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The political economy of passing climate change legislation: Evidence from a survey

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Abstract

Climate change is now a major aspect of public policy. There are almost 500 identified climate change laws in the world's leading economies. This paper reviews the main domestic factors that drive this legislation. The analysis is based on a unique dataset of climate legislation in 66 national jurisdictions for the period 1990-2013. We find that the passage of new climate laws is influenced by several factors. One important factor is the quantity and quality of previous legislation: the propensity to pass more laws decreases non-linearly with the stock of existing legislation, but increases in the presence of a strategic "flagship law" that sets an overall framework for climate policy. Contrary to widespread belief, political orientation is not a decisive factor. We find no significant difference in the number of laws passed by left-wing and right-wing governments, except perhaps in Anglo-Saxon countries. However, left-leaning governments are more inclined to pass laws in difficult economic times. Despite these elements of bipartisanship, political economy factors still matter: In democracies climate laws are less likely to be passed immediately before an election and legislation is aided by a strong executive that can take on vested interests.

Keywords: climate change legislation, climate politics, political economy.

1. Introduction

Practically all major emitters of greenhouse gases (GHGs) now have in place laws to control emissions, conserve energy, avoid deforestation or promote cleaner forms of energy production. At the same time, those countries that are vulnerable to climate change are taking steps to prepare for its impact. At the end of 2013 there were close to 500 climate or climate-related laws on the statute books of 66 major economies. On average, these countries pass a climate change-related law every 18 to 20 months (Nachmany et al., 2014).

The urgency to address climate change, combined with the quantity of laws and policies now being issued, makes climate change one of the most important aspects of public policy and a key focus of environmental legislation. Understanding the domestic dynamics of climate legislation is therefore of academic interest in its own right. There is also a strong interest in this question from a practical policy perspective. The international climate architecture is now moving toward a system of *intended nationally determined contributions*, and it is domestic legislation that gives credibility to these. Moreover, additional domestic legislation may well be required to achieve global climate objectives.

Existing research indicates that the passage of climate laws is influenced by a combination of international factors, such as treaty obligations, and country-specific domestic factors, such as the institutional context or the energy-economic situation (Never and Betz, 2014; Falkner, 2013; Bernstein and Cashore, 2012; Busch et al., 2005 and Kern et al., 2001). Yet until now there has been no attempt to explain systematically and in a statistically robust manner what drives the growing inclination to legislate on climate change. The purpose of this paper is to help filling this

gap. Its focus is on the domestic drivers of climate change legislation. A parallel paper using the same data and similar methods examines international factors (Fankhauser et al., 2015).

To begin to understand what factors drive the adoption of climate legislation we use a powerful global dataset assembled over a series of climate legislation surveys (see Nachmany et al., 2014; Townshend et al., 2013; Townshend et al., 2011). The data cover legislative action between 1990 and the end of 2013 in 66 jurisdictions, constituting 65 countries and the European Union (EU) as a block. Together these jurisdictions are responsible for almost 90 per cent of global GHG emissions. The data also include countries which are among the most vulnerable to climate change. Although not perfect (as discussed below), the data set constitutes one of the richest sources of information about climate change legislation currently available (see Dubash et al., 2013 for a list of alternative data sets). The data set can be downloaded on the website of the Grantham Research Institute at the London School of Economics (<http://www.lse.ac.uk/GranthamInstitute/legislation/>).

The comprehensive nature of the data allows us study legislative dynamics econometrically and draw broadly valid, statistically rigorous conclusions. We use the data to test a number of hypotheses, which are either derived directly from the climate change debate (e.g., on the relevance of political orientation) or explore how findings from other areas of public policy apply to climate change (e.g., on the importance of a strong executive).

There have been some prior attempts at exploring the hypotheses we post. There is a considerable literature of qualitative comparative studies dealing with climate change policy (e.g., Never, 2012; Harrison and Sundstrom, 2010; Selin and van Deever, 2009; Compston and Bailey, 2008). There is also a quantitative literature exploring the political economy of narrower climate issues

(such as treaty ratification) or different environmental problems (e.g., von Stein, 2008; Fredriksson et al., 2007; Fredriksson and Gaston, 2000; Neumayer, 2002). However, to our knowledge there is as yet no global econometric assessment of the domestic drivers of climate change legislation.

In addition to these studies, other authors have conceptualised the political economy of environmental policy (Oates and Portney 2005, Congleton 1992 and Hahn 1990). They highlight the role of institutions and the political interaction between governments and interest groups. Lachapelle and Paterson (2013), Bernauer and Koubi (2009) and Fredriksson et al. (2005) test these theories empirically. Yet rather than focusing on the adoption of laws and regulations, as we do, they measure directly the impact of political factors, broadly defined, on particular environmental outcomes (such as GHG emissions or urban air quality).

Other work has explored the theoretical basis of policy formation and change. This is typically derived from either game-theoretic or empirical case studies. However, Knox-Hayes (2012) presents an option which combines these alternatives. Under her path-dependency and coalition stabilisation framework, theory alone cannot explain policy formation. Instead policy formation processes need to be placed into a context of a time-series of interactions between conflicting interest groups of varying political power. These interactions define a set of starting conditions for policy formation, from which groups negotiate iteratively until reaching a stable policy position. This position prescribes the direction of policy formation, or the 'way of events' (Capano, 2009).

