divergent their views, the more difficult it is to change policy. One veto player, the agenda setter, gets to make the proposals to which other veto players respond. Hence, the identity of the agenda setter will also affect what policy is chosen.

The motivation of these veto players depends on the degree of political accountability. In democracies, parties and individual politicians in the

government have reason to take into account the views of their constituents. The more responsive the democracy, the more the preferences of the electorate will matter. The degree of responsiveness will depend on the electoral rules, but also on the degree of media freedom, which affects the accuracy and amount of information available to voters. The ability of voters to extract accurate information from the media and other sources will depend on their level of education.

Finally, the characteristics of interest groups will also affect the outcomes of domestic policy-making. In part, the landscape of interest groups will simply reflect the underlying economic interests in the society, associated with the economic structure. However, particular interest groups will be better organised in some places than others. Classic contributions to this literature suggest that the outcomes of policy will reflect the set of pressures – or bids – from competing interest groups (Olson, 1965; Becker, 1983; Grossman and Helpman, 1994). **Error! Reference source not found.** Figure 2 outlines the hypothesised relationships among the key actors who drive the formation of climate policy by governments (represented as G1, G2...)

Figure 2: Stylised model of climate change policy formation



Thinking about policy interactions in this way suggests a number of reasons why one country might pursue climate policy more actively than another. First, some countries are more dependent on carbon-intensive industries than others. If the income of the majority of the electorate depends on such industries, then one might expect democratic politicians to resist reforms that would threaten the livelihood of their constituents (Kahn and Matsuaka, 1997). Of course, there are local benefits, for example in terms of air quality. If the benefits of developing clean industry exceed the costs of retiring heavy polluters, the voters could in

principle be compensated. However, promises to do so may not be credible and voters may block support for clean industry.

Even if the majority of voters do not depend on carbon-intensive industry, special interests working on behalf of the carbon-intensive industry can still achieve political influence disproportionate to the share of votes it can mobilise, as long as it is well organised. Thus, a strong presence of high-carbon industries may result in the effective blocking of reform.

However, other interest groups and issue-oriented lobbies such as environmental non-governmental organisations (NGOs) may balance the pressures of carbon-intensive industry, informing both the public and politicians about the benefits of climate policy (Botcheva, 1996). In addition, low-carbon industries may lobby for policies that support their activities.

Indeed, the battle over climate change policies will in part be a battle of ideas. Supporters and opponents of climate policy will seek to inform – and sometimes to misinform – both the public and politicians on the causes of climate change and the costs and benefits of mitigation measures. Given this conflicting information, a lot may depend on the sophistication of the general public – which in turn depends on the level of education – and on the extent to which the media are free and motivated to pursue the truth rather than to represent corporate or government interests.

Public beliefs will also be shaped by history. Many countries, which have an abundance of fossil fuels, also have an energy-intensive and wasteful industrial structure. In these countries, there tends to be a widespread belief that energy use is less costly to society than it actually is. This may be another reason to expect slower reforms in countries where the energy-intensive sector is larger.

If a government is not democratic, then the paths of influence will tend to go directly from interest groups to government actors, with less influence by the public along the way. If the energy-intensive industry is well organised, it may succeed in blocking the implementation of climate policy commitments that benefit the public but are costly to entrenched interests.

The nature of the political regime may affect reform in one other way: by determining the time horizon of policy-makers. Reducing CO_2 emissions has potentially huge long-term benefits in terms of preventing climate change, but also large short-term costs. If leaders are focused on winning the next election (as in a democracy), or on avoiding an imminent coup (in an unstable autocracy), their regard for the future may be lower than that of the broader society. By contrast an (well-informed) autocrat who expects to remain in power for 20 years might take the threat of global warming more seriously.

As should be clear, most of the variables likely to affect climate policy – regime type, press freedom, even the relative size of carbon-intensive industries – may have conditional or even conflicting effects. How economic structure, the extent of democracy and other factors influence countries' performance in climate

change mitigation is therefore an empirical question. This is the subject of the following section.

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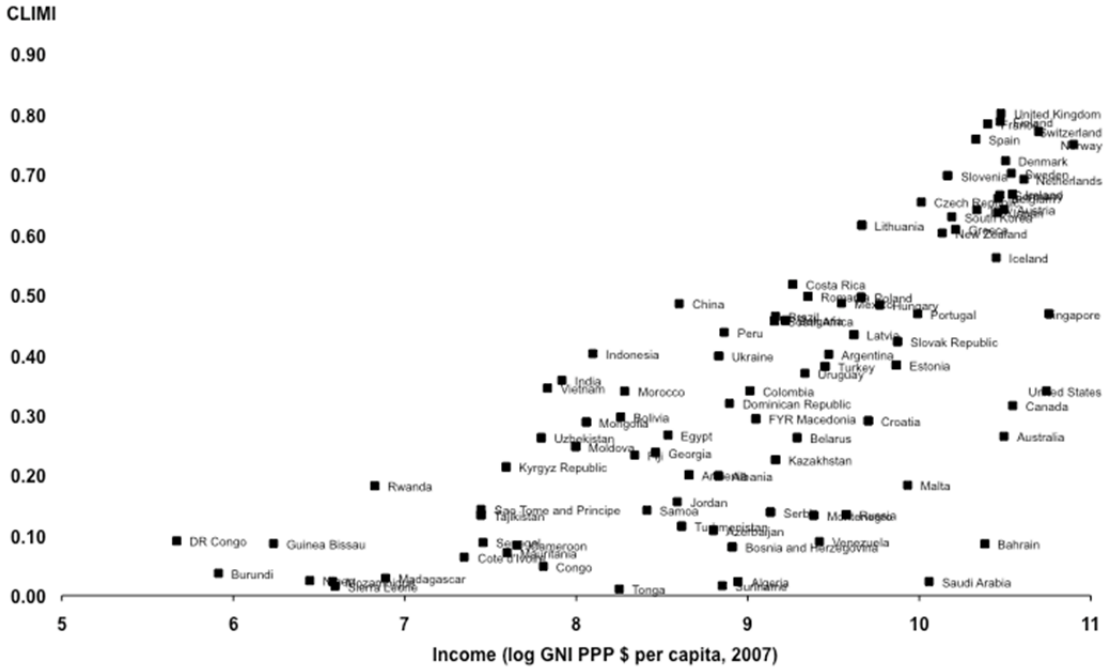
There is little correlation between countries' vulnerability to climate change and the adoption of climate change mitigation policies and measures. This reflects the fact that the countries that are most vulnerable to climate change tend to contribute little to the problem – and hence tend to focus their efforts on adaptation rather than mitigation.

Figure 1: Correlation between per capita income and CLIMI



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Putnam, 1988).[11] At the higher level, the world's governments interact strategically, each seeking to benefit from the global climate change regime while reducing their costs. Since there is no international authority with strong sanctioning power, this can be considered a "game" of voluntary contributions to a public good: climate stabilisation.[12] At the lower level, climate policies are formulated and implemented within each country by national governments once the international level is settled.

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The motivation of these veto players depends on the degree of political accountability. In democracies, parties and individual politicians in the government have reason to take into account the views of their constituents.[15] The more responsive the democracy, the more the preferences of the electorate will matter. The degree of responsiveness will depend on the electoral rules, but also on the degree of media freedom, which affects the accuracy and amount of

[11] See Putnam (1988). For an application of the two-level game approach to climate policy, see Kroll and Shogren (2008).

[12] The literature since Olson (1965) has shown the outcome of such games to be far less determinate than originally thought. Many equilibria are possible, depending on the detailed structure of the game (see, for example, Bagnoli and Lipman (1989) and Bergstrom et al. (1986)). But for some simple functional forms and assumptions, Olson's conjectures are confirmed. Most importantly, the public good is often undersupplied relative to the social optimum.

[13] We do, nevertheless, consider empirically whether membership in the EU is associated with more active climate policies. The norms and extra scrutiny associated with EU membership could plausibly motivate governments in the accession countries to demonstrate their commitment to the European approach.

[14] It is possible that a clearly defined agenda setter may not exist. Then several veto players could make simultaneous proposals.

[15] For example, Holland et al. (2011) discuss the effect of lobbying, campaign contributions, and local interests on transportation emissions regulation in the United States.

information available to voters. The ability of voters to extract accurate information from the media and other sources will depend on their level of education.

Finally, the characteristics of interest groups will also affect the outcomes of domestic policy-making. In part, the landscape of interest groups will simply reflect the underlying economic interests in the society, associated with the economic structure. However, particular interest groups will be better organised in some places than others. Classic contributions to this literature suggest that the outcomes of policy will reflect the set of pressures – or bids – from competing interest groups (Olson, 1965; Becker, 1983; Grossman and Helpman, 1994). **Error! Reference source not found.** Figure 2 outlines the hypothesised relationships among the key actors who drive the formation of climate policy by governments (represented as G1, G2...)