These processes may occur within a context of 'meta-innovation'; which is the creation of situations within which institutional innovators operate (Crouch, 2005). Marcussen and

Kaspersen (2007) describe how during such processes of institutional change, stakeholders adopt a variety of new roles. Hence the creation of new climate policies and legislation may represent not only the outcome of a stabilised climate policy field (Knox-Hayes, 2012), but also the creation of an innovated institutional space that may facilitate further legislative development. These ideas are particularly relevant to our discussion of the catalytic role of flagship policies.

The global public goods nature of climate change control adds an important international dimension. Climate action is at least in principle subject to international coordination. The two dimensions of the problem are studied by Kroll and Shogren (2008), who model climate policy as a two-level game played at the national and international level. International factors driving the adoption of climate change legislation are discussed in more detail in Fankhauser et al. (2015). Here we restrict ourselves to acknowledging their importance and introducing the necessary control variables into our empirical analysis.

Our paper is also linked to the literature on economic policy reform, which explores similar questions in a different area of public policy. That literature too emphasises the crucial role played by political institutions (see for example Persson and Tabellini, 2000). It shows how the form of government and its ideology influences policy (Persson and Tabellini, 2003), and how the presence of veto players complicates policy implementation (Alesina et al., 2006). It also offers evidence of electoral cycles, with incumbent governments more likely to adopt favourable measures (such as tax cuts) ahead of an election (see for example Besley and Case, 1995 and Franzese, 2002). In our analysis we will explore whether climate change policy, like economic policy, is influenced by such political and institutional factors.

The rest of the paper is structured as follows. We start in section 2 with a description of the data set. Section 3 then introduces our research hypotheses and the empirical method, and section 4 provides the results. Conclusions are drawn in Section 5.

2. Climate legislation data

The fourth edition of the Globe Climate Legislation Study (Nachmany et al., 2014) identifies close to 500 climate change or climate change-relevant laws in the jurisdictions it covers (see Figure 1). The number of climate change laws per country varies from less than five in much of Africa and the Middle East to well over twenty in many European states, but also in Indonesia. Among the top five GHG emitters, the European Union has 27 active climate change laws, India has passed 10 climate laws and the US and Japan have eight climate laws a piece. China, the world's largest GHG emitter, has five climate change laws or equivalent acts.

The criteria for inclusion in the database are based at on a fairly broad interpretation of climate change legislation. Researchers seek out “laws or regulations of comparable status” (Nachmany et al., 2014) across a range of sectors, as set out below. As such, the database includes both Acts of Parliament and Executive Decrees, Presidential Instructions, and Policies. It is tempting to think of the latter as a softer form of legislation and in many instances this is the case. However, there are also parliamentary acts that are primarily aspirational, while executive orders like China's *12th Five-year Plan*, have strong legal significance. In line with Nachmany et al. we refer to both types as “laws” (Figure 2).

Laws were identified via government and ministry websites, country reports, policy briefs, library searches and in-country support from networks of researchers developed over three previous studies. A distinct feature of the surveys is that they are conducted in very close cooperation with

members of the parliaments concerned. The data for each country were peer-reviewed both by independent experts and (in most cases) an official reviewer nominated by the speaker or president of the legislature (usually a legislator, or legislative/executive official; see Nachmany et al., 2014 for details). We expect this process to reduce the probability of bias from omitted data.

The survey aims to cover all sectors and all laws that are relevant to climate policy. Specifically, the database includes laws dealing with the following issues (Figure 2):

- **Energy demand**, in particular energy efficiency, both in commercial and domestic settings; an example is Italy's 2010 *Special Fund to Support the Implementation of Energy Efficiency Targets*.
- Low-carbon **energy supply**, often aimed at renewable energy, such as Germany's *Renewable Energy Sources Act*, which was first passed in 2008 and amended periodically since.
- Curbing carbon emissions through **carbon pricing**, such as Japan's 2012 *Tax Reform Act*.
- Low-carbon **transport**; for example Argentina's 2007 *Decree 140*, which among other measures establishes minimum efficiency levels for new automobiles.
- Land Use, Land Use Change and Forestry (**LULUCF**), and Reduced Emissions from Deforestation and Forest Degradation (**REDD+**); an example is Indonesia's 2011 Presidential Instruction for a *Moratorium on Forest Concessions*.
- **Adaptation** to climate change, including for example, coastal defence and climate-related disaster management; Gabon's *National Climate Change Action Plan (Plan Climat)* for example contains a spatial plan to reduce vulnerability to coastal erosion.

- **Research and development** on climate change, to identify new products and practices, and/or increase local capacity for understanding climate change models and impacts; an example is Nepal's *Climate Change Policy*, a 2011 Executive Order, which sets as a target the establishment of a research centre for climate change research and monitoring.
- New **institutional arrangements**, to manage and support domestic responses to climate change and/or mainstreaming climate change management and financing; a good example is Bangladesh's *2009 Climate Change Trust Fund Act*, which establishes a new institutional framework to fund adaptation activity.

Most climate laws address more than one of these dimensions. For example, Jordan's 2010 *Renewable Energy and Energy Efficiency Law* deals simultaneously with energy supply and energy demand.