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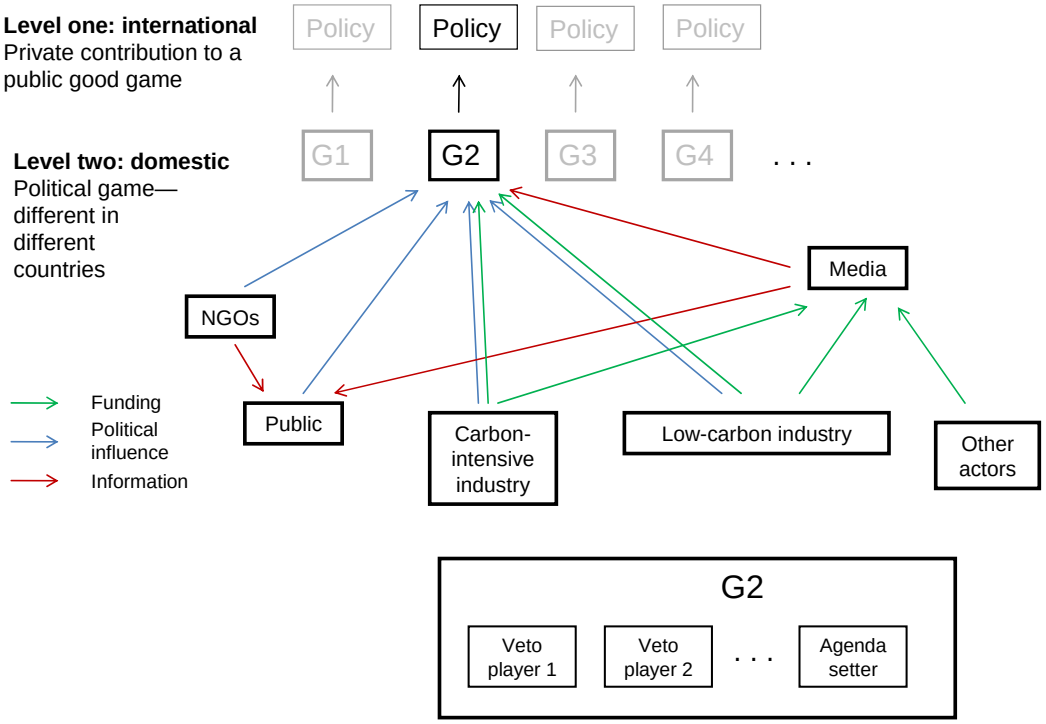

Thinking about policy interactions in this way suggests a number of reasons why one country might pursue climate policy more actively than another. First, some countries are more dependent on carbon-intensive industries than others. If the income of the majority of the electorate depends on such industries, then one might expect democratic politicians to resist reforms that would threaten the livelihood of their constituents (Kahn and Matsuaka, 1997). Of course, there are local benefits, for example in terms of air quality. If the benefits of developing clean industry exceed the costs of retiring heavy polluters, the voters could in principle be compensated. However, promises to do so may not be credible and voters may block support for clean industry.

Even if the majority of voters do not depend on carbon-intensive industry, special interests working on behalf of the carbon-intensive industry can still achieve political influence disproportionate to the share of votes it can mobilise, as long as it is well organised. Thus, a strong presence of high-carbon industries may result in the effective blocking of reform.

However, other interest groups and issue-oriented lobbies such as environmental non-governmental organisations (NGOs) may balance the pressures of carbon-intensive industry, informing both the public and politicians about the benefits of climate policy (Botcheva, 1996). In addition, low-carbon industries may lobby for policies that support their activities.

Indeed, the battle over climate change policies will in part be a battle of ideas. Supporters and opponents of climate policy will seek to inform – and sometimes to misinform – both the public and politicians on the causes of climate change and the costs and benefits of mitigation measures. Given this conflicting information, a lot may depend on the sophistication of the general public – which in turn depends on the level of education – and on the extent to which the media are free and motivated to pursue the truth rather than to represent corporate or government interests.[16]

Public beliefs will also be shaped by history. Many countries, which have an abundance of fossil fuels, also have an energy-intensive and wasteful industrial structure. In these countries, there tends to be a widespread belief that energy use is less costly to society than it actually is. This may be another reason to expect slower reforms in countries where the energy-intensive sector is larger.

If a government is not democratic, then the paths of influence will tend to go directly from interest groups to government actors, with less influence by the public along the way. If the energy-intensive industry is well organised, it may succeed in blocking the implementation of climate policy commitments that benefit the public but are costly to entrenched interests.

The nature of the political regime may affect reform in one other way: by determining the time horizon of policy-makers. Reducing CO_2 emissions has potentially huge long-term benefits in terms of preventing climate change, but also large short-term costs. If leaders are focused on winning the next election (as in a democracy), or on avoiding an imminent coup (in an unstable autocracy), their regard for the future may be lower than that of the broader society. By contrast an (well-informed) autocrat who expects to remain in power for 20 years might take the threat of global warming more seriously.[17]

[16] See Snyder and Ballentine (1996) for a discussion of the battle of ideas – and the need to regulate free speech effectively – in the development of ethnonationalism in the post-communist region.

[17] Even the public may tend to overweigh the immediate future relative to the distant future in ways that are "time-inconsistent" (O'Donoghue and Rabin, 1999). However, we see no obvious reason why such tendencies would be more pronounced in some countries than others. For an application to the political economy of climate climate change policy, see Hovi et al. (2009).

As should be clear, most of the variables likely to affect climate policy – regime type, press freedom, even the relative size of carbon-intensive industries – may have conditional or even conflicting effects. How economic structure, the extent of democracy and other factors influence countries' performance in climate change mitigation is therefore an empirical question. This is the subject of the following section.

5 Empirical investigation of climate change policy adoption

In his section, we use CLIMI to analyse empirically the relationship between climate change policies and measures – the outcome of interest in this paper – and the various aspects of the stylised model of climate policymaking outlined above.

In the real world, some governments will be constrained by overwhelming public opposition to carbon-reduction policies – regardless of the hard economic facts – while in other countries the tide of public opinion will leave political leaders with little choice but to implement policy measures that are economically painful in the short run. In some countries, the influence of the carbon-intensive industry lobby will be channelled via opaque means or personal relationships, while in other countries the debate between carbon-intensive and low-carbon industries will take place in the public arena with open engagement by civil society and the independent media.

Recognising this complexity, we estimate a reduced-form statistical model, based on six major factors that the political economy literature identifies as likely to drive climate change mitigation policy:

1. **Public knowledge of the threat represented by climate change**. Given the extent to which the government responds to public pressure, one would expect public knowledge of climate change to lead to stronger policies. The data used to measure this are taken from a 2009 Gallup poll, conducted in 175 countries, which asked people whether they see climate change as a threat, how much they know about climate change, and whether climate change is caused by human activity or is a natural phenomenon. However, because the public's understanding of climate change will itself be influenced by national climate policies, an instrumental variable approach is required to understand this link (see below).

2. **The level of democracy**. The direct effect of democratic systems on climate change mitigation policy could be either positive or negative. Democratic political systems are designed to transmit popular concerns and priorities into the policy-making process. In democratic countries where public knowledge of the threats and causes climate change is pervasive, one may expect climate policy to be ambitious. However, if the public is opposed to climate policy because it may harm short-term economic prospects, democratic political systems may inhibit the adoption of ambitious policy in

this area. We employed the widely used Polity IV regime characteristics dataset for 2007 to measure the level of democracy.

3. **The strength of the carbon-intensive industry lobby**. The political weight of the carbon-intensive industry lobby is simultaneously the most important determinant of climate change policies and measures, and the most difficult to measure. Carbon-intensive industry may hinder climate change policy especially if it is employs a large proportion of the electorate and contributes substantially to tax revenue. For the purpose of this analysis, the share of carbon-intensive industries – manufacturing, mining and utilities – in each country's Gross Domestic Product was used as a rough proxy.

4. **State administrative capacity**. Once political leaders have announced a course of policy action, the stated intention may or may not be translated into state policy. This will depend, at least in part, on the administrative capacity of the bureaucracy to draft regulations and laws, and submit them for legislative and executive approval. This factor is only implicitly addressed in the political economy literature, but might be important, particularly with regard to the complex regulatory, legal and economic challenges associated with climate policy. Countries with strong democracies, free media and weak carbon-intensive industry lobbies might nevertheless have weak climate change policies because of insufficient capabilities to design and implement such policies – much less enforce them, an issue not dealt with in this paper. The simple average of the World Bank's "Government Effectiveness" and "Regulatory Quality" Governance Indicators for 2007 was used to measure state administrative capacity.

5. **Per capita and total CO_2 emissions**. There are two possible ways that per capita or total CO_2 emissions might affect climate change policy adoption. On the one hand, the countries with the highest per capita CO_2 emissions tend to be the highest income countries which have historically generated the most atmospheric carbon and upon which most of international emission reductions obligations (e.g. Kyoto Protocol, Cancun Agreement, Doha Climate Gateway) are being placed. On the other hand, in countries with higher per capita CO_2 emissions, it is likely that introducing aggressive carbon emission-reduction targets will be resisted more fiercely by both individuals and firms. Countries that have lower total emissions may be more reluctant to cut emissions because their contribution to climate change is small and hence any decrease in emissions will only have a negligible effect on global emissions. We therefore test empirically what kind of impacts per capita and total CO_2 emissions have on the adoption of climate change policy.