The most comprehensive laws often have an overarching, strategic character and constitute what Townshend et al. (2011) call “flagship” legislation. A form of omnibus legislation (Krutz, 2002), flagship laws are wide-ranging pieces of high-profile legislation that fundamentally defines a country’s approach to climate change. They often (though not always) establish a formal GHG emissions target, set up the necessary institutions and/or unify earlier climate policies under one umbrella. Examples include the French *Grenelle* laws (2009/10) and Mexico’s *General Law on Climate Change* of 2012.

Identifying a flagship law requires judgement, as they are not necessarily legislative acts of parliament. Ethiopia’s current flagship for example is the *Climate Resilient Green Economy Initiative*, a government plan adopted in 2011. We rely on the vetting process with

parliamentarians (described above) to designate laws that have sufficient strategic significance, although we acknowledge that this process probably erred on the side of inclusion.

There are other important caveats about the data set: it focuses on action at the national level, that is, it excludes state, province or city-level activities. This is a particularly significant omission in countries with federal structures, such as Australia, Brazil, Canada and the United States. Climate policy at sub-national level is fairly advanced in many of these jurisdictions. Similarly, for the 9 EU member states in the sample the database excludes laws that merely implement EU regulations. Since the EU is also covered as a block, only laws that go beyond EU requirements are included.

The data set does not include analysis of the quality or merit of individual laws (for example, the number of exemptions granted), the degree to which a law has been implemented or enforced, nor the eventual effect it might have had.

A particular problem for our study is that when laws are amended the database only records the latest version, thus omitting earlier activities. Legal provisions are often tightened over time (as for example Switzerland did with its *CO₂ Act* in 2013), but there are also cases of reversal (such as the repeal of Canada's *Kyoto Implementation Act* in 2012 and Australia's *Clean Energy Act* in 2014). In each case, these events supersede earlier entries.

3. Hypotheses and analytical method

The climate legislation study constitutes a panel data set of climate action in 66 jurisdictions over 24 years, 1990-2013. This large number of data allows us to adopt a quantitative, statistical

approach, which can complement more qualitative comparative studies. We had to exclude three jurisdictions (the EU, the Federated States of Micronesia and the Maldives) as well as laws passed in 2013, as data were not available for all explanatory variables. The EU, as a super-national organisation, would in any case have different legislative dynamics than nation states (see Jordan and Lenschow, 2000). However, this still leaves us with over 1,400 country-year observations (63 countries over 23 years).

3.1 The model

We use the data to estimate different versions of the following equation:

$$y_{it} = \alpha + \beta \mathbf{D}_{it} + \gamma \mathbf{X}_{it} + \theta_i + \nu_t + \varepsilon_{it} \quad (1)$$

where y_{it} represents the total number of climate change laws adopted in country i at year t , excluding flagship laws which are counted separately. The vector \mathbf{D}_{it} indicates the domestic factors of interest, which influence the adoption of climate laws, while vector \mathbf{X}_{it} contains a set of control variables. The controls include international factors, such as the effect of international treaties and international policy diffusion (see Fankhauser et al., 2015 for details), the strength of democracy and GDP per capita, which controls for the level of economic development.

We also include a full set of country and year fixed effects (θ_i and ν_t) and a random error term ε_{it} . The country effect controls for time-invariant factors such as different legislative cultures or a country's vulnerability to (and therefore concern with) climate change. We know from qualitative studies that these factors are important, but they do not vary much over time and would therefore be hard to disentangle. The time fixed effect controls for inter-temporal trends that are uniform across countries, such as developments in climate science.

The full list of explanatory variables and additional controls is provided in Table 1, with additional descriptive statistics in Table 2.

3.2 Research hypotheses

We use the model to test five hypotheses. The first three are derived specifically from the recent debate about climate change and the climate change literature. Hypotheses four and five have their origin in the broader literature on the political economy of public policy. Our aim here is to test whether pertinent findings extend to the particular case of climate policy.

Hypothesis 1. *The propensity to pass climate laws depends on the quality and quantity of existing legislation. While the passage of new laws decreases with the quantity of existing legislation, we expect more legislative activity in the presence of a strategic flagship law that provides overall direction for climate policy.*

This hypothesis explores aspects of path dependence and the role of strategic frameworks in climate legislation, which has been emphasised by Townshend et al. (2011). Climate change requires a continuing and enduring programme of policy making. We should therefore expect the stock of climate laws to increase over time, as policy makers deal with different aspects of the problem, and create contexts for policy development and innovation. However, one would also expect the need for further legislation to fall, perhaps non-linearly, as more areas are addressed by each additional law.

Following Townshend et al. (2011) we hypothesise that flagship laws are an important exception from this rule. Flagship laws are by definition fairly comprehensive pieces of legislation. However, they do not offer a complete treatment of all issues (which would imply fewer

subsequent laws). Instead, they establish institutional frameworks that facilitate and guide future policymaking. Legislative activity should therefore increase in the presence of flagship laws.

We test the hypothesis by looking at three variables (see Table 1): a country's existing stock of climate laws, the square of that stock (which tests for non-linearity) and a flagship dummy variable, which takes a value of 1 following the passage of flagship legislation. The definition of a flagship law is taken from Nachmany et al. (2014).

Hypothesis 2. *Climate change legislation is affected by the business cycle, although the direction of the effect is unclear a priori.*

Climate policy over recent years, particularly in Europe, has been affected by the economic crisis of 2008 and its aftermath. The economic slowdown has had a detrimental effect on existing policies, such as the EU Emissions Trading Scheme (Neuhoff et al., 2015). It has also triggered a debate about the scope for climate policy in difficult economic times.

There are two sides to the argument. On the one hand, concern for the environment may have less political traction during a recession, when issues like growth and employment take centre stage. There is evidence that interest in the environment tends to wane in difficult economic times (Kahn and Kotchen, 2010). On the other hand, green investment can be an effective fiscal stimulus, as argued forcefully by Zenghelis (2012). Many climate investments meet closely the criteria for an effective fiscal stimulus (Bowen and Stern, 2010; Bowen et al., 2009; see Fischer and Springborn, 2011 for a broader discussion), which could make them an attractive policy option during economic crises.

Most aspects of the business cycle that are relevant to this debate – output, investment, employment, fiscal balance – are pro-cyclical. That is, their movements are correlated. For our purposes it is therefore sufficient to include just one business cycle variable, and we choose one that is widely used in macroeconomics. The cyclical component of GDP, calculated by employing a Hodrick-Prescott filter (see e.g. Doda, 2014), measures the deviation of GDP from its long-term structural trend. If the variable is significant we can draw conclusions on which of the two *a priori* effects is dominant in practice. Separately, we also explore whether attitudes to the economic cycle depend on political orientation by interacting the business cycle variable with the political orientation dummy (see Tables 1, 2).

Hypothesis 3. *Left-wing and right-wing governments have different attitudes to climate change legislation. Specifically, we expect left-wing governments to be more inclined to pass climate legislation.*

A striking feature of the climate change debate over recent years has been the rise in climate scepticism within right-of-centre political parties, certainly in Anglo-Saxon countries (see McCright and Dunlap, 2011a, b; and Painter and Ashe, 2012). Earlier studies have found that left-of-centre governments are generally more inclined to legislate on the environment (Neumayer, 2003). Although the impact of party politics on environmental policy can be complex (Folke, 2014), we should therefore expect different trends in climate legislation depending on the political orientation of the parties in power (which in turn reflects the political views of voters, see Lee et al., 2004).

We test this hypothesis by including a political orientation dummy, which takes a value of 1 for left-wing governments and 0 for centre or right-of-centre governments (see Tables 1, 2). The data

are from the World Bank dataset of political institutions (DPI), originally compiled by Beck et al. (2001) and updated in 2012.

Hypothesis 4. *Like other areas of public policy, climate change legislation is affected by the electoral cycle. We expect fewer new laws in the year immediately before and in the year of a general election.*

Electoral cycles have been observed in other areas of public policy, where controversial measures are often avoided ahead of an election (Besley and Case, 1995; Persson and Tabellini, 2003; List and Sturm, 2006). Although climate policy can entail a variety of measures, not all of which are equally controversial (e.g. energy efficiency support vs. a carbon tax), we expect the same pattern to hold for climate legislation.

We test the hypothesis by including separate dummy variables for the year of a general election and the year immediately before an election. The data again come from the World Bank database of political institutions (after Beck et al., 2001). Arguably, the hypothesis is more pertinent to strong democratic systems and we test this by interacting the election year variable with a democracy dummy (derived from the polity2 variable in the Polity IV data set, see Tables 1, 2).

Hypothesis 5. *Strong governments find it easier to pass climate legislation. We therefore expect more laws at times when the ruling party has a clear parliamentary majority.*

Climate policy engenders strong political views and the response of powerful vested interests. As in other areas of public policy (Alesina et al., 2006; Persson and Tabellini, 2003), we would expect a strong and unified executive to be better able to deal with these pressures. All else equal,

strong governments that enjoy a majority in parliament can therefore be expected to pass more climate legislation.

We test the hypothesis through a “unified government” dummy, taken from the World Bank DPI, which assumes a value of 1 if the party of the executive has an absolute majority in all relevant chambers of the legislative. This follows Alesina et al. (2006), although we acknowledge that the size of that majority may also matter (Fredriksson et al., 2011).

3.2 Estimation strategy

In our main calculations we estimate equation (1) with general (non-flagship) laws as the dependent variable, using a negative binomial fixed effects model, where the log of the expected count is a function of the predictor variables.

The count model is suitable since we are dealing with a count dependent variable characterized by over-dispersion (i.e. the mean is lower than the variance) and events (the passage of laws) that a country can experience more than once (Allison and Waterman, 2002; Cameron and Trivedi, 1998, 2010). These features prevent the use of hazard models, which have been employed to study policy adoption elsewhere (e.g., Berry and Berry, 1990, 1992). The negative binomial is also best suited to deal with the large number of zero entries (i.e. country-years without legislative action), which represent about 80 per cent of all observations.

We will comment mainly on the sign and the significance of different variables, but the negative binomial regression coefficients also have a numerical meaning. They are semi-elasticities, that is, they measure the change in the log of expected law counts when the predictor variable changes by one unit, keeping other predictor variables constant.

We run several robustness checks to support the main results. First we provide results from an alternative to the negative binomial, the Poisson fixed effects model, which is also suitable to analyse count data. The Poisson model is a special case of the negative binomial (when the over-dispersion parameter is close to zero). If data are over-dispersed the negative binomial is generally a better estimator, and it also deals with the excess of zeros. However, the Poisson with robust standard errors can still account for some degree of over-dispersion. It is therefore a useful robustness check.