6. **International commitments**. In all countries the nature of internationally negotiated carbon emission-reduction targets will play a role in domestic leaders' and polities' cost/benefit deliberations on climate change policy innovation. We therefore control for ratification of the Kyoto Protocol as well as the size of the emission-reduction target to which Annex I countries committed themselves. In addition, the most binding international commitments are entailed by membership in the EU, which we control for

using a dummy variable in the regressions. We also use a dummy variable to test whether being a post-communist transition country has a significant effect on the adoption of climate change policy, controlling for other variables.

5.1 The determinants of public opinion on climate change

Before turning to the empirical testing of the impact of the hypothesised political economy drivers on climate policy adoption, it is necessary first to 'unpack' the relationship between the first hypothesised driver – public knowledge of the threat represented by climate change – and the adoption of climate policy. As mentioned above, the observed correlation between public knowledge of the threat posed by climate change and better climate policy could reflect causal effects in both directions: better knowledge of the causes of climate change could simultaneously influence, and be influenced by, climate change policies.

To see whether public information affects climate change policies, it is therefore important to focus on cross-country differences in public knowledge that are driven by factors unlikely to be influenced by climate policies, and that do not influence policies independently. Three possible factors are considered in this context:

1. **Levels of tertiary education**. Higher levels of tertiary education produce a more sophisticated population, which is likely to be better informed about the scientific evidence on climate change. We use the latest data available from the World Bank's World Development Indicators.

2. **Freedom of the media**. Independent and critical media play a crucial role in assessing and disseminating scientific findings, particularly in such vital areas as climate change. A free media is a key factor in shaping public understanding of climate change. We use Freedom House's Freedom of the Media index for 2007 for this issue.

3. **Vulnerability.** If a country is vulnerable to climate change, the population is more likely to be aware of climate change in general and its causes in particular. For this variable, we use the Climate Change Vulnerability Index 2011 compiled by Maplecroft, a risk analysis and mapping firm.[18]

Table 1 reports the results of regressing various aspects of public opinion on climate change, as found in the 2009 Gallup poll, on the three independent variables listed above. The coefficients indicate whether countries with, respectively, a higher degree of education, more media freedom, and a greater vulnerability to climate change were more likely (positive coefficient) or less likely (negative coefficient) to agree with the statements described in the column headings.

[18] We are very grateful to Maplecroft for sharing the aggregated results of their Climate Change Vulnerability Index 2011 with us for this analysis.

Table 1: Determinants of knowledge of anthropogenic climate change

Dependent variable →	Climate change a threat		Some knowledge of climate change		Much knowledge of climate change		Global warming caused by humans		Global warming has natural causes	
Model →	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Education	0.019	0.051	.208***	.184***	.345***	.338***	.146***	.180***	-.340***	-.394***
Media freedom	0.029	0.153	-.149***	-.210***	-.190**	-.291**	-0.068	0.028	.319***	-0.046
Vulnerability	-.386***	-.330***	-0.011	-0.032	0.411	-0.447	-.441***	-.416***	.711**	.763***
EU		0.08		-0.031		-.215*		0.064		-.596***
Transition economy		-.250***		.143**		0.061		-.202***		.363***
Number of observations	71	71	83	83	83	83	81	81	81	81
R^2	0.23	0.33	0.6	0.62	0.54	0.55	0.27	0.37	0.32	0.43

As model A in this table illustrates, when controlling for the average level of education and for media freedom, the perception of climate change as a threat is driven almost entirely by a country's actual vulnerability to climate change.[19] Model B demonstrated that this relationship holds when we control for whether respondents live in the EU – with its aggressive climate change policies and widespread public debate – or in the post-communist transition countries, whose economies are the among the most energy intensive in the world and where there is limited public debate on climate change-related concerns.

Models C-F show that people in countries with more widespread tertiary education and greater media freedom are more likely to state that they have knowledge of climate change. Countries' actual vulnerability to climate change has no significant effect here. In contrast, models G-H suggest that that awareness that global warming is caused by humans depends on education and country vulnerability, while media freedom makes no difference in this context. For similar levels of education and country vulnerability, this awareness is significantly weaker in the transition countries than in the rest of the world (model H).

The same pattern is visible in the inverse question (models I-J): people in more vulnerable countries and countries with more tertiary education are less likely to believe that global warming is a natural phenomenon. Controlling for levels of education and vulnerability, this belief tends to be less prevalent in EU countries and more prevalent in the post-communist transition economies.

5.2 Political factors in climate change policy adoption

We are now in a position to test what variables affect the adoption of climate change policy. We employ a two-stage least squares regression approach to estimate the instrumental variable specification. This enables us to partially

[19] The Maplecroft Climate Change Vulnerability Index is scored on a 1-10 scale, with 1 representing extreme vulnerability and 10 representing no vulnerability.

address the problem of reverse causation outlined in the preceding section and therefore make stronger statements about the impact of public knowledge on climate change policy.

In order to justify the instrumental variable approach, our model needs to satisfy two requirements:

1. **Relevance**: the instrumented variable needs to be correlated with the instruments. In the first stage, we run a regression used in models G and H in Table 1 (pooling the respondents who believe that global warming is caused by human activity). This is used to construct predicted values of knowledge of climate change across countries. Our three instruments explain about 30 per cent of the variation in public understanding of climate change. The relevance requirement is thus satisfied.

2. **Exogeneity**: the causal impact of the instrument on the dependent variable must only be via the instrumented variable (conditional on the other independent variables). The predicted level of climate change knowledge in the first stage cannot be influenced by climate change policies. Hence, we must assume that tertiary education, vulnerability and free media can only affect climate change mitigation policy via public knowledge of climate change. This seems like a reasonable assumption. Governments act under pressure from the concerned electorate and our instruments explain how the electorate obtains its information.

In the second stage, the predicted level of climate change knowledge as well as the remaining potential determinants discussed at the beginning of the section are then used to investigate the causes of cross-country variations in climate change policy. The results of this second stage regression, using CLIMI as the outcome variable, are presented in Table 2.

Table 2: Determinants of climate change mitigation policy - IV specifications

Dependent variable →	**Climate Laws, Institutions and Measures Index**						
Model →	**OLS**	**A**	**B**	**C**	**D**	**E**	**F**
Knowledge of climate change	.833	**3.012*** **	**2.213***	**2.254*** **	**2.082** **	**2.087** **	**2.248** **
Democracy	.173	-	0.218	-0.230	-0.133	-0.0441	-0.156
Carbon-intensive industry size	**-.581***	-	-	**-0.687** **	**-0.730** **	**-0.942*** **	**-0.871*** **
State administrative capacity	.325	-	-	**1.002** **	0.682		0.562
Kyoto Protocol target	**-**	**-2.319** **	**-2.119** **	**-**	**-**	**-2.806*** **	**-2.708** **
CO_2 per capita	**.262***	**0.237***	**0.196***	-	0.0990	**0.223** **	0.139
Total CO_2 emissions	-	-0.0313	0.0168	0.0695	0.0501	0.0414	0.0453
EU	**.478*** **	0.161	**0.630** **	**0.389***	**0.390** **	0.430	0.393

Transition economy	.055	0.315	0.294	**0.494****	**0.371***	0.148	0.307
Other	Vulnerability Income per capita	-	-	-	-	-	-
Number of observations	73	75	71	77	71	71	71
R^2	0.590		0.326	0.411	0.440	0.459	0.434
Instrumented	-	*Knowledge of climate change*					
Instruments	-	*Media Freedom, Level of Education, Vulnerability*					

The OLS specification does not reject the hypothesis that greater knowledge of climate change is associated with more extensive climate change policies. However, all IV specifications show that, ceteris paribus, higher levels of popular knowledge of climate change lead to the adoption of more extensive climate change mitigation policies and measures. This result suggests that reverse causation was indeed a problem and is entirely in line with our political economy hypothesis. This is illustrated graphically in **Error! Reference source not found.** which shows that countries where a larger proportion of the population believe that climate change is anthropogenic tend also to have more ambitious climate policies – and hence to score better on CLIMI.

Figure 3: Correlation between knowledge of anthropogenic climate change and CLIMI

On the other hand, specifications C-F show that the strength of the carbon-intensive industry lobby is a factor holding back climate change policies (see in particular models E and F). This is illustrated in **Error! Reference source not found.**, which plots countries' carbon emissions per tonne of CO_2 against their scores on CLIMI.

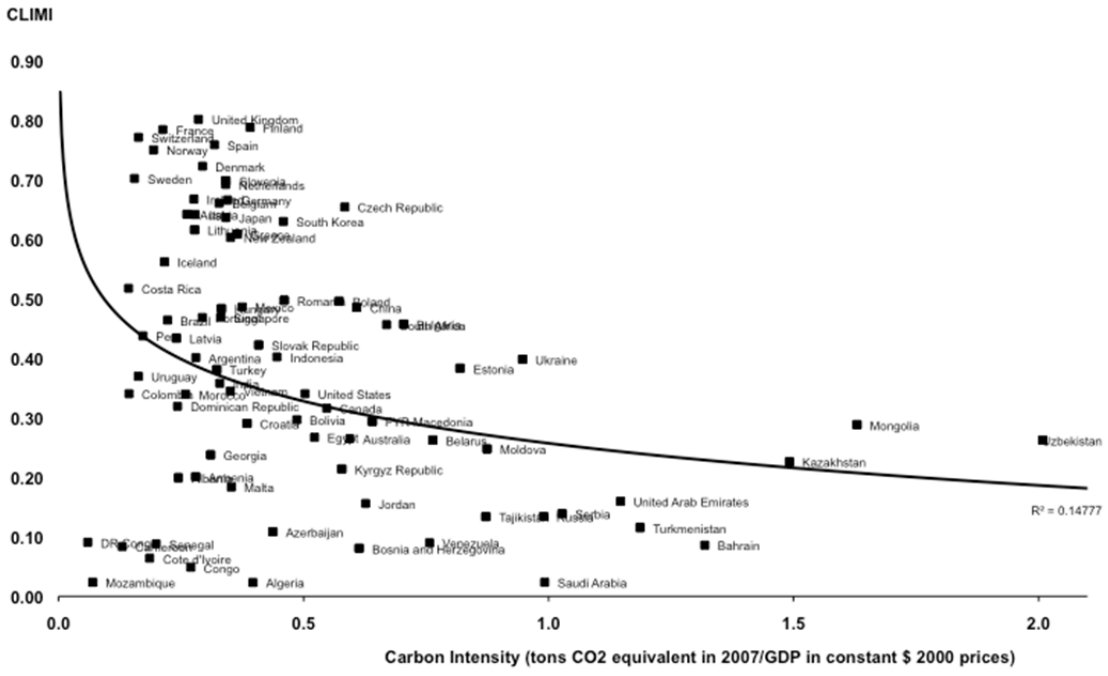

Figure 4: Correlation between carbon intensity and CLIMI

Table 2 also shows that, once knowledge of climate change is taken into account, and controlling for international commitments and CO_2 emissions, democracy and state administrative capacity are not significant predictors of good climate change policies. State administrative capacity is a significant predictor of active climate change policies only when Kyoto commitments and per capita CO_2 emissions are excluded from the regressions. It is perhaps surprising that the level of democracy does not drive the adoption of climate change policies and measures, once we control for the other factors that influence the climate change policy-making process, including popular awareness of climate change. As we argued above, democratic political systems are intended to transmit popular concerns and priorities into the policy-making process. As we argued above, in the area of climate change policy-making concerns and priorities of the electorate may be cutting both ways.

Similarly, models C and D show that EU members are significantly more likely to adopt climate change policies than non-EU members – until Kyoto Protocol commitments are controlled for.[20] Thus, Kyoto targets are of overriding significance for predicting cross-country variation in climate change policies, followed by EU membership and state administrative capacity.[21]

Model F summarises the main robust results from the analysis. Controlling for all other policy-influencing factors, including countries' CO_2 emission-reduction targets under Kyoto, reveals several findings:

- Popular knowledge of climate change is a powerful driver of climate change policy adoption. This is a robust result that holds across all IV specifications we reported above and in Appendix 7.8. This means that even controlling for democratic institutions, the public's concerns about climate change are reflected in climate policy. For every one per cent increase in public knowledge of the anthropogenic causes of climate change, there is a 2.25 per cent increase in countries' score on CLIMI. Thus, for example, if the level of public knowledge of climate change in Ukraine increased to the level seen in Italy, Ukraine's score on CLIMI would increase by 52 per cent – to be on a par with New Zealand.

- The relative size of the carbon-intensive industry is significantly and negatively associated with climate change policy adoption.

[20] The empirical finding that democracy is not a significant determinant of climate change policy adoption is consistent with the theoretical argument by Aumann, Kurz and Neyman (1983) that voting is irrelevant for pure (non-exclusive) public goods when resources are privately owned.

[21] While democracy and state administrative capacity are not significant, we leave them in as control variables to be sure that we are accurately capturing the effects of knowledge, the carbon-intensive industry lobby, per capita emissions and EU membership on climate change mitigation policy.

- There is no clear evidence that state administrative capacity matters: states with low administrative capacity are just as likely to adopt climate change policies as states with high administrative capacity.

- EU member countries tend to adopt more assertive climate policies than non-EU members, although this effect is less robust across specifications than countries' adoption of emission-reduction targets under the Kyoto Protocol. This is not surprising. EU countries share many EU-wide climate policies and targets. In addition, EU bargains as a whole in international negotiations.

- After taking account of these factors, climate change policies in post-communist transition countries do not appear to be different from those in the rest of the world.

While we have identified several drivers of climate change policy, we have not considered how governments could affect them. This is an interesting direction for further policy research. Factors such as level of education, vulnerability to climate change, and media freedom tend to evolve only very slowly over time. Press freedom can change more quickly – for instance, after coups or popular uprisings – but such events are relatively rare.

6 Conclusions and future work

This paper develops a new ranking of climate change mitigation policies and uses a political economy approach to explain why some countries adopt extensive climate change policies and measures while others do not. Our analysis leads to a series of important conclusions.

We found that, ceteris paribus, the level of democracy is not a major driver of climate change policy adoption. This is important as it means that there is no reason to assume that countries with non-democratic regimes are unable to make significant contributions to the global challenge of reducing carbon emissions. Expectations of contribution to global climate stabilisation by a given country need not, therefore, be limited by the nature of its political regime.

We also found that public knowledge of climate change is a powerful determinant of climate change policy adoption: countries in which the public is aware of the causes of climate change are significantly more likely to adopt climate change mitigation policies than countries in which public knowledge is low.

Public knowledge of climate change, in turn, is shaped by a number of key factors, including the threat posed by climate change in a particular country, the national level of education and the existence of free media. Democracy and free media tend to go hand in hand: there are few if any countries with free media but no democracy. Thus, the conclusion that democracy *per se* does not determine climate change policy does not mean that certain key aspects of democracy, such as free media, are not important drivers of policy adoption.

Our analysis found that the relative strength of the carbon-intensive industry is a major deterrent to the adoption of climate change mitigation policies and measures, regardless of the level of democracy or the administrative capacity of the state. In many resource-rich economies, these industries are the largest export earners, the largest employers and the largest contributors to the national tax base. It comes as no surprise, therefore, that these carbon-intensive industries influence governments' approaches to climate change policy. Moreover, carbon-intensive industries are unlikely to be replaced by low-carbon industry in a short enough timescale to make a difference to mitigating global climate change.

There are several avenues for further work. First, CLIMI could benefit from several potential improvements:

- Developing a more granular scale for some measures. For example, emissions reduction targets could be measured as a proportion of the most ambitious target and carbon tax could be measured relative to the average household energy bill.

- Including an implementation quality weight. Since CLIMI only considers adopted policies and measures, it does not take into account how well they are implemented on the ground. Measuring implementation quality would require extensive consultations with country experts.

- Adding government research and development spending. Many governments, such as the United States, commit to high levels of R&D spending rather than to policies that address market failures. This alternative strategy also reflects commitment. However, such data are not currently available for countries outside the OECD region.

- Inclusion of comparative mitigation policies in the waste sector.

It would be important to assess how climate change policies are affecting CO_2 emissions. Policies includes in CLIMI will take time to have a substantial effect on emissions and future work can determine which were most effective. Many seemingly robust climate change policies in developed countries reduce domestic emissions at the expense of imports produced in carbon-intensive economies. Hence, coordination of climate change mitigation policies across different countries (e.g., within the EU) must be taken into account when measuring their effectiveness.

It would also be fruitful to understand what factors influence the *change* in climate change policies over time. The analysis presented in this paper is only a snapshot encompassing many years of institutional change. In order to tackle climate change, countries need to develop policies and build institutions that commit them to emission reductions over several generations.