A second robustness check corroborates the role played by flagship legislation (hypothesis 1). Flagship laws are a special type of legislation and to verify their effect we run a “placebo test”, whereby the flagship variable is replaced by a dummy for a randomly chosen non-flagship law. The expectation is that the flagship variable would be statistically significant, but not the placebo variable.

A third robustness check uses a sharper delineation between democratic and non-democratic systems to highlight the different legislative dynamics in democracies. We run a restricted sample, which only includes full democracies (defined as having a *polity2* score of 6 or more) and autocracies (with a *polity2* score of -6 or less). Countries with semi-democratic systems (scores between -5 and +5) are excluded. Although the predictive power of this regression is weaker, given the smaller sample size, it allows for a clearer distinction in democratic practices.

In addition we will report in passing on additional checks and alternative specifications, which we used to corroborate the main results.

4. Empirical results

Our core results are shown in Table 3. The most basic regression (column 1) excludes interaction terms and specifies democracy as a continuous variable over the full range provided by *polity2* (see Table 2). In column (2) we include two interaction terms and democracy is defined as a dummy variable, which takes value one if a country is a democracy (has a *polity2* score of 6 or more). The results of the robustness checks are shown in Table 4.

4.1 The role of existing legislation (hypothesis 1)

The results on the role of existing climate laws are as anticipated, and we cannot reject hypothesis 1. Climate legislation exhibits an element of path dependence, as predicted. A larger *stock* of climate laws reduces the propensity to legislate further. This quantity effect is non-linear and levels off over time; the square term is also significant. However, we find that the *nature* of laws also matters. The presence of prior flagship legislation is a strong determinant of subsequent climate action. The flagship dummy is positive and significant in all regressions in Table 3.

The robustness checks corroborate these results (Table 4). The findings are not affected by the choice of a Poisson model (column 1), and the placebo test is also conclusive (column 2): The relevant coefficient becomes insignificant if we replace the flagship laws identified in Nachmany et al. (2014) with random (placebo) laws. We further experimented with stricter definitions for flagship legislation (e.g., by focusing on legislative acts only or excluding policies). The results are consistent, although because of the smaller number of flagships they are weaker and the effect becomes insignificant.

The findings underline the significance of a strategic approach to climate policy. The flagships are often among the first policies to be promulgated or issued by a country, indicating a stabilised policy field (Knox-Hayes, 2012), and constituting a non-linearity in policy making (Capano,

2009). With their breadth many flagship laws constitute a form of omnibus legislation. These are 'must-pass' laws that combine numerous measures from different policy areas into one piece of legislation (Krutz, 2002). This has the effect of 'suffocating' the constituent elements of the legislation such that each receives relatively little scrutiny, thus providing a means to govern on a controversial issue in a difficult political context.

Flagship laws create a space for subsequent negotiation and policy formation. Once a general climate change framework is set, the nature of subsequent legislation may change, as countries move from policy design to implementation (Townshend et al., 2011). We cannot test this claim statistically, but there is anecdotal evidence in its support. For example, in the UK the 2008 *Climate Change Act*, which sets mandatory medium and long-term carbon targets, was followed by the 2013 *Energy Act*, which adjusted energy market arrangements in light of the new commitments.

4.2 The role of the business cycle (hypothesis 2)

We offer two competing explanations about the impact of economic factors on climate legislation. One explanation suggests a negative correlation with the business cycle: voter interest in climate policy wanes in difficult times. The second explanation suggests a positive relationship: certain climate investments may be attractive as a fiscal stimulus for a sluggish economy. The results in Tables 3 (and the robustness checks of Table 4) do not allow us to identify which of the two effects dominates. The business cycle variable is insignificant, perhaps because the two effects are of similar size and cancel each other out.

However there is one significant result, which concerns the interaction of the business cycle variable with the left-wing dummy for political orientation (Table 3, column 2). The term has a

negative sign, which suggests left-wing governments are more inclined than right-wing governments to pass climate legislation in difficult economic times.

It would be dangerous to over-interpret this result. The finding probably reflects wider differences in the approach to economic management between left-wing and right-wing parties. However, it is possible that left-leaning politicians, who tend to have greater confidence in Keynesian counter-cyclical policies, might also have a greater belief in green investment as a potential fiscal stimulus, as argued by Zenghelis (2012). Anecdotal support for this claim comes from the UK. At the height of the global economic crisis in 2009, the centre-left Labour government passed the *Community Energy Saving Programme*. This aimed at improving energy efficiency in low-income households, and was also a good stimulus measure. The government had internal targets about the green component of its stimulus package at the time.

4.3 Party-political orientation (hypothesis 3)

Contrary to initial expectations, we do not find a difference in legislative activity between left- and right-wing governments in Table 3. The political-orientation dummy is not significant, which leads us to reject hypothesis 3. The result is robust to our sensitivity checks (Table 4) and to separate experiments with split-sample regressions that focus solely on periods of left-wing or right-wing administration.