7 Appendix

7.1 CLIMI results

Rank	Country	CLIMI	Rank	Country	CLIMI
1	United Kingdom	0.801	49	Canada	0.316
2	Finland	0.787	50	Bolivia	0.296
3	France	0.783	51	FYR Macedonia	0.293
4	Switzerland	0.77	52	Croatia	0.29
5	Spain	0.758	53	Mongolia	0.288
6	Norway	0.749	54	Egypt	0.267
7	Denmark	0.722	55	Australia	0.265
8	Sweden	0.701	56	Belarus	0.262
9	Slovenia	0.698	56	Uzbekistan	0.262
10	Netherlands	0.691	58	Moldova	0.247
11	Ireland	0.667	59	Georgia	0.238
12	Germany	0.665	60	Fiji	0.233
13	Belgium	0.66	61	Kazakhstan	0.226
14	Czech Republic	0.653	62	Kyrgyz Republic	0.214
15	Austria	0.641	63	Armenia	0.201
15	Italy	0.641	64	Albania	0.199
17	Japan	0.636	65	Malta	0.183
18	South Korea	0.629	66	Rwanda	0.182
19	Lithuania	0.615	67	United Arab Emirates	0.159
20	Greece	0.608	68	Jordan	0.156
21	New Zealand	0.602	69	Sao Tome and Principe	0.143
22	Iceland	0.561	70	Samoa	0.142
23	Costa Rica	0.517	71	Serbia	0.139
24	Romania	0.497	72	Russia	0.134
25	Poland	0.496	72	Tajikistan	0.134
26	Mexico	0.486	74	Montenegro	0.133
27	China	0.485	75	Turkmenistan	0.115
28	Hungary	0.483	76	Azerbaijan	0.108
29	Singapore	0.468	77	DR Congo	0.091
29	Portugal	0.468	78	Venezuela	0.09
31	Brazil	0.464	79	Senegal	0.088
32	Bulgaria	0.457	80	Guinea Bissau	0.087
33	South Africa	0.456	81	Bahrain	0.086
34	Peru	0.437	82	Cameroon	0.084
35	Latvia	0.433	83	Bosnia and Herzegovina	0.081
36	Slovak Republic	0.422	84	Mauritania	0.071
37	Indonesia	0.402	85	Cote d'Ivoire	0.064
38	Argentina	0.401	86	Congo	0.049
39	Ukraine	0.398	87	Burundi	0.037
40	Estonia	0.383	88	Madagascar	0.029
41	Turkey	0.381	89	Niger	0.025
42	Uruguay	0.369	90	Mozambique	0.023
43	India	0.358	90	Saudi Arabia	0.023
44	Vietnam	0.345	90	Algeria	0.023
45	Colombia	0.34	93	Suriname	0.016
45	United States	0.34	93	Sierra Leone	0.016
47	Morocco	0.339	95	Tonga	0.011
48	Dominican Republic	0.319			

7.2 Countries included in CLIMI

Annex I countries	Non-Annex I countries with NCs after 2005	Non-Annex I countries with NCs before 2005
Australia	Albania	Azerbaijan
Austria	Algeria	China
Belarus[22]	Argentina	India
Belgium	Armenia	Korea
Bulgaria	Bahrain	South Africa
Canada	Bolivia	Turkey[23]
Croatia	Bosnia and Herzegovina	
Czech Republic	Brazil	
Denmark	Burundi	
Estonia	Cameroon	
Finland	Colombia	
France	Congo Brazzaville	
Germany	Congo Kinshasa	
Greece	Costa Rica	
Hungary	Cote d'Ivoire	
Iceland	Dominican Republic	
Ireland	Egypt	
Italy	Fiji	
Japan	FYR Macedonia	
Latvia	Georgia	
Lithuania	Guinea Bissau	
Netherlands	Indonesia	
New Zealand	Israel	
Norway	Jordan	
Poland	Kazakhstan[24]	
Portugal	Kyrgyzstan	
Romania	Madagascar	
Russia	Malta	
Slovak Republic	Mauritania	
Slovenia	Mexico	
Spain	Moldova	
Sweden	Mongolia	
Switzerland	Montenegro	
Ukraine	Morocco	
United Kingdom	Mozambique	
United States	Niger	
	Peru	
	Rwanda	
	Samoa	
	Sao Tome and Principe	
	Saudi Arabia	
	Senegal	
	Serbia	
	Sierra Leone	
	Singapore	
	Suriname	
	Syria	
	Tajikistan	
	Tonga	
	Turkmenistan	
	United Arab Emirates	
	Uruguay	
	Uzbekistan	
	Venezuela	
	Vietnam	

[22] Although listed in the Convention's Annex I, Belarus is not included in the Protocol's Annex B as it was not a Party to the Convention when the Protocol was adopted (UNFCCC)

[23] Although listed in the Convention's Annex I, Turkey is not included in the Protocol's Annex B as it was not a Party to the Convention when the Protocol was adopted (UNFCCC)

[24] Upon entry into force, Kazakhstan, which has declared that it wishes to be bound by the commitments of Annex I Parties under the Convention, will become an Annex I Party under the Protocol. As it had not made this declaration when the Protocol was adopted, Kazakhstan does not have an emissions target listed for it in Annex B. (UNFCCC)

7.3 Structure of CLIMI

Policy or institutional variable name	Scoring range	Explanation, comments, examples and counter-examples	References
Kyoto ratification	Linear from 0 (not ratified) to 1 (earliest ratification: Fiji)	Countries, which ratified Kyoto earlier, are more committed to international cooperation in climate change.	Similar approach is taken in Bättig et al. (2008) and Bättig and Bernauer (2009)
JI or CDM domestic projects existence	None (0), existence (1) (even if no CERs have been issued yet)	Countries, which have approved and developed JI or CDM projects domestically and have submitted information about them to the UNFCCC, have developed an adequate institutional framework to implement flexible mechanisms. Countries, which only use their funds to finance projects abroad, do not necessarily exhibit this institutional framework.	This is a part of the ISE in EBRD (2008)
Existence of national climate change policy or law	None (0), Policy (0.5), Law (1)	A clearly formulated, extensive, cross-sectoral policy adopted by the government shows understanding and commitment to domestic mitigation. A law passed by the legislative branch, which creates a legally binding framework for mitigation is the strongest expression of such commitment. Appropriate amendments to existing sectoral laws score on par with separate legislation.	This is a part of the ISE in EBRD (2008)
National, ambitious target for the post-Kyoto period	None (0), NAMAs (0.5), a national target (including, QEWET) (1)	Any ambitious medium term, post-Kyoto emissions reduction target in domestic policies or in communications to the UNFCCC by Annex I countries gets 1. EU countries, which are allowed an emissions increase under EU burden sharing, but have not set their own reduction targets get 0. Annex I countries, which are expected to reach the targets they had set themselves due to the collapse of their economies during the transition period get 0. Non-annex I countries, which mention explicit targets from BAU in their NAMAs get 0.5.	Targets are included in AccountAbility (2010)

Dedicated climate change institution	None (0), government committee (0.5), autonomous agency (1)	Any sufficiently representative (ought to include scientists and/or professional and/or civil society) inter-ministerial commission, working group or committee dedicated to reviewing and drafting climate change policy gets 0.5. A small department on climate change in another ministry gets 0.5. A ministry with a core mandate for climate change or a dedicated, professionally staffed, independent agency gets 1. NGOs and ad-hoc working groups get no merit.	This is a part of the Index of Sustainable Energy in EBRD (2008)
Energy supply/renewable energy sources/energy efficiency	No policy (0), a set of policies promoting renewable energy or energy efficiency (0.5), a comprehensive law or policy with targets in renewable source in electricity production or energy efficiency and effective implementation and enforcement instruments (1)	A comprehensive set of fiscal/regulatory policies such as feed-in tariffs, green certificates, minimum RES requirements, tax breaks etc., or a clearly-defined energy efficiency strategy gets 0.5; a law or policy with medium-term targets for renewable energy in electricity (or overall consumption) or energy intensity reduction targets and a comprehensive set of secondary regulations gets 1.	See Bättig et al. (2008) and Bättig and Bernauer (2009). For weights see EBRD (2008)
Transport	None (0), support for mass/public transport and renewable energy in transport (0.5), emission regulation (1)	A comprehensive set of policies which address transport emissions (simply promoting public transport is necessary but not sufficient), such as tax break for low emission vehicles or high fuel economy standard or a commitment to biofuels gets 0.5; emissions standards for new cars or emissions targets for the fleet with effective implementation and enforcement instruments get 1. (Emission standards for new cars do not automatically give countries, which do not produce cars, 1)	For past analysis, see An and Sauer (2004) and for a review of instruments see Santos et al. (2010a) and Santos et a.

			(2010b). See also Burck et al. (2012). For weights see IPCC (2007).
Buildings	None (0), energy efficiency in buildings or residential renewable energy use (0.5), building insulation/renovation targets (1)	A comprehensive policy that addresses energy loss of buildings gets 0.5. Effective implementation and enforcement instruments and targets for refurbishing the current housing stock in order to improve energy efficiency, or tight regulation of energy consumption requirements in new or large buildings, or targets for near-zero energy buildings get 1.	See also Burck et al. (2012). For weights see IPCC (2007).
Agriculture	None (0), sectoral fiscal or regulatory policies aimed at carbon dioxide/methane / NO_x reduction or methane capture (0.5), targets for efficiency and organic farming (1)	Any policy that regulates emissions, in particular methane, from livestock and land-use management, gets 0.5. Targets for farm conversion to encourage farming with reduced emissions with effective implementation and enforcement instruments get 1.	See also Burck et al. (2012). For weights see IPCC (2007).
Forestry	None (0), reforestation/afforestation fiscal mechanisms get 0.5, REDD or	Strict and enforced regulations on logging, such as deforestation bans or only cutting down a proportion of annual surplus or REDD or *very* large reforestation programmes get 1. Tax incentives, reforestation programmes or extension of forest management coverage or tradable certificates get 0.5. General forest conservation policy gets	For weights see IPCC (2007).

	national reforestation/afforestation targets	0.	
Industry	None (0), comprehensive/sectoral GHG regulatory policy (with targets and effective implementation and enforcement instruments) (0.5), carbon emission regulation across industry, such as EU ETS (1)	EU ETS also covers the energy sector and will soon include aviation, so all the countries which are in EU ETS get 1. No credit for regulating gases, which are already regulated outside the UNFCCC. In order to score 0.5, need to show a regulatory framework for the reduction of main GHG gases, such as carbon dioxide or methane, even if only particular high-emitting sectors (such as cement or steel) are covered.	For weights see IPCC (2007). Also see Chapter 14 in Stern (2007) for emissions trading.
Additional cross-sectoral measures	None (0), regional cross-sectoral policy (0.5), national existence (1)	Any additional, extensive cross-sectoral emission reducing policy beyond the sectoral policies already noted, such as a carbon tax or a white certificates system, gets merit. Carbon tax is a tax on emissions from fuels. This cross-sectoral tax must be above and beyond existing sectoral taxes, such as petrol duties. The tax must create incentives for almost all energy consumers (such as households) to reduce the consumption of fossil fuels (e.g. by improving insulation in dwellings). White certificates system allows energy consumers to receive tradable certificates for example, for improvements in energy efficiency of buildings, get 1. Extensive cross-sectoral regional policy, which is common in federations, can get up to 0.5.	For economic arguments, see Chapter 14 in Stern (2007).

7.4 CLIMI weights

Policy area	Policy area weight	Variable	Score	Sub weight
International cooperation	0.10	Kyoto ratification	0 to 1	0.50
		JI or CDM	0/1	0.50
Domestic institutions and national climate change mitigation framework	0.40	Cross sectoral climate change legislation	0/0.5/1	0.33
		Carbon emissions target	0/0.5/1	0.33
		Dedicated climate change institution	0/0.5/1	0.33
Significant sectoral fiscal or regulatory measures or targets	0.40	Energy supply and renewable energy	0/0.5/1	0.30
		Transport	0/0.5/1	0.13
		Buildings	0/0.5/1	0.07
		Agriculture	0/0.5/1	0.13
		Forestry	0/0.5/1	0.17
		Industry	0/0.5/1	0.2
Additional cross-sectoral fiscal or regulatory measures	0.10	Cross-sectoral policy measures	0/0.5/1	1.0

7.5 Sensitivity analysis

This section explains that although sectoral and policy weights were chosen somewhat arbitrarily, they do not fundamentally affect the country ranking according to the CLIMI.

We repeated the following Monte Carlo simulations (see Schwab, 2010, p. 12) 1000 times:

1) Generate 12 pseudo-random weights, which add to 1.
2) Apply these weights to the country scores.
3) Calculate CLIMI
4) Rank the countries

We then calculated the average rank and standard deviation of the rank of the countries. The results are reported in Table 3. The correlation between the mean CLIMI rank is 0.98 and is significant at over 0.01% level of significance.
We also checked whether CLIMI is sensitive to:

a) Using country-level sectoral weights: we weighted each sector according to its emission contribution using UNFCCC data.
b) Excluding the Kyoto measure
c) Excluding the JI/CDM measure
d) Combinations of a), b) and c).

Empirical results were unaffected across all sensitivity specifications.

Table 3: CLIMI sensitivity analysis

Country	CLIMI	Mean Simulated Rank	Standard deviation of simulated rank	CLIMI rank	Rank of mean simulated rank
France	0.7831666	12.636	12.2027	3	1
Finland	0.7871667	14.796	13.0093	2	2
Switzerland	0.7701667	14.88	12.4647	4	3
Spain	0.7578334	16.265	14.3596	5	4
Slovenia	0.6975	17.765	16.0028	9	5
Norway	0.7491667	17.855	15.9188	6	6
Lithuania	0.6153333	18.685	16.6408	19	7
Netherlands	0.6911666	19.188	12.5136	10	8
Germany	0.6651667	20.604	16.6217	12	9
Ireland	0.6665	21.481	19.864	11	10
United Kingdom	0.8005	21.744	19.8786	1	11
Czech Republic	0.6531667	23.09	16.1949	14	12
Sweden	0.7011667	23.448	19.162	8	13
Austria	0.6411667	23.819	16.5801	15	14
Italy	0.6405	23.955	19.1053	16	15
Denmark	0.7218333	24.479	19.6389	7	16
Korea	0.6291667	25.024	19.4164	18	17
New Zealand	0.602	26.572	21.1068	21	18
Japan	0.6358333	27.069	21.177	17	19
Belgium	0.6598333	27.082	19.4259	13	20
China	0.4848333	29.112	21.0354	27	21
Romania	0.4968333	29.63	16.8775	24	22
Poland	0.4953333	29.921	20.4234	25	23
Greece	0.6078333	31.905	20.0826	20	24
Hungary	0.4828333	32.76	19.8418	28	25
Mexico	0.4855	33.064	16.9546	26	26
Singapore	0.468	34.308	20.7226	29	27
Bulgaria	0.4568333	34.839	19.0977	32	28
Portugal	0.4678333	34.918	19.2355	30	29

Estonia	0.383	35.548	21.6994	40	30
Slovak Republic	0.4218333	37.258	20.5341	36	31
Brazil	0.4635	37.406	17.5884	31	32
South Africa	0.456	37.645	20.517	33	33
Iceland	0.5611666	38.609	21.0014	22	34
Latvia	0.4333333	39.238	21.2036	35	35
Costa Rica	0.5168333	39.275	23.2902	23	36
Argentina	0.4008333	40.815	19.8696	38	37
Turkey	0.3803333	41.102	20.8611	41	38
Peru	0.437	41.564	22.074	34	39
Ukraine	0.3978333	42.855	22.2923	39	40
Indonesia	0.402	43.142	18.6819	37	41
India	0.3575	43.426	17.7806	43	42
Colombia	0.3398333	43.824	18.4792	46	43
Dominican Republic	0.3188333	44.133	18.5374	48	44
Uruguay	0.3693333	44.439	20.9724	42	45
Vietnam	0.3443333	45.442	20.7096	44	46
Uzbekistan	0.2621667	46.01	20.0004	57	47
Canada	0.3153333	46.951	15.0496	49	48
Bolivia	0.2963333	47.256	22.8105	50	49
Morocco	0.3393333	47.797	23.1387	47	50
United States	0.34	48.655	19.0301	45	51
FYR Macedonia	0.2933333	48.837	18.6778	51	52
Moldova	0.2476667	49.065	18.6902	58	53
Georgia	0.2376667	49.342	20.8565	59	54
Mongolia	0.2883333	49.866	21.681	53	55
Croatia	0.2901667	50.189	17.9843	52	56
Belarus	0.2623333	52.846	15.9657	56	57
Egypt	0.2668333	54.49	19.3636	54	58
Jordan	0.156	56.038	20.7747	68	59
Kyrgyzstan	0.2138333	56.117	20.894	62	60
Fiji	0.2333333	56.992	25.4624	60	61
Rwanda	0.1821667	57.026	20.381	66	62
United Arab Emirates	0.1595	57.436	20.0786	67	63
Albania	0.1991667	57.506	18.8045	64	64
Armenia	0.201	57.798	24.0438	63	65
Malta	0.1831667	60.845	21.5859	65	66
Kazakhstan	0.2256667	60.923	19.5841	61	67
Australia	0.2643333	61.544	22.3323	55	68
Russia	0.134	63.226	20.7136	72	69
Samoa	0.1416667	63.353	19.0167	70	70
Senegal	0.088	67.055	22.1888	79	71
Cameroon	0.0835	67.192	22.1537	82	72
Turkmenistan	0.1151667	67.224	21.9503	75	73
Azerbaijan	0.1081667	67.65	20.7293	76	74
Congo Kinshasa	0.0905	68.522	20.9979	77	75
Mauritania	0.0715	68.581	20.5439	84	76
Sao Tome and Principe	0.1433333	68.819	15.7264	69	77
Tajikistan	0.1336667	69.083	15.6555	73	78
Serbia	0.1386667	69.35	15.2061	71	79
Cote d'Ivoire	0.064	70.886	19.96	85	80
Montenegro	0.1335	71.053	19.8794	74	81
Venezuela	0.0896667	72.461	16.3276	78	82
Guinea Bissau	0.0866667	72.851	15.6482	80	83
Congo Brazzaville	0.0485	73.599	14.8122	86	84
Bahrain	0.0856667	73.872	15.1022	81	85
Bosnia and Herzegovina	0.0806667	74.547	14.9357	83	86
Burundi	0.037	77.617	17.8718	87	87
Madagascar	0.029	79.461	16.2195	88	88
Niger	0.025	80.48	15.1648	89	89
Saudi Arabia	0.0235	80.602	14.3013	91	90
Mozambique	0.0235	81.091	14.1113	90	91
Algeria	0.023	81.574	13.5308	92	92
Suriname	0.0165	82.723	12.2713	93	93
Sierra Leone	0.0155	82.871	12.3851	94	94
Tonga	0.011	84.113	11.0805	95	95