It appears that climate policy is, in general, a fairly bipartisan affair. This is consistent with the observation of Townshend et al. (2011) that flagship laws are frequently passed with bipartisan support. The UK's flagship law, the *Climate Change Act* of 2008, for example, was passed under a Labour government, but with near unanimous support from all political parties (Fankhauser, 2013).

There are of course differences in approaches to climate policy between left-wing and right-wing governments, but they do not concern the propensity to legislate (i.e., the overall number of laws). They might instead concern the choice of policy instruments, the role of targets or attitudes to particular technologies (such as nuclear energy). We have already seen that left-wing governments also respond differently to the economic cycle. Fankhauser et al. (2015) further find that right-wing governments are more susceptible to external reputation effects, issuing more legislation than left-wing governments after hosting a global climate summit.

Our results seem at odds with the well-documented evidence of right-wing climate scepticism in Anglo-Saxon countries (McCright and Dunlap, 2011a, b; Painter and Ashe, 2012). To test whether these countries have different party-political dynamics, we ran the regression model with a highly restrictive sample of Anglo-Saxon countries only (Australia, Canada, New Zealand, UK and US). This sample is extremely small, therefore the results are not very robust. Yet they indicate a statistically significant difference between left and right-wing governments. The latter are less inclined to pass climate legislation. This suggests that right-wing climate-scepticism may be restricted to certain polities, and that within these it does indeed, affect climate legislation.

4.4 The electoral cycle (hypothesis 4)

At first glance, climate legislation appears to differ from other areas of public policy in that there is no evidence of an electoral cycle. The electoral cycle dummies in Table 3 are either insignificant or even positive. However, this is due primarily to the widely varying levels of

democracy observed in our study countries. While most of them are functioning democracies, the sample also includes some countries with very weak electoral systems. The mean score of the democracy variable in the sample is 5, a full point below the democracy threshold of 6 (Table 2).

If we distinguish different levels of democracy, we find that in well-developed democratic systems the electoral cycle does matter. This is shown by the significant and negative coefficient for the interaction term between the year-of-election and a democracy dummy (Table 3, column 2). We can therefore not reject hypothesis 3 in this narrower sense. The robustness check with a tighter democracy definition (democracies vs autocracies; Table 4, column 3) corroborates the result.

The finding implies that climate legislation is not generally seen as a vote winner. It seems that in the climate change policy mix of most countries, the balance between voter-pleasing schemes (e.g. subsidies for energy efficient homes) and controversial measures like new taxes is tilted towards the latter.

The public debate on climate policy is indeed framed predominantly negatively in terms of the impact climate action might have on fuel poverty and business competitiveness (see Fankhauser, 2013). Attempts to frame the debate in terms of new growth opportunities or other side-benefits are rare. A notable example is South Korea's flagship climate change law, the 2009 *Framework Act on Low Carbon Green Growth*. The Act seeks to position the country as a future leader in the emerging green economy. Green growth also features in Rwanda's *National Strategy on Climate Change and Low Carbon Development* of 2011, but these tend to be the exceptions.

4.5 The strength of government (hypothesis 5)

Our results are consistent with the view that strong government is important for climate legislation. The unified-government variable is significant and positive in all regressions (Tables 3, 4). Hypothesis 5 cannot be rejected.

Governments with a majority in all chambers of the legislature find it easier to legislate and are likely to pass more laws overall, not just laws related to climate change. However, the often contested nature of climate policy makes a strong executive particularly important in the climate change field. Of course, there is lobbying both in favour and against climate action, and the government effect may cut both ways. Fredriksson et al. (2007) found that the combination of a corruptible government and a strong environmental lobby significantly accelerated ratification of the Kyoto Protocol.

Even with a strong government one would expect the adoption of climate change laws to be influenced by lobby groups. We find some evidence of this in our data. There is a significant positive correlation between the stock of climate change laws in a country and the number of national member organisations in the International Union for the Conservation of Nature (pearson correlation= 0.31, $p=0.01$). Conversely, the stock of laws is negatively correlated with the share of fossil fuel and mining exports in a country, although that relationship is not statistically significant (pearson correlation= -0.18, $p=0.16$). Whilst this is not conclusive evidence of the effect of lobbying, it underscores the important role that special interest groups can potentially play in climate change legislation.

5. Conclusions

Climate change is a global problem that requires an international response. However, the domestic actions of nation states and subnational entities are receiving increasing attention. This

is because international commitments need to be backed up by domestic action to be credible. Furthermore, global climate policy is moving toward an international agreement that is built “bottom up” from countries’ domestic commitments, rather than a binding global treaty.

The climate legislation data we use paint a picture of increasingly widespread national action on climate change (see Figure 1 above). The laws are motivated by a combination of international factors and domestic political economy considerations. This paper only focuses on the latter, but we recognise that both aspects are important and that there are (as yet under-researched) synergies between them. We also recognise that the main driver for legislation is not always exclusively or even primarily concern about anthropogenic climate change. Many laws are couched in terms of alternative objectives like green growth, energy security or air pollution, sometimes wrapped within omnibus legislation.

We do not assess the environmental impact of individual laws, nor what the optimal level of climate change rule-making might be. We differentiate only between major policy non-linearities called 'flagship' legislation and all other laws. Otherwise, our data record only the total number of laws, with no quantification of their astuteness, scope or level of ambition. Differences in number may also simply reflect different legislative practices: what requires new legislation in one country (as climate policy did in the UK) may be addressed through existing regulation in another (as happened in the US). Regardless, climate change is the result of market failure (Stern, 2007), hence policy intervention is essential to achieve the socially desirable outcome. The growing number of climate laws is therefore encouraging.