7.6 Acronyms

The following acronyms are used in this paper:

CCPI	Climate Change Policy Index (GermanWatch)
CDM	Clean Development Mechanism
EBRD	European Bank for Reconstruction and Development
GHG	Greenhouse gases
IDR	In-Depth Review
IEA	International Energy Agency
ISE	Index of Sustainable Energy
JI	Joint Implementation
NAMA	Nationally Appropriate Mitigation Actions
QEWET	Quantified economy-wide emissions targets for 2020
REDD	Reducing Emissions from Deforestation and Degradation
RES	Renewable energy sources
UNFCCC	United National Framework Convention on Climate Change

7.7 Additional sources for CLIMI

- Austrian Energy Agency: Energy in Eastern and Central Europe (http://www.enercee.net/)
- Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Legal sources on renewable energy (http://www.res-legal.eu/)
- Climatico Policy Monitor Baseline Report 2010 (edited by Paige Andrews and Marie Karaisl)
- Deutsche Bank Climate Change Advisors Global Climate Change Policy Tracker (March 2010)
- IEA Climate Change Database (http://www.iea.org/textbase/pm/index.html)
- National Communications to the UNFCCC
- National legislation, passed laws and official policies
- Official EU documents, such as EU Directives
- Official UNFCCC publications, such as IDRs
- Other national communications to the UN, such as the *note verbale* on the Copenhagen Accord
- Renewable Energy and Energy Efficiency Partnership: Policy and Regulation Review (http://www.reeep.org/9353/policy-database.htm)
- UNFCCC Climate Action Tracker (http://climateactiontracker.org/)

7.8 Alternative regression specifications

Here we present some alternative regression (OLS and IV) specifications to convince the reader of the robustness of our empirical results and conclusions.

Specification 1

Include:

- CO_2/capita
- GNI/capita
- Vulnerability

Dependent variable →	**Climate Laws, Institutions and Measures Index**				
Specification →	**A**	**B**	**C**	**D**	**E**
CO_2 per capita	-.091	-.076	.055	.202	**.262***
Income per capita	**.616*****	**.546*****	**.392****	.133	-.018
Vulnerability	-.353	**-.644***	**-.557***	-.512	-.334
Transition economy		.130	.000	-.042	.055
EU		**.575*****	**.483*****	**.447*****	**.478*****
Dirty industry size			**-.592****	-.454	**-.581***
Democracy				.353	.173
State administrative capacity				.188	.325
Knowledge of climate change					.833
Number of observations	81	81	81	77	73
R^2	.37	.44	.49	.56	.59

Dependent variable →	**Climate Laws, Institutions and Measures Index**					
Specification →	**1**			**2**		
Model →	**A**	**B**	**C**	**D**	**E**	**F**
Knowledge of climate change	**2.42****	**2.40*****	**2.57****	**2.43*****	**2.24*****	**2.33*****
CO_2 per capita	.112	.311	.323	.112	.293	.311
Income per capita	.181	-.056	-.358	.181	-.007	-.286
Vulnerability	-.000	.158	.187			
Transition economy	.397	.158	.293	.397	.167	.279
EU	**.565****	.386	.374	**.565****	**.411****	**.415***
Dirty industry size		**-.861*****	**-.803****		**-.830*****	**-.761****
Democracy			-.137			-.096
State administrative capacity			1.03			.919
Number of observations	74	74	70	74	74	70
R^2	.18	.29	.43	.18	.32	.47
Instrumented	Knowledge of climate change			Knowledge of climate change		
Instruments	Media Freedom, Level of Education			Media Freedom, Level of Education, Vulnerability		

Specification 2

Exclude at most one of:

- CO_2/capita
- GNI/capita
- Vulnerability

Dependent variable →	**Climate Laws, Institutions and Measures Index**			
Specification →	**1**	**2**	**3**	**4**
Knowledge of climate change	**.833****	**.826*****	**.929*****	**1.01*****
Transition economy	.055	.060	.014	**.413****
Dirty industry size	**-.581***	**-.578****	**-.617***	-.225
State administrative capacity	.325	.308	.401	**.257**
Democracy	.173	.171	.168	.040
EU	**.478*****	**.478*****	**.406*****	**.441*****
Income per capita	-.018		-.108	.420***
Vulnerability	-.334	-.345		-.312
CO_2 per capita	**.262***	**.253****	**.275***	
Number of observations	73	74	73	79
R^2	.59	.60	.58	.61

Dependent variable →	**Climate Laws, Institutions and Measures Index**			
Specification →	**1**	**2**	**3**	**4**
Knowledge of climate change	**2.57****	**2.17****	1.95	**4.45*****
Transition economy	.292	.337	.208	**.875*****
Dirty industry size	**-.803****	**-.724****	**-.716****	**-.790****
State administrative capacity	1.03	.643	.799	**1.56****
Democracy	-.137	-.132	-.013	-.633
EU	.374	.380	.416	.160
Income per capita	.358		.250	-.142
Vulnerability	.187	-.077		.892
CO_2 per capita	.322	.168	**.304***	
Number of observations	70	71	70	76
R^2	.43	.48	.58	.15
Instrumented	Knowledge of climate change			
Instruments	Media Freedom, Level of Education			

Specification 3

Include:

- GNI/capita
- Vulnerability

Dependent variable →	**Climate Laws, Institutions and Measures Index**						
Model →	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Income per capita	**.593*** **	**.610*** **	**.507*** **	.216	.144	.133	-.018
Vulnerability	-.235	-.325	-.393	-.330	-.301	.512	-.334
Transition economy		.208	.049	.131	.019	-.042	.055
Dirty industry size			**-.702** **	.488	**-.493***	-.454	**-.581***
CO_2 per capita			.009	.050	.177	.202	**.262***
State administrative capacity				**.914** **	.429	.188	.325
Democracy					.383	.353	.173
EU						**.447*** **	**.478*** **
Knowledge of climate change							**.833** **
Number of observations	94	94	81	81	77	77	73
R^2	.44	.44	.45	.48	.52	.56	.59

Dependent variable →	**Climate Laws, Institutions and Measures Index**					
Model →	**A**	**B**	**C**	**D**	**E**	**F**
Knowledge of climate change	**5.67*** **	**3.19*** **	**2.54*** **	**2.90*** **	**2.77** **	**2.57** **
Vulnerability	**1.70***	.552	.324	.504	.407	.187
Income per capita	-.043	**.299** **	.011	-.468	-.382	.358
Transition economy		**.551** **	.181	.373	.356	.292
Dirty industry size			**-.984*** **	**-.646***	**-.878** **	**-.803** **
CO_2 per capita			.290	3.28	.299	.322
State administrative capacity				**1.60** **	**1.37** **	1.03
Democracy					-.172	-.137
EU						.374
Number of observations	80	80	74	74	70	70
R^2	.	.19	.23	.22	.37	.43
Instrumented	Knowledge of climate change					
Instruments	Media Freedom, Level of Education					

Specification 4

Include:

- Vulnerability
- CO_2/capita

Exclude:

- GNI/capita

Dependent variable →	**Climate Laws, Institutions and Measures Index**						
Model →	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Vulnerability	**1.14*** **	**1.14*** **	-.043	-.222	-.224	-.445	-.345
Transition economy		.003	**-.267***	.080	-.026	-.085	.060
Dirty industry size			**-1.01*** **	**-.533***	**-.506***	**-.463***	**-.578****
CO_2 per capita			**.347*** **	.143	**.248****	**.268****	**.253****
State administrative capacity				**1.18*** **	.560	.307	.308
Democracy					**.420***	.382	.171
EU						**.454*** **	**.478*** **
Knowledge of climate change							**.826*** **
Number of observations	95	95	82	82	78	78	74
R^2	.15	.15	.38	.47	.52	.55	.60

Dependent variable →	**Climate Laws, Institutions and Measures Index**					
Model →	**A**	**B**	**C**	**D**	**E**	**F**
Knowledge of climate change	**5.22*** **	**4.60*** **	**2.59*** **	**2.35*** **	**2.35****	**2.17****
Vulnerability	**1.60*** **	**1.41*** **	.340	.163	.129	-.077
Transition economy		**.605****	.176	**.423****	**.407***	.337
Dirty industry size			**-.959*** **	**-.560***	**-.798****	**-.724****
CO_2 per capita			**.305*** **	.123	.132	.168
State administrative capacity				**1.07****	.958*	.643
Democracy					-.164	-.132
EU						.380
Number of observations	81	81	75	75	71	71
R^2	.	.	.22	.33	.43	.48
Instrumented	Knowledge of climate change					
Instruments	Media Freedom, Level of Education					

Specification 5

Exclude at most one of:

- CO_2/capita
- Vulnerability

Dependent variable →	**Climate Laws, Institutions and Measures Index**	
Model →	**A**	**B**
Transition economy	.014	**.413****
Dirty industry size	**-.617***	-.225
Vulnerability		-.312
CO_2 per capita	**.275***	
State administrative capacity	.401	**.257**
Democracy	.168	.040
EU	**.406*****	**.441*****
Knowledge of climate change	**.929*****	**1.01*****
Income per capita	-.108	.420***
Number of observations	73	79
R^2	.58	.61