A novel aspect of this paper is the use of a data set that seeks to comprehensively capture *all* legislation relevant to climate change. This has both advantages and disadvantages. On the one

hand, a global analysis can offer fewer nuances than the detailed case studies of comparative analysis. We also deal with a less tightly defined experiment than quantitative studies like von Stein (2008) and Fredriksson and Gaston (2000), who focus just on treaty ratification. This makes it harder to identify trends statistically. On the other hand, the results we do obtain are statistically robust and give rise to broad, externally valid conclusions. These allow us to explore some widely-held beliefs about climate policy.

One such belief is that climate change is primarily a left-wing political issue. Whilst there is evidence that a climate-sceptic right has affected the passage of climate change legislation in countries like Australia, Canada and the US, in global terms right-wing climate scepticism appears to be a predominantly Anglo-Saxon phenomenon. Looking across all countries we find that climate change is in fact a strongly bipartisan concern. Although there are differences in emphasis, we find no significant difference between left-wing and right-wing governments in terms of overall climate legislation.

Similarly, we find no evidence that the recent economic crisis has affected the number of climate change laws, although we can hypothesise that it might have changed their ambition. In some cases, low-carbon investment might even be seen as a potential fiscal stimulus, particularly by left-wing governments, which tend to have a more interventionist approach to economic policy.

Despite its international dimension the political economy of climate legislation appears to be very similar to other types of public policy. Climate change engenders strong views and meaningful policies in areas like energy or deforestation will meet powerful vested interests. The adoption of climate laws is therefore aided by a strong executive that is able to successfully challenge interest groups. Yet even strong governments are reluctant to pass climate laws immediately before an

election. In this respect climate change is not different to other reform efforts, and we were able to corroborate the pertinent results from other areas of public policy (Besley and Case, 1995; Persson and Tabellini, 2003; List and Sturm, 2006).

Perhaps our most important finding is the powerful effect of adopting a strategic approach to climate legislation. Our data identify an overarching flagship law in most study countries. The development of flagship laws constitutes an initial radical change, around which actors have coalesced to negotiate a path of policy formation. The presence of flagship legislation is therefore a powerful predictor of further climate legislation, creating consensus and clarity about the future direction of travel.

This suggests an element of path dependency in climate change policy. However, a key element of path dependency is irreversibility. The notion of irreversibility in climate change policy is undermined somewhat by the experience of Canada and Australia, both of which have repealed flagship legislation in recent years (Townshend et al., 2013; Nachmany et al., 2014). Nonetheless, we suggest that the legislative trajectories of even these outlier countries have still been altered.

Important research questions remain. There is scope for further analysis to establish how political economy factors, like pressure groups, manifest themselves in different institutional contexts and how they affect not just the quantity, but also the quality of legislation. For example, there is a suspicion that industry pressure tends to result in excessively generous compensation settlements (e.g. Martin et al., 2014).

Similarly, creating a legal basis for climate change policy is only the first step. Laws on the statute books are not perfectly implemented, since enforcement is moderated by domestic institutional conditions (see Collins et al., 2011 for a forestry example). This paper does not

assess the quality of legal provisions nor progress in their implementation. Nor do we have much to say about the success or failure of different legislative approaches. These are important topics for future research. From a normative point of view, there is a need for more evaluative and comparative assessments to establish the relative merit of different legal and policy approaches. Policy makers would like to know which approaches work and which ones do not.

The political economy of climate legislation needs to be better understood. We believe our results help both to highlight this important area of public policy, and to provide a nascent understanding of its domestic drivers.

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The political economy of passing climate change legislation: Evidence from a survey

Tables and Figures

Table 1. Variable definitions

All_laws (count)	Number of laws passed in a country in a given year
Flagship law	dummy=1 for each country passing a flagship law in the year of the pass and following years.
Domestic Stock	Total number of laws passed in a country until time t-1
Domestic_sq	Square of the Domestic Stock
Business cycle	cyclical component of the Hodrick-Prescott filtered log of real GDP
Year of an election	dummy=1 in the year of elections
Year before an election	dummy=1 in the year before the elections
Unified government	dummy=1 when the party of the executive has an absolute majority in the houses that have lawmaking powers
Left-wing government	dummy=1 for left-wing governments
Democracy	Polity2 score taking values -10 to 10 (increasing in the level of democracy)
Host	dummy=1 for each country hosting a meeting, in the year of the meeting and in the two years after
Policy Diffusion	number of laws passed in all other countries until time t-1
Kyoto	dummy=1 for the four years after Kyoto (1998-2001)
logGDP	log of real gdp per capita

Table 2. Descriptive Statistics

Variable	mean	Sd	min	Max	Observations.
All_laws (count)	0.2532	0.6174	0	5	1,449
Flagship law	0.1601	0.3668	0	1	1,449
Domestic Stock	1.6125	2.4966	0	23	1,386
Domestic_sq	8.829	32.3979	0	529	1,386
Business cycle	~0	0.1194	-.7338	.4351	1,447
Year of election	0.2104	0.4077	0	1	1,449
Year before election	0.2106	0.4079	0	1	1,449
Unified government	0.4320	0.4955	0	1	1,449
Left-wing government	0.3409	0.4741	0	1	1,449
Democracy	5.0241	5.9256	-10	10	1,447
Host	0.0379	0.1911	0	1	1,449
Policy Diffusion	99.2178	100.6524	2	334	1,386
Kyoto	0.1739	0.3791	0	1	1,449
logGDP	8,4003	2,3854	4.463	23,2697	1,447

Note: The statistics refer to country-year observations

Table 3. Analysis of climate legislation: All laws (years: 1990-2012). Model: Negative Binomial Fixed Effects.

VARIABLES	(1)	(2)
Flagship law	0.429* (0.244)	0.461* (0.253)
Domestic Stock	-0.339*** (0.081)	-0.328*** (0.086)
Domestic_sq.	0.012*** (0.003)	0.012*** (0.003)
Business Cycle	-0.153 (0.647)	0.348 (0.727)
Year of election	0.000 (0.138)	0.548** (0.216)
Year before election	-0.100 (0.147)	-0.116 (0.148)
Unified government	0.609** (0.272)	0.550** (0.270)
Left-wing	0.079 (0.216)	0.068 (0.217)
Democracy ^a	0.089* (0.046)	0.728* (0.391)
Democracy*Y_Election		-0.646** (0.265)
Left*Business_cycle		-1.518* (0.879)
Full set of control variables	YES	YES
Country FE	YES	YES
Year FE	YES	YES
Obs.	1,273	1,273

Clustered standard errors at the country level in parentheses *** p<0.01, ** p<0.05, * p<0.1. Control variables included: Policy Diffusion, Kyoto, Host, log of GDP.

^a Democracy is a continuous variable (Polity2 score) in regression 1 and a binary variable in regression 2.(1 for a score of 6 or higher, 0 otherwise)

Table 4. Robustness checks on the analysis of climate legislation: All laws (years: 1990-2012).

VARIABLES	Poisson Model (1)	Placebo on Flagship (2)	Democracy vs Autocracy (3)
Flagship law	0.461* (0.251)	0.014 (0.319)	0.308 (0.268)
Domestic Stock	-0.328*** (0.085)	-0.311*** (0.089)	-0.305*** (0.080)
Domestic_sq.	0.012*** (0.003)	0.011*** (0.003)	0.011*** (0.003)
Business Cycle	0.348 (0.721)	0.170 (0.991)	0.884 (0.783)
Year of election	0.548** (0.214)	0.464* (0.260)	0.425 (0.262)
Year before election	-0.116 (0.147)	-0.076 (0.137)	-0.046 (0.154)
Unified government	0.550** (0.268)	0.617** (0.300)	0.598** (0.300)
Left-wing	0.068 (0.215)	0.171 (0.203)	0.028 (0.219)
Democracy	0.728* (0.388)	0.683 (0.540)	1.765*** (0.486)
Democracy*Y_Election	-0.646** (0.263)	-0.612** (0.303)	-0.492* (0.287)
Left*Business_cycle	-1.518* (0.871)	-1.427 (1.010)	-2.038** (0.961)
Full set of control variables	YES	YES	YES
Country FE	YES	YES	YES
Year FE	YES	YES	YES
Obs.	1,264	1,273	1,018

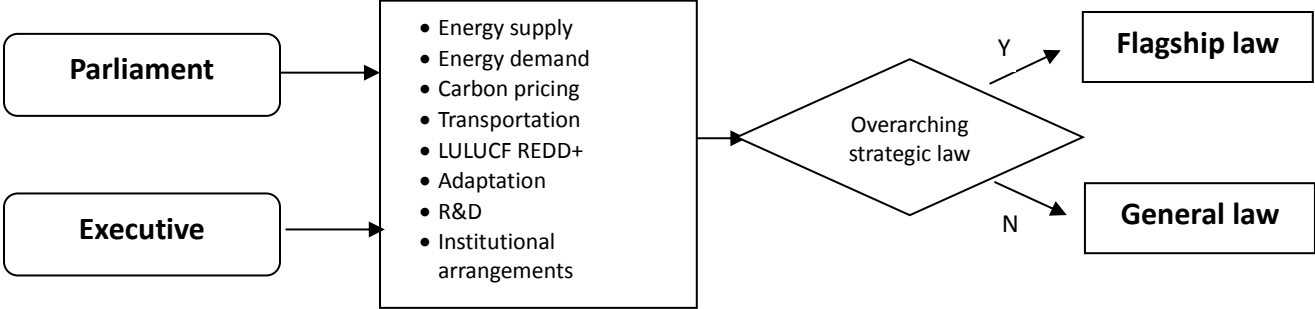
In column (1) robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. In columns (2) and (3) clustered standard errors at the country level in parentheses *** p<0.01, ** p<0.05, * p<0.1. In all columns control variables included: Policy Diffusion, Kyoto, Host, log of GDP. The democracy variable is binary (value of 1 for a polity2 score ≥ 6 ; value of 0 for a score < 6 in columns (1), (2) and ≤ -6 in column (3)).

Figure 1. Number of climate change laws at end-2013



Source: Nachmany et al.(2014)

Figure 2: Schematic of climate change laws in the database



Source: own chart, based on Nachmany et al. (2014)