Dependent variable →	**Climate Laws, Institutions and Measures Index**	
Model →	**A**	**B**
Knowledge of climate change	1.95	4.45***
Transition economy	.208	.875***
Vulnerability		.892
Dirty industry size	**-.716****	-.790**
CO_2 per capita	**.304***	
State administrative capacity	.799	1.56**
Democracy	-.013	-.633
EU	.416	.160
Income per capita	.250	-.142
Number of observations	70	76
R^2	.58	.15
Instrumented	Knowledge of climate change	
Instruments	Media Freedom, Level of Education	

References

1. Accountability (2010), *The Climate Competitiveness Index 2010: National Progress in the low-carbon economy*. Technical Report.
2. An, F. and A. Sauer (2004), *Comparison of Passenger Vehicle Fuel Economy and GHG Emission Standards Around the World*, Pew Center on Global Climate Change.
3. Andonova, L. B. (2008), "The climate regime and domestic politics: the case of Russia", *Cambridge Review of International Affairs*, Vol. 21(4), pp. 483-504.
4. Aumann, R. J., Kurz, M. and A. Neyman (1983), "Voting for public goods", *Review of Economic Studies*, 50, pp. 677-693.
5. Bagnoli, M. and B. L. Lipman (1989), "Provision of public goods: fully implementing the core through private contributions", *Review of Economic Studies*, Vol. 56(4), pp. 583-601.
6. Barr, R., Fankhauser, S., and K. Hamilton (February, 2010), "The allocation of adaptation funding", *Policy Paper*, *Centre for Climate Change Economics and Policy* and *Grantham Research Institute on Climate Change and the Environment*, London.
7. Bättig, M. B. and T. Bernauer (2009), "National Institutions and Global Public Goods: Are Democracies More Cooperative in Climate Change Policy?" *International Organisation*, Vol. 63(2), pp. 281-308.
8. Bättig, M. B., Brander, S., and D. M. Imboden (2008), "Measuring countries' cooperation within the international climate change regime", *Environmental Science and Policy*, Vol. 11(6), pp. 478-489.
9. Bättig, M. B., Wild, M., and D. M. Imboden (2007), "A climate change index: Where climate change may be most prominent in the 21st century", *Geophysical Research Letters*, Vol. 34 (L01705), doi:10.1029/2006GL028159.
10. Becker, G. (1983), "A theory of competition among pressure groups for political influence", *Quarterly Journal of Economics*, Vol. 98(3), pp. 371-400.
11. Bergstrom, T. and L. Blume, and H. Varian (1986), "On the private provision of public goods", *Journal of Public Economics*, Vol. 29(1), pp. 25-49.
12. Botcheva, L. (1996), "Focus and effectiveness of environmental activism in Eastern Europe: a comparative study of environmental movements in Bulgaria, Hungary, Slovakia, and Romania", *Journal of Environment and Development*, Vol. 5(3), pp. 292-308.
13. Burck, J., Hermwille, L., and L. Krings (2012) *The Climate Change Performance Index 2013*, Germanwatch and CAN Europe, available via http://germanwatch.org/en/CCPI
14. Charap S. and G. Safonov (2010), "Climate change and role of energy efficiency", in *Russia after the Global Economic Crisis* (eds. A. Åslund, S. Guriev and A. Kuchins) pp. 125-150, Peterson Institute for International Economics, Washington, D.C.
15. Dolsak, N. (2009), "Climate change policy implementation: a cross-sectional analysis", *Review of Policy Research*, Vol. 26(5), pp. 551-570.
16. EBRD (2011), "Political Economy of Climate Change Policy in the Transition Region" (2011) in Chirmiciu A. and S. Fankhauser (eds.) *The Low Carbon Transition*, Chapter 4, EBRD: London.

17. EBRD (April, 2008), *Securing sustainable energy in transition economies*, Brochure 7277, European Bank for Reconstruction and Development, London.
18. Emerson, J., Esty, D. C., Kim, C., Srebotnjak, T., Levy, M. A., Mara, V., de Sherbinin, A., and M. Jaiteh, (2010), *Environmental Performance Index 2010*, Yale Center for Environmental Law & Policy, Yale University and Center for International Earth Science Information Network, Columbia University.
19. Giddens, A. (2009), *Politics of Climate Change*, Polity, London.
20. Grossman, G. N. and E. Helpman (1994), "Protection for sale", *American Economic Review*, Vol. 84(4), pp. 833-850.
21. Guardian (2009), "How do I know China wrecked the Copenhagen deal? I was in the room", 22 December 2009, accessible via http://www.guardian.co.uk/environment/2009/dec/22/copenhagen-climate-change-mark-lynas
22. Hansen J., Sato, M., Glascoe, J., and R. Ruedy (1998), "A common-sense climate index: Is climate changing noticeably?" *Proceedings of the National Academy of Sciences (Geophysics)*, Vol. 95, pp. 4113–4120
23. Helm, D. (2008), "Climate-change policy: why has so little been achieved?", *Oxford Review of Economic Policy,* Vol. 24(2), pp. 211-238.
24. Helm, D. and C. Hepburn (2009), *The Economics and Politics of Climate Change*, Oxford University Press, Oxford.
25. Holland, S. P., Hughes, J. E., Knittel, C. R. and N. C. Parker (2011), "Some Inconvenient Truths About Climate Change Policy: The Distributional Impacts of Transportation Policies", Working Paper No. 17386, NBER.
26. Hovi, J., Sprinz, D. F. and A. Underdal (2009), "Implementing long-term climate policy: time inconsistency, domestic politics, international anarchy", *Global Environmental Politics*, Vol. 9(3), pp. 20-39.
27. Kahn, M. E. and J. G. Matsuaka (1995), "Demand for Environmental Goods: Evidence from Voting Patterns on California Initiatives", *Journal of Law and Economics*, Vol. 40, pp. 137-173.
28. IGBP (2009), *IGBP Climate-Change Index*, International Geosphere-Biosphere Programme, Royal Swedish Academy of Sciences.
29. Inglehart, R. (1977), *The Silent Revolution: Changing Values and Political Styles among Western Publics*, Princeton University Press, New Jersey.
30. IPCC (2007), Climate Change 2007: Synthesis Report, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Pachauri, R.K and A. Reisinger, A. (eds.). *Intergovernmental Panel on Climate Change*, Geneva.
31. Kroll, S. and J. F. Shogren (2008), "Domestic politics and climate change: international public goods in two-level games," *Cambridge Review of International Affairs*, Vol. 21(4), pp. 563-583.
32. New York Times (2010), "A Scientist, His Work and a Climate Reckoning", 22 December 2010, accessible via http://www.nytimes.com/2010/12/22/science/earth/22carbon.html?page wanted=all
33. O'Donoghue, T. and M. Rabin (1999), "Doing it now or later", *American Economic Review*, Vol. 89(1), pp. 103-124.
34. Olson, M. (1965), *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press, Cambridge, MA.

35. *On Its Eighth Session, Held At New Delhi From 23 October To 1 November 2002*, United Nations, FCCC/CP/2002/7/Add.2.
36. Putnam, R. D. (1988), "Diplomacy and domestic politics: the logic of two-level games", *International Organization*, Vol. 42(3), pp. 427-460.
37. Santos, G., Behrendt, H. and A. Teytelboym (2010) "Part II: Policy instruments for sustainable road transport", *Research in Transportation Economics*, Vol. 28(1), pp. 46-91.
38. Santos, G., Behrendt, H., Maconi, L., Shirvani, T. and A. Teytelboym (2010) "Part I: Externalities and economic policies in road transport", *Research in Transportation Economics*, Vol. 28(1), pp. 2-45.
39. Schwab, K. (2010) *The Global Competitiveness Report 2010-2011*, World Economic Forum, Geneva, Switzerland.
40. Snyder, J. and K. Ballentine (1996), "Nationalism and the marketplace of ideas", *International Security*, Vol. 21(2), pp. 5-40.
41. Stern, N. (2007), *The economics of climate change: the Stern review*, HM Treasury, London.
42. Stern, N. (2009), *Blueprint for a safer planet: How to Manage Climate Change and Create a New Era of Progress and Prosperity*, Bodley Head.
43. Tsebelis, G. (2002), *Veto Players: How Political Institutions Work*, Princeton University Press, Princeton, NJ.
44. UNFCCC (1992), *United Nations Framework Convention On Climate Change*, United Nations, FCCC/INFORMAL/84.
45. UNFCCC (1998), *Kyoto Protocol To The United Nations Framework Convention On Climate Change*, United Nations.
46. UNFCCC (2000), *Report Of The Conference Of The Parties*
47. UNFCCC (2003), *Review Of The Implementation Of Commitments And Of Other Provisions Of The Convention*, United Nations, FCCC/CP/1999/7.
48. World Bank (June, 2009) *Adapting to Climate Change in Europe and Central Asia*, World Bank Report, available via http://go.worldbank.org/7OOC1E7AU0.

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